CALIFORNIA ZERO-EMISSION APPLIANCE AWARENESS STUDY

What Californians Think About Zero-Emission Appliances, What They Do Not Know (Yet), and What This Means for California's Climate and Air Quality Goals

Results from Quantitative and Qualitative Research among Consumers, Landlords, and Builders in California

October 30, 2023

CALIFORNIA AIR RESOURCES BOARD

SOUTHERN CALIFORNIA EDISON®
Energy for What's Ahead℠

Research conducted by Pacific Consulting Group
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EXECUTIVE SUMMARY

California has proactively set some of the most ambitious climate, air quality, and clean energy goals in the country. The California Air Resources Board and Southern California Edison recognized the need for robust primary research among key decision-makers to help California achieve the state's ambitious climate goals – specifically through the adoption of zero-emission appliances such as heat pump water heaters, induction stoves, central heat pumps, mini-split or ductless heat pumps, and heat pump clothes dryers. To that end, three surveys were conducted by Pacific Consulting Group – one each among Californian consumers (including both homeowners and renters), builders in California, and landlords in California – with a series of 16 in-depth interviews employed among builders and landlords.

The research shows that in principle, homeowners and renters are on board (as shown in the reasons below), across demographic groups and audiences, but there is more work to be done to increase awareness that leads to adoption. Builders in California, and to a lesser degree landlords in California, are more aware of environmentally friendly options, but they need buy-in and expressed permission from consumers, whose preferences have a direct effect on their bottom lines.

Key findings from the research include, but are not limited to, the following:

1. **Californians hold pro-environmental views. This benefits those seeking zero-emission appliance/system adoption.** Californian consumers care about their environment and are tuned in to the potential impact of climate change (58% say issues related to the environment and climate change are at least very important). There are significant gaps in this perception by age (54% among 65+ vs. 61% among 18-29), income (57% <$50K vs. 67% $150K+), and education level (50% high school education or less vs. 67% college education or more). However, concern about climate change does not inherently mean Californians are thinking about the environmental implications of their appliance, water heating, and HVAC equipment upfront selection and usage as much as they should. Though a majority (55%) say they think about the environment when deciding what to

buy, only 23% said the type of energy source used to power their appliances/systems was very important during their most recent home search. Advocates need to understand, when communicating, that pro-environmental attitudes are a starting point, but do not drive the entire decision.

2. **Consumers are confused and often misinformed about the benefits of gas vs. electric – especially the financial benefits.** Consumers are unsure about just how different gas and electric appliances are and have trouble assessing, for example, whether electric or gas appliances are more expensive, whether switching from gas to electric would affect the environment, or whether gas stoves have a detrimental effect on indoor air quality. When asked to judge the veracity of eight different statements about electric and gas appliances, anywhere from 35% to 58% say they have no idea whether the statement is true or false. Perhaps most critically, consumers were +19 percentage points more likely to (incorrectly) think that the statement "on average, electric appliances/systems are more expensive to purchase than gas appliances/systems" was true), despite the fact that electric appliances/systems are not universally more expensive (and can be less expensive). Advocates for change must effectively communicate the true economic advantages to consumers.

3. **Consumers have much to learn about electric appliances.** Familiarity levels for electric appliances among consumers are relatively low, leaving room for education. While between 18% and 24% say they are very or extremely familiar with each of the five tested appliances/systems, a majority say they are only slightly familiar or not familiar at all for each. There is a clear gap between renters and owners, with renters more likely to be unfamiliar (by 3 percentage points to 17 percentage points, depending on the appliance/system.) With millions of Californians likely to upgrade their appliances, or have their appliances upgraded, in the next few years, advocates must act urgently to educate them on the merits of these systems/appliances before their next decision points.

4. **Builders and landlords are more informed, and they prefer electric appliances/systems to gas in nearly all scenarios.** Builders are even more likely to say their buyers prefer electric appliances/systems than landlords say about their renters. Between 63% and 77% of builders were very familiar with each appliance/system, as were between 44% and 54% of all landlords. Some of these preferences may be due to increased knowledge and familiarity with additional options, as those who mentioned having to abide by laws and regulations, or having taken part in incentives, are more familiar with these appliances/systems. In one-on-one interviews, those who preferred electric appliances/systems cited reasons around safety as particularly noteworthy, as such systems would not be vulnerable to gas leaks or cracked pipes after earthquakes.

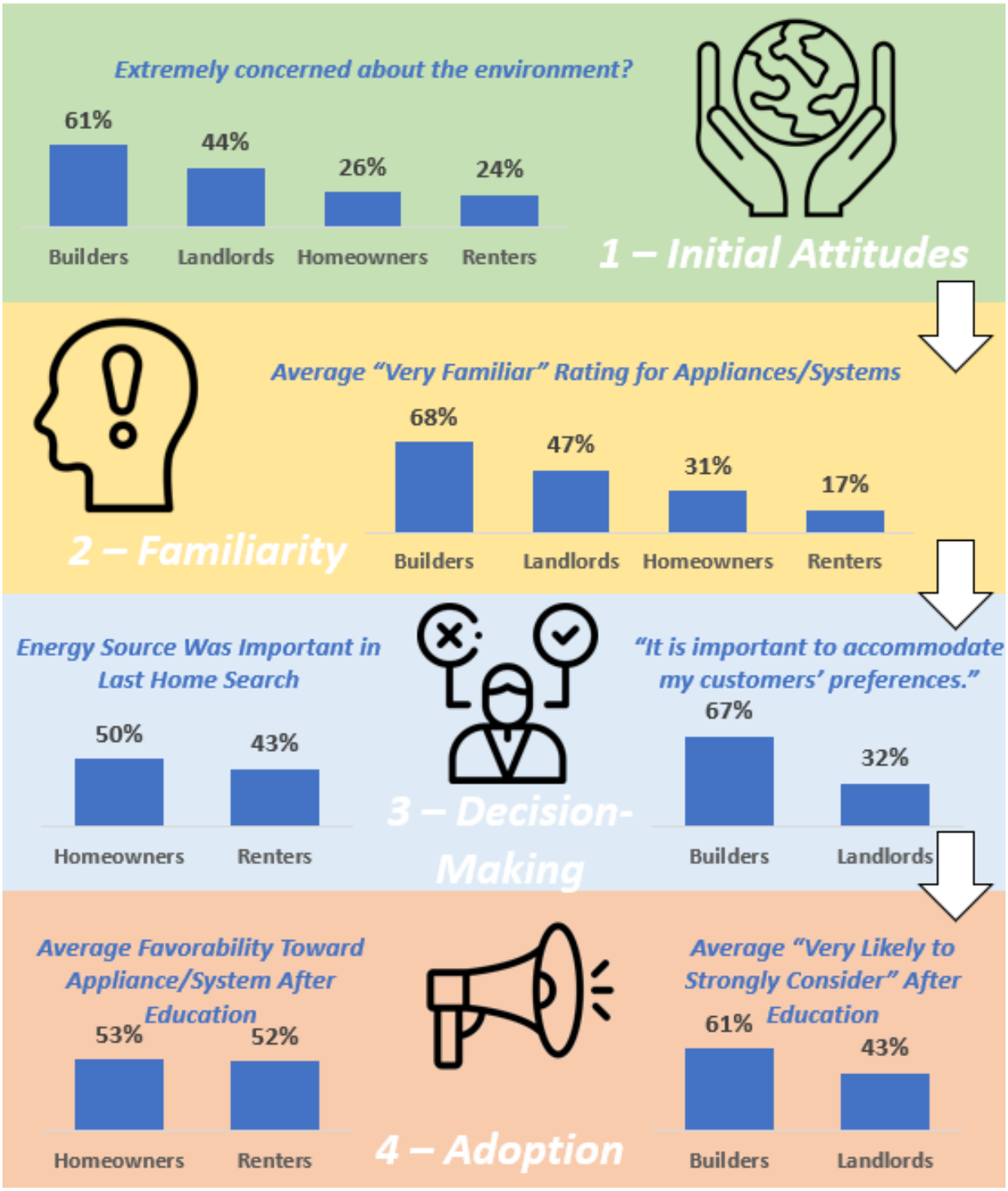
5. **Educating consumers around how these appliances/systems work and benefit consumers is likely to be successful.** Despite low levels of information, Californians become favorable toward electric appliances as they learn more over the course of the survey. Even after learning a few basic facts, a majority say they are at least somewhat favorable toward induction stoves, central heat pumps, heat pump clothes dryers, and heat pump water heaters (with mini-split or ductless heat pumps close at 49%). In each case, fewer than one-in-five are unfavorable. Additionally, younger Californians, those with the highest levels of income, and those with the highest levels of education, are even more likely to say they are very favorable post education.

6. **Education of builders and landlords is also likely to be successful; however, robust incentives are necessary to help defray the expenses.** Around 90% of builders and 80% of landlords are at least somewhat likely to consider purchase of each electric appliance/system (heat pump water heaters, induction stoves, central heat pumps, mini-split or “ductless” heat pumps, and heat pump clothes dryers) upon learning more. In interviews, builders and landlords point out that the primary barrier to switching from gas to electric is cost, and that incentives or rebates would help motivate them to advocate for, and install, more electric appliances/systems.

7. **The most effective messages for consumers appeal to economic and health considerations, rather than purely environmental considerations.** The seven top messages for adoption of electric systems/appliances among consumers were: "Electric powered systems and appliances use less energy" (57% said this was convincing), "Electric-powered systems and appliances are more reliable" (56%), "Electric systems and appliances last longer compared to gas-powered ones" (55%), "I can receive a rebate for the purchase of an electric-powered system or appliance" (55%), "Electric powered systems create less air pollution and are better for my family's health" (55%), "It would save me money over time" (53%), and "Electric-powered systems reduce my home's carbon footprint and environmental impact" (53%). Demographically, younger Californians are more receptive to messages than older Californians, especially around electric-powered systems creating less pollution and being better for their family's health, being easier to fix or service, and lasting longer. Low-income Californians react more favorably to messages around lasting longer. While each demographic group has different messages which resonate more strongly, most benefits are best received when framed economically.

Detailed findings follow.

Four Stakeholders, Four Steps
Key Data Points Along Their Journey



PURPOSE AND METHODOLOGY

We employed a two-phase, quantitative/qualitative research design. The goal was to gain a full understanding of the ways in which Californian homeowners, renters, builders, and landlords were thinking about electric appliances, as well as how their attitudes, perceptions, and awareness could be leveraged by those seeking to affect environmentally-friendly behavior change. Ultimately, this study will help begin such a dialogue about that behavior change.

This study assessed four elements of generating buy-in to using or adopting electric appliances:

- Attitudes toward the environment, climate change, and energy sources
- How homeowners, renters, builders, and landlords make decisions when deciding which appliances to install, replace, or upgrade
- Current levels of awareness of different electric appliances/systems (specifically heat pump clothes dryers, heat pump water heaters, ductless heat pumps, central heat pumps, and induction stoves), current levels of usage of those appliances/systems, and what misconceptions exist about the decision to install electric or gas appliances
- How more education or messaging on the benefits of these appliances, as well as electric solutions more generally, impacted these audiences

Four Decision-Makers in California

Throughout this study, four primary audiences are given special attention, given how impactful the results of their appliance-buying and upgrading decisions are:

- *Homeowners*: Consumers who make decisions as to what appliances and/or systems will heat or cool their air and water, dry their clothes, and cook their food, and feel the impact of those decisions on a daily basis.
- *Renters*: Consumers who may or may not have input into what appliances and/or systems will heat or cool their air and water, dry their clothes, and cook their food, yet feel the impact of those decisions on a daily basis.
- *Builders*: Those who build homes or units in California, who balance many factors (economic, client preference, environmental) as they decide what types of appliances and/or systems to install for a potential owner they may never see again.

- *Landlords*: Those who own and lease out units in California, who also balance many of the same factors as builders as they decide what types of appliances and/or systems to install or upgrade, though with different customer bases and more of an on-going relationship with their tenants.

Taken together, understanding the attitudes, awareness levels, usage levels, and responsiveness to messaging and education for these four significant audiences starts to piece together the ways in which California can act to achieve decarbonization goals.

In addition to looking at consumers overall, and by the basic split of homeowner vs. renter, these analyses identified differences in attitudes, awareness, and usage levels by age, income-level, and opinion on climate change. Additionally, other consumer subgroups – such as race/ethnicity, geography, gender, and others – are cited as well when the difference is informative or insightful.

Note that the sample size for both builders and landlords does not allow for the same depth of analysis as that of consumers.

Research Design Development

The research instruments – questionnaires for each of the surveys and a discussion guide for the in-depth interviews – were written with several goals in mind. They adhered to best research practices when capturing feedback with regard to wording, question order, randomization, and other techniques that are employed to ensure consumers' opinions are accurately being captured. The questionnaires were further refined and validated by a number of cognitive testing interviews to ensure the language, questions, and usability of the questionnaire worked for respondents.

The sample design – particularly for the consumer audience in the survey – was constructed with a heavy emphasis on gathering high-quality, representative data (which is described further in the quantitative approach section.) Because the actions stemming from this research will affect all Californians – regardless of demographic differences – an innovative methodology

was selected to ensure hard-to-reach audiences were not missed and that the sample is as representative of the state of California as possible.

Finally, the questionnaire was designed to be repeatable. As Californians learn more about the promise of electric appliances over time, it will be critical to measure which messages are resonating with consumers, how trends are changing, and where there is still work to be done. The research team envisions that future studies will track against these baseline questions.

Homeowners and Renters Survey

In October and November of 2022, Pacific Consulting Group surveyed N=2,014 consumers in California. Californians were reached using a combination of address-based sampling, targeted online invitations, and dynamic online targeting which locates individuals from underrepresented groups. The sample, which was provided by Verasight, was designed to be representative of the home-owning and home-renting population within California, and the data were weighted to achieve that representativeness. This method was chosen as the most representative option for surveying consumers statewide. Other details of the sample are as follows:

- The sample was demographically balanced by key variables including age, gender, race/ethnicity, education, region, and housing type. Of note:
    - The sample contains an oversample of low-income Californians (28%) to ensure analytic reliability.
    - 57% of the unweighted sample were homeowners; 43% of the unweighted sample were renters.
    - 873 unique ZIP codes (over half of CA ZIPs) were represented in the survey, which includes 455 unique cities/municipalities.

Builders and Landlords Survey

As Phase 1 in a two-phase qualitative/quantitative approach, Pacific Consulting Group surveyed N=211 builders and N=221 landlords in California in September and October of 2022. These were sourced from a third-party panel provider called Audience-Align, which specializes in

surveying hard-to-reach audiences. Unlike the consumer sample, these results are not meant to be representative of these audiences overall.

The **builder** sample included builders who:

- Were involved in some combination of residential home construction, custom home development, and/or construction of mobile homes or accessory dwelling units in the state of California;
- Were project managers in charge of construction/building projects;
- Make decisions, or contribute to the decisions, about purchasing and installing energy-using equipment; and
- Built either a relatively low (1-50), medium (51-150) or high amount (151+) of homes in a year

The **landlord** sample included landlords who:

- Currently own or manage a relatively low number (fewer than 30) or relatively high number (31+) of homes in the state of California; and
- Make decisions, or contribute to the decisions, about replacing or upgrading energy-using equipment in the rental units they own or manage

Builders and Landlords In-Depth Interviews

As Phase 2 in a two-phase qual/quant approach, we conducted 16 interviews; eight among landlords in California and eight among builders in California. The roles of the landlords and builders varied by amount of homes built/leased, geography, and total years of experience. With the aid of a discussion guide, a trained moderator probed the builders and landlords on the "why" behind their decisions – specifically, why they are currently installing the appliances/systems they prefer now, how they make their decisions when weighing a host of factors, and what might incentivize them toward solutions that are environmentally optimal.

