Pathway to Zero Natural Gas

Survey Report

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1 Survey Procedure

Researchers from the University of New Mexico and New Mexico State University, in collaboration with LADPU, conducted a survey from July to September 2025 to examine households' attitudes and preferences toward appliance fuel switching. The survey comprised two parts: Part I gathered demographic, billing, housing, and appliance stock information, while Part II was a discrete choice experiment (DCE) presenting respondents with appliance-switching scenarios to elicit their willingness to pay to move away from natural gas.

We received 912 responses, of which 582 were complete. The median completion time across both parts of the survey was 17 minutes. More than half of the respondents rated the survey as being of good quality or higher (Table 1).

On average, the survey received a score of 3.51 on a 1–5 scale. There are 53% of respondents who rated the survey as "Good" and above, and 36% as "Fair". Among all responses, most participants viewed the survey positively, with the majority clustering around the mid-to-high end of the scale.

Table 1: Survey Summary Statistics for Survey Quality

Variables	Mean	S.D.	Min	Max	N
How would you rate the quality of this survey?	3.51	0.9	1	5	627
Responses					
Very Poor	0.03	–	–	–	627
Poor	0.07	–	–	–	627
Fair	0.36	–	–	–	627
Good	0.42	–	–	–	627
Excellent	0.11	–	–	–	627

Note: Responses were coded on a scale ranging from 1 = "Very Poor" to 5 = "Excellent". Standard deviation, minimum, and maximum values are not reported for dummy variables. The mean values can capture the spread in the dataset, while the minimum and maximum are always 0 and 1, respectively, and therefore omitted for brevity.

In total, 242 comments were collected from the survey. We applied an AI-assisted text analysis to identify the most common themes of concern. Using ChatGPT[1], we categorized the responses into key themes. Figure 1 summarizes the distribution of these categories, and the full set of comments used for this analysis is provided in Appendix C.

[1] The specific prompt was: "list the most common concerns among these comments."

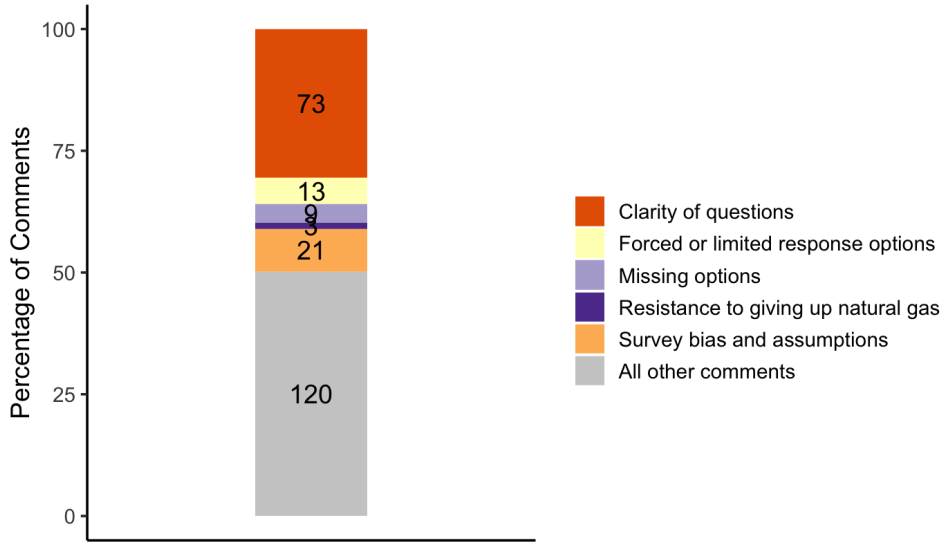


Figure 1: Survey comment themes

Most Common Concerns

- Clarity of questions (73 mentions, 30.2%):
  Many respondents noted that some survey questions were unclear, confusing, or ambiguously worded. They felt that better phrasing and clearer answer choices were needed.
- Technical and feasibility issues (47 mentions, 19.4%):
  Respondents highlighted practical barriers to switching from gas to electric, such as appliance reliability (e.g., ovens during blackouts), panel upgrades, or infrastructure concerns.
- Survey bias and assumptions (21 mentions, 8.6%):
  Several participants felt the survey assumed that switching to electric is inherently better, which biased the framing of questions.
- Forced or limited response options (13 mentions, 5.3%):
  Respondents disliked being required to choose from answer sets that did not reflect their views. They often felt constrained by a lack of flexibility in responses.
- Missing “none of the above” or “other” options (9 mentions, 3.7%):
  Many requested that surveys include “none of the above” or a write-in option, especially when existing answers did not match their reasoning.
- Resistance to giving up natural gas (3 mentions, 1.2%):
  A small but notable group explicitly stated they would never want to fully switch away from natural gas.

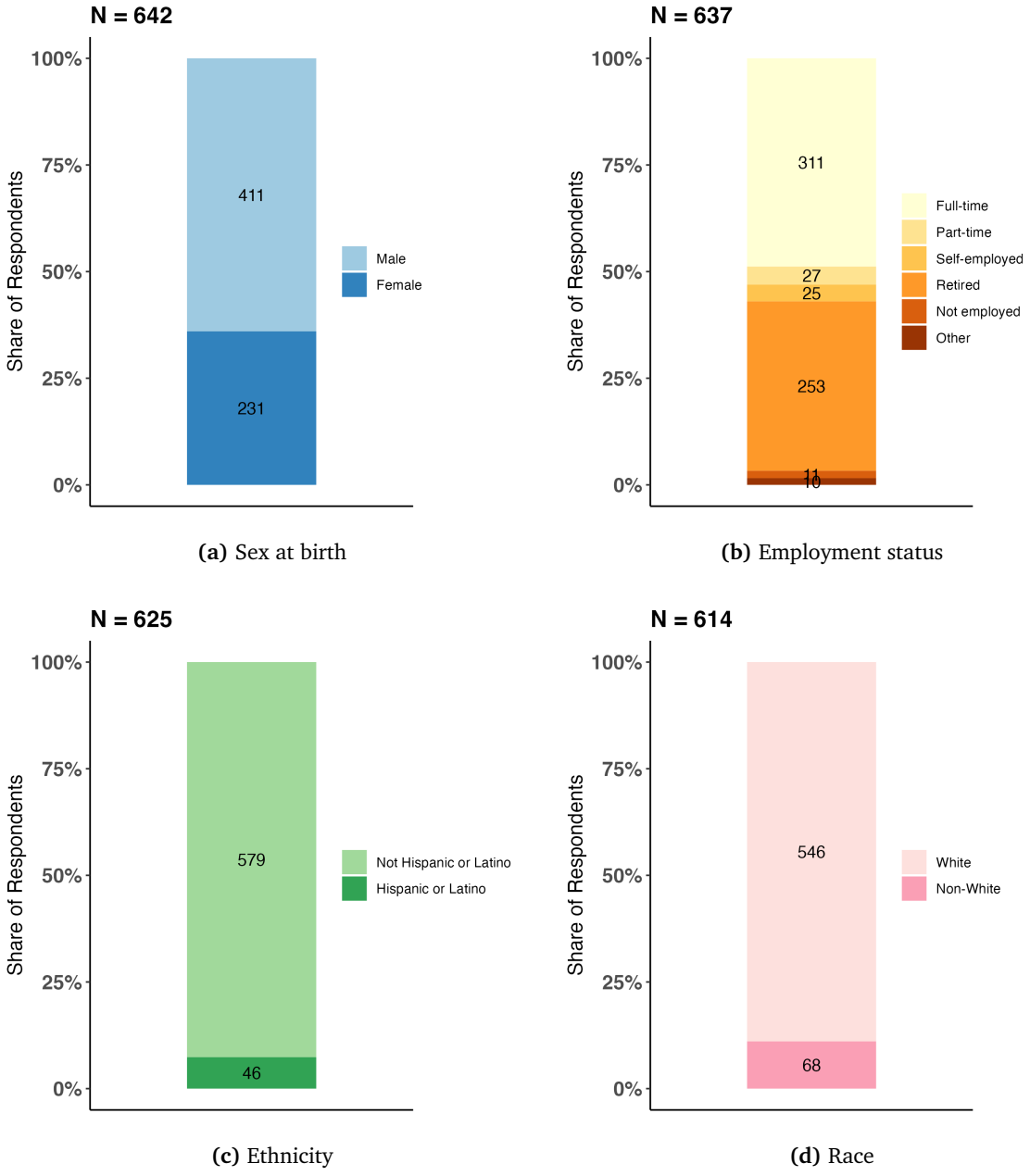
Below, we summarize the survey responses by section and highlight the preliminary findings.

2 Survey Summary

2.1 Demographics of survey respondents

In this section, we summarize the survey respondents' basic demographic characteristics, including age, sex at birth, race and ethnicity, education, income, employment status, and household composition.

Figure 2 illustrates the demographic characteristics of the survey respondents. Among respondents who reported sex at birth, 64% identified as male. Employment status was concentrated among those working full-time (49%) and those who were retired (40%), while smaller shares reported part-time employment (4%), self-employment (4%), not employed (2%), or other categories (2%). In terms of race and ethnicity, 89% of respondents identified as White, and 93% reported not being Hispanic or Latino. Taken together, the sample is disproportionately male, White, and non-Hispanic, with employment primarily concentrated among full-time workers and retirees.



(a) Sex at birth

(b) Employment status

(c) Ethnicity

(d) Race

Figure 2: Survey Respondents Demographics

Figures 3 and 4 summarize the income and education level of the surveyed households. Reported household incomes are concentrated in the upper ranges, with over one-third of respondents earning more than $200,000 annually and more than 40% reporting an annual income between $100,000 and $200,000. Relatively few households fall into the lowest income categories, with just 4% earning under $20,000 and 8% between $20,000 and $50,000.

Educational attainment follows a similar pattern of upward concentration: 60% of respondents held a master's degree or higher, and 26% reported a bachelor's degree as their highest degree obtained. Only a negligible portion reported a high school diploma or less (less than 0.1%). These distributions highlight that the respondent pool is heavily weighted toward higher-income and highly educated individuals, characteristics that may shape the perspectives and responses represented in the survey data.

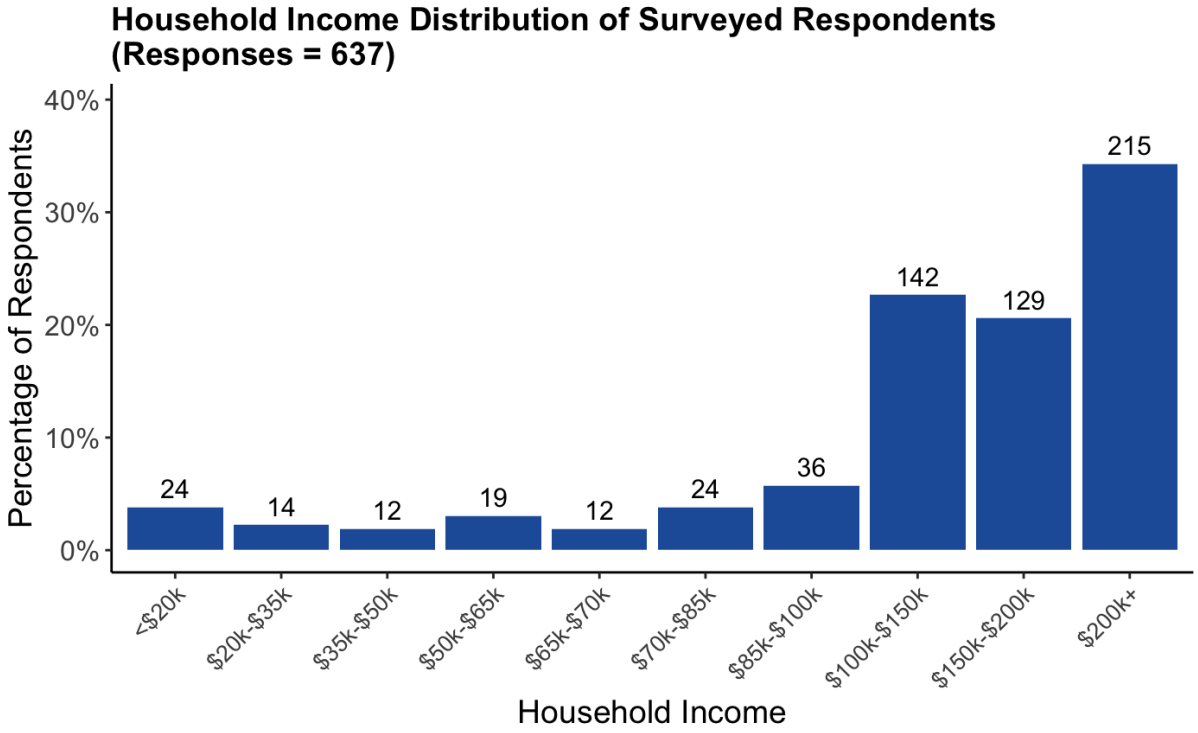


Figure 3: Total household income for the past year

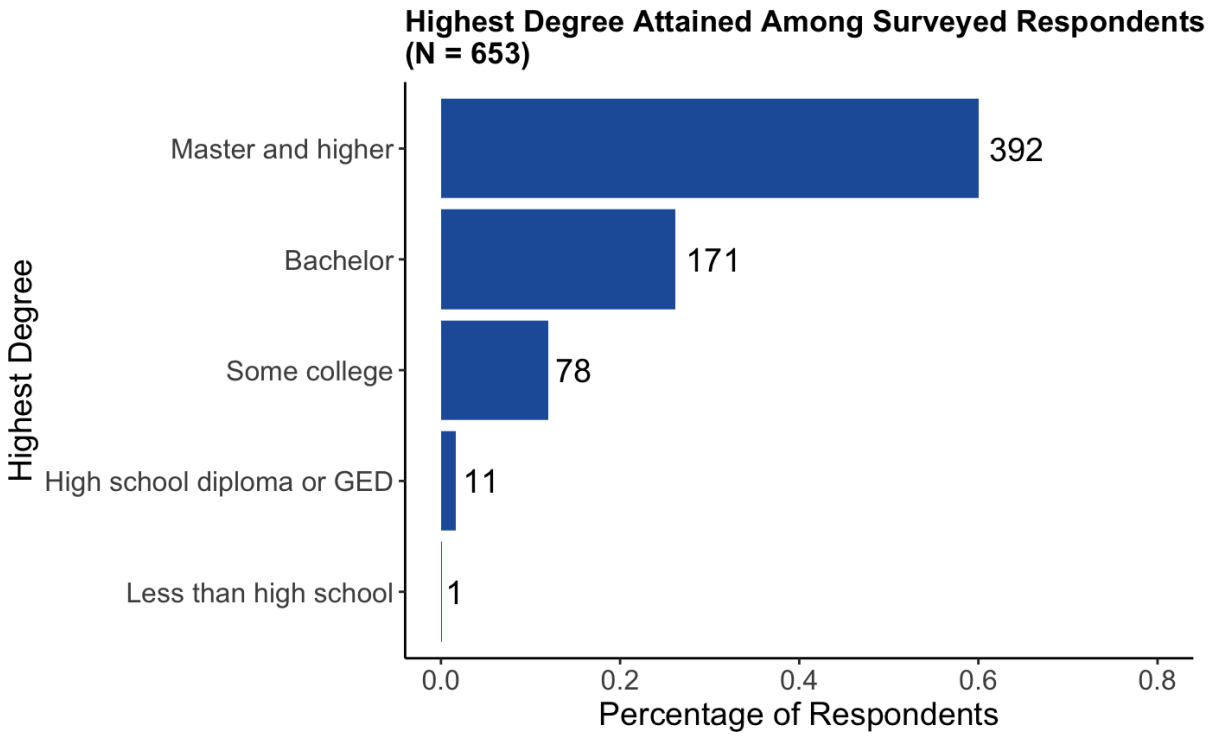


Figure 4: The survey respondents' highest education attainments

Other additional demographic variables are summarized in Table A.1.

To check whether the survey respondents are a representative sample of the broader LADPU residents, we compare the key demographic variables to the census data collected by the U.S. Census Bureau (U.S. Census Bureau 2023). Table 2 presents the results of a t-test comparing the survey data with the 2023 Los Alamos Census data, weighted by the 2023 population. Our sample is representative of the LADPU Customer base population in terms of age distribution, while the share over 65 is higher. However, our sample over-represents males and under-represents Hispanic or Latino individuals. Educational attainment is notably higher among survey respondents.

Table 2: Comparison of Demographic Characteristics: Los Alamos Census Data vs. Survey Results

Variable	Los Alamos Census Data	Survey Result	N	t-test	p-value
% Under 18	21.426	21.552	427	-0.152	0.889
% Between 18 and 65	60.411	49.323	524	2.345	0.101
% Over 65	18.164	29.126	509	-5.050	0.015
% Male	51.564	64.019	642	-9.559	0.002
% Hispanic or Latino	17.885	7.360	625	3.534	0.039
% Highschool degree or above	98.311	99.847	653	-1.458	0.241
% Bachlor degree or above	68.247	86.217	653	-13.125	0.001

2.2 Billing information

In this section, we ask respondents about their billing preferences, including how they receive and pay their bills, their use of the customer portal, and participation in the utility's billing programs.

Figure 5 summarizes household preferences regarding billing, payment methods, and portal usage. Most households still receive paper bills (73%), but the majority use electronic payment options, with 42% enrolled in autopay and 41% paying online. Only a small share pays by check (12%) or in person (4%), indicating a continued shift away from traditional payment methods.

Customer portal use is almost evenly split, while a small share (6%) is unaware of its existence. The portal is clearly a valuable tool for many customers, but a lack of awareness and adoption among a substantial portion of the population may limit its effectiveness in supporting digital engagement. Table A.2 summarizes the billing information statistics for all questions in this section.

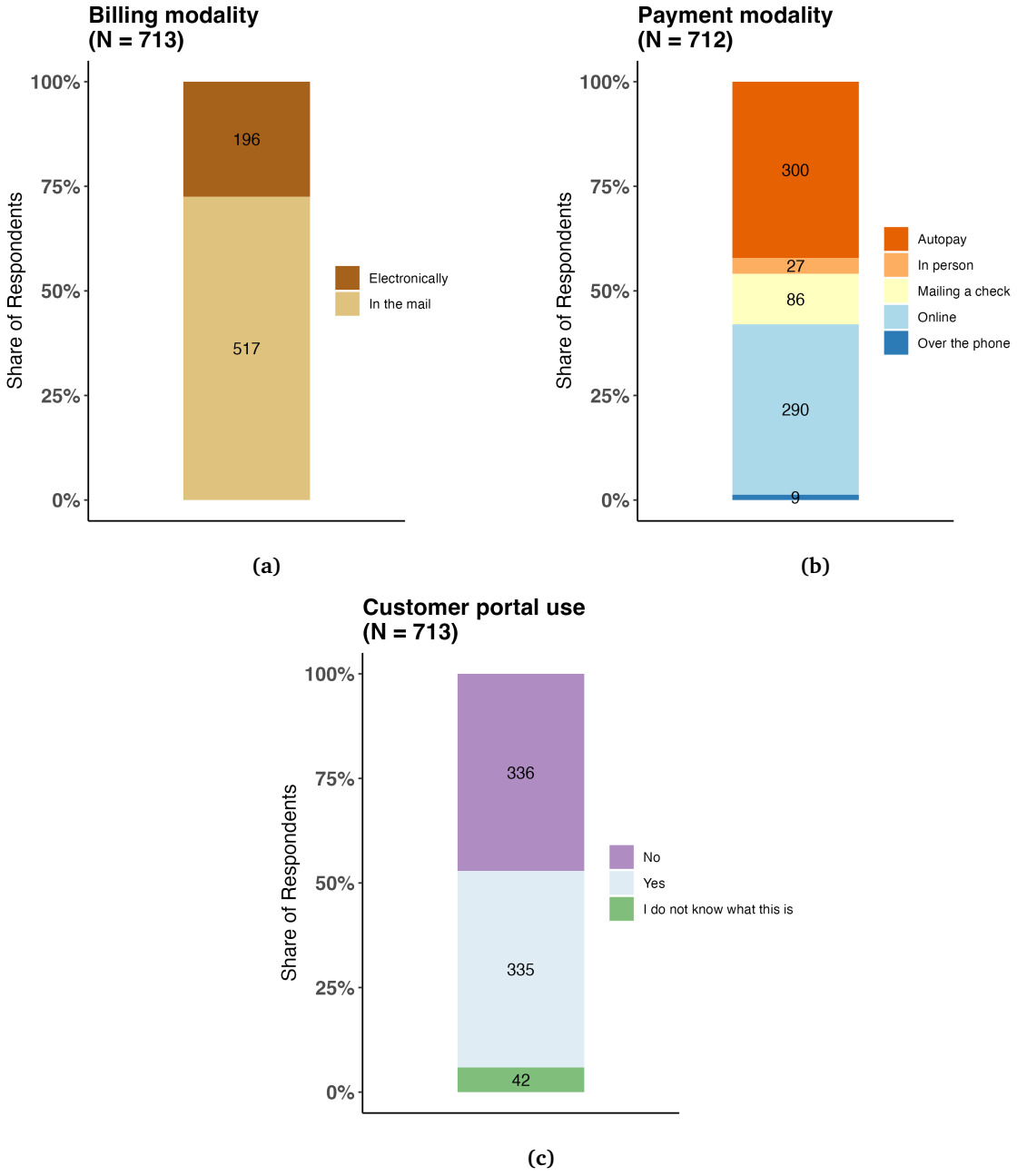


Figure 5: Survey Respondents Billing Preferences

2.3 Housing characteristics

In this section, we collected information on respondents' housing characteristics, such as the number of bedrooms, garage size, insulation status, and rooftop solar adoption. Figures 6–9 summarize key housing characteristics among surveyed households. The majority of respon-

dents are homeowners, with the vast majority (82%) living in single-family detached homes. More than half (56%) reside in homes built between 30 and 60 years ago, while relatively few live in homes constructed within the past 15 years. In terms of size, the most common residences range from 1,000–2,000 square feet (43%) and 2,000–3,000 square feet (36%). Even though rooftop solar adoption remains limited, with only 15% of households reporting a solar system, it aligns with overall adoption patterns across Los Alamos County, suggesting that the survey sample is representative of local trends in renewable energy uptake. Table A.3 summarizes the housing characteristics statistics for all questions in this section.

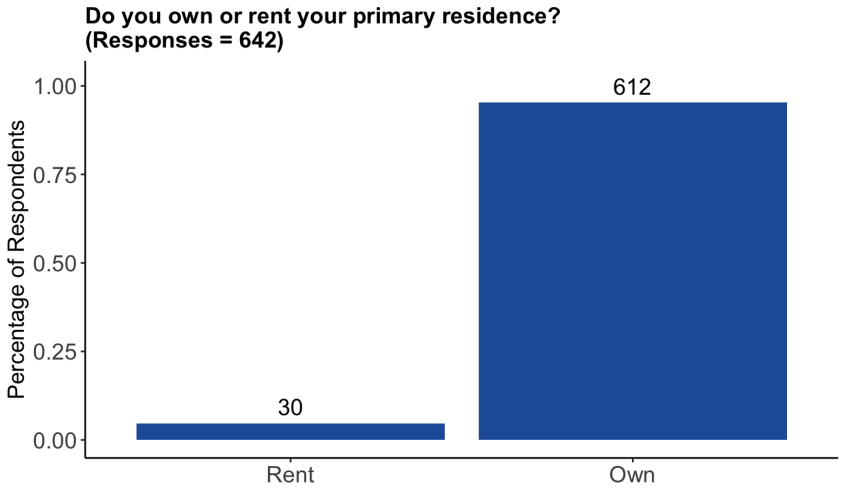


Figure 6: Residence ownership

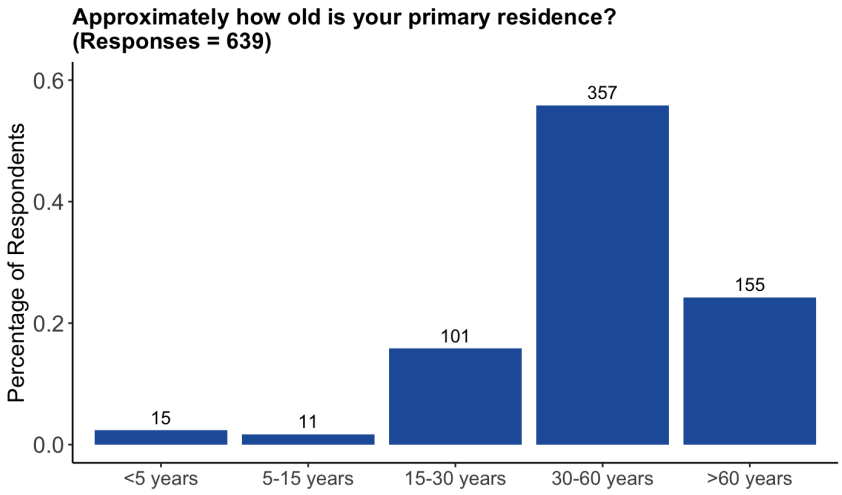


Figure 7: Residence age

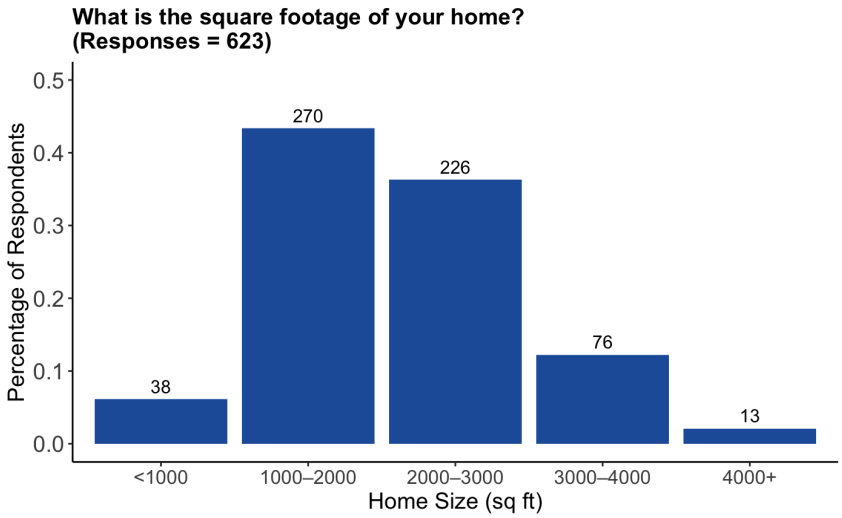


Figure 8: Residence size (square footage)

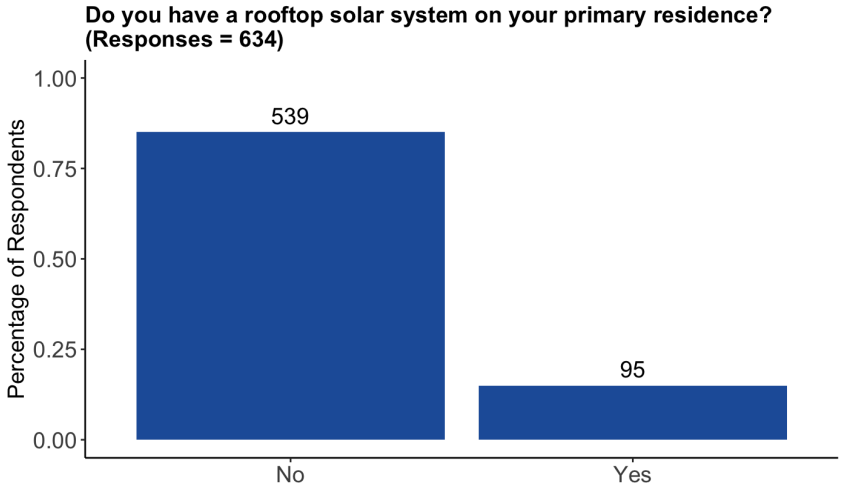


Figure 9: Solar households

2.4 Appliance stock

In this section, we ask detailed questions about the natural gas appliances stock and their usage within each household.

2.4.1 Natural gas usage and primary space heating

Nearly all surveyed households (96%) use natural gas appliances. All households report heating their homes, predominantly through central furnaces (59%) or steam/hot water systems (32%), with heat pumps representing only a small fraction (5% combined). Natural gas dominates as the primary heating fuel, powering 90% of main heating equipment compared to just 8% for electricity. The age distribution of heating equipment reveals a substantial replacement need, with one-third of systems being 20 or more years old and only 12% less than two years old. Usage patterns show intensive reliance on primary heating systems, with 91% of households using their main equipment all or almost all of the time (Table 3).

Table 3: Survey Summary Statistics for Household & Primary Space Heating.

Variables	Mean	N
Natural Gas Usage		
Natural gas appliance use	0.96	708
Main Heating Equipment		
Central furnace	0.59	693
Steam or hot water system	0.32	693
Central heat pump	0.02	693
Ductless heat pump	0.03	693
Other	0.04	693
Main Equipment's Fuel		
Electricity	0.08	690
Natural gas (underground pipes)	0.90	690
Other	0.02	690
Main Equipment's Age		
Less than 2 years old	0.12	670
2 to 4 years old	0.11	670
5 to 9 years old	0.18	670
10 to 14 years old	0.16	670
15 to 19 years old	0.10	670
20 or more years old	0.33	670
Main Equipment's Use		
Use all or almost all of the time	0.91	690
Use at least once per week	0.05	690
Use a few times per month	0.001	690
Use only when it is very cold	0.04	690
Use only in rare situations	0.001	690

2.4.2 Secondary heating and temperature control

While 32% of households rely solely on their primary heating system, the remaining 68% use supplementary heating equipment, most commonly portable electric heaters (16%), fireplaces (16%), and wood/pellet stoves (11%). Among secondary heating systems, electricity (46%) and wood or pellet stoves (29%) are more common than in primary heating, though natural gas still accounts for 22%. Secondary equipment tends to be newer than primary systems, with 35% less than five years old compared to 23% for primary equipment. Usage patterns for secondary heating are more varied and situational: 28% use it constantly, 25% at least weekly, and 32% only during very cold weather or rare situations. Most households (54%) use programmable thermostats, while 31% have manual controls and only 13% have smart thermostats. Winter thermostat setpoints average 69°F when someone is home during the day,

dropping to approximately 65°F when no one is home or at night (Tables 4 and 5).

Table 4: Survey Summary Statistics for Secondary Space Heating.

Variables	Mean	N
Secondary Heating Equipment		
No other equipment used	0.32	689
Portable electric heaters	0.16	689
Fireplace	0.16	689
Wood/pellet stove	0.11	689
Built-in electric units	0.04	689
Ductless heat pump	0.11	689
Other	0.10	689
Secondary Equipment's Fuel		
Electricity	0.46	469
Natural gas (underground pipes)	0.22	469
Wood or pellets	0.29	469
Other	0.03	469
Secondary Equipment's Age		
Less than 2 years old	0.16	449
2 to 4 years old	0.19	449
5 to 9 years old	0.20	449
10 to 14 years old	0.11	449
15 to 19 years old	0.08	449
20 or more years old	0.27	449
Secondary Equipment's Use		
Use all or almost all of the time	0.28	471
Use at least once per week	0.25	471
Use a few times per month	0.15	471
Use only when it is very cold	0.21	471
Use only in rare situations	0.11	471

Table 5: Survey Summary Statistics for Controls & Setpoints.

Variables	Mean	S.D.	Min	Max	N
Thermostat Type					
Manual/non-programmable	0.31	–	–	–	476
Programmable	0.54	–	–	–	476
Smart (internet-connected)	0.13	–	–	–	476
No Thermostat	0.02	–	–	–	476
Winter indoor temperature (F)					
During the day- Someone home	68.75	3.06	58	78	476
During the day- No one home	65.18	4.66	45	76	467
At night	65.21	4.59	45	78	473

2.4.3 Cooking appliances

Three-quarters of households (76%) have one cooking range, with 21% having none (likely using cooktops or wall ovens instead). Among ranges, natural gas (63%) is twice as common as electricity (34%). Households show more diversity in their cooking appliances' stock compared to heating: 64% of households have no separate cooktop, while 34% have one. For those with cooktops, natural gas (59%) dominates electricity (40%). Wall ovens are present in 30% of homes, but unlike ranges and cooktops, these are predominantly electric (83%) rather than gas-powered (17%). This pattern suggests that although households prefer gas for stovetop cooking, they are more accepting of electric ovens (Table 6).

Table 6: Survey Summary Statistics for Cooking Appliances: Stock & Fuels.

Variables	Mean	N
Number of Ranges		
0	0.21	692
1	0.76	692
2	0.02	692
3+	0.01	692
Fuel for Ranges		
Electricity	0.34	547
Natural gas from pipes	0.63	547
Other	0.03	547
Number of Cooktops		
0	0.64	692
1	0.34	692
2+	0.01	692
Fuel for Cooktops		
Electricity	0.40	250
Natural gas from pipes	0.59	250
Propane (bottled gas)	0.02	250
Number of Wall Ovens		
0	0.70	692
1	0.19	692
2+	0.11	692
Fuel for Wall Ovens		
Electricity	0.83	207
Natural gas from pipes	0.17	207
Propane (bottled gas)	0.00	207

2.4.4 Water heater and clothes dryer

Water heater shows the strongest natural gas dominance of any appliance category, with 90% of households using gas-fired water heaters compared to just 9% electric. Tank-style water heaters are standard, with medium-sized units (31-49 gallons, 43%) and large units (50+ gallons, 41%) being most common, while tankless systems represent only 11% of installations. Water heaters show a broader age distribution than heating equipment, with 26% between 5-9 years old and a more balanced distribution across other age categories. Nearly all households (99%) have clothes dryers at home, with electricity (74%) being more prevalent than natural gas (26%). Clothes dryers are one of the few appliance categories where electric use exceeds natural gas. Pool heaters are rare, present in only 3% of households (Table 7).

Table 7: Survey Summary Statistics for Water Heating & Laundry.

Variables	Mean	N
Main Water Heater Size- house		
Small (30 gallons or less)	0.05	534
Medium (31 to 49 gallons)	0.43	534
Large (50 gallons or more)	0.41	534
Tankless or on-demand	0.11	534
Main Water Heater Fuel- house		
Electricity	0.09	580
Natural gas from pipes	0.90	580
Other	0.01	580
Main Water Heater Age- house		
Less than 2 years old	0.13	566
2 to 4 years old	0.14	566
5 to 9 years old	0.26	566
10 to 14 years old	0.19	566
15 to 19 years old	0.11	566
20 or more years old	0.17	566
At-Home Clothes Dryer		
Yes/No	0.99	690
At-Home Dryer Fuel		
Electricity	0.74	678
Natural gas from pipes	0.26	678
Propane (bottled gas)	0.00	678
Pool Heater at home		
Yes/No	0.03	609

2.4.5 Economic sensitivity and bill guesstimates

Households display varying levels of economic sensitivity to energy cost increases. At modest increases of $10-25 per month, most households (77% and 63% respectively) report no hardship. However, sensitivity increases sharply at $50/month, where 61% would face some or great hardship. By $100/month, 82% would experience hardship, with a majority (52%) reporting it would cause great hardship. This suggests a threshold between $25-50/month where energy affordability becomes a significant concern for most households.

Regarding current bills, households estimate their electricity bills to be substantially higher than natural gas bills: 47% report peak electricity bills of $150 or more (including 29% exceeding $200), compared to 28% for natural gas bills of $150 or more (only 10% exceeding $200). The most common billing bracket for both utilities is $100-149. However, natural gas bills skew lower overall, with 37% under $100 compared to just 22% for electricity. These guesstimates

show that electricity already represents the larger utility cost burden for most households, which may inform their resistance to electrification given concerns about costly energy bills (Tables 8 and 9).

Table 8: Hardship of a Net Monthly Out-of-pocket Increase for all Energy-Related Costs

Increase ($/month)	No hardship (%)	Some hardship (%)	Great hardship (%)	N
$10	77.0	12.9	10.1	435
$25	62.7	24.3	13.0	437
$50	39.2	35.1	25.7	436
$75	24.3	34.3	41.4	437
$100	17.8	30.6	51.5	454

Note: Most households report no hardship at $10/month (77%) and still a majority at $25 (63%), but the response shifts sharply by $50, where 61% say they would face hardship (35% "some," 26% "great"). Hardship grows at higher amounts: at $75, three in four report hardship, and by $100 a clear majority (82%) say it would cause hardship.

Table 9: Survey Summary Statistics for Bills' Guesstimates

Variables	Mean	N
Highest electricity bill guesstimate		
Less than $50	0.04	457
$50-$99	0.18	457
$100-$149	0.31	457
$150-$200	0.18	457
More than $200	0.29	457
Highest natural gas bill guesstimate		
Less than $50	0.11	457
$50-$99	0.26	457
$100-$149	0.35	457
$150-$200	0.18	457
More than $200	0.10	457

Note: Electricity bills tend to be higher than natural gas bills: 47% of households report electricity bills $\geq$ $150 (including 29% over $200), compared with 28% for natural gas (10% over $200). The most common bracket for both utilities is $100-$149 (electricity 31%, gas 35%), while lower bills are more common for gas, with 37% under $100 versus 22% for electricity.

2.5 Natural gas to electric switching preferences

The goal of this section is to assess households' preferences for switching away from natural gas appliances. The questions explore satisfaction with current natural gas appliances, perceived reliability of electric alternatives, the likelihood of switching across different appliance types, and the potential concerns or barriers to adoption.

Most households (88%) are satisfied with their current gas appliances, with only 4% expressing dissatisfaction. This satisfaction is reinforced by perceptions of reliability, as the majority of households (54%) perceive electric appliances to be worse than gas appliances, while only 11% view electric appliances as strictly more reliable. Consistent with these attitudes, a strict majority of households (74%) are not planning to switch to electric appliances at all (Figures 10 to 12).

When considering what might influence a transition to electric appliances, cost savings, performance, efficiency, and incentives rank as the top four factors, while environmental and health factors emerge as the lowest-ranked considerations. Notably, 16% of households state that no given factor would get them to electrify their appliances. The primary barriers preventing electrification are upfront installation costs, followed by concerns about costly energy bills and reliability issues. Only 5% of households express no concerns regarding electric appliances (Figures 13 to 14).

One of the survey questions asked respondents to indicate how likely they were to switch each appliance to an electric alternative. To do so, participants categorized appliances into three groups—very likely to switch, no intention to switch, and already electric. All respondents, including those without gas appliances, could freely drag and drop items into the categories and were not required to classify every equipment type. The results show an interesting pattern: among the appliances that respondents chose to categorize as "very likely to switch," water heaters, space heaters, and ranges were most frequently selected, which aligns with descriptive statistics showing these are predominantly gas-powered. The data also show that cooktops, clothes dryers, and wall ovens were most frequently placed in the "already electric" category. In particular, this equipment-specific willingness to switch appears somewhat at odds with the general reluctance toward electrification expressed elsewhere in the survey (Figure 12). This may suggest that while respondents express general resistance to switching, they may be more open to replacing specific appliances when considered individually (Figure 15).

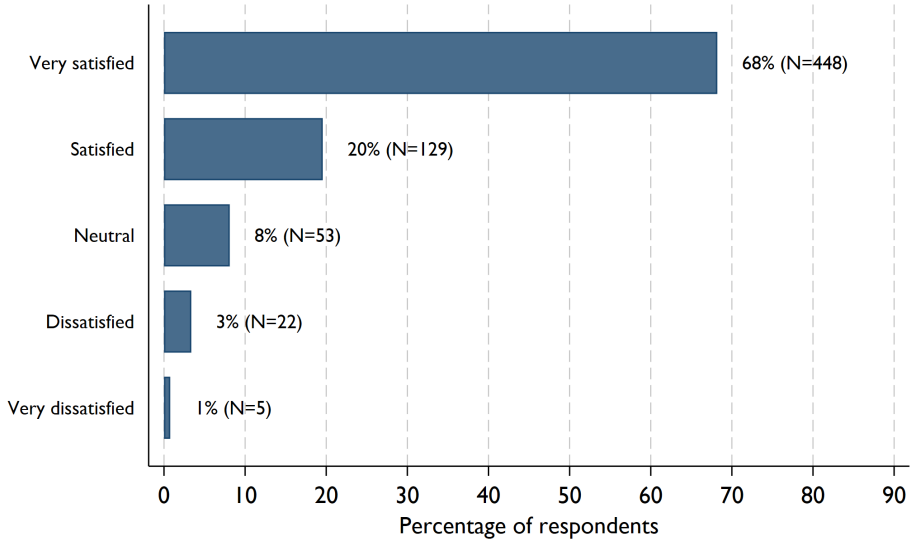


Figure 10: Satisfaction with Current Gas Appliances

Notes: The figure plots responses on a Likert scale to the question: "How satisfied are you with your current natural gas appliances?"

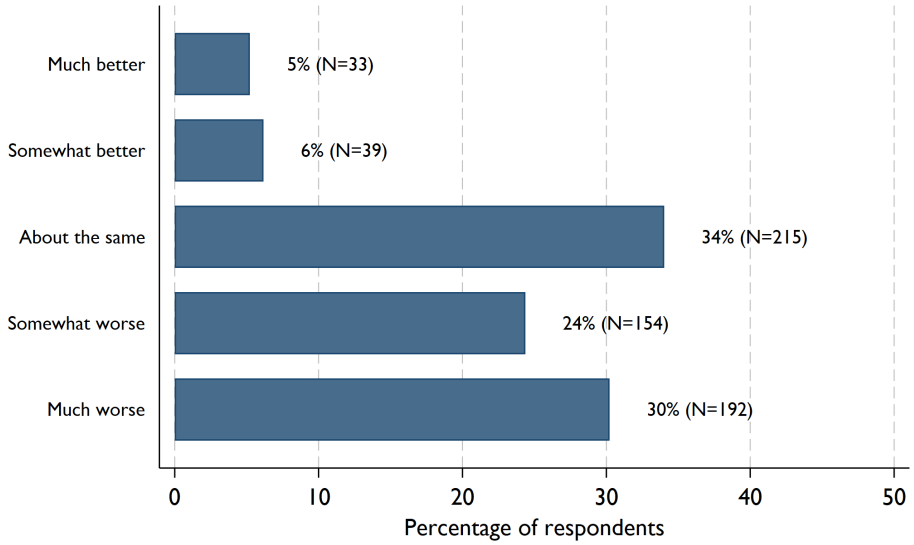


Figure 11: Perceived Reliability of Electric Appliances

Notes: The figure plots responses on a Likert scale to the question: "How do you perceive the reliability and performance of electric appliances compared to natural gas alternatives?"