Perceptions of Climate Change and the Environment

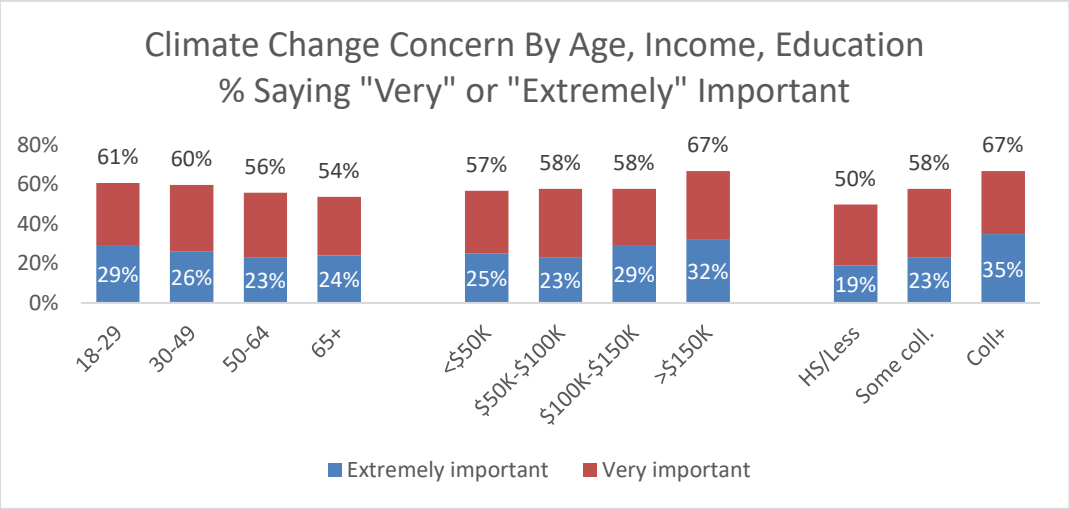
Key Finding #1: Concern about climate change is an important part of many Californians' belief system; many of them keep the environment in mind when making purchase decisions, even if it isn't the primary driver.

Consumers

A clear majority of Californians think that issues related to the environment and climate change are at least very important (58%), including one-in-four who say these issues are *extremely* important (25%). Only 16% believe that environmental and climate change issues are either not too important (8%) or not important at all (8%). This perception holds broadly; at least half (and usually more) of each major demographic group says that these issues are at least very important. Additionally, when asked later in the survey whether they agree with the statement "I believe people are overreacting to the changes in the climate," just 31% agreed, compared to 51% who disagree (and 37% who disagreed strongly.)

To the extent that attitudes vary, differences in opinion are most stark when looking at three key factors: income, age, and education (**figure 1**). The largest gap exists on the dimension of education: fewer than one-in-five (19%) of those with a high school degree or less believe that climate change is extremely important, compared to 23% with at least some college education, and 35% of those with a college degree or higher.

Figure 1



In general, the youngest Californians are the most concerned about climate change. The youngest Californians (age 18-29) are the most likely age cohort to say these issues are extremely important (29% age 18-29, 26% age 30-49, 23% age 50-64, 24% age 65+); they are also the most likely to say these issues are at least very important (61%, 60%, 56%, 54%).

The most affluent Californians are disproportionately concerned as well. With regard to income, 67% of those who earn $150K+ say climate change is at least very important, compared to 58% who earn <$150K who say the same. The highest earners are also considerably more likely to say climate change is extremely important (32% of those earning $150K+, compared to 29% for those earning $100K - $149,999, and 24% for those earning <$100K.)

As noted, these gaps in perception of importance are relative to each, as at least half of each one of these subgroups believes that climate change and environmental issues are at least very important. Understanding the degree to which these audiences are already concerned with the environment will play a large role in understanding how well messaging around appliance usage is likely to permeate.

Spotlight: Key Decision-Makers (Homeowners and Renters)

Homeowners and renters are equally likely to say issues related to the environment and climate

change are very or extremely important. However, those who are planning to purchase a house in the next couple of years are considerably more likely to say this. 65% of those who plan to purchase in the next two years say climate change issues are at least very important (including 29% who say they are extremely important), compared to 54% of those who are not planning to purchase who say the same (23% extremely important.) Age may be driving these attitudes rather than homeownership, as 74% of those who are planning to purchase homes in the next two years are under the age of 50, while just 48% of those who do not plan to purchase in the next two years are under the age of 50.

Though there is not much difference between homeowners and renters when it comes to their levels of agreement on statements about the environment, those planning to purchase a house indicate that they have the environment in mind when making financial decisions. Of those planning to buy, 70% agree (including 46% who strongly agree) that they believe they should make investments to reduce emissions that harm the environment, and 66% agree (including 32% who strongly agree) that they think about the environment when deciding what to buy.

The one environmental statement that owners are more likely to agree with than renters is "I believe that changing gas to electric will have no effect on the environment." While only 26% of renters agree with this, 36% of homeowners agree, including 22% who agree strongly, indicating that there may be more difficulty influencing behavior change among this group.

Spotlight: Age

Though Californians of all ages are environmentally conscious, the youngest Californians (age 18-24) are the most likely to say issues related to the environment and climate change are very or extremely important. Still, a majority (54%) of those in the oldest cohort – age 65+ - feel the same way. Men age 50 and over are the least likely to describe these as at least very important, with just 50% of them expressing this sentiment.

Californians over 65 – and men over 50 – are the most likely to agree with a statement that is skeptical toward climate change. Fully 39% of men over 50 agree that "people are overreacting to the changes in the climate," compared to 31% overall; 36% of all Californians (regardless of

gender) over the age of 65 say the same. In contrast, it is younger men who are especially likely to agree (40%, compared to 32% overall) that "changing gas to electric will have no effect on the environment."

Two-thirds (64%) of those under the age of 50 agreed that they should make investments to reduce emissions that harm the environment, with nearly half of those aged 25-34 (44%) strongly agreeing with this. For women over the age of 50, they were considerably more likely to strongly agree that they are concerned about how air quality affects their health and the health of their family (57% strongly agree, compared to 47% overall).

In terms of connecting environmental attitudes towards purchase decisions, men under the age of 50 are the most likely to say they strongly agree that they think about the environment when deciding what to buy (31%, compared to 25% overall).

Spotlight: Low-Income Californians

Those who earn $35K - $50K in annual income are the least likely across any income bracket to say that issues related to the environment and climate change are extremely or very important (53%, compared to 58% overall). Those in the lowest bracket are similar in their attitudes to the Californian consumers at large (59%, compared to 58% overall).

Speaking in terms of health is more effective; 71% of the lowest income bracket and 66% of the second-lowest income bracket agree at least somewhat that "I am concerned about how air quality affects my health and the health of my family." There is a particular lack of resonance for those earning less income when asked to agree with the statement, "I believe that I should make investments to reduce emissions that harm the environment." While 55% of those earning $35K or less and 54% of those earning $35K - $50K agree with this, all other income brackets agree at a level of at least 60%.

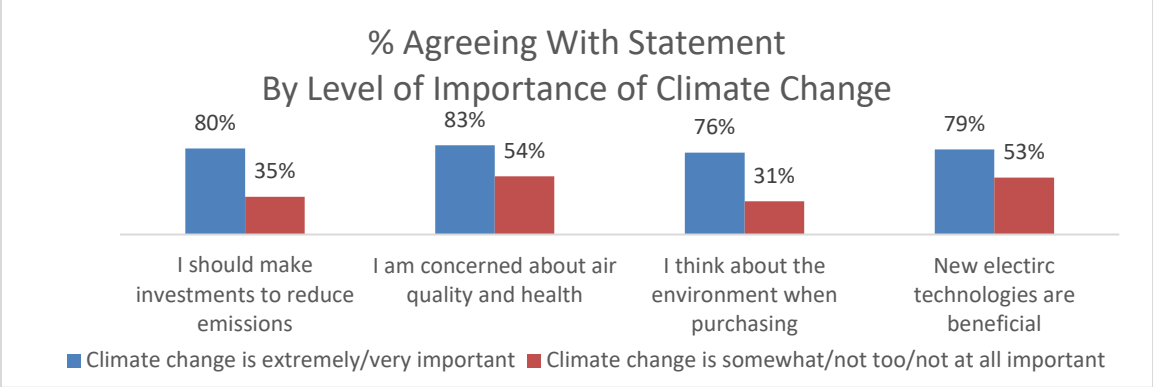
When it comes to agreeing with various statements, low-income Californians are disproportionately likely to say they neither agree nor disagree. Fully 34% (more than any other group) of those making $35K or less say they neither agree nor disagree that "changing from

gas to electric will have no effect on the environment," and 21% neither agree nor disagree that "people are overreacting to climate change" (second highest of any group.)

Spotlight: Perspective on Climate Change

Those who hold the most pro-environmental positions are especially likely to agree with statements about actually using one's dollars to help the environment. These Californians – who are more likely to be female, college-educated, employed, and based in L.A. or the Bay Area – are 45 percentage points more likely to personally make investments with their own money or to think about the environment when making purchases compared to their less-environmentally-conscious counterparts **(figure 2)**.

Figure 2



Other Notable Consumer Findings

Additional subgroup findings regarding consumers' environmental attitudes include:

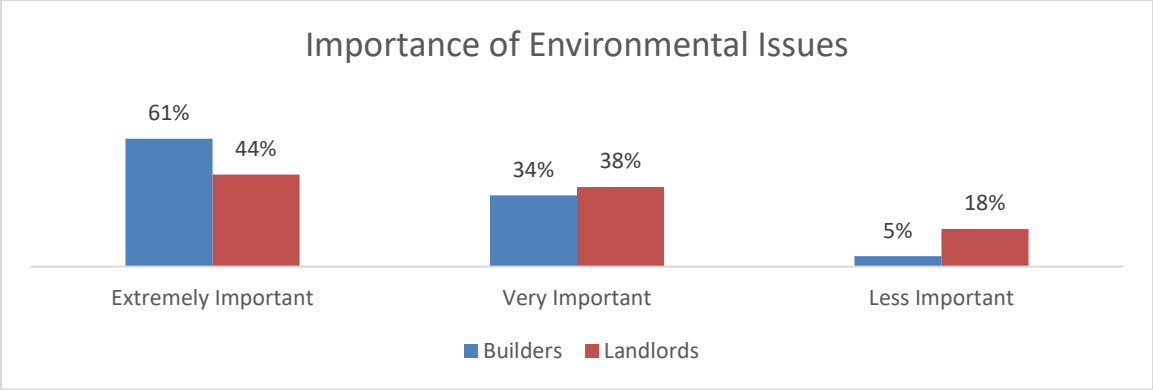
- Black (64%) and Asian Californians (70%) are more likely to say these issues are at least very important
- More than two-thirds (69%) who plan to purchase a home in the next year say these issues are at least very important
- Those in the San Francisco Bay Area are the most environmentally inclined (65% at least very important) compared to other regions

- While 63% of full-time employed Californians are likely to see these issues are at least very important, just 47% of those who are unemployed (excluding retirees) say the same

Builders and Landlords

Landlords, and especially builders, are both more likely than consumers to say that issues related to the environment are not just very important, but are *extremely* important (**figure 3**). More than three-in-five (61%) builders say issues related to the environment and climate change are extremely important; while just one-in-four (25%) consumers say the same. The vast majority of the rest of the builders (34%) say these issues are *very* important. Landlords are less likely than builders to say that environmental issues are extremely important; fewer than half agree with this sentiment, though that still outpaces consumers. More than four-in-five (82%) landlords say that these issues are at least *very* important.

Figure 3



In one-on-one interviews, builders were quick to cite their clients' views on the environment as something that factored into their own decision-making:

> *"Being in California, a lot of clients do come up regarding fossil fuels and stuff like that. So I'd say out of the houses we build in a year, [the client's environmental views] may come up maybe 20, maybe 25% of the time." – Builder*

> *"There's a couple of independent folks out there that want to go way beyond what's required [to help the environment], and that's fine with me." - Builder*

> *"There are a lot of people out here that really are concerned about the environment, and there's a lot of people out here that just want to have a big fancy house, and they don't really care [about] that." – Builder*

In contrast, landlords were more likely to say that tenants' environmental views did not tend to come up.

> *"I do whatever is affordable for the building. We have to go on what we can afford at the building is what we've got to do. [Tenants are not] forcing me to make environmental changes." – Landlord*

> *"I don't think tenants know exactly what's going on in terms of the environment real time." – Landlord*

Builders and landlords also pointed out that, to some degree, their own views on the environment are moot. They are used to complying with environmental regulations, though some found the regulations either burdensome or difficult to apply to all situations; for example, one builder who worked primarily with low-income housing noted that decarbonization goals may be at odds with the requirement to reduce the amount of electricity that project is using.

> *"We have a pretty restrictive building code out here in California." – Builder*

> *"I don't know enough about the environmental issues…but if it becomes a requirement and it's like, 'You're going to get fined if you don't do it,' I'm not going to have much of a choice." - Landlord*

> *"I personally think that there should be [different rules for low-income housing.] If you are building based on a set of criteria, and yet you're asked to make a switch from electric to gas or from gas to electric, there's got to be a way for you to meet those requirements. And if you set very stringent regulations on the power that you're able to bring into a new building, then you are limited to using gas appliances." – Builder*

> *"So we have two apartment buildings. One is in West Hollywood and one is in regular Hollywood. They're about five minutes away from each other, but West Hollywood is its own city, so there are different rules and regulations in the two buildings." - Landlord*

When asked about their awareness of California's decarbonization goals, most builders and landlords did not know the specifics. Most tended to be positive toward the goals and were eager to figure out how to help make those goals work, but they did want to make sure the state met them halfway and understood their challenges.

"I think that could cause some sort of concern for some clients who prefer gas power to appliances and things like that versus electrical ones." – Builder

"I know California is pretty radical in doing that. I think they're trying to lead maybe the rest of the nation or something like that in that respect. And I've got four kids and some grandkids and I want the planet to be a good place when they grow up. So even though it's crazy a little bit and a little bit radical, I still try to see how close I can get to maybe working with some of that in my own endeavors." – Builder

"There's so many agencies here that is keeping an eye on the environment, especially more so when it comes to climate change. We have a statewide water, regional water quality control board that looks at a lot of this stuff. And so, maybe the responsibility sort of falling on the landlord is not fair as far as decarbonization, I think there's many other industries than ones where we just have homes, but I could be misinformed." - Landlord

Overall Implications

The environmentally-inclined character of Californian consumers – which is even more prominent among landlords and builders in California – is a tremendous asset as California attempts to achieve its ambitious climate and air quality goals. It indicates an openness to environmental solutions once more Californians become appropriately informed. The buy-in on the necessity for climate goals to be achieved among consumers, builders, and landlords is a firm, sturdy foundation on which any successful environmental action plan will be built.

(Lack of) Familiarity and Misconceptions about Electric Appliances

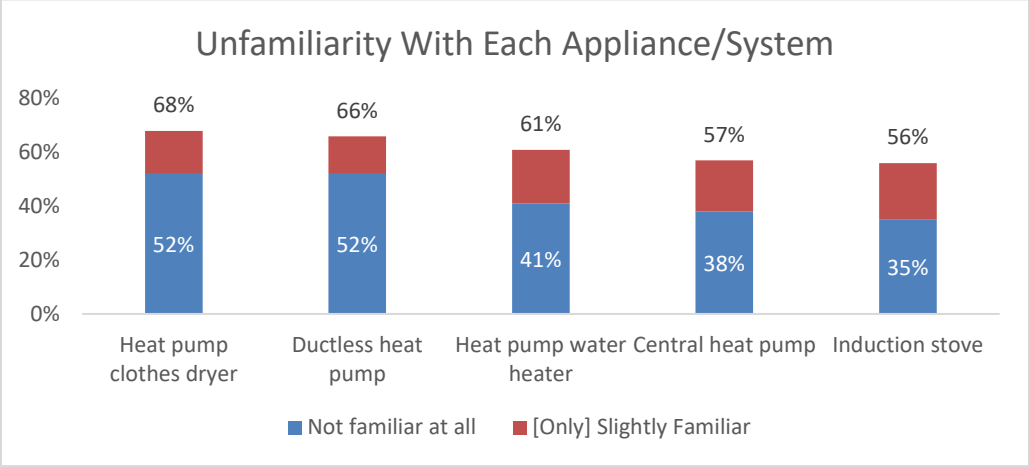
Key Finding #2: As of today, most Californians are unfamiliar with environmentally friendly alternatives. However, with a foundation of pro-environmental attitudes and other strong incentives to adopt environmentally friendly alternatives, there is a high ceiling for potential adoption.

Consumers

Familiarity with more environmentally friendly electric appliances and systems among consumers is relatively thin. While low familiarity often is viewed as an obstacle, this is actually encouraging, as it indicates significant room for perceptions to improve as Californians learn more about the subject matter.

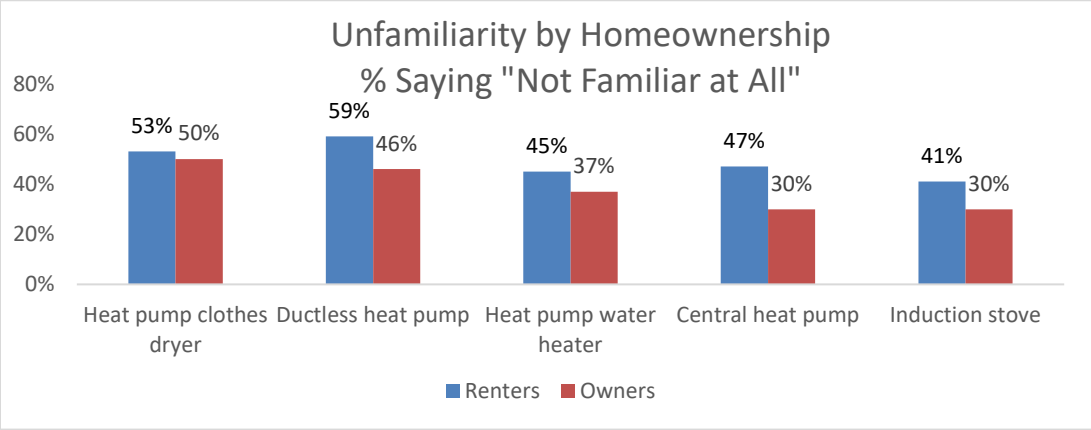
Between 18% and 24% say they are "very" or "extremely" familiar with each of these appliances outright; fewer than one-in-ten say they are "extremely" familiar with any. For each appliance/system, a majority describes themselves as either "[only] slightly familiar" or "not familiar at all" **(figure 4).** For ductless heat pumps and heat pump clothes dryers, a majority describe themselves as "not familiar at all" outright. This leaves plenty of room for communication to positively affect perceptions.

Figure 4



The largest differences in unfamiliarity typically centered on whether individuals owned their home or were renting a home **(figure 5)**. Renters were considerably more likely to say they were "not at all familiar" with each appliance – by as few as 3 percentage points and as many as 17 percentage points.

Figure 5

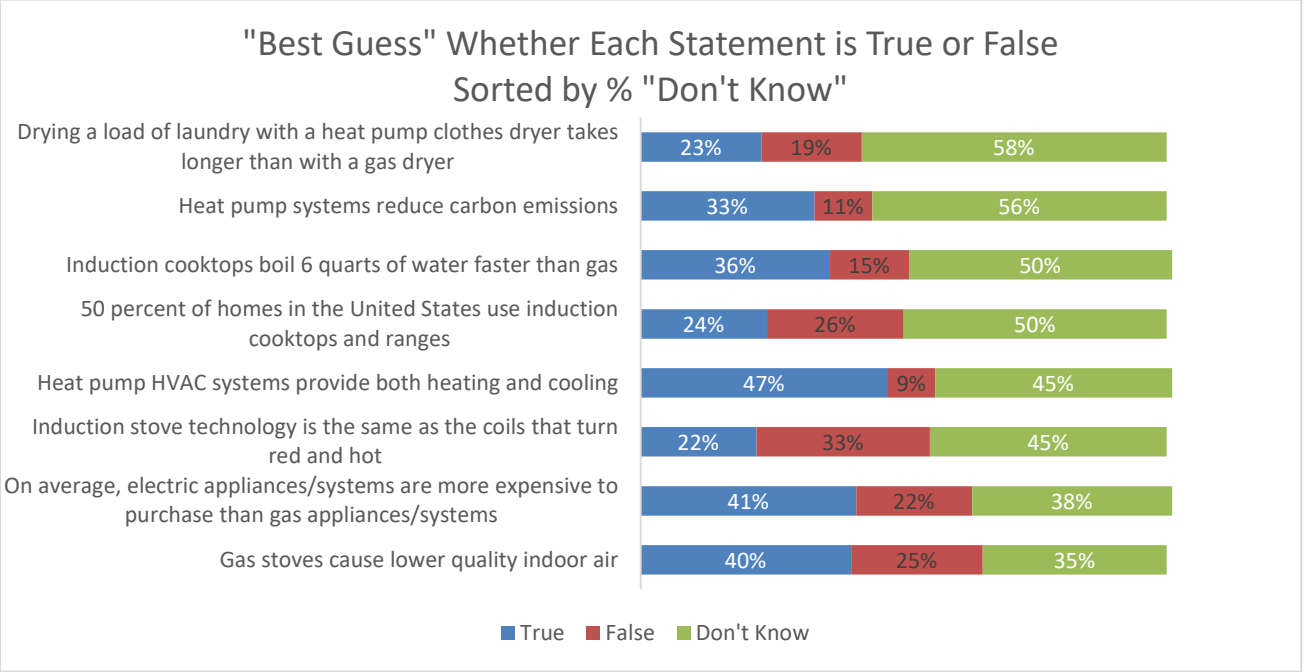


Consumers may not currently understand the true environmental potential of new electric appliances and systems. In some ways, their perceptions depend on how the issue is framed. For example, on the one hand, 65% agree (including 38% who strongly agree) that "there are new electric technologies that are beneficial," and just 12% disagree with that statement. On the other hand, consumers were split on whether they agreed with the statement "I believe that changing gas to electric will have no effect on the environment," with 29% agreeing, 36% disagreeing, and 35% saying they were neutral or did not know whether there would be an effect. **The ambiguity once again points to an opportunity to educate**; Californians do not seem firmly entrenched in their opinions, but rather they simply lack enough knowledge to accurately make these judgments.

In fact, the lack of knowledge is especially evident when consumers are asked to judge whether they think eight different statements about electric and gas appliances are true or false **(figure 6)**. For each statement, anywhere between around one-third (35%) and close to three-in-five (58%) outright admit not being able to attempt a guess between whether the statement is true or false. Among those who do choose true or false, there is rarely much agreement in either

direction. Misperceptions around induction stoves are especially interesting; 22% believe induction stoves are the same technology that turn coils red and hot, and nearly half (45%) don't know. The statement with the highest level of misconception was that electric appliances are more expensive than gas appliances; consumers were +19 percentage points more likely to think this was true, though it is false. This is important, considering the relative effectiveness of economic messaging that is seen later in the study.

Figure 6

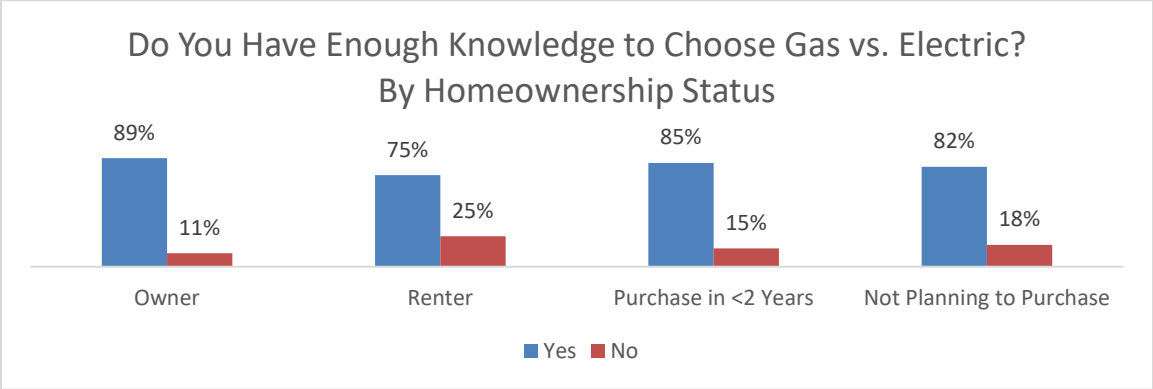


Despite the fact that many do not know the answers to these questions, or otherwise guess incorrectly, consumers feel confident that they have enough knowledge or understanding to choose whether to buy gas or electric. Fully 83% say they have enough knowledge, while just 17% say they do not. This may be overconfidence on the part of some consumers, given the overall stated lack of familiarity with the appliances themselves. Those are most likely to say they are confident in this include those over age 65 (93%), those who earn at least $100K (91%), and homeowners (89% - compared to 75% of renters).

Spotlight: Key Decision-Makers (Homeowners and Renters)

While nine-in-ten owners say they have enough knowledge or understanding to choose whether to buy gas or electric appliances/systems, just three-in-four renters say the same **(figure 7)**.

Figure 7



Renters and owners are similarly likely to agree that new electric technologies are beneficial to the environment. Those who plan to purchase a house in the next two years are more likely to believe this – 75% agree with the statement, compared to 65% among those who do not plan to purchase a house within two years.

Though overall familiarity is not high for any appliance, owners are significantly more likely than renters to be extremely or very familiar with heat pump water heaters, central heat pumps, and mini-split/ductless heat pumps. Additionally, those who are likely to purchase a home in the next two years are sometimes up to twice as likely to be extremely or very familiar as those who do not plan to purchase a home within that time frame.

Familiarity with Electric Systems/Appliances By Homeownership Status				
% Extremely or very familiar	*Owner*	*Renter*	*Purchase in 0-2 Yrs*	*No Purchase*
Heat pump water heater	24%*	18%	31%*	16%
Induction stove	26%	21%	30%*	20%
Central heat pump (HVAC)	30%*	17%	30%*	21%
Mini-split or "ductless" heat pump (HVAC)	23%*	12%	23%*	15%
Heat pump clothes dryer	19%	19%	28%*	13%
**Indicates statistical significance compared to at least one other number in the row*				

When presented with a series of true/false questions about electric alternatives, owners were more likely to be correct than renters were in most instances; one notable exception is that renters were more likely than owners to (correctly) know that gas stoves cause lower quality indoor air. While those who plan to purchase a house in the next two years were also more likely to be correct than those who were not planning to purchase a house in most instances, purchasers were much less likely to note that electric appliances/systems are, on average, more expensive to purchase than gas appliances/systems. Combating that perception among those who are about to invest in such systems is important.

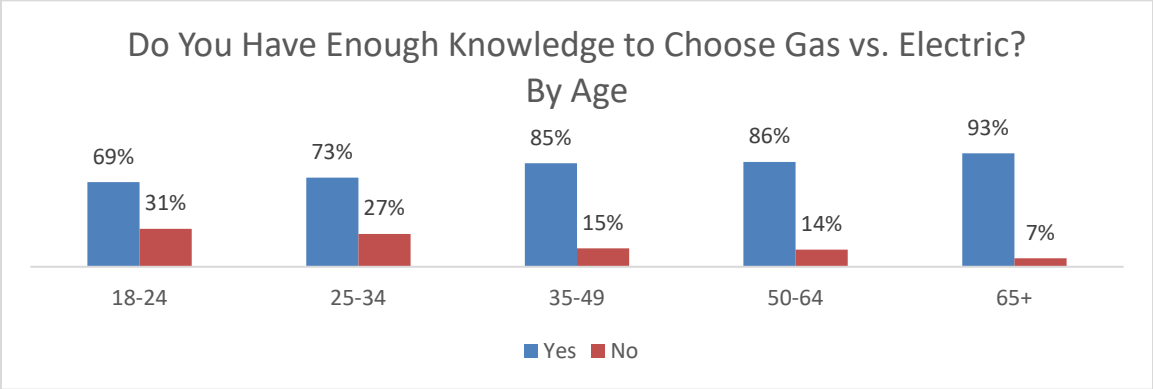
Net Correct (Correct Answer Minus Incorrect Answer)	Total	Owner	Renter	Purchase in 0-2 Yrs	Not Planning to Purchase
Heat pump HVAC systems provide both heating and cooling	**38%**	41%	34%	40%	36%
Heat pump systems reduce carbon emissions	**22%**	25%	18%	29%	19%
Induction cooktops boil 6 quarts of water faster than gas	**21%**	26%	15%	28%	16%
Gas stoves cause lower quality indoor air	**15%**	11%	19%	25%	9%
Induction stove technology is the same as the coils that turn red and hot	**11%**	18%	2%	7%	13%
Drying a load of laundry with a heat pump clothes dryer takes longer than with a gas dryer	**4%**	3%	5%	12%	0%
50 percent of homes in the United States use induction cooktops and ranges	**2%**	13%	-8%	-7%	7%
On average, electric appliances/systems are more expensive to purchase than gas appliances/systems	**-19%**	-13%	-26%	-31%	-13%

Note: Statements with green fill are true, while statements with pink fill are false. Numbers with greener fill indicate that the subgroup represented in the column is relatively more likely to correctly answer this question. Numbers with redder fill indicate that the subgroup represented in the column is relatively more likely to incorrectly answer this question.

Spotlight: Age

Perceptions of whether one has enough knowledge or understanding to choose whether to purchase gas or electric appliances/systems correlates with age. Though over two-thirds of the youngest Californians say they believe they have enough information, they are the least likely to say this by far **(figure 8)**. (And interestingly, they actually have more knowledge than others on specific appliances.)

Figure 8



Though younger Californians say they have less knowledge on the question of gas vs. electric, they are more likely to agree that there are new electric technologies which are beneficial; Californians age 25-34 are the most likely to agree with this (74%) while those over 65 were the least likely (63%). Additionally, Californians under 50 were the most likely to be familiar with alternative appliances.

Familiarity with Electric Systems/Appliances By Age					
% Extremely or very familiar	*18-24*	*25-34*	*34-49*	*50-64*	*65+*
Heat pump water heater	24%*	31%*	24%*	15%	13%
Induction stove	30%*	27%*	29%*	17%	17%
Central heat pump (HVAC)	23%	28%	26%	20%	22%
Mini-split or "ductless" heat pump (HVAC)	17%	21%*	21%*	15%	13%
Heat pump clothes dryer	24%*	29%*	23%*	10%	9%
**Indicates statistical significance compared to at least one other number in the row*					

In terms of misconceptions about electric systems and appliances, older Californians were, in most cases, the least likely to have misconceptions. For example, they were the most likely to correctly identify "heat pump HVAC systems provide both heating and cooling" and "induction cooktops boil 6 quarts of water faster than gas" as true; they were similarly most likely to correctly identify "induction stove technology is the same as the coils that turn red and hot" and "50 percent of homes in the United States use induction cooktops and ranges" as false. However, with other statements, they were the least likely to be correct; they were the only demographic group to be more likely to wrongly think "gas stoves cause lower quality indoor air" was false than true. Older Californians are also more likely to misunderstand the difference between induction stoves and election stoves than younger Californians. Understanding the generational misconceptions is key.

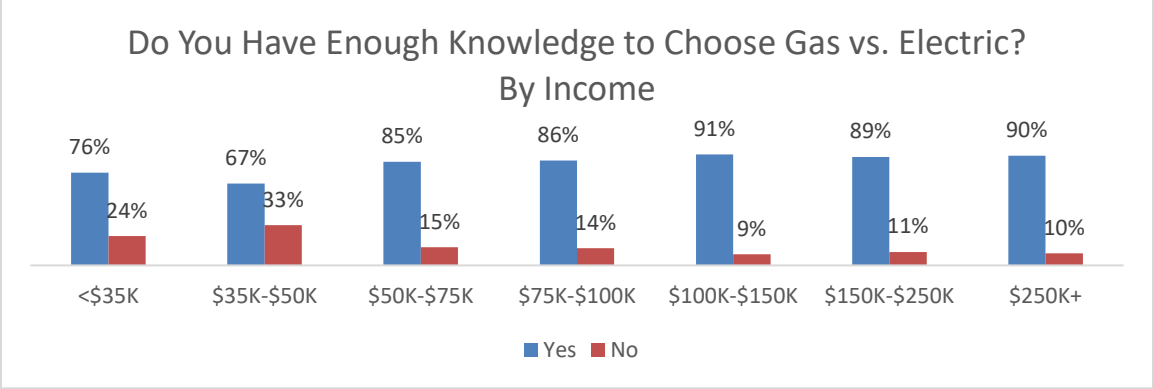
Net Correct (Correct Answer Minus Incorrect Answer)	Total	18-24	25-34	35-49	50-64	65+
Heat pump HVAC systems provide both heating and cooling	**38%**	35%	34%	39%	34%	48%
Heat pump systems reduce carbon emissions	**22%**	22%	31%	27%	15%	15%
Induction cooktops boil 6 quarts of water faster than gas	**21%**	15%	16%	21%	21%	28%
Gas stoves cause lower quality indoor air	**15%**	27%	33%	18%	6%	-3%
Induction stove technology is the same as the coils that turn red and hot	**11%**	-4%	-1%	2%	20%	30%
Drying a load of laundry with a heat pump clothes dryer takes longer than with a gas dryer	**4%**	8%	13%	5%	-1%	-5%
50 percent of homes in the United States use induction cooktops and ranges	**2%**	-43%	-3%	-6%	14%	32%
On average, electric appliances/systems are more expensive to purchase than gas appliances/systems	**-19%**	-31%	-29%	-17%	-16%	-10%

Note: Statements with green fill are true, while statements with pink fill are false. Numbers with greener fill indicate that the subgroup represented in the column is relatively more likely to correctly answer this question. Numbers with redder fill indicate that the subgroup represented in the column is relatively more likely to incorrectly answer this question.