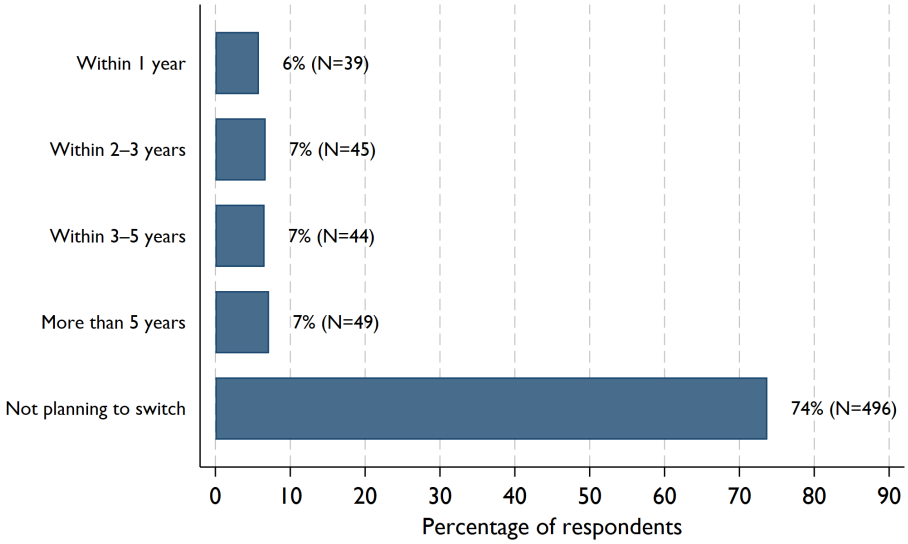


Figure 12: Intended Timeframe to Switch to Electric Appliances

Notes: The figure plots responses to the question: "How soon would you consider making a transition from natural gas to electric, if at all?"

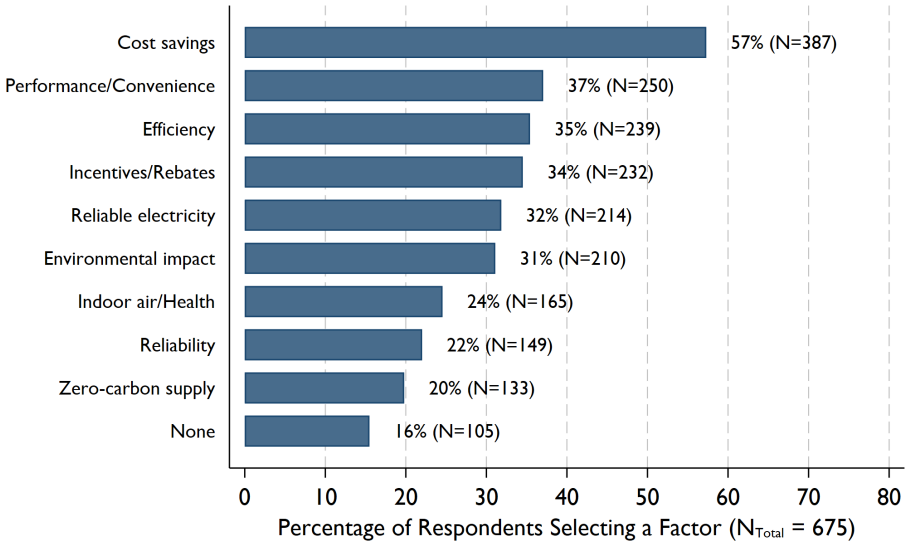


Figure 13: Factors Influencing Switching to Electric Appliances

Notes: The figure plots responses to the question: "Which factors would influence your decision to switch from the current natural gas appliances to electric ones?" Respondents can select all factors that apply; thus, percentages would not sum up to 100%.

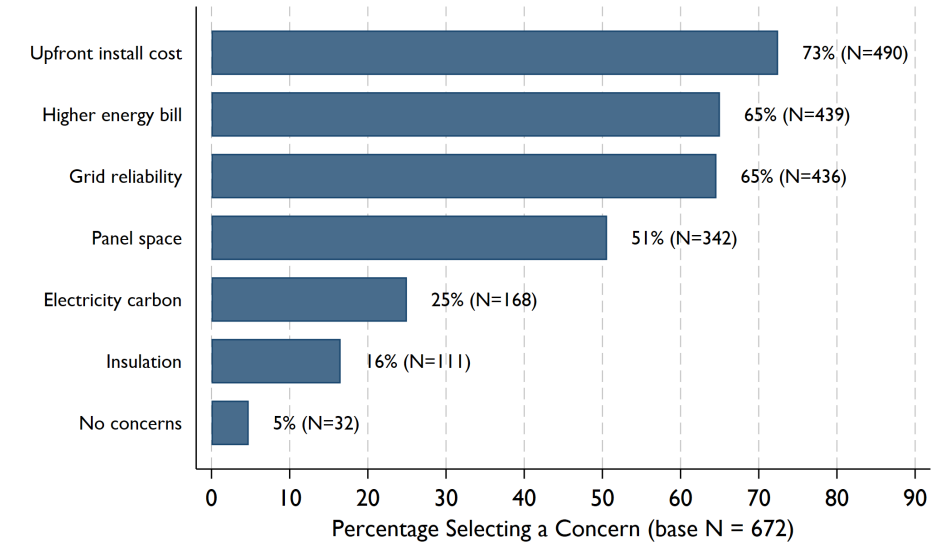


Figure 14: Concerns & Barriers to Switching to Electric Appliances

Notes: The figure plots responses to the question: "What concerns or barriers, if any, do you have about transitioning from natural gas to electric appliances?" Respondents can select all concerns that apply; thus, percentages would not sum up to 100%.

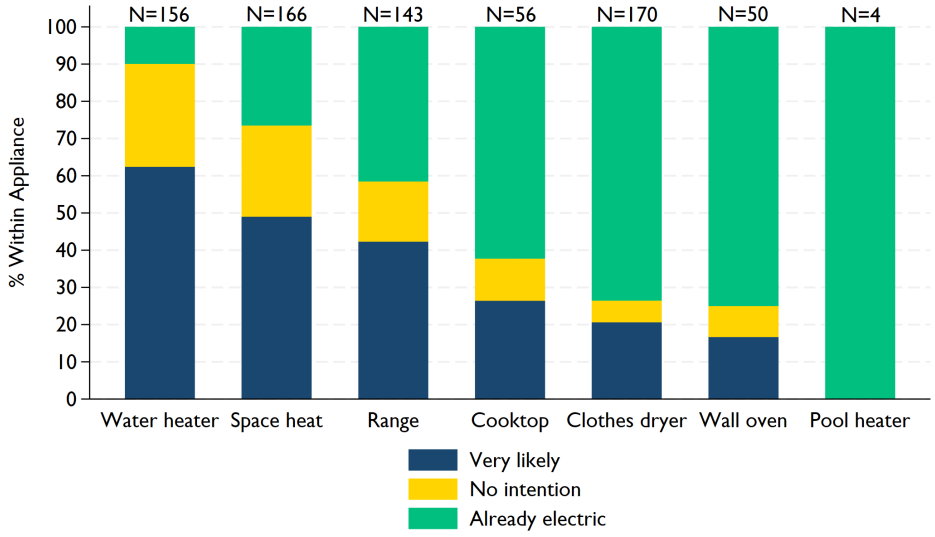


Figure 15: Intentions to Switch a Given Appliance to Electric

Notes: The figure plots responses to a task asking respondents to put any given heating equipment(s) in one of three categories: (1) Very likely to switch; (2) No intention to switch; (3) Already Electric. Respondents are not required to answer for all equipment.

2.6 Environmental sentiments

We also measure respondents' environmental attitudes using six questions adapted from the New Ecological Paradigm (NEP) scale, a widely used framework for measuring pro-environmental worldviews. The NEP items capture beliefs about the relationship between humans and the natural environment, including perceptions of ecological limits, human dominance over nature, and the balance between development and environmental protection. Higher scores on the NEP questions—and lower scores on the reverse-coded items—indicate stronger pro-environmental (pro-NEP) attitudes.

Table 10 summarizes household responses to the NEP questions. Overall, the results indicate that respondents exhibit a moderate level of environmental concern. Most respondents recognize both human responsibility for environmental stewardship and the fragility of ecological systems. In contrast, agreement with the reverse-coded items is relatively low, with the weakest support for the notion that nature is sufficiently resilient to withstand the pressures of modern industrial activity.

Table 10: Survey Summary Statistics for NEP Variables

How strongly do you agree with the following statement?	**Mean**	**S.D.**	**Min**	**Max**	**N**
Humans are severely abusing the environment.	3.35	1.64	1	5	480
The earth has plenty of natural resources if we just learn how to develop them. **(R)**	3.38	1.40	1	5	480
The balance of nature is strong enough to cope with the impacts of modern industrial nations. **(R)**	2.31	1.41	1	5	477
Human ingenuity will ensure that we do NOT make the earth unlivable. **(R)**	2.99	1.45	1	5	478
The balance of nature is very delicate and easily upset.	3.06	1.40	1	5	479
The so-called "ecological crisis" facing humankind has been greatly exaggerated. **(R)**	2.68	1.66	1	5	478

Note: Responses were coded on a scale ranging from 1 = "Strongly disagree", 3 = "Unsure", to 5 = "Strongly agree". Items marked with "(R)" are reverse-coded statements, where higher scores indicate lower environmental concern. For the non-reverse statements, higher scores instead reflect greater environmental concern.

Figure 16: Attitudes Toward NEP Questions

3 Discrete Choice Experiment (DCE)

We designed a DCE with four attributes derived from four focus groups. In this section, respondents were asked to choose between two hypothetical investment alternatives and a status quo option in each choice task. The purpose of this design is to understand how respondents make trade-offs among different attributes of switching, allowing us to use econometric methods to estimate their willingness to pay (WTP) for each attribute. In a DCE, each choice task presents respondents with a set of alternatives that vary systematically across attributes. By observing repeated choices, we can infer the relative importance of each attribute and the value respondents place on specific changes, such as improved energy efficiency, lower upfront costs, or reduced emissions.

The DCE section begins with a preparatory module that introduces each attribute and asks respondents about their general support for the corresponding policy dimensions. After this introduction, each respondent answers six choice questions, each presenting two hypothetical investment options and an opt-out option. Figure 17 depicts a choice question as presented to respondents. Finally, the survey includes an Attribute Non-Attendance (ANA) module, which asks

respondents to indicate which attributes they considered or ignored when making their choices. This step helps us understand how much importance respondents placed on each attribute and allows for more accurate modeling of preference heterogeneity.

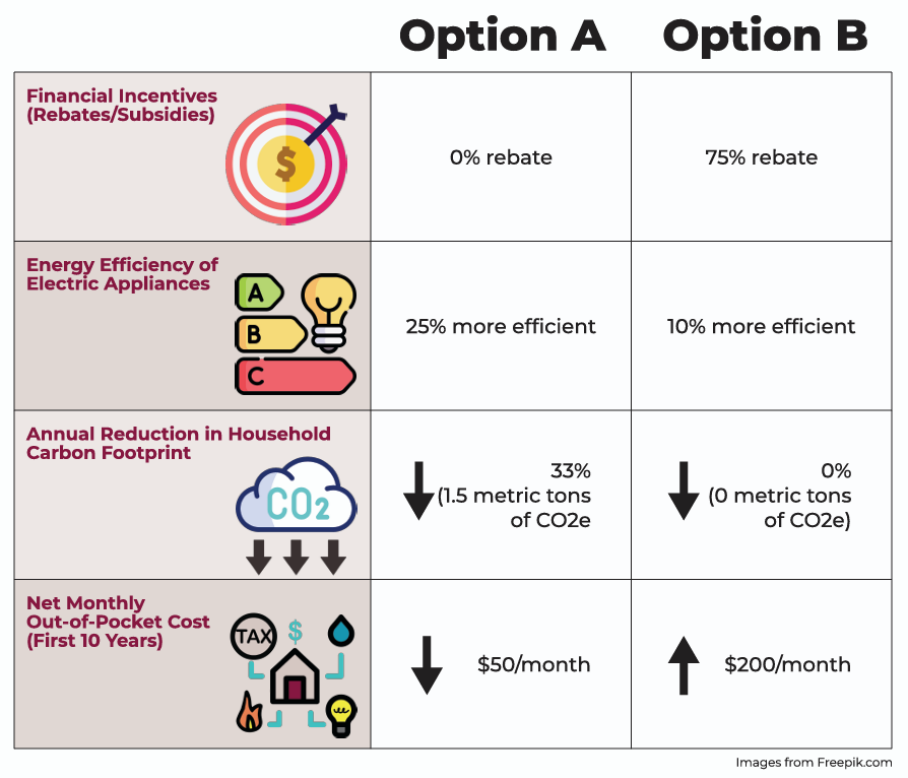


Figure 17: Attitudes Toward NEP Questions

3.1 DCE prep and policy preference

Table 11 summarizes respondents' attitudes and preferences in the discrete choice experiment section.

Overall, support for long-term decarbonization goals appears limited. On a five-point scale, respondents reported low support for the LAC-DPU goal of eliminating natural gas usage by 2070, with a mean of 2.27, and expressed even lower support for a statewide zero-emission appliance mandate by 2070, with a mean value of 2.02.

Concerns regarding pre-switching costs were particularly salient, with 75% of respondents indicating that their electrical panel would require an upgrade if transitioning to electric appliances. Moreover, the anticipated need for such upgrades was rated as a significant deterrent to adoption.

Financial and performance-related considerations played a central role in respondents' decision-making. Financial incentives were viewed as moderately important, while monthly energy bill

savings and appliance energy efficiency were also regarded as moderately influential. By contrast, environmental motivations, such as reducing CO_2 emissions, were assigned comparatively lower importance.

Table 11: Survey Summary Statistics for Discrete Choice Experiment Section

Discrete Choice Experiment Question	Mean	S.D.	Min	Max	N
How supportive are you of LAC-DPU's goal to eliminate natural gas usage by 2070? **(A)**	2.27	1.55	1	5	471
How much would the need for pre-switching upgrades affect your willingness to adopt an electric appliance? **(B)**	3.83	1.37	1	5	470
How important are financial incentives, such as rebates and subsidies, in your decision to switch to an electric appliance? **(C)**	3.44	1.54	1	5	468
To what extent do you support or oppose a policy that requires all appliances by households in New Mexico be only zero-emission appliances by 2070? **(A)**	2.02	1.43	1	5	470
When choosing an electric appliance, how much does energy efficiency influence your decision? **(D)**	3.33	1.31	1	5	470
How important is the environmental impact, specifically the reduction of CO_2 emissions, when considering the adoption of an electric appliance? **(C)**	2.61	1.53	1	5	469
How important are monthly energy bill savings in your decision to switch to an electric appliance? **(E)**	3.00	1.41	1	5	461

Note: Responses were coded on a scale ranging from 1 = "Strongly disagree" to 5 = "Strongly agree". Questions marked with "(A)" were coded on a scale ranging from 1 = "Not at all supportive" to 5 = "Extremely supportive". Questions marked with "(B)" were coded on a scale ranging from 1 = "Not at all concerning" to 5 = "Extremely concerning". Questions marked with "(C)" were coded on a scale ranging from 1 = "Not at all important" to 5 = "Extremely important". Questions marked with "(D)" were coded on a scale ranging from 1 = "Not at all influential" to 5 = "Extremely influential". Questions marked with "(E)" were coded on a scale ranging from 1 = "Not at all appealing" to 5 = "Extremely appealing". Standard deviation, minimum, and maximum values are not reported for dummy variables. The mean values can capture the spread in the dataset, while the minimum and maximum are always 0 and 1, respectively, and therefore omitted for brevity.

3.2 Distribution of choices

Table 12 and Figure 18 present choice frequencies from the discrete choice experiment, where 415 respondents completed multiple choice tasks evaluating various electrification scenarios. The results reveal clear preference patterns across the four attributes tested.

Financial incentives demonstrate a strong positive relationship with selection rates: scenarios with no rebate achieve only 21% selection, rising to 33% at the "$30 financial incentive"

level, and peaking at 40% with a "$50 financial incentive." Interestingly, the effect appears to plateau at higher subsidy levels, with the "$75 financial incentive" showing a slightly lower 35% selection rate, suggesting diminishing marginal returns or potential skepticism about overly generous offers.

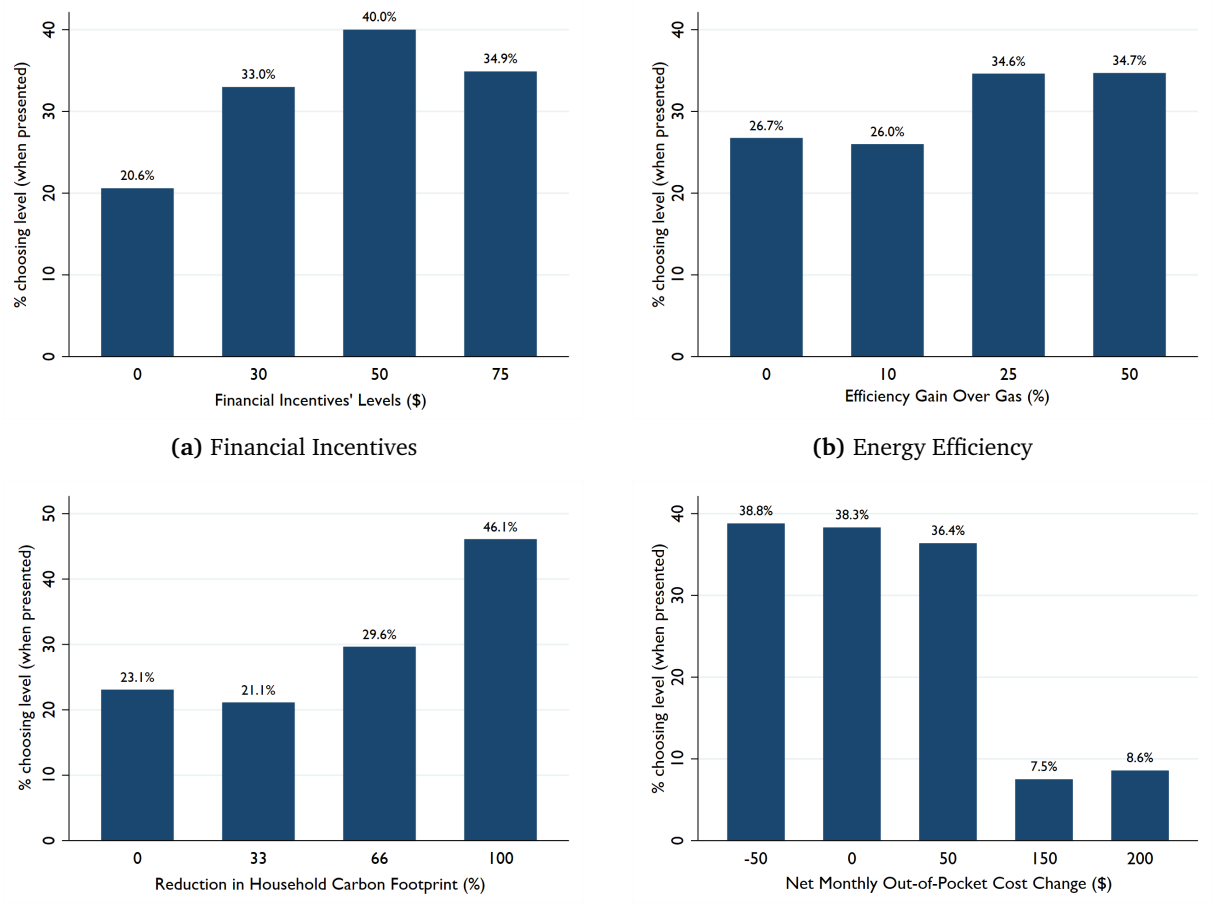
Energy efficiency improvements show a threshold effect: lower efficiency gains of "0% more efficient" and "10% more efficient" both achieve approximately 27% selection rates, while higher efficiency levels of "25% more efficient" and "50% more efficient" both reach around 35%, indicating that respondents value meaningful efficiency improvements but may not distinguish between moderate and high efficiency gains once a threshold is crossed. Carbon footprint reduction shows a generally positive relationship with selection rates, rising from 23% at zero reduction to 46% at complete (100%) household carbon reduction. While this suggests environmental benefits influence choice between specific alternatives, it should be reconciled with earlier findings (Figure 13) where environmental concerns ranked lowest among motivating factors for switching.