Spotlight: Low-Income Californians

While 83% overall say that they have enough knowledge or understanding to choose whether to buy gas or electric appliances/systems, just 76% of those earning <$35K say this, and just 67% of those earning $35K - $50K say the same **(figure 9)**.

Figure 9



This unfamiliarity extends to appliances and systems as well; those who earn <$50K are less likely to say they are extremely or very familiar with any of the five alternatives presented than

Californians overall. Their opinions are less formed compared to other income brackets, highlighting the potential for education to make a difference.

Familiarity with Electric Systems/Appliances By Income				
% Extremely or very familiar	*Overall*	*Lowest Income (<$35K)*	*Second Lowest ($35K-$50K)*	*Highest ($250K+)*
Heat pump water heater	**21%**	16%	18%	32%*
Induction stove	**24%**	16%	18%	39%*
Central heat pump (HVAC)	**24%**	18%	17%	39%*
Mini-split or "ductless" heat pump (HVAC)	**18%**	11%	13%	30%*
Heat pump clothes dryer	**19%**	16%	17%	20%*
**Indicates statistical significance compared to at least one other number in the row*				

A similar dynamic occurs when respondents are quizzed about their knowledge of electric appliances. Those who earn less income are typically the most likely to guess incorrectly if they volunteer a "true" or false" response on the statements about electric appliances. As one example, while Californians overall are 11 percentage points more likely than not to correctly know that induction stove technology does NOT refer to that which makes the coils red and hot, those earning $35K - $50K are 14 percentage more likely to incorrectly say that it DOES.

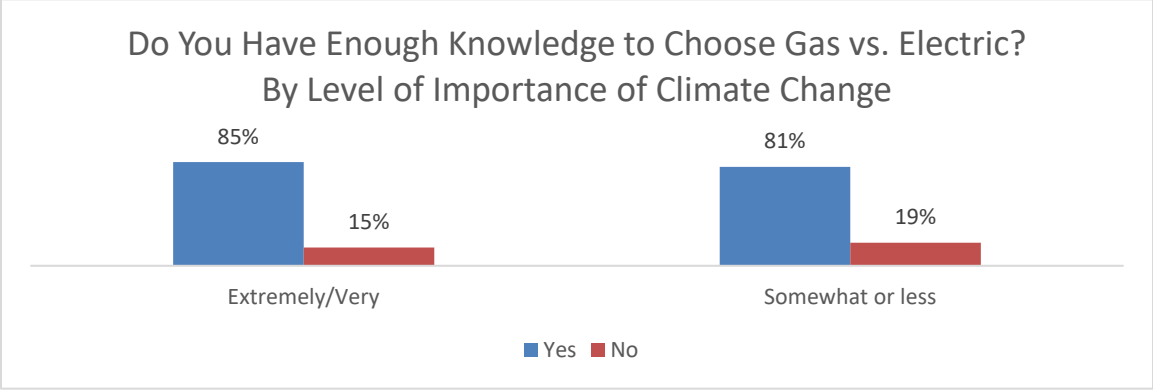
Net Correct (Correct Answer Minus Incorrect Answer)	Total	<$35K	$35-$50K	$50-$75K	$75-$100K	$100-$150K	$150-$250K	$250K+
Heat pump HVAC systems provide both heating and cooling	**38%**	30%	30%	44%	40%	44%	43%	47%
Heat pump systems reduce carbon emissions	**22%**	19%	21%	23%	17%	23%	38%	25%
Induction cooktops boil 6 quarts of water faster than gas	**21%**	16%	6%	18%	29%	13%	37%	31%
Gas stoves cause lower quality indoor air	**15%**	11%	25%	13%	5%	18%	32%	21%
Induction stove technology is the same as the coils that turn red and hot	**11%**	-2%	-14%	2%	20%	27%	25%	32%
Drying a load of laundry with a heat pump clothes dryer takes longer than with a gas dryer	**4%**	9%	-9%	6%	-10%	13%	16%	11%
50 percent of homes in the United States use induction cooktops and ranges	**2%**	-11%	-12%	0%	14%	9%	17%	11%
On average, electric appliances/systems are more expensive to purchase than gas appliances/systems	**-19%**	-30%	-33%	-23%	-13%	-5%	-10%	-23%

Note: Statements with green fill are true, while statements with pink fill are false. Numbers with greener fill indicate that the subgroup represented in the column is relatively more likely to correctly answer this question. Numbers with redder fill indicate that the subgroup represented in the column is relatively more likely to incorrectly answer this question.

Spotlight: Perspective on Climate Change

One's perspective on climate change does not have much of an impact on the level of confidence Californians feel in deciding between gas and electric appliances. Those who feel climate change is extremely or very important are only slightly more likely to say they are informed enough to make such a decision compared to those who say climate change is somewhat or less important **(figure 10)**.

Figure 10



There is a significant difference in perceptions of whether there are new, beneficial, electric technologies. Fully 79% of those who say climate change is at least very important agree with

this statement, while just 53% of those who say climate change is somewhat or less important agree. Looking further, just 38% of those who say climate change is not too important, or not important at all, believe there are beneficial electric technologies.

Those who place a greater importance on climate change are more familiar with electric options, and those differences are statistically significant – though, given the vast difference in attitudes toward climate change, one might expect these gaps to be even larger. The percent of those who are extremely or very familiar with these appliances/systems is between five and eight percentage points higher among those who feel climate change is important compared to those who say it is less important.

Familiarity with Electric Systems/Appliances By Importance of Climate Change		
% Extremely or very familiar	*Extremely/Very*	*Somewhat or Less*
Heat pump water heater	24%*	17%
Induction stove	27%*	19%
Central heat pump (HVAC)	27%*	20%
Mini-split or "ductless" heat pump (HVAC)	20%*	14%
Heat pump clothes dryer	21%*	16%
**Indicates statistical significance*		

When presented with a series of a true/false questions about electric alternatives, there were four statements where those who found climate change less important were at least eight percentage points less likely to correctly identify a statement as true or false compared to those who found climate change more important. This indicates an opportunity to education Californians on these points. Specifically, environmentally-conscious Californians were much more likely to correctly note that "gas stoves cause lower quality indoor air," "heat pump systems reduce carbon emissions," and "induction cooktops boil 6 quarts of water faster than gas" were true statements than less-environmentally-conscious Californians. And while both groups were – along with most Californians – more likely to say that electric appliances/systems

are more expensive on average, those who were less environmentally-conscious were even more certain of this misconception.

Net Correct (Correct Answer Minus Incorrect Answer)	Total	Extremely/Very	Somewhat Or Less
Heat pump HVAC systems provide both heating and cooling	**38%**	39%	36%
Heat pump systems reduce carbon emissions	**22%**	29%	13%
Induction cooktops boil 6 quarts of water faster than gas	**21%**	29%	10%
Gas stoves cause lower quality indoor air	**15%**	29%	-4%
Induction stove technology is the same as the coils that turn red and hot	**11%**	10%	11%
Drying a load of laundry with a heat pump clothes dryer takes longer than with a gas dryer	**4%**	4%	3%
50 percent of homes in the United States use induction cooktops and ranges	**2%**	0%	5%
On average, electric appliances/systems are more expensive to purchase than gas appliances/systems	**-19%**	-16%	-24%

Note: Statements with green fill are true, while statements with pink fill are false. Numbers with greener fill indicate that the subgroup represented in the column is relatively more likely to correctly answer this question. Numbers with redder fill indicate that the subgroup represented in the column is relatively more likely to incorrectly answer this question.

Other Notable Consumer Findings

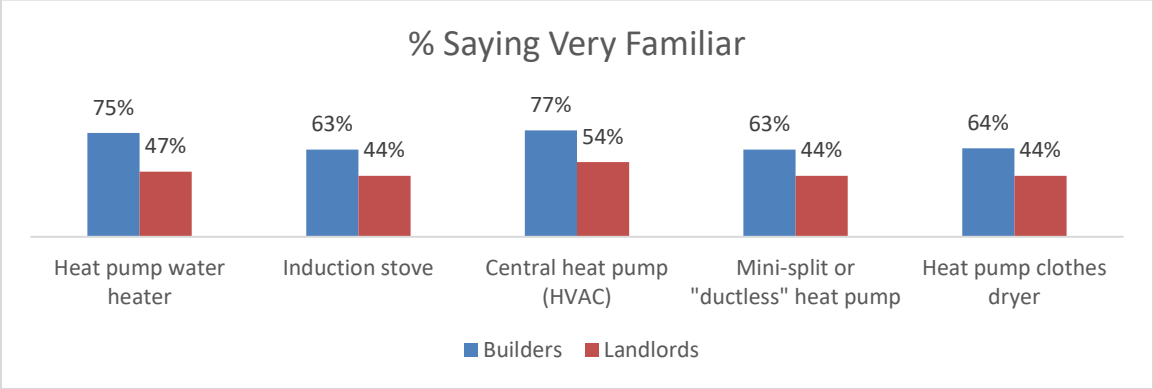
Additional demographic findings relating to initial levels of familiarity include:

- While both men and women tended to have the same levels of being "extremely" familiar with each of these appliances, women are significantly more likely to say they are "not familiar at all" with each.
- The youngest Californians (18-29) were much less likely to say "not familiar at all" than the oldest Californians (65+) for every appliance except for central heat pumps.
- Higher income correlated with greater familiarity. This was especially true with induction stoves; 38% of the highest-earning Californians were at least very familiar with induction stoves; just 16% of the lowest-earning Californians said the same.

Builders and Landlords

Builders are better versed in the suite of appliance and system options than landlords are. Prior to receiving any additional information, fewer than half of landlords say they are very familiar with each appliance tested, with the exception of central heat pumps **(figure 11).** In contrast, between two-thirds and three-quarters of builders say they are very familiar with the same appliances.

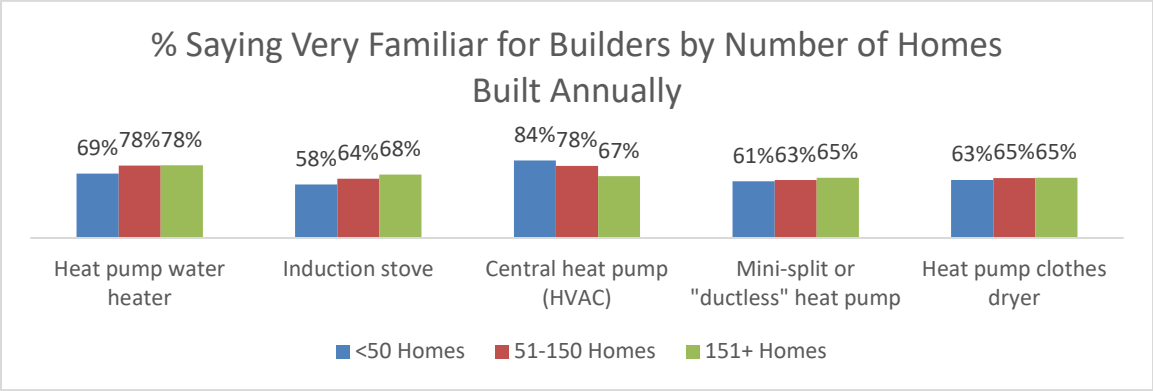
Figure 11



For each appliance, between 2% and 7% of builders report being unfamiliar, while between 14% and 24% of landlords say the same. While the sample size of landlords in this study was not large enough to determine any regional or demographic patterns, understanding whether this gap in knowledge is consistent among all landlords or just confined to certain areas or landlord subgroups is essential as overall messaging is created.

For builders, the number of homes built sometimes correlates with appliance/system familiarity, but in different ways for each appliance/system **(figure 12)**. For example, those building fewer homes are the least likely to be very familiar with heat pump water heaters and induction stoves, but the most likely to be very familiar with central heat pumps. There is little difference based on the number of homes built when it comes to ductless heat pumps and heat pump clothes dryers.

Figure 12



In one-on-one interviews, builders and landlords tended to agree that electric appliances were somewhat inevitable, regardless of how much experience they had currently with electric appliances. In some ways, this was considered to be positive – especially related to decarbonization and the overall ease of decision-making:

> *"That's definitely the trend moving forward. And myself as a builder, I can see the state really pushing for everyone to be fully electrical in the next 10, 15, 20 years or so. So I can definitely see that's the way that it's going and I can see that a lot of the Californians are really pushing towards that as well." – Builder*

> *"Looking from an umbrella perspective, at the rate gas is going up it's harder for clients to request for gas appliances. Electricity now is the path they're going towards because of, one you can sub that with a solar panel installation to kind of counter the bill attached to having electrical appliances." – Builder*

> *"I think it'll make everything easier, because they'll be streamlined in terms of the decisions." – Builder*

> *"I think it's inevitable, and I think when it does become legally required, it'll just make all the decision-making a lot easier for everyone." – Builder*

> *"I would not be doing anything environmental unless, because I'm always looking into the future. Sustainability, environmental, that's going to be the future. If I don't do it now, I'm going to pay a bigger price later 'cause I'm going to be forced to do it because California is so heavy into environmental issues." - Landlord*

In other ways, the inevitability of electric appliances was perceived negatively, with builders and landlords worrying about the supply chain implications, the need to retrofit old systems, and the potential impact on the grid.

> *"That could definitely rule out 50% of the appliances I used to use back 5, 10, 15, 20 years ago. So I can see maybe a shortage of supplies maybe in my area or being more expensive for customers just because so many Californians are going to be forced to use them if they're buying new building homes." – Builder*

> *"We are very adaptable and if we had to switch to electric, we would find a way to do it. As I mentioned, maybe more solar panels on the roof, maybe finding other things that we can reduce as far as the electrical load, maybe one elevator as opposed to two elevators." – Builder*

> *"I think it'll start becoming a little bit more of a pain to have to deal with older renovations. Is that required to be changed? Do we have to try to source a gas appliance that will fit into things that are grandfathered in and stuff like that?" – Builder*

> *"I think is the important thing is electric cars are coming into play from [inaudible] to get away from gas, but do we have the infrastructure for that? I think it's one of those things they have to, I think, build electric cars and then later figure out how to supply all electricity for everything. They haven't supplied electricity enough. I think they handle everything." - Landlord*

> *"Electricity goes out from time to time, so the infrastructure of saying everything needs to be electric, it's not there. There's outages, there's wildfires that are going to affect electric, I feel, more than gas. And then the infrastructure for renewables too. I love the thought of renewable energy sources, solar winds, water, all of that. But the energy suppliers would really need to beef up that infrastructure to be able to solely supply renewable energy, renewable electricity versus line fed electricity." - Landlord*

> *"So my thought on that is if you're switching to electric for the environment, you're still having to power it, and that power's still got to come from somewhere. So I don't see the benefit as far as the environment goes. I mean, I'd be maybe more open to electric things if the grid was more secure, especially here in California. I mean, we've had rolling blackouts, brownouts. So that makes me nervous as well." - Landlord*

Builders generally had richer impressions or were more likely to have already thought through the pros and cons of different specific electric appliances compared to landlords. Some specific impressions of appliances/systems follow below:

Heat Pump Water Heaters

Initial impressions of heat pump water heaters among builders who were aware of them tended to be favorable. They praised their efficiency, their speed in heating water, and their efficacy in larger buildings with multiple units. Some were concerned that ambient heat would be more difficult to take from the cooler air in Northern California.