Finally, net monthly out-of-pocket costs reveal the most dramatic preference pattern and clear price sensitivity: scenarios offering "$50 savings" achieve a 39% selection rate, and break-even scenarios ("+$0 change") maintain a similar 38% selection. However, selection rates remain relatively stable at 36% even with "+$50 change" in additional monthly costs, before collapsing to just 7-9% when costs reach "+$150 change" per month. This sharp threshold indicates that while respondents can tolerate modest cost increases for electrification benefits, monthly expenses beyond $100-$150 become prohibitive for the vast majority, consistent with the hardship responses showing 82% of households would face difficulty with $100/month increases (Table 8).

Table 12: Survey Summary Statistics for DCE responses (415 complete DCE responses).

Attribute (level)	Presented	Chosen	% Chosen
Financial Incentives (Rebates/Subsidies)			
$0 financial incentive	1,680	646	20.59%
$30 financial incentive	1,240	409	32.98%
$50 financial incentive	940	376	40.00%
$75 financial incentive	685	239	34.89%
Energy Efficiency of Electric Appliances			
0% more efficient	830	222	26.75%
10% more efficient	1,250	325	26.00%
25% more efficient	1,245	431	34.62%
50% more efficient	1,130	392	34.69%
Annual Reduction in Household Carbon Footprint			
0% (0 metric tons CO2e)	745	172	23.09%
33% (1.5 metric tons CO2e)	710	150	21.13%
66% (3 metric tons CO2e)	1,265	375	29.64%
100% (4.5 metric tons CO2e)	1,460	673	46.09%
Net Monthly Out-of-Pocket Cost (First 10 Years)			
–$50 change	1,670	648	38.80%
+$0 change	1,125	431	38.31%
+$50 change	635	231	36.38%
+$150 change	200	15	7.50%
+$200 change	525	45	8.57%

Notes: This table shows choice frequencies for each attribute level conditional on inclusion in the choice set. For each level, we report: (1) the number of times the level was presented in either alternative A or B, (2) the number of times respondents chose the alternative containing that level, and (3) the percentage choosing that level when presented.



(a) Financial Incentives

(b) Energy Efficiency

(c) Carbon Footprint Reduction

(d) Out-of-Pocket Cost

Figure 18: Choice frequencies by attribute level in the discrete choice experiment. Each panel shows the percentage of times respondents selected alternatives containing each attribute level when presented in the choice set.

3.3 Attribute importance

Table 13 describes how respondents weighed different factors when selecting their preferred investment plan. Financial considerations were most influential, with net monthly out-of-pocket cost and financial incentives rated as the most important determinants. By contrast, appliance energy efficiency and reductions in household carbon footprint were given lower importance. This result highlights that while respondents acknowledge the ecological fragility, cost savings are still a stronger motivator for household energy investments than environmental concerns alone.

Table 13: Survey Summary Statistics for ANA Variables

How important do you think the following factor was in choosing your preferred investment plan?	Mean	S.D.	Min	Max	N
Financial Incentives (Rebates/Subsidies)	3.41	1.54	1	5	519
Energy Efficiency of Electric Appliances	2.92	1.40	1	5	476
Annual Reduction in Household Carbon Footprint	2.42	1.50	1	5	480
Net Monthly Out-of-Pocket Cost (First 10 Years)	3.65	1.45	1	5	477

Note: Responses were coded on a scale ranging from 1 = "Not At All Important" to 5 = "Very Important", with 3 indicating "Somewhat Important".

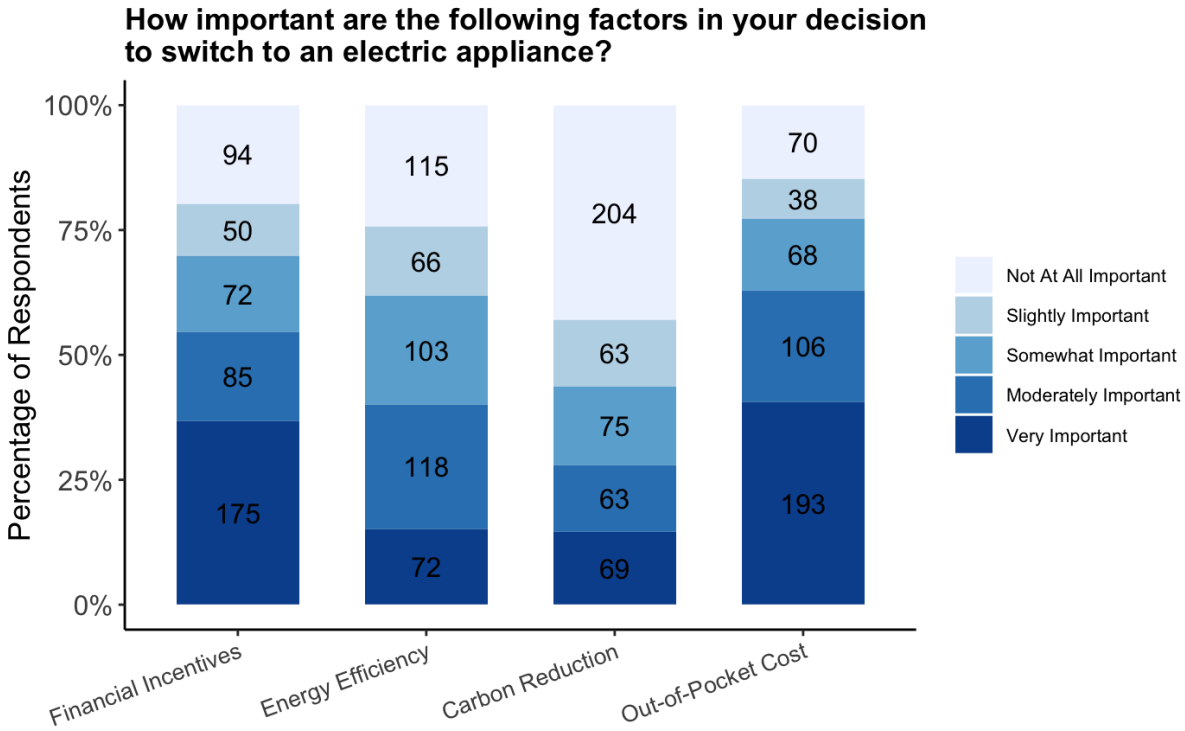


Figure 19: Factors in Switching Decisions

3.4 Protest behavior in DCE questions

Approximately 29% of DCE respondents (121 out of 415) show protest behavior by consistently selecting "neither" option across all choice questions in their assigned block (Table 14). This substantial protest rate warrants investigation into the demographic characteristics associated with non-engagement. Protest responses may reflect genuine opposition to electrification, confusion about the choice tasks, or systematic differences in how subgroups approach hypothetical

scenarios.

Educational attainment shows significant differences between protesters and non-protesters (Table 15). Non-protesters are disproportionately concentrated among those with graduate degrees (66.9% Master's/Doctoral), while protesters show relatively greater representation at the Bachelor's level (33.3% versus 22.4%) and among those with some college or Associate's degrees (17.5% versus 8.6%). Within this highly educated sample, the relative differences suggest that those with graduate training may be more willing to engage with the choice scenarios. It is worth noting that higher education is often correlated with higher income.

Income patterns reveal similar relative differences (Table 16). Non-protesters skew toward the highest income bracket, with 64.6% earning $150,000 or more, while protesters show somewhat broader distribution across upper-middle and high-income categories (49.2% over $150,000, 34.8% in $70,000-$150,000 range). In particular, protesters are more than twice as likely to report incomes below $70,000 (16.1% versus 6.3%). These relative differences suggest that households at somewhat 'lower' income levels may consider the presented electrification scenarios as less economically feasible or relevant to their circumstances.

Perceptions about the need for electrical panel upgrades show no significant difference between protesters and non-protesters (Table 17). The majority in both groups (75.2% of non-protesters and 81.0% of protesters) believe a panel upgrade would be necessary if they switched to electric appliances.

Table 14: Protest DCE responses (415 complete DCE responses).

Protest status	**N**	**%**
Non-Protest	294	70.84%
Protest	121	29.16%
Total	415	100%

Notes: The table reports column distribution of protest responses. Protest responses are those answering "neither" for all DCE questions in their block.

Table 15: Protest DCE responses by education level (415 complete DCE responses).

Education level	Non-Protesters	Protesters	Total
High school / GED	6 (2.07%)	2 (1.67%)	8 (1.95%)
Some college/Associate	25 (8.62%)	21 (17.50%)	46 (11.22%)
Bachelor's	65 (22.41%)	40 (33.33%)	105 (25.61%)
Master's/Doctoral	194 (66.90%)	57 (47.50%)	251 (61.22%)
Total	290 (100%)	120 (100%)	410 (100%)

Notes: The table reports column percentages within each group. Among non-protesters (N=290), 66.9% have a Master's/Doctoral degree, 22.4% have a bachelor's degree, 8.6% have some college, and 2.1% have a HS degree. The distribution of education levels differs significantly by protest status ($\chi^2(3)=15.20$, $p=0.002$).

Table 16: Protest DCE responses by income category (415 complete DCE responses).

Yearly Income	Non-Protesters	Protesters	Total
Less than $35,000	6 (2.08%)	9 (7.63%)	15 (3.69%)
$35,000 to $70,000	12 (4.17%)	10 (8.47%)	22 (5.42%)
$70,000 to $150,000	84 (29.17%)	41 (34.75%)	125 (30.79%)
$150,000 or more	186 (64.58%)	58 (49.15%)	244 (60.10%)
Total	288 (100%)	118 (100%)	406 (100%)

Notes: The table shows column percentages by protest status. Among non-protesters, the largest share falls in the top income bracket: 64.6% report $150k+, followed by 29.2% reporting $70-150k. Protesters are relatively more evenly distributed across income levels. The χ^2 test shows a statistically significant difference in distribution ($\chi^2(3)=13.99$, $p=0.003$).

Table 17: Protest DCE responses by perceived need for electrical panel upgrade (415 complete DCE responses).

Panel Upgrade Needed	Non-Protesters	Protesters	Total
No	73 (24.83%)	23 (19.01%)	96 (23.13%)
Yes	221 (75.17%)	98 (80.99%)	319 (76.87%)
Total	294 (100%)	121 (100%)	415 (100%)

Notes: The table reports column percentages within each group based on responses to: "Do you think your electrical panel would need to be upgraded if you switched to electric appliances?" The distribution does not differ significantly by protest status (Pearson $\chi^2(1)=1.63$, $p=0.201$).

4 Electricity and Natural Gas Consumption Patterns

We obtained hourly metered electricity and natural gas consumption data for the LADPU service area from January 2023 through June 2025. The objective is to combine households' actual consumption behavior with detailed information on their demographics and appliance stock to analyze how switching from natural gas to electric appliances affects electricity demand. This integration will also enable us to forecast future electricity load under various appliance-switching scenarios.

In what follows, we describe the consumption patterns of both natural gas and electricity and compare households that participated in the survey with those that did not. Among the surveyed households, we further compare the consumption patterns between solar and non-solar households.

4.1 Survey respondents VS. rest of LADPU

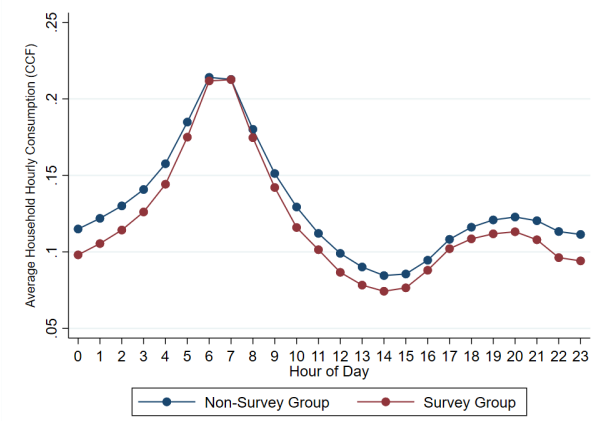
We compare natural gas and electricity consumption between surveyed households and the rest of the LADPU service area. The consumption data span January 2023 through June 2025 and are recorded at an hourly frequency. Survey respondents were matched to their corresponding consumption records using fuzzy matching algorithms, followed by manual verification for accuracy and completeness. In total, 607 surveyed households were successfully matched, while the remaining 7,944 households constitute the non-survey group out of 8,551 total households.

Figure 20 compares hourly, daily, and monthly patterns of gas and electricity consumption between surveyed and non-surveyed households (including unmatched cases). Across all temporal dimensions, the two groups exhibit broadly similar consumption trends, suggesting that survey respondents are representative of the broader customer base.

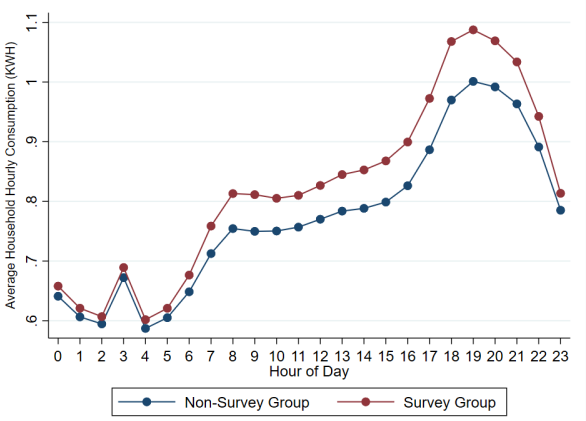
Subfigures (a), (c), and (e) illustrate that, at all resolutions, survey participants consume less natural gas than their non-survey counterparts. Several patterns emerge: Hourly consumption peaks in the morning, declines through the afternoon, and rises again in the evening as households return home. Weekly trends show higher consumption on weekends and lower usage on weekdays. Monthly patterns reveal high gas usage in winter months and low usage during summer, indicating that gas consumption is inversely tied to prevailing heating needs. The summary statistics for gas consumption across the two groups are presented in Table A.4.

Subfigures (b), (d), and (f) indicate that, across all resolutions, surveyed households consume more electricity than their non-survey counterparts. Hourly consumption rises steadily throughout the day, peaking in the evening before declining sharply as households wind down for the night. Weekly patterns show higher usage on weekends, while monthly trends reveal elevated consumption during both the winter heating and summer cooling seasons—suggesting the presence of electric heating in some households—with noticeable declines during the more

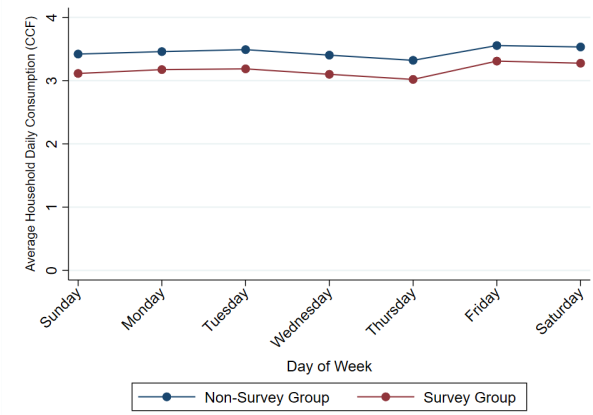
temperate spring and fall months. The summary statistics for electricity consumption across the two groups are presented in Table A.5.



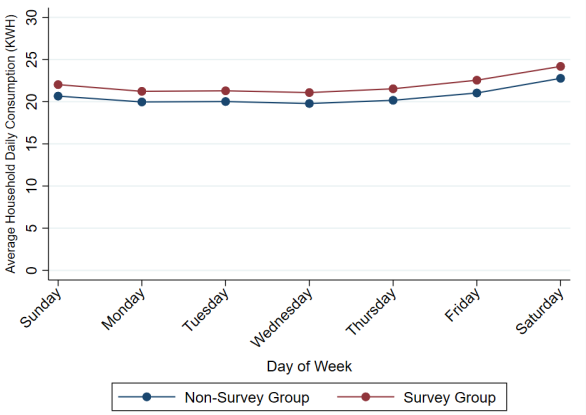
(a) Average hour-of-day consumption for gas



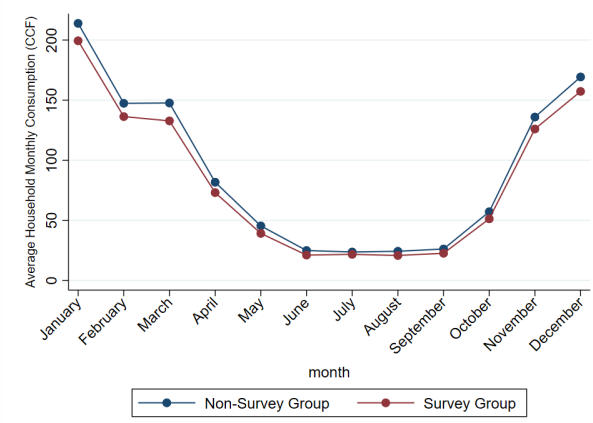
(b) Average hour-of-day consumption for electricity



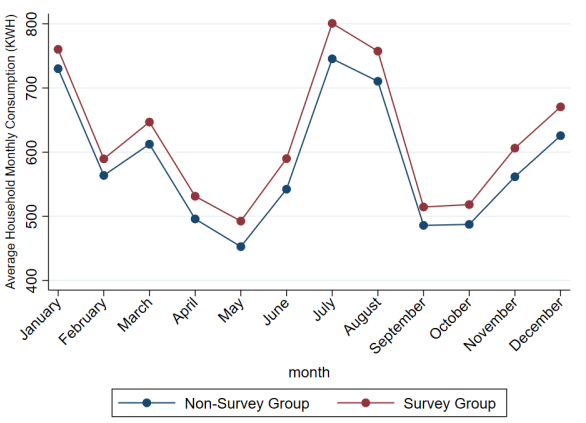
(c) Average day-of-week consumption for gas



(d) Average day-of-week consumption for electricity



(e) Average month-of-year consumption for gas



(f) Average month-of-year consumption for electricity

Figure 20: Gas and electricity consumption patterns for survey vs. non-survey households

4.2 Solar VS. non-solar households in surveyed sample

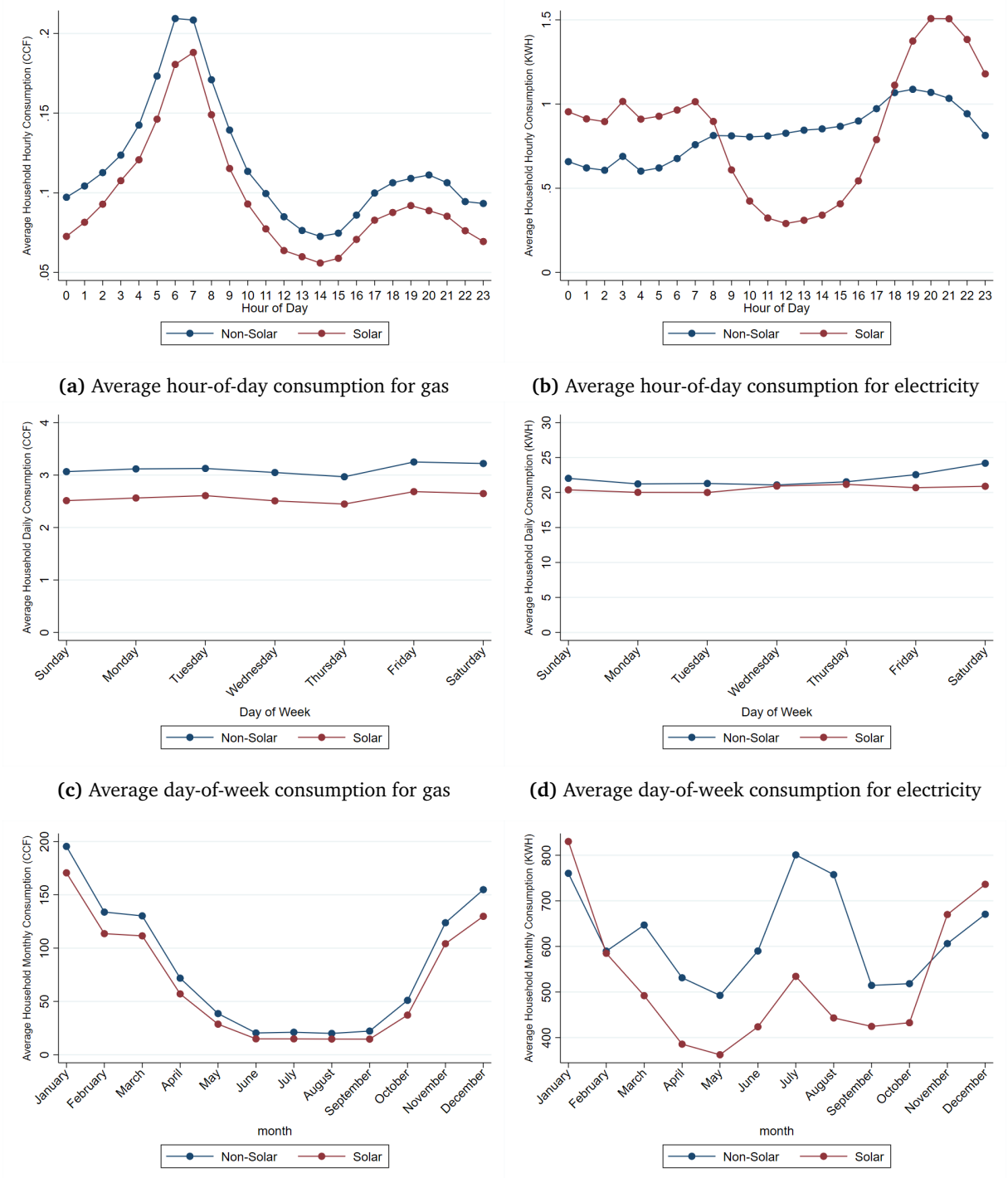
Figure 21 compares the dynamics of gas and electricity consumption among surveyed households, distinguishing between solar and non-solar adopters. Overall, households with solar installations consume less gas and less grid electricity than their non-solar counterparts. However, this relationship is not consistent across all temporal aggregations for electricity consumption.

Subfigures (a), (c), and (e) show that solar-adopting households consistently use less natural gas across hourly, daily, and monthly levels. This pattern suggests that these households may have undertaken greater electrification—replacing some gas appliances with electric alternatives—alongside their solar adoption. The summary statistics for gas consumption across the two groups are presented in Table A.6.

In contrast, subfigures (b), (d), and (f) illustrate that grid electricity consumption among solar households diverges from that of non-solar households, with reductions occurring in proportion to sunlight availability. In (b), solar households exhibit higher grid consumption during the morning and evening hours, with a visible midday dip when on-site solar generation offsets demand. Subfigure (d) shows that, on an average day, solar households consume less total electricity, with a slightly different daily pattern—peaking midweek (Wednesdays and Thursdays) rather than on weekends, as observed for non-solar households. These differences may reflect demographic, behavioral, or lifestyle distinctions between solar adopters and non-adopters. Finally, subfigure (f) indicates that solar households consume more electricity during winter months but draw substantially less from the grid between March and October. The summary statistics for electricity consumption across the two groups are presented in Table A.7.

It is important to note that the data captures only grid-supplied electricity; direct on-site solar generation use is not observed. As a result, the total electricity consumption (grid plus self-generation) of solar households may actually exceed that of non-solar households. This pattern suggests potential endogeneity in solar adoption decisions—households with higher overall electricity needs may be more likely to invest in solar systems.

Table A.8 reports the Kolmogorov–Smirnov (KS) test p-values comparing electricity and gas consumption distributions across household groups. For electricity, there are statistically significant differences between survey and non-survey households, as well as between solar and non-solar households, across nearly all time periods. In contrast, gas consumption exhibits few statistically significant differences. These results suggest that electricity consumption patterns vary more systematically with survey participation and solar adoption status than do gas consumption patterns.



(a) Average hour-of-day consumption for gas

(b) Average hour-of-day consumption for electricity

(c) Average day-of-week consumption for gas

(d) Average day-of-week consumption for electricity

(e) Average month-of-year consumption for gas

(f) Average month-of-year consumption for electricity

Figure 21: Gas and electricity consumption patterns for solar vs. non-solar households among survey respondents

5 Preliminary Willingness to Switch Analysis

We use the DCE responses to estimate households' WTP for each appliance attribute using a random parameter logit (RPL) approach. The goal is to quantify how households value key factors such as environmental impact, rebates, efficiency, and cost when considering switching from natural gas to electric appliances. This approach allows us to capture both the average preferences across respondents and the variation in preferences within the population. Detailed model specifications and estimation procedures are provided in the Appendix B.1.

5.1 Main WTP Results

Below we synthesize the main findings from Table B.1 (RPL coefficient estimates for Models 1–4) and Table B.2 (Krinsky–Robb MWTP estimates with 90% Confidence Interval, 50,000 repetitions). All MWTP values reported are taken directly from Table B.2 and expressed in dollars per unit of the attribute as defined in the survey. Note that the income baseline is `inc_below35k` and the education baseline is `edu_nocollege`. All the opt-out (indicated by ASC) interaction coefficients are interpreted relative to these baselines.

5.1.1 Main attribute effects

Across all four models, the main attributes behave as expected and are statistically meaningful:

- **Financial incentive (`rebate`)**: MWTP for the rebate attribute is positive and significant (approximately \$0.72–\$0.82 across models). This implies respondents value rebated/subsidized offers, and the positive sign confirms that rebates increase the probability of selecting an electric-appliance alternative.
- **Appliance energy efficiency (`eff`)**: This attribute shows the largest MWTP among the main attributes: roughly \$1.91–\$2.10. Coefficients on `eff` are positive and significant in the RPL results, indicating households particularly value higher-efficiency appliances.
- **Environmental impact (CO_2 footprint reduction / `carbon`)**: The estimated mean MWTP is about \$1.57–\$1.64 per each one percent carbon footprint reduction per month (Table B.2). The RPL coefficients on `carbon` are positive and statistically significant in Table B.1. This indicates respondents, on average, are willing to pay more for options that reduce household CO_2-equivalent emissions.
- **Cost (net monthly out-of-pocket cost)**: Cost enters negatively (Table B.1), as expected. This negative Cost parameter is used as the denominator in MWTP calculations.

Taken together, the pattern is intuitive: respondents prefer lower-cost, higher-efficiency, and lower-emission alternatives and are sensitive to rebates.

5.1.2 Electrical-panel-upgrade interactions

A key set of results concerns interactions between a respondent's belief that their electrical panel would need upgrading and the main attributes:

- **EP upgrade** × **rebate**: This interaction is positive and significant (MWTP ≈ +\$0.61–+\$0.72, 90% CI excludes zero). Households who expect a panel upgrade are *more responsive to rebates*; rebates meaningfully raise the attractiveness of switching for this subgroup.
- **EP upgrade** × **efficiency**: The interaction MWTP is negative (about –\$0.31 to –\$0.48) but its 90% CI overlaps zero, so evidence is weaker that perceived panel-upgrade needs alter the valuation of efficiency.
- **EP upgrade** × **CO_2**: The interaction is negative and statistically significant in both coefficient space and in MWTP (Table 6: MWTP ≈ –\$0.64 to –\$0.72 with 90% CI that excludes zero). Respondents who think an electrical-panel upgrade would be required place *less* incremental value on their household CO_2 reductions compared with respondents who do not expect an upgrade.

Overall, panel-upgrade expectations both reduce the marginal benefit households assign to emissions reductions and increase their responsiveness to direct financial incentives; they also substantially increase the likelihood of opting out.

5.1.3 Information nudge and interactions

When adding the informational nudge to the specification (Models 2 & 4), the incremental effects are generally small and statistically imprecise:

- **Info** × **carbon / rebate / eff**: The MWTPs for `info_carbon` and `info_rebate` are close to zero with wide 90% CIs that include zero (Table B.2). `info_eff` has a positive point estimate in Model 4, but its 90% CI overlaps zero. These patterns indicate the textual information about natural gas risks and indoor air pollution produced at most modest and statistically uncertain shifts in marginal valuations of the attributes.
- **Info** × **ASC**: The info nudge's interaction with the ASC also yields wide CIs, so there is no clear evidence that the nudge alone meaningfully changed opt-out propensities in this sample.

In sum, the specific information nudge tested here does not produce robust shifts in MWTP for emissions, rebates, or efficiency at conventional levels, though there are suggestive (but imprecise) positive effects on efficiency valuation in some specifications.

5.1.4 Socio-demographic interactions

A negative and significant coefficient on ASC interactions implies that a subgroup is less likely to opt out ("neither"), and thus more likely to choose an electrification alternative. Conversely, a positive and significant coefficient indicates a higher propensity to opt out. Using this convention:

- **Income (ASC_inc_*)**: Higher-income categories (e.g., `ASC_inc_70_150k`, `ASC_inc_above150k`) are negative and statistically significant. Higher-income respondents are less likely to opt out relative to the lowest-income baseline, meaning they are more likely to select electrification alternatives.
- **Education (ASC_edu_*)**: Compared with the baseline (`edu_nocollege`), more educated respondents (especially college degree holders) are significantly less likely to opt out. Education increases the likelihood of switching.
- **Age (ASC_age)**: Positive and significant; older respondents are more likely to opt out, i.e., less likely to choose electrification.
- **Other socio factors:** Gender (`ASC_female`) and graduate education show no robust effects.
- The strong baseline preference for opting out in simpler models was driven largely by income, education, and age heterogeneity.
- Once socio-demographic differences are accounted for, the residual ASC disappears. In other words, observable socio-demographics explain much of the opt-out tendency.
- The scale of MWTPs becomes more interpretable in the socio models, since the inflated ASC no longer dominates the utility space.

5.2 Policy-relevant summary

The preliminary DCE results reveal several important patterns in households' willingness to switch from natural gas to electric appliances. Higher-income respondents are significantly more likely to choose electrification options, suggesting that financial capacity plays a key role in adoption decisions. Similarly, respondents with higher levels of education exhibit a greater

propensity to switch, indicating that awareness and understanding of new technologies may facilitate uptake. In contrast, older respondents are less inclined to switch, instead showing a stronger tendency to opt out of electrification choices, which points to potential barriers related to risk aversion or lower expected returns from long-term investments.

Providing informational nudges about the health and climate risks associated with natural gas use had little measurable impact on respondents' choices, suggesting that awareness alone may be insufficient to drive behavioral change. Concerns about electrical panel upgrades also shape preferences: respondents who anticipate needing upgrades place less value on carbon and efficiency improvements but respond more strongly to financial rebates. This highlights the importance of targeted incentive design.

Overall, the findings suggest that financial incentives and appliance efficiency are the most influential factors motivating electrification, while adoption is more pronounced among higher-income and better-educated households. Older populations may require tailored outreach or financing strategies, and addressing upgrade-related barriers through well-designed rebate programs could substantially enhance policy effectiveness. These results are robust to alternative model specifications that exclude protest respondents, as detailed in Appendix B.3.

References

U.S. Census Bureau. (2023). https://data.census.gov/

A Additional tables

Table A.1: Survey Summary Statistics for Demographic Variables

Variables	Mean	S.D.	Min	Max	N
Number of current residents in each of the following age categories					
0 to 17 years old	0.82	1.08	0	5	427
18 to 64 years old	1.53	0.92	0	5	524
65 years or older	0.93	0.93	0	5	509
Age of the survey respondent					
Age	58.3	16.99	18	120	650
Sex at birth					
Male	0.64	–	–	–	642
Female	0.36	–	–	–	642
Hispanic or Latino					
Yes/No	0.07	–	–	–	625
Race (Multi-select)					
White	0.88	–	–	–	623
Black or African American	0.00	–	–	–	623
American Indian or Alaska Native	0.01	–	–	–	623
Asian	0.02	–	–	–	623
Native Hawaiian or Pacific Islander	0.00	–	–	–	623
Other	0.08	–	–	–	623
Highest degree or level of school of the survey respondent					
Less than high school diploma or GED	0.00	–	–	–	653
High school diploma or GED	0.02	–	–	–	653
Some college or Associate's degree	0.12	–	–	–	653
Bachelor's degree	0.26	–	–	–	653
Master's, Professional, or Doctoral degree	0.60	–	–	–	653
Total combined income of all household members for the past year					
Less than $20,000 per year	0.04	–	–	–	627
$20,000 to $34,999	0.02	–	–	–	637
$35,000 to $49,999	0.02	–	–	–	637
$50,000 to $64,999	0.03	–	–	–	637
$65,000 to $69,999	0.02	–	–	–	637
$70,000 to $84,999	0.04	–	–	–	637
$85,000 to $99,999	0.06	–	–	–	637
$100,000 to $149,999	0.23	–	–	–	637
$150,000 to $199,999	0.21	–	–	–	637
$200,000 or more	0.34	–	–	–	637
Current employment status of the survey respondent					
Employed full-time	0.49	–	–	–	637
Employed part-time	0.04	–	–	–	637
Self-employed	0.04	–	–	–	637
Retired	0.40	–	–	–	637
Not employed	0.02	–	–	–	637
Other	0.02	–	–	–	637
Having residents work from home more than three days per week?					
Yes/No	0.28	–	–	–	637

Note: Standard deviation, minimum, and maximum values are not reported for dummy variables. The mean values can capture the spread in the dataset, while the minimum and maximum are always 0 and 1, respectively, and therefore omitted for brevity.

Table A.2: Survey Summary Statistics for Billing Variables

Variables	Mean	N
How does your household receive the monthly utility bill from LAC-DPU?		
Electronically	0.27	713
In the mail	0.73	713
How do you pay your utility bill?		
Autopay	0.42	712
In person	0.04	712
Mailing a check	0.12	712
Online (credit/debit/checking account)	0.41	712
Over the phone	0.01	712
Do you use the LAC-DPU customer portal to see your bill and usage?		
No	0.47	713
Yes	0.47	713
I do not know what this is	0.06	713
How often do you examine your utility usage in the LAC-DPU customer portal? (only recorded for the portal users.)		
Never	0.01	334
Sometimes (1 to 2 times per year)	0.22	334
Often (3 to 6 times per year)	0.22	334
Regularly (7 to 12 times per year)	0.55	334
Which of the following best explains why you do not track your utility usage in the LAC-DPU customer portal?		
I do not have an account in the customer portal	0.08	333
I prefer receiving utility information through traditional methods	0.43	333
I find the customer portal difficult to navigate or use	0.12	333
I don't see a need to track my utility usage online	0.20	333
I don't have reliable internet/computer access	0.01	333
I don't pay attention to how much my energy bill is	0.03	333
Other	0.14	333
Are you enrolled in the LAC-DPU Utilities Assistance Program?		
No	0.97	705
Yes	0.01	705
Not sure	0.01	705
Are you enrolled in the Budget Billing Program?		
No	0.93	708
Yes	0.05	708
Not sure	0.02	708

Note: Standard deviation, minimum, and maximum values are not reported for dummy variables. The mean values can capture the spread in the dataset, while the minimum and maximum are always 0 and 1, respectively, and therefore omitted for brevity.

Table A.3: Survey Summary Statistics for Residence Variables

Variables	Mean	S.D.	Min	Max	N
Type of Residence					
Single-family detached house	0.82	–	–	–	708
Single-family attached house	0.12	–	–	–	708
Apartment/condominium	0.04	–	–	–	708
Mobile home	0.02	–	–	–	708
Other	0.004	–	–	–	708
Do you own or rent your primary residence?					
Rent	0.05	–	–	–	642
Own	0.95	–	–	–	642
Is your utility bill included in your rent? (only recorded for renters).					
Yes/No	0.03	–	–	–	30
Approximately how old is your primary residence?					
Less than 5 years old	0.02	–	–	–	639
5 to 15 years old	0.02	–	–	–	639
15 to 30 years old	0.16	–	–	–	639
30 to 60 years old	0.56	–	–	–	639
Older than 60 years	0.24	–	–	–	639
What is the square footage of your home?					
Size	2175.50	875.81	0	6000	628
How many bedrooms does your primary residence have?					
1	0.00	–	–	–	631
2	0.12	–	–	–	631
3	0.48	–	–	–	631
4	0.32	–	–	–	631
5+	0.07	–	–	–	631
Excluding basements and attics, how many stories does your primary residence have?					
1	0.55	–	–	–	633
2	0.38	–	–	–	633
3+	0.07	–	–	–	633
Does your primary residence have a garage?					
Yes/No	0.77	–	–	–	635
What size is the garage at your primary residence? (only recorded if having garage).					
1	0.19	–	–	–	484
2	0.72	–	–	–	484
3+	0.08	–	–	–	484
Which of these describes your garage? (only recorded if having garage).					
Attached and heated	0.14	–	–	–	490
Attached and not heated	0.76	–	–	–	490
Detached and heated	0.02	–	–	–	490
Detached and not heated	0.09	–	–	–	490
Is your heated garage insulated? (only recorded if having heated garage).					
No	0.15	–	–	–	67
Yes	0.85	–	–	–	67
I don't know	0.00	–	–	–	67
Do you have rooftop solar system on your primary residence?					
Yes/No	0.15	–	–	–	634

Note: Standard deviation, minimum, and maximum values are not reported for dummy variables. The mean values can capture the spread in the dataset, while the minimum and maximum are always 0 and 1, respectively, and therefore omitted for brevity.

Table A.4: Gas Consumption: Survey (N=588) vs. Non-Survey (N=7,268)

	Survey (N=588)		Non-Survey (N=7,268)		
	Consumption (CCF)	**S.D.**	**Consumption (CCF)**	**S.D.**	**T-Test**
Year					
2023	913.68	1092.19	990.54	1906.66	0.97
2024	955.37	1231.62	1058.91	2265.43	1.11
2025 (Incomplete)	555.45	746.6	626.98	1485.43	1.16
Month					
1	198.61	210.61	215.33	372.69	1.09
2	135.17	150.15	147.9	263.22	1.17
3	132.59	155.09	149.38	308.83	1.32
4	71.68	92.58	82.36	211.47	1.23
5	37.67	56.1	45.66	171.59	1.14
6	20.45	37.5	25.34	123.29	0.97
7	22.06	56.33	23.37	118.76	0.26
8	20.37	40.46	24.03	120.14	0.73
9	22.15	39.63	26.03	110.08	0.84
10	50.83	65.17	57.38	155.42	1.00
11	124.52	139.23	135.55	236.69	1.09
12	156.09	166.72	170.32	316.3	1.06
Day of Week					
Sunday	3.17	3.6	3.57	8.16	1.2
Monday	3.19	3.61	3.6	8.02	1.25
Tuesday	3.22	3.66	3.62	7.92	1.24
Wednesday	3.12	3.54	3.52	7.73	1.24
Thursday	3.02	3.44	3.41	7.51	1.27
Friday	3.3	3.8	3.66	8.13	1.05
Saturday	3.27	3.79	3.64	8.16	1.1

Notes: A t-value with an absolute magnitude greater than 1.96 indicates statistical significance at the 5% level.

Table A.5: Electricity Consumption: Survey (N=536) vs. Non-Survey (N=7,746)

	Survey (N=536)		Non-Survey (N=7,746)		
	Consumption (KWH)	**S.D.**	**Consumption (KWH)**	**S.D.**	**T-Test**
Year					
2023	6267.3	3791.82	6547.96	4622.61	-1.39
2024	7296.39	4621.66	7925.67	5618.25	-2.55
2025 (Incomplete)	3532.71	2319.47	3901.11	2798.9	-2.98
Month					
1	727.04	623.08	758.78	492.62	-1.17
2	559.92	468.52	587.15	367.01	-1.34
3	608.63	491.89	646.36	384.41	-1.77
4	490.41	381.66	527.66	302.74	-2.25
5	445.92	342.77	489.5	287.08	-2.92
6	533.05	412.48	585.64	372.94	-2.92
7	741.57	576.2	799.08	542.43	-2.27
8	705.66	553.56	755.11	504.65	-2.04
9	481.91	374.94	513.4	328.31	-1.92
10	482.92	370.03	517.51	296.51	-2.14
11	557.07	458.75	605.37	371.11	-2.41
12	621.03	530.18	668.89	434.62	-2.06
Day of Week					
Sunday	20.45	15.06	22.1	12.73	-2.52
Monday	19.74	15.01	21.28	12.28	-2.36
Tuesday	19.69	20.1	21.38	12.38	-1.95
Wednesday	19.56	14.77	21.15	12.22	-2.48
Thursday	19.89	14.86	21.52	12.28	-2.53
Friday	20.8	15.16	22.54	12.7	-2.65
Saturday	22.43	15.98	24.2	13.52	-2.54

Notes: A t-value with an absolute magnitude greater than 1.96 indicates statistical significance at the 5% level.

Table A.6: Gas Consumption: Solar (N=74) vs. Non-Solar (N=588)

	Solar (N=74)		Non-Solar (N=588)		
	Consumption (CCF)	**S.D.**	**Consumption (CCF)**	**S.D.**	**T-Test**
Year					
2023	894.91	739.4	770.33	428.27	1.41
2024	937.18	829.71	774.12	497.82	1.65
2025 (Incomplete)	544.83	525.32	447.79	320.05	1.54
Month					
1	195.25	142.44	169.74	95.18	1.49
2	132.97	103.2	113.56	64.39	1.57
3	130.24	108.22	111.28	66.74	1.47
4	70.58	66.44	57.13	31.45	1.71
5	37.21	42.56	28	16.06	1.84
6	19.86	24.54	14.88	9.49	1.71
7	21.6	49.99	15	11.07	1.12
8	19.6	24.4	14.7	10.76	1.68
9	21.77	26.67	14.55	9.95	2.26
10	50.58	49.37	37.07	22.88	2.24
11	122.3	92.43	103.78	64.58	1.61
12	153.92	112.41	128.22	76.63	1.84
Day of Week					
Sunday	3.14	2.61	2.59	1.38	1.78
Monday	3.14	2.51	2.61	1.4	1.77
Tuesday	3.17	2.52	2.67	1.48	1.65
Wednesday	3.08	2.44	2.56	1.44	1.77
Thursday	2.97	2.36	2.48	1.32	1.75
Friday	3.26	2.61	2.71	1.47	1.77
Saturday	3.22	2.62	2.67	1.44	1.78

Notes: A t-value with an absolute magnitude greater than 1.96 indicates statistical significance at the 5% level.