> *"I would recommend them because if you're trying to go all electric anyway, it's so nice to have a heat pump water heater because it's about as efficient as it can get." – Builder*

> *"When you have 200 units, that's impossible to satisfy the need of all of the units at the same time. Simply because if somebody on the 10th floor turns on the hot water, it takes such a long time for the water to actually get to that person because they have to go through 10 stories of pipes. We find that electric water heaters work better because it's almost instantaneous." – Builder*

> *"Yeah, [electric heats] it quicker. The cost is a little bit higher, but it does it quicker because it's more instantaneous for it to heat up, for it to move the air." – Builder*

> *"We don't live in the warmest place, being that I'm in the San Francisco Bay area, so it's a little bit harder to pull the heat out of the air." – Builder*

> *"Definitely I'd [try installing heat pump water heater] on a project where I have a little bit more flexibility in terms of time, a little bit more leniency in budget." – Builder*

> *"When you install them, they require a certain installation and locations that require a certain type of temperature, so you can't really be installing it in a region that's going to have really, really high temperatures." – Builder*

While some landlords interviewed were aware of heat pump water heaters, most had limited overall impressions, nor could they articulate why they would or should use them.

Induction Stoves

Builders and landlords noted that their clients might prefer induction stoves (or sometimes

electric stoves more generally) for reasons related to safety and efficiency.

> *"A lot of people will prefer them because they can be considered safer, they heat up a little bit faster." – Builder*
>
> *"You can't burn your hand on it, which is great. You put your hand on it, it won't burn. Unless you put a pot on it, then it'll heat up." - Landlord*
>
> *"I'd say most of it comes down, when we talk about doing an induction stoves, a lot of it comes down to going to be more efficient and also sustainable." – Builder*
>
> *"When the gas stove doesn't come on and they smell gas, oh my God, it's instant panic, windows are open, so it's a safety issue more." – Builder*
>
> *"We're trying to keep it electric as opposed to gas for safety reasons, in case one of these younger students forget and leaves it on and they're going out to party, maybe they can use their smartphone or they have a smart feature that might shut that off." - Landlord*

Despite the benefits, builders and landlords cited three primary challenges to adoption given their initial impressions. First, many perceived a natural bias toward a gas range, especially among those with culinary interests, or those who perceived a large Viking or Wolf style gas range as a sign of luxury.

> *"There's a big camp of people that really like the big chef stove, and it's got like 5 million BTUs and all that. And I guess they picture themselves in their kitchen cooking up this fantastic feast. But from my experience, it seems like you put those kinds of appliances in a show home just to make it look like, "Wow, a professional chef could be here and really cook and do all sorts of stuff." But I swear, I seldom see them using those big stoves. So, I think that's kind of fading away now. And I think, a lot of people are going more electric and trying to be a little more conscious of the use of fossil fuels." – Builder*
>
> *"There's a big camp of people that really like gas stoves and cooktops." – Builder*
>
> *"I think some of [the preference for gas stoves] is like the old cavemen hanging around a campfire cooking their food is kind of a cool thing. And I think there's some of that there too." – Builder*

> *"I'll always do a gas range. Gas ranges are equivalent to luxury. If Viking started doing a premium electric range and started really getting behind it, that maybe that would turn. Like, what is the Tesla of ranges?" – Builder*

Second, some thought their clients/tenants may be confused on how to use an induction stove, or intimidated at the prospect.

> *"Let's say a person who's low income, whose lived either on the streets that's homeless or has mental issues does not... Not always, and I'd hate to say all the people all the time, but majority of the time they do not have the experience or education on how to use those appliances in a proper way." – Builder*

> *"I think if you've never had one of those, then it's hard to imagine exactly what it's all about. And especially if you don't understand how it works, then it's just this mystery." – Builder*

Third, landlords were particularly worried about the need to purchase additional cookware for tenants if they provided induction stoves.

> *"On the landlord rental side, it sounds like something I would either have to warn the tenant about or even supply pots and pans, which would be a little bit of a turnoff from a landlord renting situation."*

Central Heat Pumps

The few builders who offered a substantive impression of central heat pumps noted their efficiency.

> *"They're getting more and more efficient as time goes by. My brother happens to be an air conditioning mechanic and he thinks the way they're going is great. He says he can't even believe how efficient some of them are." – Builder*

> *"We find that if we take, especially the heating in California, if we take the hot air from the outside, distribute it, clean and distribute it, it's a much better system. Cleaner and more efficient." – Builder*

In contrast, one landlord noted that the lack of insulation in her building's units made her doubtful about the central heat pump's efficiency.

> *"With the units that I currently have, it's not so efficient because the walls are not well insulated to begin with. And so, I think that's why that I haven't looked into it as much." - Landlord*

Mini-Split or Ductless Heat Pumps

Interestingly, when builders or landlords discussed mini-split or ductless heat pumps, their decision to use them did not typically address the goal of decarbonization or greater energy efficiency. Instead, those who were aware of these usually thought of them as logistical solutions for different scenarios.

> *"We do that probably about 30% of the time. And usually when a customer asks for a mini split or a ductless, I'm trying to really think of, you can do an in-ceiling unit or you can do them on the floor as well." – Builder*

> *"They're quick and they're easy to install because there's no duct work required." – Builder*

> *"The mini splits are nice because you can actually have a unit in each room with its own thermostat and you can just have one condenser on the outside that is variable, variable speed, so that as more and more units are turned on inside, then the variable speed feature allows it to spool up to meet the demand." – Builder*

Convincing builders and landlords to adopt mini-split or ductless heat pumps may benefit from addressing the logistical benefits in addition to the environmental benefits. That said, those with perceptions of mini-splits did not always think positively of them:

> *"I'm familiar with it, but I don't recommend that system, because, one, it's harder to install and maintain, and more expensive because you're talking about two pumps, two heating system pumps, one outside, one inside. It also depends on the square foot of the building that you're building, but usually those systems are used in small neat areas. But again, I don't really install those. I don't recommend those." – Builder*

> *"I think they're ugly to look at, and it's hard... you can't really hide it completely because you need it to face the room and let the air out and take the air in. So if there were a way*

to install it behind a grill, which the grill would cut down on the efficiency though. But, yeah, they're pretty ugly." - Landlord

Heat Pump Clothes Dryer

Builders and landlords were typically open to heat pump clothes dryers, though few had direct experience with them. They were considered relatively new and untested, but with potential.

"I mean, if it's electric and it's more efficient than the standard old school electric, I would definitely be into the heat pump clothes dryer." - Landlord

"And they're fairly new, I mean not new within the past five or 10 years, but they're new to, I think a lot of people being installed in their house. I think they're more European type of inspired." – Builder

"I think in California, we're trying to reduce fossil fuels for residential homes. That's a good alternative to using an appliance like that." – Builder

"No, I didn't even realize that they existed." – Builder

"It's not common yet. Studies are still being done, even though it's out there, but it's not common to where we recommend it." – Builder

"It's not anything I've installed. That's definitely interesting. It's like a 360 approach. Like being zero waste and composting. It's almost like composting for air." – Builder

Overall Implications

Lack of familiarity with different electrical appliances/systems should be embraced and considered an opportunity for education. Consumers know very little about the possibilities of electric alternatives and are unsure whether certain key facts about electric appliances/systems are true or false. While landlords and builders know more than consumers, a) they still have room to grow in their own perceptions, and b) their decision-making process follows the lead of the consumers. As consumers become more familiar not only with the suite of alternative options, but also the rationale for those options, builders and landlords will be incentivized to follow their customers' preferences.

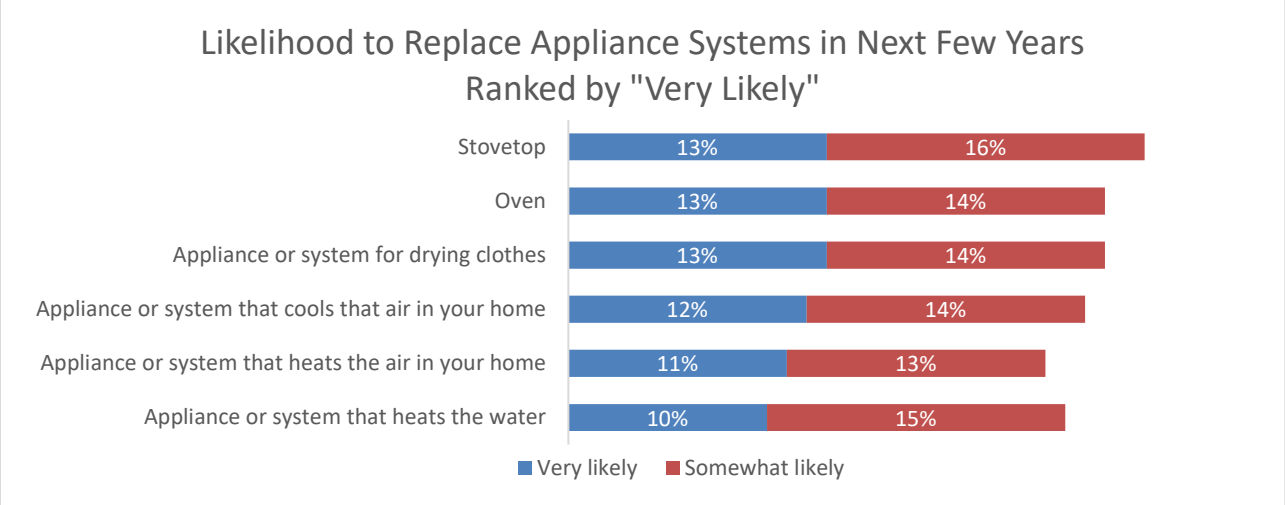
How Pro-Environmental Attitudes and Low Overall Awareness Interact with Californians' Decisions to Purchase Electric Appliances/Systems

Key Finding #3: Californians – millions of whom self-describe being likely to replace their appliances or systems in the next few years – consider the environment in their purchase decisions, but they consider other things (like comfort and cost) too.

Consumers

Advocates of zero-emission appliances and equipment have a strong incentive to educate consumers on those solutions, given how many Californians will soon be having their appliances or systems upgraded or replaced. Between 24% and 29% of Californians say they are at least somewhat likely to have each mentioned appliance or system replaced within the next few years **(figure 13)**.

Figure 13

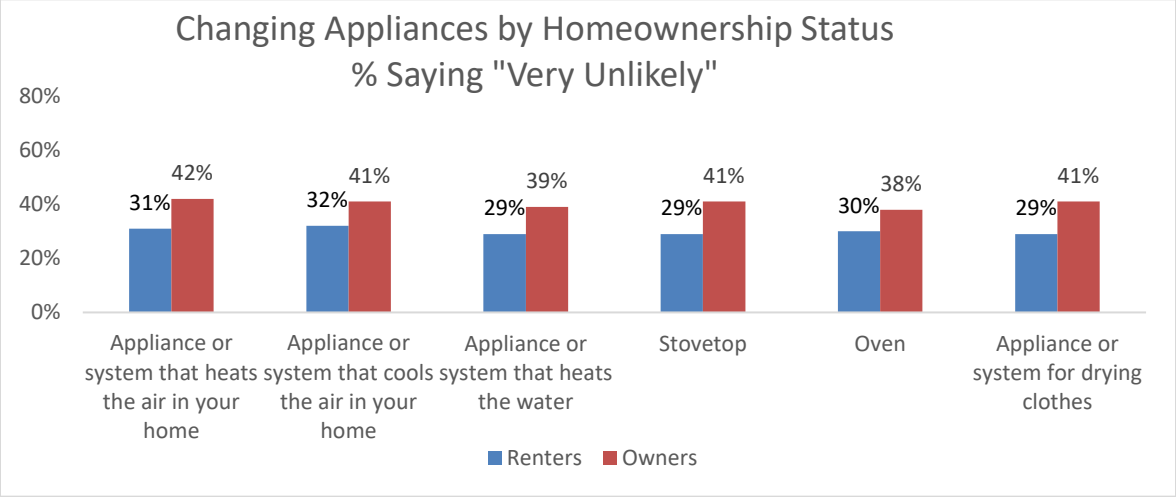


Though most say they are either unlikely, or neither likely nor unlikely, to replace their appliances, the 24% - 29% who say they are at least somewhat likely to do this represent between 7 million and 9 million Californian adults for each appliance. Among those who say they are at least somewhat likely to do this, the desire to reduce energy costs, the desire to use

less energy, and the overall concern for their environmental impact are three of the top four most common reasons cited (from a list of nine[1].)

Homeowners are considerably more likely to say that they are "very unlikely" to change appliances soon than renters are to say that their landlords are "very unlikely" to change appliances soon **(figure 14)**. This indicates that, if renters' perceptions of their landlords are accurate, some of the onus of positive change falls on the landlords.

Figure 14



However, it is important to note that, as of now, concern with climate change does not necessarily equal concern with the source of energy used. The connection between climate change and appliance usage may not be self-evident to all Californians, or it may be less important to some Californians as they consider other factors such as their perceptions of comfort, convenience, and cost.

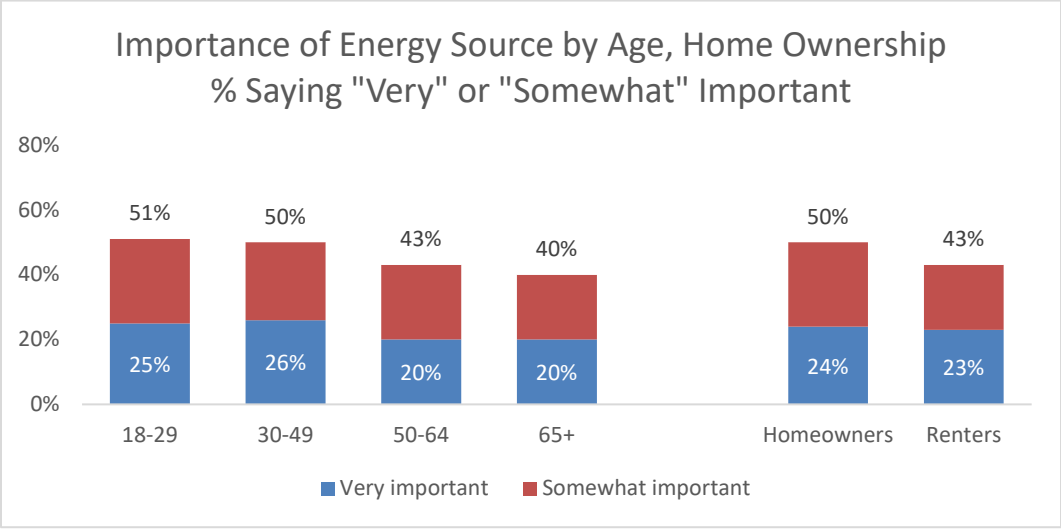
Even if that connection is not yet explicit, the research does strongly indicate that most Californians seek to consider the environment in their purchases. Fully 55% agreed that they think about the environment when deciding what to buy (and just 18% disagreed). These

[1] *"Update an old or failing system/appliance," "Reduce energy cost," "Use less energy," "Concern for environmental impact," "Upgrade to one that works better or is more reliable," "Taking advantage of rebate or incentives," "Change from electric to gas," "Change from gas to electric," "Other."*

perceptions are led by those with a higher income and higher levels of education. Yet, fewer than one-in-four (23%) said that the type of energy source used to power their appliances and heating/cooling systems was very important during their most recent home search, with another 23% saying it was somewhat important. A majority said it was either neutral (25%) or unimportant (29%) to their search.

The degree to which Californian consumers consider the environment as they make purchases varies by homeownership status and age **(figure 15)**. Homeowners are more likely to say that this was at least somewhat important (50%) to their home search than renters are (43%). Californians age 50 and under are more likely to say this was at least somewhat important to their search (51% for ages 18-29, 50% for ages 30-49) than Californians over age 50 (43% for ages 50-64, 40% for ages 65+), though the research cannot determine for certain whether that decline in importance is due to differences in perceptions of climate change or in the recency of their home searches. (For example, a Californian over the age of 65+ who has lived in the same house for 40 years may not have considered their energy sources 40 years ago, but would now.) Among all income levels, those who earn $150K+ were the only group where over half (54%) thought this was at least somewhat important to their housing search. This suggests that those who earn less are more likely to see energy considerations as a second- or third-tier housing consideration, rather than a top-tier consideration.

Figure 15



Spotlight: Key Decision-Makers (Homeowners and Renters)

While 47% of Californians overall say that when searching for their most recent home, the type of energy source used to power appliances and heating/cooling systems was at least somewhat important, those who are likely to purchase soon are much more likely to say this. Among those purchasing in the next two years, 60% say this is important, including 33% who say this is very important. For those who are purchasing in the next year, the percentages are higher; 67% say this is at least somewhat important and 44% say this is very important.

Renters are more likely to have electric appliances/systems compared to owners for each type of appliance/system mentioned. This is especially true when considering stovetops (43% of renters using electric, 28% of owners using electric), appliances/systems for heating air (74% renters, 59% owners), and appliances/systems for drying clothes (71% renters, 57% owners.) To a lesser degree, renters are also more likely to use electric water heating (by 7 percentage points) and an electric oven (by 8 percentage points) over owners. Air-cooling was the only appliance/system where the difference in usage between renters and owners was within the margin of error.

Spotlight: Age

When searching for their most recent homes, younger Californians were more likely to say that the type of energy source used to power their appliances and heating/cooling systems was important. Over half of 18–24-year-olds (53%) and 25-35 year-olds (52%) said this, as did 49% of those aged 35-49. In contrast, those aged 50-64 (43%) and 65+ (40%) were less likely to place any importance on this.

Older Californians are significantly more likely to use gas appliances/systems to heat their air, heat their water, and dry their clothes, than younger Californians are. The difference is starkest when it comes to drying clothes; while 84% of 18–24-year-olds and 73% of 25-34 year-olds use an electric appliance or system for drying their clothes, just 53% of those age 50-64 and 50% of those age 65+ do the same. Usage rates were far more consistent by age for stovetops, ovens, and systems for cooling air.

When looking at changing preferences over time, the youngest Californians are likely to be the key drivers of this change. This is seen most strongly in their behavior relative to other age cohorts when it comes to appliances/systems that heat water. Among 18-24 year-olds who recently changed, upgraded, or installed a new appliance or system that heats water, they were nearly four times as likely to make a change from gas to electric than they were to change from electric to gas. (The second-highest ratio was 1.4x as likely, for those aged 25-34.)

Spotlight: Low-Income Californians

In terms of current usage, low-income Californians are more likely to be using electric appliances than other income brackets for four appliances/systems in particular: drying clothes (70% <$35K, 63% overall), stovetops (43% <$35K, 35% overall), appliances which heat the air (74% <$35K, 66% overall), and appliances which heat the water (37% <$35K, 31% overall). Among those earning $35K or less, 32% said that the source of energy used to power their house was a very important consideration, which is higher than for any other income bracket (and compares to 23% who say the same statewide.)

Spotlight: Perspective on Climate Change

Californians with more attention to climate change are, perhaps unsurprisingly, much more likely to consider energy source when making decisions around home purchase. Fully 57% of Californians more concerned with climate change said the energy source was at least a somewhat important consideration, compared to 33% of those with less environmentally-conscious attitudes who say the same. For those who say climate change is “extremely” important, 62% say energy source was important to their decision.

Interestingly, rates of electric vs. gas appliance usage tend to be similar regardless of one’s self-described level of interest in climate change. The one area where there is a slight difference is around usage for appliances or systems for drying clothes; while 66% of those who find climate change extremely or very important use an electric system, just 59% of those who say “somewhat or less” do the same.

Other Notable Consumer Findings

Those who say, at a higher rate, that they are at least somewhat likely to replace, upgrade, or install at least one type of appliance/system (or have their landlord do the same) in the next few years include:

- Californians age 18-24 (average of 35% likelihood across appliance/system types, compared to 27% average overall)
- Highest-income Californians, earning over $250K+ (32% average)
- Black (41%) and Latinx Californians (32%)
- Those without children <18 in the home (35%)

Those who, like younger Californians and homeowners, are more likely to say that the source of energy for appliances is at least somewhat important, include:

- Those earning $150K-$250K (55%) or over $250K (51%)
- Black Californians (57%)
- Those planning to purchase a house next year (67%)
- Those who say climate change and environmental issues are extremely important (62%)
- Those without children <18 in the home (53%)

Builders and Landlords

Despite their preferences for certain appliances and systems, consumers, of course, do not always have the opportunity to be the ones making those decisions directly. Builders and landlords are often the individuals whose opinions most matter when it comes to the actual installation, replacement, or upgrade process. In these cases, builders and landlords they are considering multiple factors beyond environmental concerns, such as cost, their customers' preferences, and their assessment of the short-term and long-term economic feasibility of what they choose to install. One builder summarized the decision-making process succinctly: "I'm client-driven. Whatever the client wants is what I deliver."

In their respective surveys, both builders and landlords were asked whether their primary customers – buyers for builders, renters for landlords – tended to prefer electric or gas for their needs related to five uses of energy: space heating, space cooling, water heating, stove/oven

cooking, and clothes drying. In each case, builders and landlords thought their customers would prefer an electrical appliance for each of these uses. The one exception occurred with the decision of whether renters preferred gas or electric stoves; landlords thought their renters preferred gas stoves by a net 5 percentage points. However, electric overshadowed gas, usually by double-digit margins, in all cases other than landlords' preferences for gas stoves over electric stoves.

Net Preference for Electric ("Tend to Prefer Electric" minus "Tend to Prefer Gas", in percentage points)	Builders	Landlords
Clothes Drying	+54 (73% electric, 19% gas)	+31 (57% electric, 26% gas)
Space Cooling	+36 (63%, 27%)	+14 (47%, 33%)
Water Heating	+31 (60%, 29%)	+16 (48%, 32%)
Space Heating	+20 (55%, 35%)	+39 (60%, 21%)
Stove/Oven Cooking	+8 (50%, 42%)	-5 (38%, 43%)

Interestingly, though builders were significantly more net-likely to think their customers preferred electric energy compared to gas for clothes drying (+54 builders, +31 landlords), space cooling (+36 builders, +14 landlords), water heating (+31 builders, +16 landlords), and stove/oven cooking (+8 builders, -5 landlords), landlords were considerably more net-likely to think their customers preferred electric energy for space heating (+20 builders, +39 landlords.)

When asked in interviews to explain their affinity for electricity or gas in different scenarios, several themes emerged. Builders and landlords both had myriad reasons for choosing electricity over gas.

<u>*Safety – Especially Gas Leaks and Earthquakes*</u>

"I love gas…but in California it is just easier and safer with electric." – Builder

"If they're worried about gas leaks or they've had some other issues in the past possibly, I'd recommend against gas." – Builder

"A lot of their complaints are just questions are the pollutants that come along with gas stoves, whether it's nitrogen dioxide, carbon monoxide, or things like that. They're worried about the pollutants possibly or possibly a gas leak and things like that." – Builder

"Out here is earthquake country, so you don't want to have those gas lines breaking or anything like that in an earthquake." – Builder

"The only thing that people keep saying, but I don't know how accurate or reliable it is, is that you can get the gas appliances can leak. You can get sick, things like that. I don't know to what extent, just a regular range that's not leaking. If it's just a minimal amount, I don't know that that's a worrisome enough situation." - Landlord

"I've converted one of my buildings to all electric heating system in the building, and that's because of the, I'm afraid of the gas leaks, explosions, the fires. I have to think environmental, but more importantly, I think of how that relates to safety of my tenants. You don't want to put your tenants at risk because you've got to deal with this lead and asbestos and keep them away from that as well." - Landlord

Maintenance and Installation

"If you're doing gas, maintenance can be more expensive just because some of the piping is hidden, so if there's any sort of maintenance issues like that." – Builder

"With the earthquakes and what goes on out here, there is a lot of maintenance that you have to upkeep and there are standards that buildings that once they get older, the piping leaks and everything else with gas." – Builder

"Electric, either the unit is on or it's off. If a stove is on, there are alarms that go off and then you'll burn the coil out, but unless you have something sitting on top of it, there's no fear of it damaging the unit unless it's used improperly. With gas, if you try to be cheap there line can be cracked. Anything can happen where if the actual resident isn't used to gas and doesn't know how to keep up with the maintenance of gas." – Builder

"It's a lot easier when you're installing electric appliances. If the person has no gas running through their house for whatever reason, it's a lot easier just that hookup, talking about like a gas stove or a gas range or something like that." – Builder

Smart homes/Connectedness/Control

"Everyone wants the house to be automated. Smart houses, it's so electronically influenced where we're doing a lot of that, where we're having to put in a lot of, and

wiring, and having my contractors do a lot of the wiring beforehand to wire for surround sound speakers and they want everything to be smart and automated and things like that." – Builder

"Coming to the star rating of environmentally friendly and drawing power from, I think you have more control over electric appliances than you do over gas." – Builder

"Electric is always more appealing to the younger crowd with the smart home and the environmental and the efficiency, so if that is the case, that's when we really consider electric." - Landlord

Advantages for Older Californians

"If you are a senior citizen, like I do a lot of remodel for senior citizens in their communities. They like things to be more quiet. So I kind of advise on electrical components and electrical gadgets and stuff like that, but not really gas." – Builder

"We have a lot of buildings with older tenants and the whole gas situation of leaving it on a little bit too long or even older buildings where we have the wall heater and we have to come around and ensure that it's safe." – Builder

Potential to Use Renewable Energy

"With solar and everything else, there are different ways to draw electricity and around the world there's wind, there's solar, then you're on the grid." – Builder

"It can also draw from solar, from wind. We don't have wind here, but solar and everything else, you can give back. Whatever you're not using, you can send back out to the grid. It just seems like it's a more workable utility than gas." – Builder

In contrast, those who tended to prefer gas mentioned the burden on the grid, the need for gas in an electrical outage, the perceived speed of electric appliances/systems, and the perceived reliability of electric appliances/systems.

Burden on Grid

"Let's say our project is 200 units, buying electrical products puts a lot of unnecessary burden on the transformers that we need to get and electrical that we need to get. And a lot of times we just won't qualify for certain credits." – Builder

"We typically choose gas appliances because with our type of funding, we have to satisfy certain requirements like solar panels and reduction in electrical use." – Builder

"We are reliant on our consultants' calculations as far as what we can and cannot put into the building. If the load allows us to do that, but if we cannot reduce the energy consumption, then we're stuck with gas." – Builder

"it's like every summer we have power outages all over town because the air conditioners can't even run, so we're all going to have... Somehow we're all going to be able to plug in Teslas somewhere. It doesn't seem like there's a lot of thought given to a lot of these issues. And like the electric car one, which I just think not reasonable and not everybody can obviously live with a [inaudible] car or afford an electric car or have a place to charge an electric car." - Landlord

Gas as a Necessary Back-up Option

"If the power went out I could still use my gas stove because it had a lighter. It's a Wolf stove, so it's gas and electric, but the electric is just the oven. So I could still get like hot water, and even though I could not do other stuff electric wise if the power's out, so that was nice. I could still make a cup of coffee or something." - Landlord

Heating Speed

"For water heater and stove top and oven, personally I would prefer gas, especially with the stove top. I just like the instant on, instant off of the heat versus where the electric takes a while to heat up or cool down. " - Landlord

"If you're doing electric, you have a slower heating process, it can be a little more expensive to install and maybe the maintenance may be a little bit higher as well." – Builder

Reliability

"We take mid-level equipment and it has a shelf life of five years. They tend to burn out. Even though it's a green product, are we being environmentally friendly by flipping these pieces of equipment more often?" – Builder

One area where perceptions were ambiguous was around cost. Some builders and landlords thought of gas as less expensive, while others thought of electricity as less expensive.

"As a monthly utility, yes, but as maintenance and everything else, and I'll be honest with you, we've been using electric appliances as much as possible. I would dare say you're not getting any rebates from the state of California on particular gas units. If you want

to go gas, the units are expensive, they're very effective, but at the same time, I don't see where the rebates are coming in because it isn't considered... it's considered not doing your shares as far as the footprint that the building or the appliances is using. Again, monthly, yes, but the overall cost of the unit, say, over five years, I'm going to go with electricity." – Builder

"I would even say electric appliances are a little less expensive and with the net savings you're getting from environmentally friendly, it's just all encompassing." – Builder

"Actual financial cost, not environmental cost or whatnot, but that gas is cheaper, and the idea of a gas stove just heating better or working better is appealing to people." – Builder

"Electricity is expensive, but I think a lot of times it's price gouging." – Builder

"I think that the considerations before was, electrical appliances, especially things like a water heater, really used a lot of energy and cost a lot of money, and that was the big factor before. And now I think it's switching over a little bit." – Builder

"We found that gas prices on a building that's 200 units is a third of electrical prices or prices of electricity." – Builder

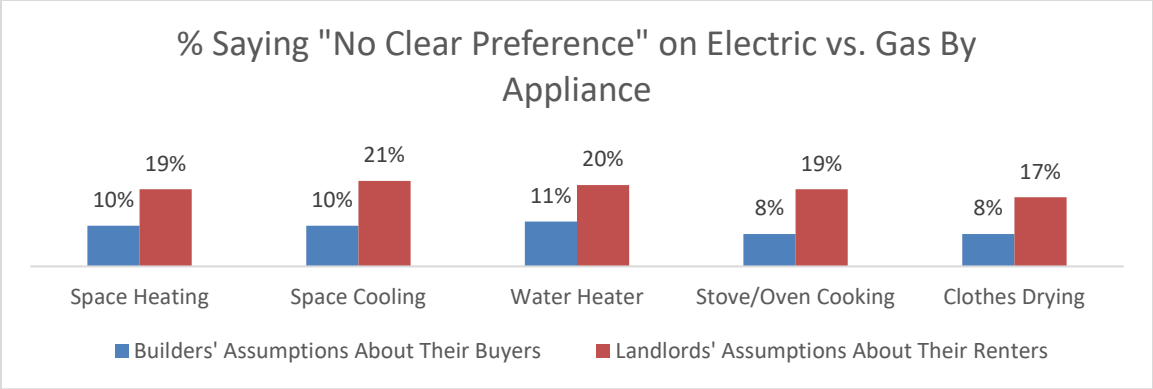
"Electrical appliances, those sometimes can be a little more cost-effective than buying a gas range stove." – Builder

Builders' relative affinity for, and familiarity with, electric appliances could be driven by their experience with regulations and incentives. Nearly four-in-five (79%) report having been required by local laws or regulations to install electric systems or appliances into a new home, and similarly four-in-five (79%) have received incentives for installing electric systems or appliances into new homes. Landlords report lower levels of experience than builders when it comes to regulations and incentives; 58% have been required by law to install electric systems or appliances (-21 percentage points from builders) and 62% have received incentives for installing electric systems (-17 from builders). A push to educate landlords on incentives could be helpful; while 40% are very familiar with incentives offered, 44% are only somewhat familiar, and 16% are unfamiliar.

The gap between builders' perceptions of their buyers and landlords' perceptions of their renters could indicate that the intended permanence of residence plays a role in their

preferences as well. Landlords were often around twice as likely to believe their renters had no preferences on gas vs. electric than builders were to believe their buyers had no preferences **(Figure 16)**. This is important because one incentive for landlords and builders to act is their belief that they are serving the marketplace, and if they do not believe their buyers/renters have an opinion, the incentive to consider their preferences is weakened.

Figure 16



Understanding the attitudes that builders and landlords are coming to the table with right now is critical to understanding the amount of new information they need to change behaviors. Overall, builders and landlords seem aligned on the importance of financial considerations in their decision-making process, but builders are much more likely to consider environmental factors, their buyers' preferences, and modern design.