Table A.7: Electricity Consumption: Solar (N=82) vs. Non-Solar (N=536)

	Solar (N=82)		Non-Solar (N=536)		
	Consumption (KWH)	**S.D.**	**Consumption (KWH)**	**S.D.**	**T-Test**
Year					
2023	6547.96	3791.82	9461.36	5333	-5.74
2024	7925.67	4621.66	10745.14	5861.21	-4.93
2025 (Incomplete)	3901.11	2319.48	6100.99	3240.91	-7.54
Month					
1	758.78	492.62	1034.18	697.41	-4.43
2	587.15	367.01	885.37	502.79	-6.51
3	646.36	384.41	891.11	456.98	-5.24
4	527.66	302.74	962.92	467.64	-11.2
5	489.5	287.08	937.02	436.93	-12.19
6	585.64	372.94	953.03	451.9	-8.13
7	799.08	542.43	1037.08	477.65	-3.63
8	755.11	504.65	888.67	404.39	-2.22
9	513.4	328.31	922.3	448.24	-9.88
10	517.51	296.51	862.07	418.68	-9.15
11	605.37	371.11	918.23	540.15	-6.62
12	668.89	434.62	962.86	609.92	-5.36
Day of Week					
Sunday	22.1	12.73	35.8	17.57	-8.7
Monday	21.28	12.28	36.44	17.77	-9.82
Tuesday	21.38	12.38	36.6	17.81	-9.79
Wednesday	21.15	12.22	37.33	18.42	-10.43
Thursday	21.52	12.28	37.38	19.22	-10.12
Friday	22.54	12.7	36.05	17.32	-8.61
Saturday	24.2	13.52	36.74	17.71	-7.58

Notes: A t-value with an absolute magnitude greater than 1.96 indicates statistical significance at the 5% level.

Table A.8: KS Test P-Values for Electricity and Gas Comparisons

	Electricity		Gas	
	Survey vs. Non-Survey	**Solar vs. Non-Solar**	**Survey vs. Non-Survey**	**Solar vs. Non-Solar**
Year				
2023	0.004	<0.0001	0.199	0.124
2024	<0.0001	<0.0001	0.466	0.267
2025 (Incomplete)	<0.0001	<0.0001	0.803	0.197
Month				
1	<0.0001	0.001	0.132	0.162
2	<0.0001	<0.0001	0.154	0.093
3	<0.0001	<0.0001	0.436	0.208
4	<0.0001	<0.0001	0.475	0.147
5	<0.0001	<0.0001	0.307	0.088
6	<0.0001	<0.0001	0.634	0.255
7	0.008	<0.0001	0.418	0.198
8	0.014	<0.0001	0.217	0.223
9	0.001	<0.0001	0.26	0.016
10	<0.0001	<0.0001	0.539	0.109
11	<0.0001	<0.0001	0.148	0.254
12	<0.0001	<0.0001	0.07	0.089
Day of Week				
Sunday	<0.0001	<0.0001	0.058	0.172
Monday	<0.0001	<0.0001	0.177	0.153
Tuesday	<0.0001	<0.0001	0.161	0.188
Wednesday	<0.0001	<0.0001	0.117	0.152
Thursday	<0.0001	<0.0001	0.148	0.129
Friday	<0.0001	<0.0001	0.096	0.074
Saturday	<0.0001	<0.0001	0.13	0.168

Notes: Kolmogorov–Smirnov (KS) test p-values comparing electricity and gas consumption distributions across household groups. A p-value below 0.05 indicates a statistically significant difference between the two distributions.

B DCE Methodology and Results

B.1 Methodology

We estimate random parameter logit (RPL, also called mixed logit) models of household preferences over natural gas versus electric end-use appliances. For respondent i, alternative j, and choice occasion t, the indirect utility is specified as

$$U_{ijt} = V_{ijt} + \varepsilon_{ijt}, \tag{B.1}$$

where V_{ijt} is the deterministic component of utility and ε_{ijt} is an i.i.d. extreme value error term. The systematic utility is written as

$$
\begin{aligned}
V_{ijt} = {} & \beta_{\text{carbon},i}\,\text{carbon}_{jt} + \beta_{\text{rebate},i}\,\text{rebate}_{jt} + \beta_{\text{eff},i}\,\text{eff}_{jt} + \beta_{\text{cost},i}\,\text{cost}_{jt} \\
& + \sum_k \psi_k\,(\text{elect\_upgrade}_i \times x_{k,jt}) + \sum_k \phi_k\,(\text{info}_i \times x_{k,jt}) \\
& + \eta' Z_i + \alpha \cdot ASC_j \; + \; \delta \cdot (ASC_j \times protester_i),
\end{aligned} \tag{B.2}
$$

where:

- carbon_{jt}, rebate_{jt}, eff_{jt}, and cost_{jt} are the main DCE attributes (environmental impact, financial incentive, appliance energy efficiency, and net monthly out-of-pocket cost, respectively),
- $x_{k,jt}$ denotes each main attribute in a generic index $k \in \{\text{carbon}, \text{rebate}, \text{eff}, \text{cost}\}$,
- $\text{elect\_upgrade}_i \in \{0,1\}$ indicates respondent i's belief that their electrical panel would need upgrading. Among surveyed households, 75% of respondents indicated that they would need to upgrade their electrical panel if they switched to electric appliances.
- $\text{info}_i \in \{0,1\}$ indicates whether respondent i received the informational nudge,
- Z_i is the vector of socio-demographic covariates and η are their coefficients (these typically enter as interactions with the opt-out ASC),
- ASC_j is an indicator equal to 1 when alternative j is the opt-out ("neither") option and 0 otherwise,
- α is the baseline alternative-specific constant (ASC) coefficient for the opt-out option,
- $protester_i$ is a dummy equal to 1 for respondents who always chose the opt-out across all tasks ("protesters") and 0 otherwise,
- δ captures the incremental propensity of protesters to choose the opt-out option (i.e., it is the coefficient on the $ASC_j \times protester_i$ interaction).

The inclusion of the protester interaction term $\delta \cdot (ASC_j \times protester_i)$ allows us to retain all respondents in the estimation while absorbing systematic protest behavior into the opt-out ASC, rather than distorting attribute tradeoffs. Robustness checks are performed by re-estimating the model, excluding protest respondents entirely.

To allow taste heterogeneity (that is, differences in how respondents value the attributes), we estimate an RPL in which the main attribute coefficients $\beta_{\text{carbon},i}$, $\beta_{\text{rebate},i}$, $\beta_{\text{eff},i}$, and $\beta_{\text{cost},i}$ are specified as random draws from a multivariate distribution (we assume normal distributions),

while interaction coefficients with elect_upgrade, info, protesters, and socio-demographic interactions are treated as fixed.

Marginal willingness-to-pay (MWTP) for attribute k is computed as the ratio of the attribute coefficient to the (negative of the) cost coefficient:

$$\text{MWTP}_k = -\frac{\beta_k}{\beta_{\text{cost}}}. \tag{B.3}$$

Because $\boldsymbol{\beta}$ is distributed, we compute MWTP distributions by simulation and obtain point estimates and confidence intervals using the Krinsky–Robb procedure (here: 50,000 repetitions and 90% confidence intervals). All interaction terms (elect_upgrade, info, socio) are treated as fixed in the MWTP calculation by adding their estimated effect to the mean β_k before ratioing to β_{cost}.

We estimate four model variants (all are RPL with main attributes assumed to be normally distributed and all interaction terms fixed):

1. **Model 1 (Panel Upgrade interactions).** Main effects plus interactions between elect_upgrade$_i$ and each main attribute (carbon, rebate, eff, cost).

2. **Model 2 (Panel Upgrade + Info).** Model 1 plus interactions between the information nudge info$_i$ and each main attribute.

3. **Model 3 (Panel Upgrade + Socio).** Model 1 plus socio-demographic interactions (socio $\times$ ASC and/or attributes as specified).

4. **Model 4 (Panel Upgrade + Info + Socio).** Model 2 plus the socio-demographic interactions from Model 3.

B.2 Main results

Table B.1: Random Parameter logit results for main effect and interaction models.

	M1: Panel Upgrade		M2: Panel upgrade & Info nudge		M3: Panel Upgrade + Socio		M4: Panel upgrade & Info nudge + Socio	
VARIABLES	Mean	SD	Mean	SD	Mean	SD	Mean	SD
CO_2 Footprint Reduction	0.034***	0.029***	0.034***	0.029***	0.035***	0.030***	0.034***	0.030***
	(0.005)	(0.003)	(0.005)	(0.003)	(0.006)	(0.003)	(0.005)	(0.003)
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Financial Incentive	0.017***	0.016***	0.017***	0.014***	0.016***	0.017***	0.015***	0.015***
	(0.004)	(0.005)	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)
	0.000	0.001	0.000	0.002	0.001	0.000	0.001	0.004
Appliance Energy Efficiency	0.042***	0.033***	0.040***	0.033***	0.045***	0.033***	0.041***	0.032***
	(0.007)	(0.005)	(0.007)	(0.005)	(0.008)	(0.006)	(0.007)	(0.006)
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Optout	0.109	2.540***	0.019	-2.486***	0.897	2.305***	0.445	-2.273***
	(0.431)	(0.267)	(0.461)	(0.257)	(2.006)	(0.265)	(1.966)	(0.282)
	0.799	0.000	0.967	0.000	0.655	0.000	0.821	0.000
Cost	-0.021***	-0.014***	-0.021***	-0.014***	-0.022***	-0.014***	-0.021***	-0.014***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
protester_Optout	37.041		33.925		40.535		37.730	
	(4,841.913)		(1,318.547)		(32,445.934)		(9,747.050)	
	0.994		0.979		0.999		0.997	
EP upgrade x CO_2	-0.013**		-0.014**		-0.016***		-0.014**	
	(0.005)		(0.006)		(0.006)		(0.006)	
	0.014		0.013		0.008		0.016	
EP upgrade x rebate	0.013***		0.013**		0.015***		0.015***	
	(0.005)		(0.005)		(0.005)		(0.005)	
	0.010		0.010		0.005		0.004	
EP upgrade x efficiency	-0.007		-0.007		-0.010		-0.009	
	(0.008)		(0.008)		(0.008)		(0.008)	
	0.391		0.344		0.212		0.273	
EP upgrade x Optout	1.141**		1.181**		1.670***		1.596***	
	(0.485)		(0.499)		(0.521)		(0.514)	
	0.019		0.018		0.001		0.002	
ASC_inc_35_70k					1.022		0.936	
					(1.582)		(1.730)	
					0.518		0.588	
ASC_inc_70_150k					0.663		0.785	
					(1.503)		(1.601)	
					0.659		0.624	
ASC_inc_above150k					0.383		0.441	
					(1.400)		(1.457)	
					0.784		0.762	
ASC_edu_college					-2.860**		-2.466	
					(1.433)		(1.547)	
					0.046		0.111	
ASC_edu_BA					-2.668**		-2.431*	
					(1.355)		(1.457)	
					0.049		0.095	
ASC_edu_grad					-2.948**		-2.606*	
					(1.313)		(1.408)	
					0.025		0.064	
ASC_female					0.380		0.343	
					(0.409)		(0.415)	
					0.352		0.408	
ASC_age					0.020		0.023*	
					(0.012)		(0.013)	
					0.111		0.072	
info_carbon			0.000				-0.001	
			(0.005)				(0.006)	
			0.973				0.923	
info_rebate			0.001				-0.000	
			(0.005)				(0.006)	
			0.862				0.948	
info_eff			0.008				0.012	
			(0.008)				(0.009)	
			0.316				0.163	
info_ASC			0.305				-0.124	
			(0.483)				(0.539)	
			0.528				0.819	
Observations	8,478		8,478		7,461		7,461	
Log likelihood	-1650		-1649		-1450		-1451	
DF	5		5		5		5	
AIC	3329		3336		2946		2957	
BIC	3435		3469		3105		3144	

Standard errors are clustered at individual level and are presented in parentheses.
*** p<0.01, ** p<0.05, * p<0.10. 1,000 Halton Draws are used for estimation.

Table B.2: Marginal Willingness-to-Pay for all four estimated models using the Krinsky-Robb approach and reported in brackets.

	M1: Panel Upgrade		M2: Panel upgrade & Info nudge		M3: Panel Upgrade + Socio		M4: Panel upgrade & Info nudge + Socio	
	MWTP	90% CI	MWTP	90% CI	MWTP	90% CI	MWTP	90% CI
CO_2 Footprint Reduction	\$1.62	[1.25,2.05]	\$1.64	[1.24,2.09]	\$1.63	[1.24,2.07]	\$1.57	[1.18,2.02]
Financial Incentive	\$0.82	[0.48,1.18]	\$0.82	[0.47,1.19]	\$0.74	[0.39,1.12]	\$0.72	[0.36,1.1]
Appliance Energy Efficiency	\$2.00	[1.48,2.57]	\$1.95	[1.41,2.54]	\$2.10	[1.55,2.7]	\$1.91	[1.37,2.5]
Optout	\$5.25	[−29.62,39.18]	\$0.91	[−36.84,37.66]	\$41.55	[−114.47,195.4]	\$20.80	[−133.19,173.26]
EP upgrade x CO_2	-\$0.64	[−1.09,-0.22]	-\$0.66	[−1.12,-0.23]	-\$0.72	[−1.18,-0.28]	-\$0.65	[−1.12,-0.21]
EP upgrade x rebate	\$0.62	[0.23,1.04]	\$0.61	[0.22,1.03]	\$0.70	[0.29,1.15]	\$0.72	[0.32,1.16]
EP upgrade x efficiency	-\$0.31	[−0.92,0.29]	-\$0.35	[−0.96,0.26]	-\$0.48	[−1.12,0.16]	-\$0.41	[−1.03,0.21]
EP upgrade x Optout	\$54.74	[16.88,95.08]	\$57.11	[17.79,98.8]	\$77.37	[37.67,119.54]	\$74.54	[35.01,116.59]
info_carbon			\$0.01	[−0.43,0.45]			-\$0.03	[−0.51,0.45]
info_rebate			\$0.04	[−0.37,0.46]			-\$0.02	[−0.47,0.44]
info_eff			\$0.38	[−0.25,1.02]			\$0.57	[−0.11,1.27]
info_ASC			\$14.76	[−23.99,54.3]			-\$5.77	[−47.86,36.57]
ASC_inc_35_70k					\$47.33	[−74.3,170.68]	\$43.70	[−89.43,179.83]
ASC_inc_70_150k					\$30.70	[−83.66,147.36]	\$36.64	[−86.99,162.49]
ASC_inc_above150k					\$17.75	[−90.59,125.67]	\$20.61	[−92.35,134.99]
ASC_edu_college					-\$132.48	[−244.38,-23.7]	-\$115.15	[−239.51,3.49]
ASC_edu_BA					-\$123.61	[−229.23,-20.95]	-\$113.51	[−230.19,-0.93]
ASC_edu_grad					-\$136.56	[−238.53,-37.25]	-\$121.71	[−234.64,-13.59]
ASC_female					\$17.63	[−13.71,49.58]	\$16.01	[−16.2,48.13]
ASC_age					\$0.90	[−0.05,1.88]	\$1.06	[0.09,2.08]

B.3 Robustness Checks

All four models are re-estimated with and without protest respondents. Table B.3 reports results including protest respondents, while Table B.5 presents results after their exclusion. Across both specifications, findings remain robust.

Table B.3: Random Parameter logit results for main effect and interaction models excluding protesters.

	Panel Upgrade		Panel upgrade & Info nudge		Panel Upgrade + Socio		Panel upgrade & Info nudge + Socio	
VARIABLES	Mean	SD	Mean	SD	Mean	SD	Mean	SD
CO_2 Footprint Reduction	0.034***	0.030***	0.034***	0.030***	0.035***	0.029***	0.035***	0.029***
	(0.005)	(0.003)	(0.005)	(0.003)	(0.005)	(0.003)	(0.006)	(0.003)
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Financial Incentive	0.017***	-0.016***	0.017***	-0.016***	0.016***	-0.016***	0.016***	-0.016***
	(0.004)	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)
	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000
Appliance Energy Efficiency	0.042***	0.034***	0.040***	0.034***	0.044***	0.033***	0.042***	0.033***
	(0.007)	(0.006)	(0.007)	(0.005)	(0.007)	(0.006)	(0.008)	(0.006)
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Optout	0.095	2.469***	0.037	2.468***	0.326	2.339***	0.240	2.330***
	(0.418)	(0.248)	(0.432)	(0.248)	(1.974)	(0.278)	(1.962)	(0.278)
	0.821	0.000	0.932	0.000	0.869	0.000	0.903	0.000
Cost	-0.021***	0.014***	-0.021***	0.014***	-0.022***	0.014***	-0.022***	0.014***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
EP upgrade x CO_2	-0.014***		-0.014***		-0.015**		-0.015**	
	(0.005)		(0.005)		(0.006)		(0.006)	
	0.010		0.010		0.011		0.011	
EP upgrade x rebate	0.013**		0.013**		0.015***		0.015***	
	(0.005)		(0.005)		(0.005)		(0.005)	
	0.011		0.011		0.005		0.005	
EP upgrade x efficiency	-0.008		-0.008		-0.009		-0.010	
	(0.008)		(0.008)		(0.008)		(0.008)	
	0.312		0.318		0.252		0.234	
EP upgrade x Optout	1.179**		1.174**		1.623***		1.621***	
	(0.473)		(0.473)		(0.513)		(0.514)	
	0.013		0.013		0.002		0.002	
ASC_inc_35_70k					0.663		0.740	
					(1.676)		(1.682)	
					0.693		0.660	
ASC_inc_70_150k					0.440		0.496	
					(1.536)		(1.540)	
					0.774		0.748	
ASC_inc_above150k					0.126		0.146	
					(1.413)		(1.401)	
					0.929		0.917	
ASC_edu_college					-2.138		-2.096	
					(1.387)		(1.373)	
					0.123		0.127	
ASC_edu_BA					-2.109		-2.058	
					(1.307)		(1.293)	
					0.106		0.111	
ASC_edu_grad					-2.310*		-2.258*	
					(1.247)		(1.231)	
					0.064		0.067	
ASC_female					0.367		0.366	
					(0.417)		(0.416)	
					0.378		0.379	
ASC_age					0.024*		0.024*	
					(0.012)		(0.013)	
					0.056		0.057	
info_carbon			0.000				-0.002	
			(0.006)				(0.006)	
			0.942				0.710	
info_rebate			0.001				-0.001	
			(0.005)				(0.006)	
			0.890				0.878	
info_eff			0.008				0.011	
			(0.008)				(0.009)	
			0.324				0.217	
info_ASC			0.255				-0.042	
			(0.480)				(0.549)	
			0.595				0.939	
Observations	5,994		5,994		5,319		5,319	
No of Respondents	335		335		297		297	
Log likelihood	-1650		-1649		-1450		-1449	
DF	5		5		5		5	
AIC	3328		3335		2945		2951	
BIC	3422		3456		3090		3122	

Standard errors are clustered at individual level and are presented in parentheses. *** p<0.01, ** p<0.05, * p<0.10. 1,000 Halton Draws are used for estimation.

Table B.4: Marginal Willingness-to-Pay for all four estimated models, excluding protesters, using the Krinsky-Robb approach and reported in brackets.

	M1: Panel Upgrade		M2: Panel upgrade & Info nudge		M3: Panel Upgrade + Socio		M4: Panel upgrade & Info nudge + Socio	
	MWTP	CI	MWTP	CI	MWTP	CI	MWTP	CI
CO_2 Footprint Reduction	$1.65	[1.27,2.07]	$1.64	[1.25,2.08]	$1.62	[1.23,2.05]	$1.64	[1.24,2.08]
Financial Incentive	$0.82	[0.49,1.19]	$0.82	[0.47,1.2]	$0.73	[0.38,1.11]	$0.75	[0.39,1.14]
Appliance Energy Efficiency	$2.04	[1.51,2.61]	$1.95	[1.4,2.54]	$2.05	[1.51,2.64]	$1.95	[1.4,2.55]
Optout	$4.56	[−29.46,37.69]	$1.77	[−33.48,36.07]	$15.07	[−137.81,167.17]	$11.12	[−141.01,162.53]
EP upgrade x CO_2	-$0.68	[−1.14,-0.26]	-$0.68	[−1.14,-0.26]	-$0.68	[−1.14,-0.25]	-$0.68	[−1.14,-0.25]
EP upgrade x rebate	$0.62	[0.22,1.04]	$0.61	[0.22,1.03]	$0.71	[0.3,1.15]	$0.70	[0.29,1.14]
EP upgrade x efficiency	-$0.37	[−0.99,0.24]	-$0.37	[−0.98,0.24]	-$0.44	[−1.07,0.2]	-$0.45	[−1.09,0.18]
EP upgrade x Optout	$56.84	[19.68,96.27]	$56.61	[19.34,96.06]	$75.13	[36.12,116.84]	$75.14	[35.94,117.03]
info_carbon			$0.02	[−0.44,0.47]			-$0.10	[−0.57,0.36]
info_rebate			$0.03	[−0.38,0.45]			-$0.04	[−0.49,0.41]
info_eff			$0.38	[−0.26,1.02]			$0.51	[−0.17,1.2]
info_ASC			$12.28	[−25.98,51.32]			-$1.95	[−44.47,40.67]
ASC_inc_35_70k					$30.67	[−97.09,162.14]	$34.31	[−94.34,166.47]
ASC_inc_70_150k					$20.37	[−96.27,140.22]	$22.97	[−95.11,142.75]
ASC_inc_above150k					$5.82	[−103.29,114.98]	$6.75	[−101.02,115.34]
ASC_edu_college					-$98.99	[−209.47,6.52]	-$97.13	[−207.29,7.65]
ASC_edu_BA					-$97.63	[−201.29,1.84]	-$95.41	[−199.22,3.35]
ASC_edu_grad					-$106.94	[−205.09,-12.23]	-$104.68	[−203.53,-10.46]
ASC_female					$17.00	[−14.93,49.7]	$16.97	[−15.12,48.86]
ASC_age					$1.09	[0.15,2.07]	$1.12	[0.15,2.12]

Table B.5: Random Parameter logit results for main effect and interaction models including protesters.