Looking deeper at how builders and landlords are making decisions, it is clear that each group has a different set of motivating factors. In the survey, builders and landlords were both asked to rate whether they agreed or disagreed with seven different statements. For builders, they ranked (by strongly agree) as follows:

- It is important to me to accommodate preferences for appliance types (67% strongly agreed)
- Offering electric systems and appliances in my units makes me/my company seem more modern (57% strongly agreed)
- I am concerned about the impact that air quality has on health (55% strongly agreed)

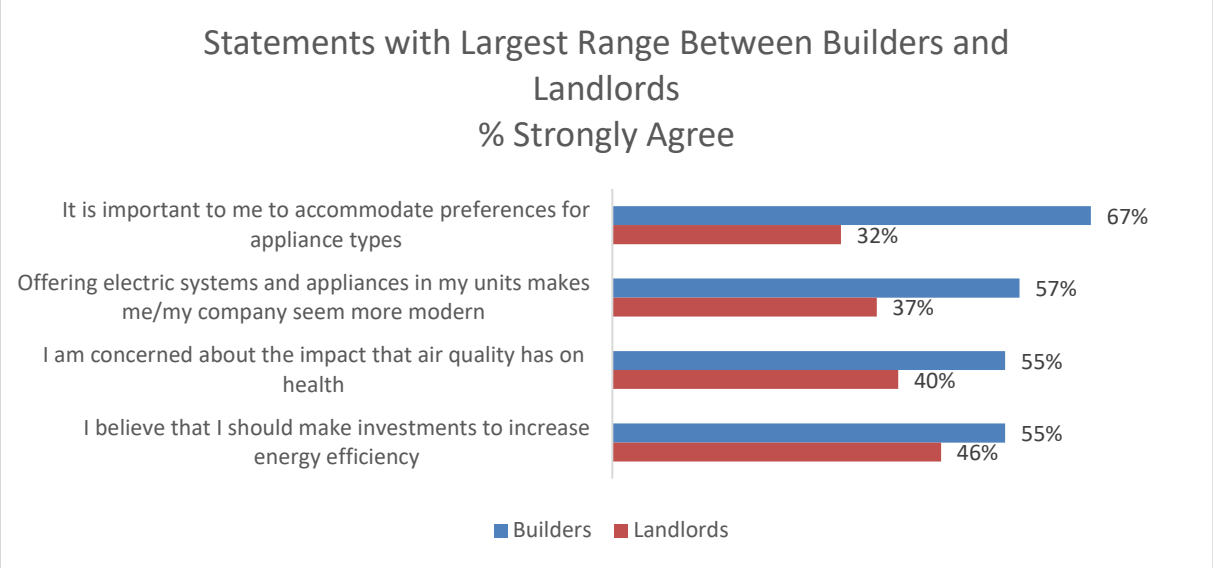
- I believe that I should make investments to increase energy efficiency (55% strongly agreed)
- I make decisions about upgrades solely based on whether they make economic sense for my bottom line (45% strongly agreed)
- Upfront costs are the biggest driver of my equipment specification decisions (36% strongly agreed)
- I rely on the expertise of contractors or other technical experts to make decisions (35% strongly agreed)

Landlords were less likely than builders to agree with almost all these statements. They were most motivated by language around investments and air quality, though still to a lesser degree than builders were. They ranked (by "strongly agreed") as follows:

- I believe that I should make investments to increase energy efficiency (46% strongly agreed)
- I am concerned about the impact that air quality has on health (40% strongly agreed)
- I make decisions about upgrades solely based on whether they make economic sense for my bottom line (39% strongly agreed)
- Offering electric systems and appliances in my units makes me/my company seem more modern (37% strongly agreed)
- I rely on the expertise of contractors or other technical experts to make decisions (35% strongly agreed)
- Upfront costs are the biggest driver of my equipment specification decisions (34% strongly agreed)
- It is important to me to accommodate preferences for appliance types (32% strongly agreed)

Comparing the statements with the most variance between the perceptions of builders and landlords, there were four statements where a significant majority of builders strongly agreed, while fewer than half of landlords strongly agreed **(figure 17)**.

Figure 17



The 35-percentage point gap between the 67% of builders who strongly agree that they want to accommodate preferences for appliance types and the 32% of landlords who strongly agree with the same statement is striking. In fact, of the seven statements tested, this was the statement builders strongly agreed with *most*, and the statement landlords strongly agreed with *least*.

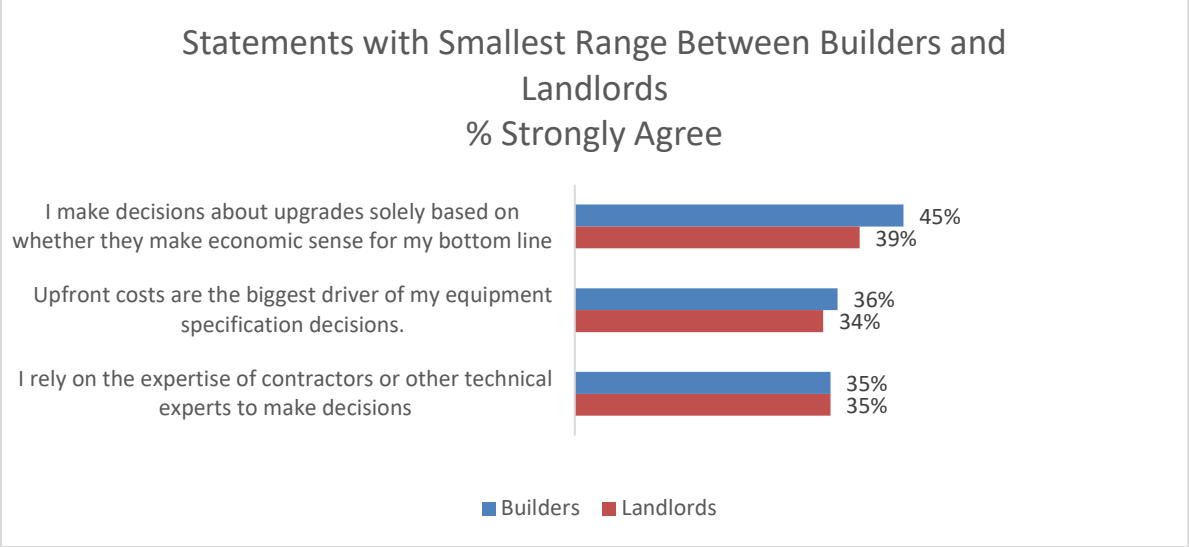
Looking deeper demographically, the builders who are most likely to say this are those who build 51-150 homes a year (74%). Landlord attitudes on climate change and experience with regulations and incentives correlate with their willingness to accommodate preferences for appliance types; 48% of landlords who find climate change extremely important strongly agree with this statement (compared to 32% overall), as do 39% who have been required by local laws to make changes to electric appliances and 38% who have received incentives.

These subsets of landlords behave more like the average builder than other landlord subsets throughout the dataset. Note that this is not to say landlords find their renters' preferences *un*important. In fact, when asked whether renters' preferences will affect landlords' decision-making about gas or electric appliances, more than two-in-three landlords said they would be at least somewhat likely to weigh those decisions for each appliance (space heating 69%, space

cooling 69%, water heater 68%, stove/oven cooking 68%, clothes drying 69%). Also interesting for landlords, the statement with which they strongly agree the most has to do with making investments in increase energy efficiency. The economic component of this statement – i.e., framing energy efficiency spending as an investment – may be especially salient with landlords.

Builders and landlords were more likely to have similar opinions on economic questions and on their use of contractors than they were on other questions, with small gaps between the percent who strongly agree with each statement **(figure 18)**. For builders, these preferences trail behind customer preferences, modern design, and air quality. For landlords, these fall into a middle tier.

Figure 18



Overall Implications

The research shows that it is important to understand the implications of the decision-making process when it comes to the usage of electric alternative appliances – as well as how these processes vary by consumers, builders, and landlords. Each audience is responding to their own incentives. Similarly, though each audience is environmentally driven in its attitudes – builders primarily, followed by landlords, followed by consumers overall – they are each considering much more than their environment when they make the replace/install/upgrade decision. In

the qualitative interviews, concerns around logistics, large-scale cost, and not wanting to push systems on clients that they were uninterested in became compelling factors as they made their decisions. This puts a premium not only on messaging which explains how electric appliances/systems will help California achieve its energy goals, but on how other benefits line up neatly with consumers', landlords', and builders' respective incentives. A multi-tiered messaging campaign will be the best way to help each other audience understand that that which is good for the environment is also sensible in addressing other economic, comfort, health, and quality of life concerns.

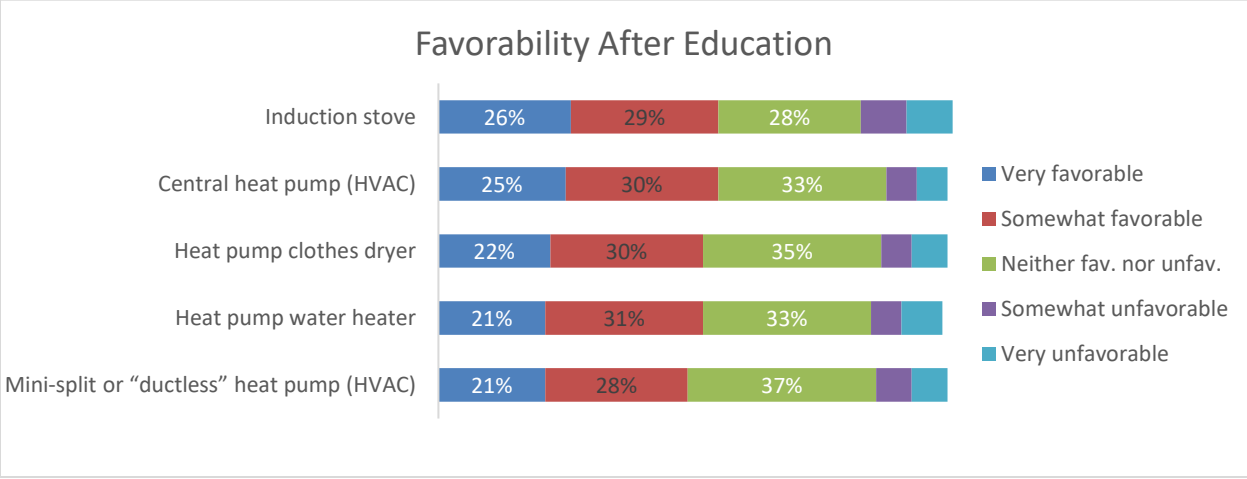
Education and Messaging in Service of Adoption

Key Finding #4: As consumers, builders, and landlords learn more, they become more favorable toward alternatives; consumers respond especially to certain economic messages.

Consumers

After consumers become educated in the survey on the alternatives, they exhibit cautious optimism about these appliances/systems. In the survey, consumers are given a short description and are shown a diagram of each of the five different types of electric appliances/systems with which they may or may not have previously been familiar. After learning a little about each of the appliances/systems, Californians are far more likely to be favorable than unfavorable – though that favorability is tepid, with the vast majority either "somewhat favorable" or "neither favorable nor unfavorable" **(figure 19).** The relative lack of enthusiasm – i.e., the percent saying "very favorable" – could be attributed to the fact that many are just receiving information on this for the first time in the survey and would need to learn more or have these facts verified before committing outright.

Figure 19



Looking at demographic differences, the most environmentally conscious groups are the most likely to be favorable. Additionally, younger Californians, those with the highest levels of

income, and those with the highest levels of education are disproportionately likely to say they are very favorable once they have learned more about each of these appliances/systems.

Pro-environmental messaging helps convince consumers, but so does pro-health messaging and pro-savings messaging. At the end of the survey, Californians are asked to assess how convincing 16 different messages are, assuming they are true, as reasons to consider electric appliances.[2]

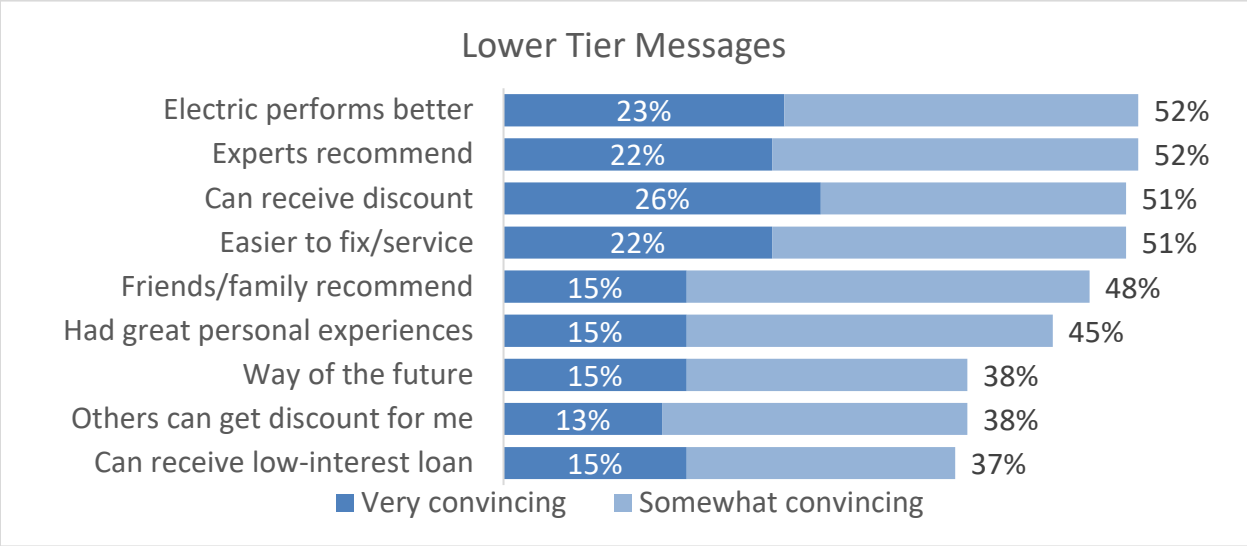
Seven top messages include the following:

- *Economic Reasons*
  - "Electric-powered systems and appliances are more reliable." (56% convincing, including 25% who say very convincing)
  - "Electric systems and appliances last longer compared to gas-powered ones." (55%, 26%)
  - "I can receive a rebate for the purchase of an electric-powered system or appliance." (55%, 25%)
  - "It would save me money over time." (53%, 29%)
- *Economic/Environmental Hybrid Reasons*
  - "Electric powered systems and appliances use less energy." (57%, 28%)
- *Environmental Reasons*
  - "Electric-powered systems reduce my home's carbon footprint and environmental impact." (53%, 28%)
- *Health Reasons*
  - "Electric powered systems create less air pollution and are better for my family's health." (55%, 30%)

[2] *Specifically, they are first asked to choose which messages they find unconvincing. They then rate all messages which they do not find unconvincing as either "a little convincing," "somewhat convincing," or "very convincing." For simplicity's sake, the data from these two questions has been combined.*

Other lines of reasoning – such as appealing to a notion that electric energy is inherently modern, or that friends and family recommend these – are less likely to convince consumers **(figure 19)**.

Figure 19



Spotlight: Key Decision-Makers (Homeowners and Renters)

A majority of homeowners is favorable toward each appliance once they have learned more – especially central heat pumps (56% somewhat or very favorable) and heat pump water heaters (54%). Renters are slightly less likely to be favorable toward each appliance when compared to homeowners, except for induction stoves; 57% of renters are favorable toward induction stoves, compared to 53% of owners.

Those nearest to purchasing a new house are a group where the benefit of education can be seen. Among those purchasing in the next year, 67% say they are favorable toward induction stoves (compared to 55% overall), 61% toward heat pump clothes dryers (52% overall), and central heat pumps / ductless heat pumps (60% overall for each.) This shows the importance of delivering education at some point during the home-buying process; prospective buyers have these appliances and systems on their radar and are more likely to meaningfully absorb the benefits.

Messages tended to appeal more to renters or those who were buying in the next two years than to owners or those who had no plans to buy in the next two years. Renters were considerably more likely than owners to be convinced that "electric systems and appliances last longer compared to gas-powered ones" (63% very/somewhat convincing for renters, 48% for owners), "electric-powered systems and appliances are more reliable" (62%, 51%), and "I can receive a rebate for the purchase of an electric-powered system or appliance" (60%, 50%) are good reasons for implementing these changes.

Spotlight: Age

After learning more about each electric appliance alternative, a majority of Californians under 50 say they are favorable toward each alternative. More specifically, close to two-thirds of Californians under the age of 34 are favorable about central heat pumps and induction stoves. Those 50 and over are less likely to be favorable, though they still range between 43% and 49% in favorability for any given appliance.

Messages are generally more convincing to younger Californians, with only those who are age 65 and up expressing consistent skepticism.