	Panel Upgrade		Panel upgrade & Info nudge		Panel Upgrade + Socio		Panel upgrade & Info nudge + Socio	
VARIABLES	Mean	SD	Mean	SD	Mean	SD	Mean	SD
CO_2 Footprint Reduction	0.031***	0.035***	0.031***	0.035***	0.032***	0.034***	0.032***	0.034***
	(0.005)	(0.005)	(0.006)	(0.004)	(0.006)	(0.004)	(0.006)	(0.004)
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Financial Incentive	0.016***	-0.019***	0.016***	-0.019***	0.014***	-0.020***	0.015***	-0.020***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.005)	(0.004)
	0.000	0.000	0.001	0.000	0.004	0.000	0.004	0.000
Appliance Energy Efficiency	0.040***	0.035***	0.038***	0.035***	0.042***	0.036***	0.040***	0.036***
	(0.007)	(0.006)	(0.007)	(0.006)	(0.008)	(0.006)	(0.008)	(0.006)
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Optout	1.645*	6.029***	1.537*	6.038***	1.088	5.712***	0.920	5.714***
	(0.844)	(0.585)	(0.849)	(0.569)	(2.880)	(0.505)	(2.895)	(0.506)
	0.051	0.000	0.070	0.000	0.706	0.000	0.751	0.000
Cost	-0.021***	0.014***	-0.021***	0.014***	-0.021***	0.014***	-0.021***	0.014***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
EP upgrade x CO_2	-0.015**		-0.015**		-0.015**		-0.015**	
	(0.006)		(0.006)		(0.006)		(0.006)	
	0.013		0.013		0.015		0.016	
EP upgrade x rebate	0.014**		0.014**		0.017***		0.017***	
	(0.005)		(0.005)		(0.006)		(0.006)	
	0.010		0.010		0.004		0.004	
EP upgrade x efficiency	-0.007		-0.007		-0.009		-0.010	
	(0.008)		(0.008)		(0.009)		(0.009)	
	0.395		0.394		0.271		0.253	
EP upgrade x Optout	1.976**		1.983**		2.541***		2.548***	
	(0.936)		(0.925)		(0.837)		(0.835)	
	0.035		0.032		0.002		0.002	
ASC_inc_35_70k					-1.199		-1.171	
					(2.177)		(2.142)	
					0.582		0.585	
ASC_inc_70_150k					-3.077		-2.995	
					(1.881)		(1.952)	
					0.102		0.125	
ASC_inc_above150k					-3.068*		-2.995*	
					(1.698)		(1.746)	
					0.071		0.086	
ASC_edu_college					0.907		0.811	
					(2.034)		(1.999)	
					0.656		0.685	
ASC_edu_BA					0.679		0.648	
					(1.843)		(1.816)	
					0.713		0.721	
ASC_edu_grad					-1.572		-1.579	
					(1.830)		(1.791)	
					0.390		0.378	
ASC_female					-0.106		-0.082	
					(0.683)		(0.686)	
					0.876		0.905	
ASC_age					0.069***		0.072***	
					(0.020)		(0.021)	
					0.001		0.001	
info_carbon			-0.000				-0.003	
			(0.006)				(0.007)	
			0.961				0.695	
info_rebate			0.002				-0.001	
			(0.005)				(0.006)	
			0.762				0.859	
info_eff			0.007				0.011	
			(0.008)				(0.009)	
			0.378				0.222	
info_ASC			0.501				-0.328	
			(0.863)				(0.903)	
			0.562				0.716	
Observations	8,478		8,478		7,461		7,461	
No of Respondents	473		473		416		416	
Log likelihood	-1922		-1921		-1682		-1681	
DF	5		5		5		5	
AIC	3872		3879		3409		3415	
BIC	3970		4006		3561		3595	

Standard errors are clustered at individual level and are presented in parentheses. *** p<0.01, ** p<0.05, * p<0.10. 1,000 Halton Draws are used for estimation.

Table B.6: Marginal Willingness-to-Pay for all four estimated models, including protesters, using the Krinsky-Robb approach and reported in brackets..

	M1: Panel Upgrade		M2: Panel upgrade & Info nudge		M3: Panel Upgrade + Socio		M4: Panel upgrade & Info nudge + Socio	
	MWTP	CI	MWTP	CI	MWTP	CI	MWTP	CI
CO_2 Footprint Reduction	$1.52	[1.1,1.99]	$1.52	[1.09,2.01]	$1.48	[1.06,1.95]	$1.50	[1.07,1.98]
Financial Incentive	$0.78	[0.42,1.17]	$0.77	[0.4,1.17]	$0.68	[0.29,1.09]	$0.69	[0.3,1.11]
Appliance Energy Efficiency	$1.94	[1.4,2.53]	$1.86	[1.3,2.47]	$1.99	[1.42,2.62]	$1.89	[1.31,2.53]
Optout	$80.10	[12.25,149.05]	$74.92	[6.51,144.37]	$51.08	[−173.87,278.24]	$43.21	[−183.35,271.45]
EP upgrade x CO_2	-$0.72	[−1.21,-0.25]	-$0.72	[−1.22,-0.25]	-$0.72	[−1.23,-0.24]	-$0.72	[−1.23,-0.24]
EP upgrade x rebate	$0.67	[0.25,1.12]	$0.66	[0.24,1.11]	$0.79	[0.34,1.27]	$0.78	[0.33,1.26]
EP upgrade x efficiency	-$0.32	[−0.96,0.31]	-$0.32	[−0.96,0.31]	-$0.44	[−1.11,0.22]	-$0.46	[−1.13,0.21]
EP upgrade x Optout	$96.23	[21.7,175.44]	$96.66	[22.98,174.84]	$119.26	[55.09,187.63]	$119.70	[55.49,188.33]
info_carbon			-$0.01	[−0.51,0.48]			-$0.12	[−0.64,0.4]
info_rebate			$0.08	[−0.37,0.53]			-$0.05	[−0.55,0.45]
info_eff			$0.35	[−0.31,1.02]			$0.53	[−0.19,1.27]
info_ASC			$24.41	[−45.44,95.4]			-$15.42	[−86.79,55.51]
ASC_inc_35_70k					-$56.26	[−228.1,112.34]	-$55.02	[−223.36,111.53]
ASC_inc_70_150k					-$144.43	[−294.19,1.5]	-$140.69	[−296.25,10.3]
ASC_inc_above150k					-$143.99	[−281.69,-12]	-$140.69	[−281.68,-4.87]
ASC_edu_college					$42.56	[−116.75,201.91]	$38.07	[−119.1,195.45]
ASC_edu_BA					$31.86	[−111.78,175.86]	$30.42	[−112.3,172.75]
ASC_edu_grad					-$73.79	[−218.78,68.1]	-$74.18	[−217.64,64.03]
ASC_female					-$4.99	[−58.7,48.13]	-$3.86	[−57.79,48.73]
ASC_age					$3.23	[1.68,4.88]	$3.37	[1.76,5.1]

Socio-demographic characteristics explain much of the variation in the opt-out constant. Once these factors are controlled for, the baseline opt-out variable becomes statistically insignificant. This highlights the role of observable heterogeneity in shaping household electrification choices. In other words,

C Open-Ended Survey Comments

1. As much as I would like to switch my dryer to full electric (if my landlord would allow of course) I don't think I could ever switch my oven because there have been too many times in my life where, because of a blackout, it had been the only reliable source of heat for hours or even days.

2. Survey seems to presume that the consumer intends to switch from gas to electric and believes that that is best for the environment, efficiency, etc.

3. Give an none of above options on question about changing to electrical.

4. The question on why I don't want to switch from gas didn't have a write in option or other option, and didn't include my rationale. This survey likely misses my reasoning for not wishing to switch at this time.

5. For the question about "what would it take to change from natural gas to all electric", include an answer that says "I never want to change away from natural gas"

6. Add options of will not change and none of the above to questions instead of forcing me to choose one of your answers when none fit my beliefs

7. You only asked how we feel about our gas appliances. Not how we currently feel about our electric ones. I have an electric range and stove, can't stand it. I would always choose a gas range and stove over electric.

8. Have no interest in electric heating. Costs much more than gas.

9. Question about perceived benefits of switching to electric appliances does not have a "none of the above" option.

10. Some of the questions felt invasive & unnecessary. I did not like being forced to give some information I was uncomfortable providing.

11. The questions about if I would be interested in chatting from natural gas to electric could have asked for each appliance as I'd like to change some (water heater), but not all (gas fireplace and stove). There could also have been an option in the "reasons you don't want to switch" about the quality of electric being less (specifically in regards to stoves)

12. My residence is already all-electric. It's also passive solar with active solar DHW heating. Prior to 2023, I heated primarily with solar and wood. In 2023, I could have installed a gas furnace with central cooling, but I chose to go with the ductless mini-split heat

pump system. I left the resistance heating system connected and use that system in the bathrooms. Your survey doesn't capture any of the above.

13. Stop trying to push electric power for everything.

14. You rock!

15. Give people a no choice option on why they would consider switching to electric

16. Ask if our rooftop solar actually works

17. ask if we 'want' to switch (not at all!) we cook all our own meals and would 'never' use electric to cook with, nor would we live in a location without gas cooking appliances

18. The thing that has prevented us from switching from gas to electric was not included as an option in this survey. It is lack of good-quality, unbiased information. What is the sane way to move from gas-boiler hot-water-baseboard to electric heat pump?? Besides our own research, we have asked several HVAC companies, and they all gave different answers, all of which seemed way too complicated.

19. None of the incentives to change to electricity from natural gas pertained, yet the question required an answer (none or N/A was not an option). This will give a false set of answers. Bottom line, I REALLY do not want to switch to all electrical appliances. Induction stoves do not work on Pyrex pots and pans.

20. Forcing me to give a reason for an incentive to switch to electric is inappropriate; there isn't one. Also, asking my race and gender is HIGHLY inappropriate, sexist, and racist.

21. The question about factors influencing my decision to switch to electric wasn't clearâ€"are these factors that I consider as being in electric's favor or just general categories that I consider? Also, the primary reason that I do not intend to ever switch is that I would no diversity of energy accessâ€"if the power does go out for whatever reason (and we know in great detail about the insecurity and instability of our power grid), then all of our emergency and survival resources would be all affected, all at once. As a mother with children at home, this is extremely concerning, particularly in the winter months. There would be no diversity of energy access, and therefore no safety in a situation where electric energy is affected. Even if there is diversity in how that electric energy is produced (wind, solar, nuclear, etc), it is still bottle-necked through a wildly unstable, vulnerable, and poorly managed power grid.

22. Not many opportunities to respond that we don't want all-electric.

23. The survey should consider that some of us may be actively transitioning our appliances from electric to gas.

24. If I could start from fresh I'd install solar and use that energy to run all my natural gas appliances except the natural gas stove/fireplace and outdoor grill. But I have all these gas appliances and will not switch any over to electric unless they stopped working and electric was cheaper. There is little motivation to switch a working gas appliance to electric (for me). But if the house was setup to run electric, that's what I'd do.

25. Leave natural gas alone. It's a superior cooking and heating product when compared to electricity.

26. Charge an EV with home electricity

27. More identifying questions for those who have high efficiency solar houses that are all electric.

28. You do not give people the options they need. I would have liked to say none of the above on a couple answers. It is not good when you must choose even if it is a false answer.

29. Don't change to all electric

30. Asking personal questions about age sex and minors should not be part of a survey about gas or electric use. Being forced to replace 10s of Thousands of dollars because someone thinks it is good for them doesn't make it good for me. Unless they pay for the change over. This includes new wiring and appliances.

31. Questions are not neutral. No place to address cooking performance and lower costs of gas.

32. the level of rental properties is high in this County and most pay their own utilities but will not be responsible to replace appliances of HVAC. The survey will be challenging to have this be an 'apples to apples' data source

33. Trying to convert people from CNG to CNG powered e-plants is stupid. How about you focus on getting the entire state, Dine', Pueblos, Ranches, etc.. on a reliable power, water, and CNG grid. Stop selling our CNG to other states to reduce our carbon foot print. Sell your Tesla so Ukrainian's don't die needlessly over greed. Put a Nuclear powerplant or two in every state, and reuse / recycle fuel rods. CNG is the best source of heat for cooking and baking, as it is easy to control and does not emit long wave, uncontrolled, radiant heat.

34. Include wood pellet smoker in the outdoor grill section.

35. Make it clearer how to answer if one has two utility systems.

36. The impediment for converting to gas was NOT mentioned. I had to provide a false answer, blaming the cost. The real reason is implementation – could be a massive, lengthy undertaking.

37. First, I installed solar to help the environment and save money. When I installed it, I was reimbursed at residential rate now it's commercial rate. I feel I've been punished for making a virtuous decision.

    FYI: my older home is not wired for 240V and it's thousands of dollars to install it. My gas stove died. I had no choice but replace it with gas.

38. ask about cost to upgrade electic service from 100 amp to something suffucuient to use all electric

39. Many questions should have an 'other/text' option since my situation does not fit neatly into the pre-populated answers.

40. If already all electric should ask if want to stay electric or move to natural gas. I would want to go to gas.

41. favor using electric energy

42. Note: Electrical costs are the biggest part of our utility bill. No incentive to go all electric because of the cost of electricity. The electrical grid tends to go out at the wrong time, not as often as it did when we first moved here, just often enough to cause concern in winter. Also, with a gas fired hot water heating system we've been advised to leave the thermostat set at one point because it takes something like 24-36 hours to bring it up to heating temp.

43. Cooking quality and ease of food preparation are top priorities in our family. My wife is a chef, and I am a serious food hobbyist. We've not been to a restaurant that uses electricity to prepare food. Natural gas and indoor hardwood grilling are our go-to fuels. We would not switch to electricity. Fuel is being burned and is polluting somewhere to send electricity to consumers. A nuclear-fired power generating plant would be the best source of electricity...however, we would still cook over fire.

44. Don't ask me personal wage, sex, and age to information.

45. not now, not ever, planning on an all electric house. It is, and always should be a customers choice as to utility sources

46. Doesn't take into factor unavailable electric alternatives to natural gas appliances

47. Your salary ranges are very low for Los Alamos

48. The fact that I was not given the chance to mark I was dissatisfied with the performance of electric appliances (of which I have tried several) as being a concern is telling how you wanted to set up the survey to get the result you want.

49. Yes, your survey is biased to promote the forced switch to electric based on bogus “climate change” ideology. Times have changed !! The federal government has derailed that train. We now have freedom of choice to promote competion in the energy sector. The County of Los Alamos is trying to force fit radical left policies onto iots citizens. Instead of this stealth study, you should have public meetings and let the voters have a say !!

50. Yes. This is the second of these dumbass surveys that you’re having us fill out which means you guys didn’t get the hint the first time. We shit on this the first time because people want the choice. Gas or electric or wood fire. The electricity goes out every year. So what is your idiotic plan for us to be able to cook when the power goes out? Just plain stupid.

51. No. Thank you.

52. A factor not listed in the reasons not to switch to electric is performance in extreme weather. Our heat pump, and most residential heat pumps, are not viable options in extreme cold conditions we encounter for the worst part of winter. Ours frequently switches into “emergency heat” mode using a conventional electric heater and an enormous amount of power. Until the technology improves or electricity is cheaper, there is simply no reason not to switch to gas. Additionally, for cooking performance, induction or electric heat simply can’t compete with the BTU output of a gas range - unless an enormous upfront cost is invested.

53. I will not be forced to change to electricity to have inferior appliances and utilities above 1000.00 per month. I will move first

54. Really annoyed to have to answer the question about income.

55. Drag and drop selection is deceiving in my opinion. I would add qualifiers, such as: If you were to receive a rebate, etc. I would consider switching to electric, certainly, but in my opinion the cost savings case (and honestly, the need, i.e. if it was to break and need replacement) needs to arise in order for me to be motivated to make a switch.

56. My income, race and gender have nothing to do with gas vs. electric

57. After the questions any intention to switch, perhaps a space for free-text feedback about why or why not intending to switch. May also help to know whether the respondent chose the appliances (electric or gas) and why they chose the modality they chose.

58. Please do not switch the county. Electricity is currently way too expensive, already struggling with numerous utility bill increases. Find an affordable option and KEEP NATURAL GAS

59. Electricity for heating is simply stupid. If I am looking for carbon friendly, I will look for pellet stove.

60. I was not able to NOT check any item of what I would consider to switch. I would NOT consider any of them, by I did not have that choice

61. The sex question, sex at birth, give me a break

62. The question asking "what things would motivate you to switch" was a bit confusing, becuase it is unclear whether the things are true or aspirational. I think the ambiguity should be cleared up.

    For example. electric cooktops are fine, I like them, but it is difficult to imagine them becoming all around better than gas stoves.

63. Not as many extraneous questions

64. Would be nice to have room to input other options for barriers to switching: in our case, we figure we'll use what we have until it's time to replace it, and then we'll weigh our options for efficiency, climate, and health at that point in time. Also, hoping to wait until induction ranges are better because we love how responsive gas cooktops are. We aren't particularly resistant to switching EVENTUALLY, but we'd be pretty irritated if we had to switch significantly sooner than the end of our appliances' life spans.

65. The phrasing about reasons to switch and concerns about switching to electric appliances did not include an "Other" category or take into account a simple preference for gas over electric.

66. You didn't include hot water in floor radiant heating in types of heating.

67. In sections that ask to check all that apply either add a n/a or allow no selection.

68. Very through

69. Switching to all electric is not pratical and very expensive compared to natural gas.

70. I have no desire to change from gas to electric when heating and cooking but this survey did not give me the option to say that.

71. Would be nice to have a comment section! Extremely against going all electric

72. Abandoning home natural gas usage is stupid. Convert NM's power plants to nuclear. Consider banning wood burning fireplaces that pollute outside neighbor air in the winter.

73. The survey misses obvious reasons why they would not switch. The cost is more than just buying new appliances. There is rewiring, space considerations, and some of us like our gas fireplaces that can't be replaced with electric.

74. It is not ok to ask for my address and age because that allows you to identity who I am.

75. Allow answers that don't require loving all electric!

76. Yes - you don't ask how many gas fired heating units we have (we have 2, one for each floor). While your survey asked about outdoor grills, you did not consider pellets as a fuel type. You should also inquire about the home insulation and utilization of double or triple pane windows. You should also ask if the homeowner has forced air or in floor heating. Overall, the survey is sufficient. Until the Los Alamos county upgrade the electrical infrastructure, I am unconvinced that the county could transition to all electric with the current power grid. Also, how does the county expect the home owners to pay for the transition to new electric appliances - will the county provide subsidies? Regardless, I am against this proposal.

77. More questions on my preference for gas versus electric, would likely be helpful to you. Electric utilities are very expensive, and gas is far better for cooking. Why would I want to switch because the county has a goal?? I have my own interested.

78. You seem to ask questions that have little relevance to gas appliances, I can olny assume you are really not interested in our natural gas issues how does my income, gender or age have any relevance. In the future to be honest you should indicate why each question is being asked,

79. How do we get to tell the county that this is a dumb idea

80. Questions about utility costs and numerous rate increases for those who are on fixed incomes.

81. Our home is heated/cooled with a mini split pump and we have a gas heater in the sunroom. I was only allowed the choice of one heating source.

82. Provide options in responses that do not appear to suggest one outcome (electric) is more favorable than another (gas).

83. Hate giving income and so many private details

84. Individual home infrastructure age, and very low contractor availability, are common barriers to electrification.

85. The question on income is too intrusive. My answer is wrong

86. Seems biased favoring electric over natural gas.

87. GFY and your income question. Irrelevant.

88. A few are biased

89. Ask if we agree with electrification and DPUs goals.

90. allow for none of the above answers. Don't ask what type of fuel you use in a pellet stove.

91. One question requires me to answer what would influence my decision to switch to electric. I had to choose at least one, but NOTHING would convince me to switch. So the answers to that question are biased to give you a false idea of how to market a switch for people.

92. Options to add comments

93. Sex at birth is irrelevant and also very non-inclusive. I highly doubt what is in my pants correlates to electrification. Very disappointed in the county for asking such intrusive questions and for mapping to our home address.

94. Our path to electric conversion would require a mini-split upgrade to hyper-heating. The survey does not facilitate that consideration. This could be a common situation for many residences in Los Alamos. (It may be addressed in part 2 of the survey.)