% Saying Message is Very or Somewhat Convincing	Total	18-24	25-34	35-49	50-64	65+
Electric powered systems and appliances use less energy	**57%**	63%	65%	62%	53%	42%
Electric-powered systems and appliances are more reliable	**56%**	63%	65%	60%	51%	42%
I can receive a rebate for the purchase of an electric-powered system or appliance	**55%**	61%	54%	64%	52%	39%
Electric systems and appliances last longer compared to gas-powered ones	**55%**	67%	66%	59%	48%	36%
Electric-powered systems create less air pollution and are better for my family's health	**55%**	68%	64%	58%	50%	39%
It would save me money over time	**53%**	66%	58%	56%	48%	39%
Electric-powered systems reduce my home's carbon footprint and environmental impact	**53%**	62%	60%	59%	48%	38%
Electric-powered systems and appliances have better performance and functionality compared to gas-powered	**52%**	64%	55%	55%	48%	40%
Electric-powered systems and appliances come highly recommended from energy experts	**52%**	54%	54%	62%	46%	37%
It is easier to fix or service electric-powered systems and appliances	**51%**	67%	53%	53%	49%	38%
I can receive a discount at the time of purchase for electric-powered systems or appliances	**51%**	61%	49%	58%	51%	38%
Electric-powered systems and appliances come highly recommended from friends and family	**48%**	61%	53%	51%	43%	33%
I have had great experiences with electric-powered systems and appliances	**45%**	55%	50%	48%	47%	28%
Electric appliances are the way of the future and I want a modern home	**38%**	45%	43%	41%	37%	24%
Whether someone else is responsible for getting me a rebate or discount on the electric appliances or systems	**38%**	45%	42%	48%	30%	23%
I can receive a low-interest loan to finance my upgrade to an electric-powered system or appliance	**37%**	29%	47%	42%	36%	23%

Note: Cells in green represent the top 6 messages in each column (or more if multiple messages tie for 6th place).

Spotlight: Low-Income Californians

The level of education given in the survey may not be sufficient for low-income Californians, or may not be speaking to them as directly as it should to be effective compared to other demographic groups. After learning more about each appliance/system, those who earn less income remain less favorable than their higher-income counterparts.

Favorability Toward Electric Systems/Appliances By Income				
% Very or somewhat favorable	*Overall*	*Lowest Income (<$35K)*	*Second Lowest ($35K-$50K)*	*Highest ($250K+)*
Heat pump water heater	**21%**	18%	20%	32%*
Induction stove	**26%**	27%	28%	35%*
Central heat pump (HVAC)	**25%**	20%	25%	36%*
Mini-split or "ductless" heat pump (HVAC)	**21%**	19%	15%	33%*
Heat pump clothes dryer	**22%**	19%	22%	30%*
**Indicates statistical significance compared to at least one other number in the row*				

The most resonant messages vary slightly for the lowest-income earners. The most convincing message for those earning < $35K is that electric systems and appliances last longer; 66% find this convincing. This is also one of six messages for those earning $35K-$50K which at least 60% of that group finds convincing (while none of the messages reach the 60% threshold among the population overall.) Among $35K-$50K Californians, they are disproportionately likely to find rationales around better air quality, better health outcomes, and better appliance performance to be convincing.

% Saying Message is Very or Somewhat Convincing	Total	<$35	$35-$50K
Electric powered systems and appliances use less energy	**57%**	56%	67%
Electric-powered systems and appliances are more reliable	**56%**	61%	60%
I can receive a rebate for the purchase of an electric-powered system or appliance	**55%**	49%	57%
Electric systems and appliances last longer compared to gas-powered ones	**55%**	66%	63%
Electric-powered systems create less air pollution and are better for my family's health	**55%**	59%	65%
It would save me money over time	**53%**	53%	49%
Electric-powered systems reduce my home's carbon footprint and environmental impact	**53%**	55%	61%
Electric-powered systems and appliances have better performance and functionality compared to gas-powered	**52%**	59%	65%
Electric-powered systems and appliances come highly recommended from energy experts	**52%**	57%	55%
It is easier to fix or service electric-powered systems and appliances	**51%**	55%	44%
I can receive a discount at the time of purchase for electric-powered systems or appliances	**51%**	53%	50%
Electric-powered systems and appliances come highly recommended from friends and family	**48%**	52%	48%
I have had great experiences with electric-powered systems and appliances	**45%**	51%	51%
Electric appliances are the way of the future and I want a modern home	**38%**	52%	46%
Whether someone else is responsible for getting me a rebate or discount on the electric appliances or systems	**38%**	41%	47%
I can receive a low-interest loan to finance my upgrade to an electric-powered system or appliance	**37%**	40%	31%

Spotlight: Perspective on Climate Change

After messaging, there is an enormous gap in favorability toward each appliance based on pre-existing perceptions of importance of climate change. Nearly two-thirds of those who find climate change to be at least very important are favorable toward each appliance, while closer to one-third of those who find climate change to be somewhat important or less are favorable toward the same. This serves to illustrate the fact that it is difficult to motivate those who reject the premise that fighting climate change and achieving air quality goals are important in the first place.

Favorability with Electric Systems/Appliances by Importance of Climate Change		
% Very or somewhat favorable	*Extremely/Very*	*Somewhat or Less*
Heat pump water heater	64%*	38%
Induction stove	64%*	42%
Central heat pump (HVAC)	65%*	42%
Mini-split or "ductless" heat pump (HVAC)	60%*	34%
Heat pump clothes dryer	64%*	37%
**Indicates statistical significance*		

Unsurprisingly, and similarly, messages are better received by those whose attitudes are already aligned with climate and air quality goals. Only on "electric-powered appliances/systems are more reliable" did a majority of those with less environmentally-conscious views say they found that a convincing reason to adopt those appliances and systems. The gap between views based on climate change importance is smallest on that message, at nine percentage points (60% convincing among greener Californians, 51% convincing among less-green Californians); the gap on all other messages is between 10 and 24 percentage points. The 24-point gap belongs to the statement "Electric-powered systems and appliances come highly recommended from energy experts" (61% greener Californians, 37% less-green Californians.) This is a significant point because it may indicate unwillingness for less-green Californians to listen to independent third-party experts.

% Saying Message is Very or Somewhat Convincing	Total	Extremely/Very	Somewhat Or Less
Electric powered systems and appliances use less energy	**57%**	63%	48%
Electric-powered systems and appliances are more reliable	**56%**	60%	51%
I can receive a rebate for the purchase of an electric-powered system or appliance	**55%**	59%	48%
Electric systems and appliances last longer compared to gas-powered ones	**55%**	62%	45%
Electric-powered systems create less air pollution and are better for my family's health	**55%**	62%	45%
It would save me money over time	**53%**	60%	43%
Electric-powered systems reduce my home's carbon footprint and environmental impact	**53%**	61%	41%
Electric-powered systems and appliances have better performance and functionality compared to gas-powered	**52%**	57%	45%
Electric-powered systems and appliances come highly recommended from energy experts	**52%**	61%	37%
It is easier to fix or service electric-powered systems and appliances	**51%**	58%	41%
I can receive a discount at the time of purchase for electric-powered systems or appliances	**51%**	57%	42%
Electric-powered systems and appliances come highly recommended from friends and family	**48%**	52%	41%
I have had great experiences with electric-powered systems and appliances	**45%**	50%	38%
Electric appliances are the way of the future and I want a modern home	**38%**	42%	31%
Whether someone else is responsible for getting me a rebate or discount on the electric appliances or systems	**38%**	42%	32%
I can receive a low-interest loan to finance my upgrade to an electric-powered system or appliance	**37%**	43%	27%

Other Notable Consumer Findings

On average, certain demographic groups are more responsive to messaging. Taking an average score across the 16 tested messages, those most likely to say each message was at least somewhat convincing included:

- Younger Californians – especially those age 18-24 (58% average convincing score, compared to 50% average convincing overall)
- Women under 50 (57%)
- Asian (56%) and Black (54%) Californians
- Renters (54%)

- Those purchasing a home in the next year (56%)
- Those who say climate change is extremely important (58%)
- Those with no one <18 in the home (55%)
- Those in Los Angeles (54%)
- Those who live in semi-detached homes (57%), apartments (56%), or condos (56%)

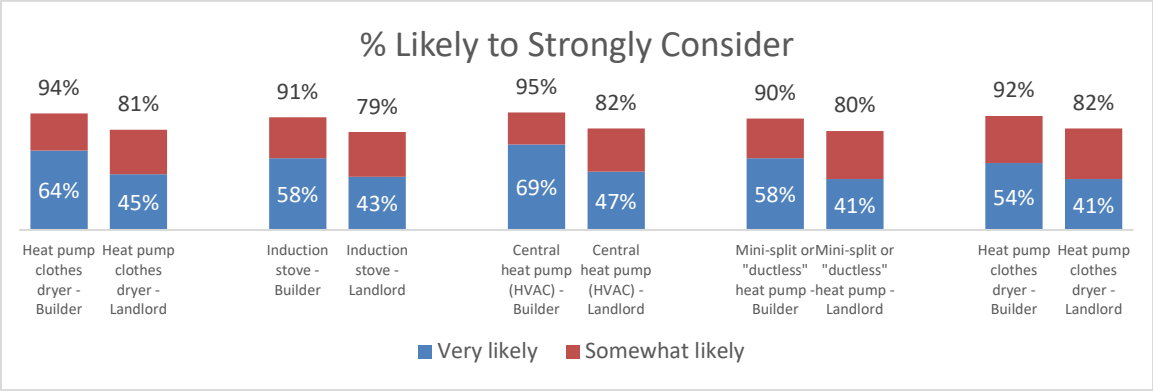
Those who, on average, are less likely to say each message was at least somewhat convincing included:

- Californians 65+ (35% average convincing score, compared to 50% average convincing overall)
- Men 50 and over (37%)
- Those with some college-education, but no degree (46%)
- Those earning $150K to $250K (45%)
- Those who say climate change is not too important or not at all important (32%)

Builders and Landlords

Builders and landlords also respond favorably to new information about electric appliances/systems. Though they only received education about each appliance (rather than the full battery of messages that consumers received), the impact of that education was strong. Fully nine-in-ten builders and eight-in-ten landlords were at least somewhat likely to consider these appliances/systems after learning more. Additionally, most builders (between 54% and 69%) say they would be *very* likely to strongly consider these, while a plurality of landlords (between 41% and 47%) say the same **(figure 20)**.

Figure 20



Those who said they were likely to strongly consider each appliance were given lists of potential reasons why they would consider them, with builders picking up to three from a list of 18 reasons and landlords picking up to three from a list of 22 reasons. Overall, the most commonly-cited reasons from these lists tended to be:

- An appliance/system being more reliable or more high performing
- An appliance/system using less energy
- An appliance/system having a longer lifetime
- An appliance/system heating or cooling more quickly
- Cost savings on annual energy bills
- Electric systems being better for air quality

The ranking of these top reasons was similar between builders and landlords, though landlords were understandably more likely to cite cost savings given the fact that they would likely be those who bear the costs. Special emphasis on the money saved over time for landlords could be helpful in increasing adoption rates.

Landlords also note that different programs weigh heavily on their upgrading/replacing decisions. 71% say that rent control and stabilization programs are at least somewhat relevant to their purchase decisions, as are pass through cost restrictions (72%), buyout policies (62%), owner move-in policies (69%) and “Just Cause” eviction policies (66%). Landlords who have

been required by local laws to install electric equipment are significantly more likely – twice as much or more, depending on the ordinance – to say these policies are highly relevant.

% Highly Relevant	*Landlords Who Have Been Required to Install*	*Landlords Who Have Not Been Required to Install*
Rent control/stabilization	53%*	26%
Pass through cost regulations	51%*	26%
Tenant buyout ordinances	51%*	22%
Owner/relative move-in ordinances	52%*	26%
"Just cause" eviction	46%*	19%

**Indicates statistical significance*

In interviews, builders and landlords were clear that having a robust and well-publicized incentive or rebate program would help them adopt electric appliances/systems. They gave examples of similar incentives they have found to be effective.

> *"I have heard of some sort of rebate or kickback where I'm not sure if it's already in effective, but where they will pay for some of the installs or some of the repairs on some of the appliances. If you're installing an electric appliance, you'll get 50% back or on the repairs or installs on certain super-efficient type of heating systems or cooling systems or appliances." – Builder*

> *"One thing that the state does that I hope they do more of is maybe incentivize solar panels. I know they've already kind of done that, but it'd be nice if it was even a better incentive I think." – Builder*

> *"I think they might have it in other countries, is to encourage people to maybe get maybe many more solar panels than maybe their house uses and kind of contribute more to the electric grid altogether. And then also maybe incentivize that a little bit where anything that you produce over and above what you use, maybe you might get paid for those kilowatt-hours." – Builder*

> *"If a manufacturer is selling me a product that is green build energy efficient, then the prices shouldn't be as high. So maybe the government or the state of California can subsidize those efficient materials or gadgets." – Builder*

"Put a system out where homeowners, or potential future homeowners have an opportunity to have access to solar on a cheaper rate. I think if we drive that, then a lot more electrical appliances can be installed at homes because they will just be offset by their solar panels." – Builder

"Definitely if it was some kind of rebate or coupon structure, I think either of those at an immediate point of sale of said appliance or permitting, not something necessarily that would be down the line for bills. I'm also comfortable with tax incentives." – Builder

"California has so many incentives that we're trying to take advantage of that you almost need someone in the office that's looking at it on a weekly basis." – Builder

"So help with the subsidies with solar, give maybe additional utility credits if you see a landlord trying to move towards a more environmentally-friendly pathway." - Landlord

"I think it's just, it needs to be, again, either free or rebate. There needs to be some economic impetus pushing us to do it, some reward back or I would need to know for sure that everyone's getting deadly sick from these gas appliances." - Landlord

Overall Implications

The results from the education and messaging portions of the research reinforce the notion that consumers do not dislike these appliances systems; rather, they were mostly unaware of them and become positive as they learn more. Consumers, builders, and landlords all become favorable as they learn more about each appliance and system, and consumers are especially convinced by messages around the environment, their economic well-being, and quality of life. Focusing on the needs of each consumer, each builder, and each landlord, using these arguments, is likely to be an effective way to drive adoption in the service of helping California meet its climate and air quality.

RECOMMENDATIONS

Five key recommendations stem from this research. CARB and SCE should consider:

1. **Illustrate in messaging how Californians are affected not just on a macro level, but a micro level, when it comes to switching, installing, upgrading or replacing gas appliances with more environmentally-friendly electric appliances.** Concern about climate change is a shared value and part of the Californian identity, and it is helpful for orienting Californians toward an overall goal. That said, it is just a starting place for the discussion. The research found messaging to be most effective among consumers when it highlights other economic components and quality of life components. In other words, consumers need to see how they benefit directly, beyond merely being satisfied that changing from gas to electric would satisfy their desire for better environmental stewardship.
2. **Demonstrate consumers' desire for electric appliances, and the desire for these appliances among landlords and builders will follow.** Like consumers, landlords and builders are environmentally-minded; in fact, they are more likely than the average consumer to care about climate change. However – also like consumers, they need to be shown why environmental concerns need to be paramount. Builders consider their buyers' preferences, as landlords consider their renters' preferences. If these audiences are actively making living decisions based on the types of appliances installed, the economic incentive for builders and landlords alone should have a measurable effect.
3. **Consider a multi-tiered media campaign by age and circumstance.** The demographic data shows clear differences in what Californians know, or think they know, about electric appliances, and what they are willing to do to help California achieve its energy goals. Older Californians have different misconceptions than younger Californians. Higher-income Californians are more likely than lower-income Californians to think about the environment when making purchases and during home searches. Those who are about to purchase a home have higher levels of appliance/system awareness than those with no plans to do this at all. This calls for a highly nuanced, multi-channel, multi-message media plan that differs by demographics such as age, homeownership status, and income. Understanding where those groups get their information, and how best to

reach them with messaging, is critical.

4. **Consider the profile of the more responsive consumer; engage these groups first.** Those who respond to messaging most tended to be younger, have more environmentally friendly views, be more likely to expect to purchase a home in the next year, be more likely to be currently renting. Other demographic spikes as well should be considered – such as the fact that women under 50, Asian Californians, and Black Californians are more responsive to messaging as well. These groups are relatively unaware of electric appliances (as are all Californians), but changing their opinions may be more quick and efficient once they learn more. In contrast, groups with greater skepticism of messaging – such as those over 65, men over 50, and those with some college education but no degree – can be avoided as they are less likely to change their opinions immediately. Most importantly, those who say climate change is not too important or not important at all should not be targeted for persuasion; they are the most skeptical and do not become much more favorable when learning about appliances.
5. **Continue to monitor trends and shift in consumers' opinion after messaging has been delivered.** The numbers in this report are setting a baseline around awareness and understanding of the potential for electric appliances to positively affect California's climate and air quality goals. Further and frequent research, using the same high-quality methodology with a focus on representativeness and reaching difficult-to-survey audiences, will help show the rates at which awareness is rising, electric appliance usage is being adopted, misconceptions are being corrected, and messaging is being understood.