95. I do not like the idea of forcing the citizens of this county to remove natural gas as an energy source. The global warming scenerio is a farce as determined by good and reliable scientific investigations. Natural gas is very good, clean, and efficient energy source, it is abundant, and it is inexpensive relative to the total cost of electricity. We use both electrical and gas appliances based how well they perform for their specific tasks. People should be able to make their own decisions on what appliances they want and not have them mandated by the government. As to survey improvement, being able to say what I just said and have it be heard and not ignored by the DPU board would be an improvement.

96. You forced me to select an answer for making a change to electric. There should have been a choice for "none of the above"

97. The survey didn't really get at the main reason that I would be hesitant to change my range from natural gas to electricity, which is that I feel like natural gas cooks much better and more consistently. There was an electric range in the house when I bought it and I changed it to be natural gas. Maybe there will be an improvement in electric cooking technology before the county does the full transition to electric. I would also be hesitant to change out my water heater in the short term because I just replaced it less than 5 years ago, but would be willing to go electric next time it needs to be replaced. However, I think I would have to upgrade my electrical service, which is something the county could make cheaper and therefore more appealing.

98. I wish there was a place to write more comments about our home's current energy setup and provide more information about our current motivations. That's where the real insight comes and you have AI tools now to crunch the comments into data. Our heating system is old but we need to upgrade our service from 100 to 200A in anticipation of switching appliances to electric and charge an electric vehicle. There can be all the incentives in the world, but we need someone to install the service. I called 20 electricians and only 1 showed to give a quote. He is from Espanola. He has the equipment and permit, but we've been waiting 5 months for the actual install because he is so busy. And, he's old and will soon retire. Again, all this won't mean a thing if we can't get an electrician.

99. I will not convert my natural gas home to electricity. Electric hot water heaters are nowhere near as good as gas- slow to heat, slow to get hot water out, etc.

100. 1-The question regarding my perception of the reliability of electric vs gas appliances excludes my perception of the reliability of the electrical supply in Los Alamos. This supply system has historically been unreliable and we have used gas appliances to function during periods of electrical outages. The question regarding factors that would affect a decision to convert to electric vs gas does not cover this situation because we are not now nor do we plan to convert to all-electric. 2-The question regarding household income is one I typically do not answer. This survey doesn't allow that option so my replay may or may not be accurate. I suggest allowing respondents to prefer not to reply unless you choose to explain why you need these data.

101. Insufficient room for comments, or "other" to capture unusual responses. Also, frankly, the removal of natural gas might cause me to move out of Los Alamos County– electric cooktops/ranges are INSUFFICIENT, and there was no discussion of what I might do if forced.

102. You asked a question that was not answerable, yet required, about what would motivate me to move from gas to electric. Nothing would. I answered cost savings just to move

ahead with the survey, but your results are now inaccurate. I've seen similar comments on-line. Poor job on the survey.

103. You forced me to provides answers that didn't make sense. For instance, I can't answer what I would consider in switching away from gas, because I don't have any gas appliances. I hope this doesn't throw off your numbers.

104. Ask when I bought the heat pump, did I consider buying a mini splits which have much warmer out put temp than central heat pumps. Give examples of out put temp for both systems vs outside temp. Make sure who buys a heat pump considers size (also mini splits) ie. Not using electric or gas as a supplement. This is tough since heat pumps are sized for air conditioning. Don 505 413. 8534

105. Absolutely do NOT switch from natural gas to electric. Its worse for the environment, less stable, less secure, basically in every way inferior.

106. It could be shorter, and it would be better if it didn't ask the financial questions.

107. I do not want to change from natural gas to electric only

108. Need to give the option to select if home is already all electric or gas so i don't have to take the whole survey.

109. Wish that barriers to electrical switch included the concern about the high quality of gas top range cooking over poor quality of electrical range cooking

110. Tune questions about the following somewhat better: we own a quad in which we live in one apartment and rent out three apartments. Not easy to create questions that get at this dwelling situation.

111. Not really.

112. Too long

113. Give respondents the opportunity to opine about the politics of electrification.

114. You are going to need more information on types of heating systems that can replace natural gas furnaces and what are being considered.

115. We do not want to switch!

116. Race doesn't matter with this kind of thing. Demographic collecting is largely unnecessary

117. Yes, have it ask me if I want to give up natural gas at the start of a major quest for energy by companies creating/owning AI. I want nothing to do with an electric grid that will have brownouts starting in the next 2-5 years for the foreseeable future. Do you guys read the news? Natural gas is reliable, cheap and energy efficient. Leave our quality of life alone and focus on getting this town powered by a small nuclear that is off the main grid. Cheap reliable power for generations.

118. Allow “choose not to answer” as an option, especially for age and income. Some questions should allow “don’t know”, or give ranges. For example square footage.

119. Would like the option to not provide some information. Income and age. Prefer broader ranges or option to not answer

120. Make it shorter. This is a pretty intrusive survey asking a lot of questions about salary and race.

121. Add more reasons why one would be resistant to purchasing electronic devices. Add monthly costs and expected costs with replacement.

122. Factors that would cause me to switch to electric. Needs an option for nothing. I will not switch from natural gas to electric for any reason except that the government shuts off all gas and pays entirely for electric appliances including installation and retro fit costs.

123. None, Thanks

124. The influence question should have allowed for “none”. Not much (if anything) would influence me to want to change to all electric.

125. Why consider electricity over gas as AI will strain electric use, thus increase the cost of electricty.

126. Survey seems to assume in-floor heating piping and gas boiler are both the same age.

127. What factors would influence your decision to switch from the current natural gas appliances to electric ones. You didn’t include “None” and therefore are skewing the survey results. Unsurprised given the quality of education in this state.

128. Are you seriously asking what energy source an electric heater uses? Also, you should show an example of an acceptable number for square footage of the house. I struggled for several minutes with trying to figure out why it didn’t take my entry that did not have the comma after the first “1”.

129. This survey is an attempt by DPU to promote anthropogenic global warming and reduced population levels. There is no valid scientific evidence to support either.

130. Questions seem biased to exclude historical factors that weigh decisions, such as a home with aluminum wiring, as well as recent events where electricity was cut off in emergencies.

131. Age of house question assumes this year is 2020–fail!

132. We have an in floor radiant hydronic heating system. Natural gas is the only viable way to heat the home. Heat pumps are not efficient enough in Los Alamos and electric water heat is prohibitively expensive, even with our rooftop solar.

133. Use of main heating was a weird question, j think in warmer areas of NM this might make sense, but when it is 30 out and you want the house to be 72, the heating is running all the time during that season. That question in not well trailered to being in the mountains.

134. Leave out salary, race and age

135. all electric is not the answer

136. Audio assistance

137. Some of the answers leave out alternatives. As an example, we have passive solar heating, during the most days during the winter we do not need to heat the house. In fact, we need to run fans to distribute the heat around the home. The simple question of what temperature is your house during the day ignores this completing. Also, we turn up the heat in the early morning so that the rooms are warm when we wake up and take our baths/showers. Again this is not captured.

138. Some questions asked twice

139. Provide space for open ended answers. This may be in part two, but in case not It seems pertinent to note that we installed mini splits to completely replace our furnace, and did so for one winter. Last winter we went back to using our furnace in addition to the mini splits, because it did not feel warm enough, especially due to cold floors. This might be solvable with improved insulation.

140. Ability to add comments about converting appliances.

141. Asking for too much personal information.

142. While it would be nice to switch my range to electric. It is not in any near term plans, but I listed that I intend to switch. This is true, it is in a decadal time scale.

143. You don't need my income and you don't need my race. I don't own my home and I don't rent. I have a mortgage. I own most but the bank owns the rest.

144. Some questions reflect unstated assumptions, such as the list of reasons why someone would/would not switch from gas to electricity. The issue is more complex than the list of options so a more nuanced/detailed list would be helpful.

145. Ask about fireplaces (some are gas).

146. Grill options are incomplete–need wood fired as an option. Also seems like asking about solar needs follow up. We did look into getting solar– but got quoted ¿75K for ground panels (roof not possible due to roof shape, trees) AND would require a variance from county. That makes it impossible to afford and likely impossible to happen due to county code. Survey needs to ask more about why people are reluctant to make construction changes that would be needed for switch to electric–you only hinted at this with 'space in panel'– you'll likely get 1) county code/county permit process. 2) impossible to find construction workers up here. We were quoted ¿ $6K to just get a single new 50amp breaker installed. To switch from gas, based on projects we've had to have done in last couple of years, and the age of our house, we'd be looking at ¿$100K due to the direct costs and all the costs for old house required 'code compliance' updates that would get tacked on. Fix the county permitting/county code rules for getting solar, electric upgrades. Fix the permit process. Find housing that can support construction workers living in Los alamos. Until then, switching off natural gas, even if I could afford it, does not make economic sense. (And given our inflated house prices, it will not be money I'd recoop when selling my house....it's simply a financial loss that I can't afford.)

147. It is difficult to consider the possibility of switching from natural gas without a clear understanding of the cost and logistics of doing so as a resident. I have no idea how difficult it is to switch existing gas systems to electric, especially systems built into the house like our fire place.

148. I wish I hadn't been asked more demographic data. Los Alamos County already has much of that information and I don't like re-sharing without extra assurances and to why it's needed.

149. This survey questions are very slantted toward electric. Sort of a self fulfilling purpose. The county has just instituted a huge rate increase on electric!!! Also they say they are committed to electric. Gas wil become even cheaper in the coming years. Utility department needs to consider new data & not rush blindly forward!!!! My husband & I own rentals in Elk ridge, no electric panel space for all electric. Let diviversity of power source

continue. This is a science community...re- evaluate variables & come up wth a better solution. Talk to me when nuclear energy is an option. This is a very rigid goal!!!

150. Some questions did not provide an answer that fit my situation. I know most residents are wealthy, but I'm one of the people just barely making it. I don't replace appliances because I can't afford to do so. Tax credits are useless to someone in my situation. You're not anticipating my situation with your questions.

151. Should not have required answer to salary question - I believe some people will quit survey or answer it inaccurately due to privacy concerns.

152. I will not change to electric appliances and this option was not provided on the options for switching to electric. This whole survey is baseless and politically biased based on faulty assumptions about consumer needs.

153. Skip the racist questions and gender question.

154. Demographics should not matter other than to put people in a box.

155. Survey needs to be updated (5 years not built after 2017)

156. What do racial demographics have to do with it?

157. Should have "none of the above" option for "what would make you switch from natural gas to electricity"

158. Some of the answer choices don't fit our household.

159. Yes - wrote a letter to Ohilo

160. There should be some way to express the complete satisfaction I have with Gas, and the worries I have about our electrical grid. I think you are headed in the wrong direction.

161. Leave out race and gender

162. Assess the answer choice types, especially for factors to consider when switching. The factors to switch doesn't have a 'none' option but the other set of choices does. This implies a strong bias in the survey

163. Some answers don't fit our situation. Also, collects unnecessary demographic information (race, sex). Didn't take into account physical changes needed to go from hot water baseboard to electric heat.

164. It will be very very expensive for the whole town to go totally electric as lots of upgrades will be needed (Grid/electrical service entrance ampacity/new appliances) New Mexico has lots of natural gas and it should be used. If going all electric was really important you would suggest 2030 instead of 2070.

165. Since this is a self-selecting survey, it will have bias and not be reliable.

166. Regarding the question about the time frame for switching to electric, my response would depend on the cost. I would have to replace my furnace, hot water heater and range, which would be a really large expense. I also have a gas driveway melt system. All those gas appliances cost around $40,000 originally, so it would be a HUGE expense to replace them with comparable electric appliances.

167. clarify if water heater is considered an appliance

168. Find more relevant questions to this topic.

169. You don't ask why we would not put in solar. You don't ask if we support the county's move to eliminate natural gas .

170. You missed a reason I do not want to switch from gas to electric cooktop - gas cooks better than electric.

171. Had to contact the survey runners to get an "other" option added where appropriate.

172. Remove demographics

173. Question about "concerns about electric appliance performance" might be too generic - different appliances have different performance characteristics and potential concerns.

174. Check your years on the age of the home question.

175. Please consult energy experts before making a rather foolish decision to discontinue natural gas usage.

176. Too much PII

177. Natural gas .... If it ain't broke, don't fix it!! Also I did check in my pants to verify my sex at birth.

178. The question: what are the risks of having gas inside the house after reading information was confusing. I selected "gas can cause indoor pollutants" which the reading did indeed say. However the survey rejected that answer saying it was incorrect. The other two options "improves efficiency" and "reduces outdoor pollution" are not risks and as far as I

could tell were not talked about in the reading. I'm unclear if that question had a mistake or if I am misunderstanding something. I checked that the survey accepted the other two answers, which is confusing.

179. Having two sources of energy is always the best and safest solution.

180. The question about fuel source on ranges is confusing. The cook top on our range uses gas, while the oven uses electricity.

181. You have not provided any information on the future of electric power generation in the U.S. Electric power generation increased a factor of 10 from 1950 to 2000, From 2000 to 2025 electric power generation had essentially remained unchanged but electric demand has increased by almost 30%. EPRI has estimated electric demand without incentive to convert from fossil fuels to electric to reach 6000 billion kWh by 2050. That's another 33%. Where is the electricity going to come from. The only two options for this amount of energy is fossil and nuclear. Solar and wind does not have the efficiency or capacity. Comparing cost of electric heating to gas is almost 2:1. Converting to electric heat from gas would double heating bills in the winter. this is not a sustainable situation.

182. You use leading questions manipulate material to bias survey takers. It's not neutral

183. Shorter is better. I wanted to do this and it still felt long

184. The screen asking us to pick a correct answer based on information in the previous screen is malfunctioned. The only answer of the 3 options that is correct is the one in the middle but the survey gives an error when you choose that option and won't let you move on to the next screen unless you pick one of the other options that are both incorrect.

185. The question regarding risks of natural gas should be stated in respect to benefits rather than risks..

186. I have NO gas appliances, or heating or cooling. You keep asking me if I am going to switch to electric, but i already am all electric. Need to add options in questions for those of us without gas

187. Needs a lot of work. IMHO, the questions were invasive; it was painful for me to answer because of three hand surgeries–your form design could have been closer instead of spread all over the page, and you could have had more questions per page. Your overall tone was one of accusation or "gotchas," instead of earnestly seeking helpful information. I don't recall how I got into this, but I don't recall being drawn into a biased or predisposed questionnaire favoring the all-electric home, either.

188. Your question about internal gas emissions harmful effects with only one answer is a stupid question. There is other science on climate change sources that are very credible. Changes to LAC emissions will have zero effect in the climate!!

189. You need to allow a portion of the survey for people to express their full opinion of this proposed switch to all electric utilities. This is cost prohibitive for households: Initial costs for the new furnace, water heater, and stove/oven as well as installation of an upgraded electric panel (100 amp to 200 amp), to include the possibility of having to upgrade wiring is significant. Utility rates/service fees in this county are very expensive. Forcing this additional financial burden on people on the people in this county to satisfy a minorities perception of what they feel is good for the environment is unconscionable.

190. Which natural gas uses would you consider changing to electric?

191. don't be testing people on your perceived notion of PC energy issues

192. The categories for the age of the house question do not match.

193. I am concerned that Los Alamos County would cheat their neighbors out of energy from solar (I.e. solar panels) because they already don't use excess energy that their neighbors already have. They let their neighbors use enough solar power to pay their bills but have yet to compensate any one to use what energy is in excess. Imagine, spending a LOT of money for panels and you only get to use a small portion, everything else is wasted? Someone had to think up that idea, present it, rally other council to approve this asinine plan. The nerve.

194. It might be useful to ask about what particular changes are desirable–induction cooktops, for instance, might be worth a change even if traditional electric ones were not.

195. Section on utilities should include more on attached solar.

196. The more this county fucks around the more likely I am of installing a BIG propane tank! And a generator!

197. We have 2 furnaces one fir each floor. I didn't find anyway to indicate this on the survey. Also why no questions about airconditioning

198. Quit wasting tax dollars on them

199. Will never give actual income numbers. There should be a comments section at some to clarify, some answers were pick the best that apply

200. allow more comments and reasons for not using electric for heating.

201. too many unnecessary personal questions.

202. We have a ground based solar system, not a roof-top.

203. A good, in-depth survey

204. Realized I had probably made a mistake on a question, but I could not find a way to go back and correct the error.

205. Your question regarding our intent to switch was misleading.

206. make answers optional, I don't like answering personal question!

207. It was kinda long but I'm glad you're asking enough questions to get the info you need

208. No comments

209. Thank you for looking into this issue.

210. Questions seem to be leading to answers that I do agree with. I DO NOT want to transition from the natural gas appliances that I have. I do not believe that the current electric grid could support the usage.

211. Some questions are not relevant to the natural gas to electric conversion issue

212. Make the purpose clear!

213. Have an Undecided option for the question about what gas appliances may be replaced.

214. Personal questions such as my income and education level have nothing to do with the survey. You should ask about factors like quality insulation that make a difference in fuel usage for all purposes. Electricity is inefficient and unreliable and is not the solution. I don't appreciate being forced to choose electricity just because a few squeaky wheels in town think it's awesome.

215. This survey presumes natural gas is bad and electricity is good. Having lived with a heat pump, etc on the east coast - natural gas is better and less expensive overall for heating.

216. Don't eliminate natural gas for made up reasons. As a person that is interested in e vehicles and solar technology, I think eliminating multiple energy sources is a bad idea.

217. Yes, you should ask how old the range is along with the dryer. I just bought a brand-new range and dryer this year. I had to buy gas or I would have had to obtain a new electric panel, which would be very expensive and difficult to install since there is no one in town who does electrical work anymore. Not only would government incentives be nice, but a

list of electricians that could do the necessary conversions would be nice. Traditionally, natural gas has been cheaper than electricity and more efficient especially for heating.

218. I have complained twice about demanding personal information in order to complete the survey. These sorts of questions are irrelavent to the question of what the thoughts about doing away with natural gas in Los Alamos and also inappropriate. After the first complaint there was a partial fix, but not a tatal one. It was only after the second complaint that I was able to skip all the personal information questions.

219. This survey seems to be gathering data to support the need to go all electric. GE and others have been pushing that since at least the '60s. Today the county is pushing it to support perceived global warming problems.

    Seems like the data collected here should already be available from other sources. Utility bills, census information, construction permits, ...

220. I do not want to see this county go all electric.

221. Provide less leading questions

222. Offer a fireplace section

223. Ethnicity is not a race. In Los Alamos County the issue is not grid capability (electrical supply to the County), but rather infrastructure - the entire electrical distribution system would have to be replaced, making this proposal moot. The inability of the electrical system was the reason the County limited solar production on homes here.

224. lacks detail that may make some answers lacking

225. Questions about transition away from gas were irrelevant. Questions about heating living space and water did not align with how we use energy.

226. need a maybe switch choice

227. when looking at "how likely are you to switch to electric" you should have split it based on each gas appliance. Reason being my wife will NOT switch to an electric range, but we could swap our water heater. So my response was "not looking to swap" when in reality its half and half.

228. You should have a comment section that allows residents to address their objections to the county's intent to FORCE all citizens to go all electric. New Mexico has great natural gas reserves. Allow citizens to have a choice between clean natural gas energy and electric energy. Los Alamos county should investigate nuclear energy.

229. Explain in detail why the county has decided to phase out natural gas. Many 1960s mid-century houses that rely on baseboard hot water heat cannot be easily converted because of lack of an attic or basement. Explain why their owners should be penalized to attain an insignificant greenhouse gas reduction?

230. Requests for non-relevant personal information...

231. Too much personal information requested

232. What would affect choice page VERY biassed.

233. Ask whether we want the county to abandon natural gas usage. The most absurd idea the county has come up with this century.

234. biggest flaw: most surveys underestimate the time it takes to complete. I spent a good hour on this considering that some questions require some thought

235. Overall, it's clear. I see no relevance to a question about race, which should simply be "human," since that is the only true answer.

236. Yes. Ask questions about the premises of this survey. 1) Should Los Alamos County spend resources to eliminate/reduce carbon emissions, and 2) Should citizens be forced to stop using natural gas.

237. Although hard to quantify a section for the participant to write/describe their views on if they want to go full electric or stay with natural gas and why. I have concerns about the reliability of electric over natural gas. There have been more power outages since I've owned my home than there have been for natural gas and I'd be concerned for my health and safety if I could not have heat during the winter.

238. This is a survey about energy usage. Leave the sex at birth out of if. Trans people don't want to be reminded who they are, and they are less than 1% of the population so its not going to skew the data much in a total population of 14-15K if they put down what they want. Simultaneously, I don't was to do a lesson on 8th grade biology, to explain that my XY chromosomes don't change depending on how I feel, what season it is, or which water heater I prefer. Its not my sex at birth, its just my sex. Stay on topic.

239. The survey is biased toward a desire to eliminate the delivery of natural gas to residencies in favored if all electric residences - the question about - which statements are values you gave toward deciding to go all electric is TOTALLY INAPPROPRIATE!!! The surveyors should have realized that and never posed it.

240. No.

241. None.

242. Nope.