evoenergy

Appendix 2.2: The Centre for International Economics Price elasticity of demand for natural gas

Access Arrangement Information

ACT and Queanbeyan-Palerang gas network 2026–31

June 2025

FINAL REPORT

Price elasticity of demand for natural gas

Stated preference research

Prepared for
Evoenergy

23 June 2025

THE CENTRE FOR INTERNATIONAL ECONOMICS
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Introduction

Evoenergy commissioned the CIE to forecast the number of disconnections from its gas network and reductions in gas usage per customer over the next 20 years and to estimate how these forecasts would be impacted by a range of gas and electricity price scenarios.

The most significant impacts on demand for gas result from appliance replacement decisions. Appliance replacement decisions are complex and depend not only on expectations about the relativity of gas and electricity prices, but on the age of existing appliances, household preferences for reducing their own greenhouse gas (GHG) emissions, the relative quality and costs of installing new gas or electric appliances, and any government incentives.

This study uses a choice modelling (or discrete choice experiment) survey of 1885 of Evoenergy's residential customers to quantify the relationship between appliance replacement decisions and energy prices/incentives. It also includes simpler, small-sample surveys of non-residential customers.

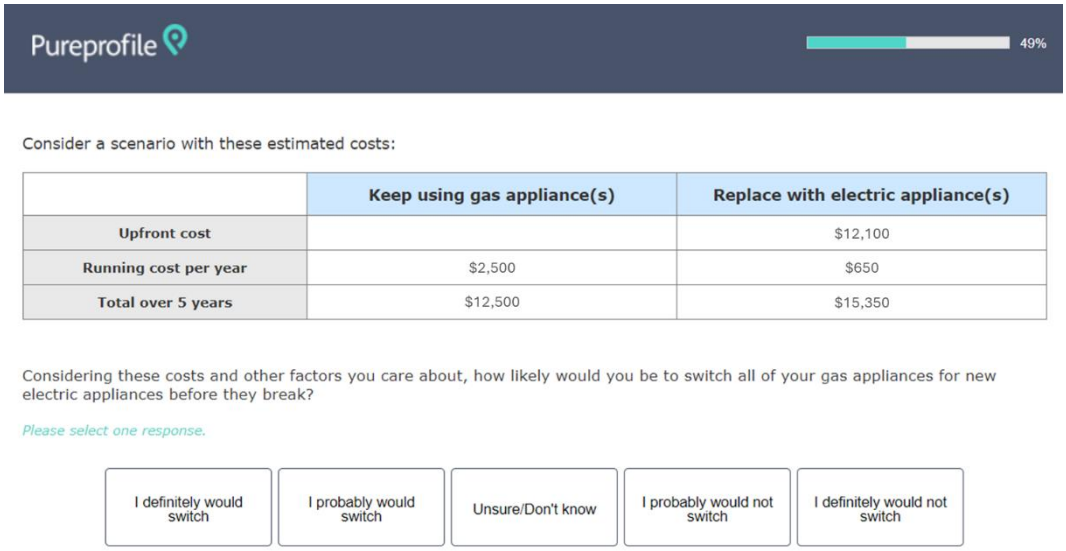
Methodology

Residential respondents were asked about their electrification intentions under two types of choice question:

- Pre-emptive appliance replacement: Intentions to switch from gas appliances to electric appliances before their existing gas appliances break, and
- End-of-life (EOL) appliance replacement: Intentions to switch from gas appliance to electric appliances when their existing gas appliances break.

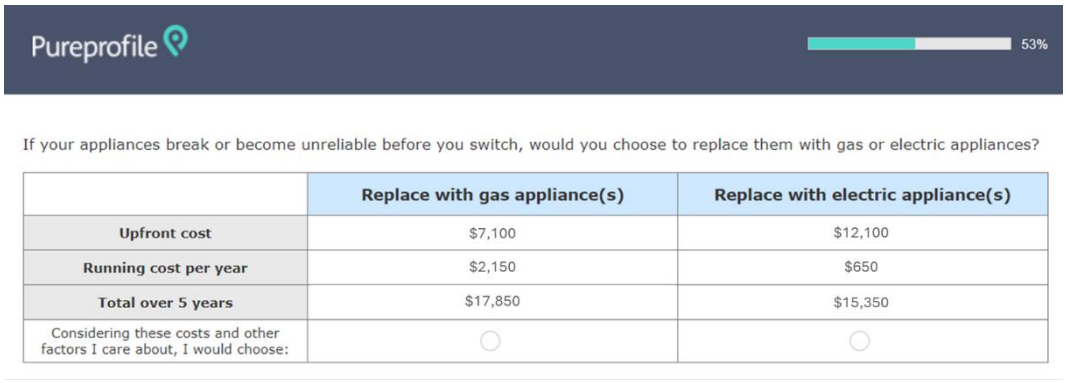
The cost levels shown in the questions were tailored to the respondent's characteristics based on questions in the survey about which gas appliances they own, the size of their dwelling, how much time they spend at home, and whether they have solar (photovoltaic) panels. Each residential respondent answered four of each type of question (pre-emptive and EOL replacement); that is, eight choice questions in total. The cost levels varied across questions to enable estimation of a statistical model of how fuel type and cost levels drive household decisions. An example of a choice question involving pre-emptive replacement is provided in figure 1. An example of a choice question involving EOL replacement is provided in figure 2.

1 Example of choice question, pre-emptive disconnection



Data source: CIE, Pureprofile.

2 Example of choice question, end-of-life disconnection



Data source: CIE, Pureprofile.

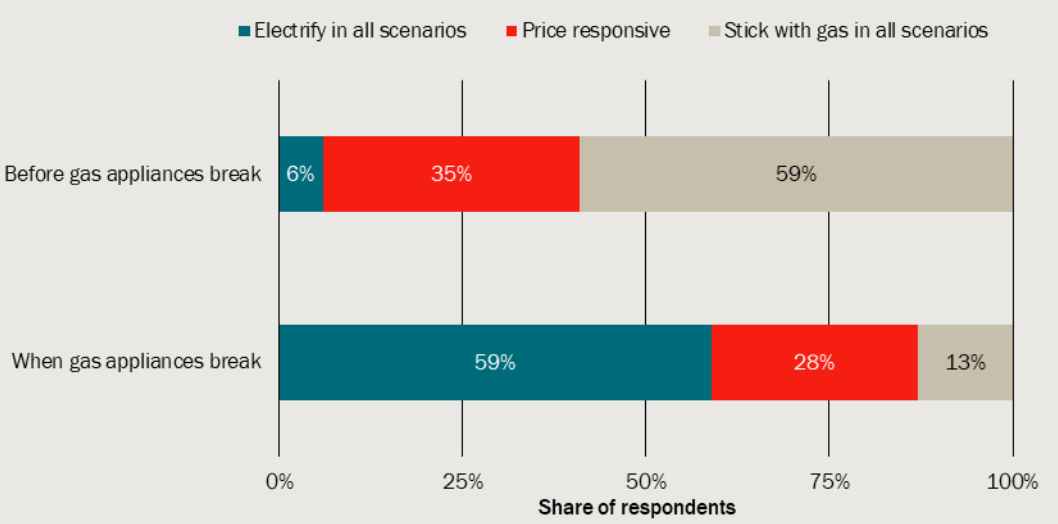
Survey findings

High-level findings from the surveys were:

- The main factors influencing switching decisions are total cost over time, affordability of upfront costs, environmental concerns, and appliance quality.
- For most households, the timing of decisions is tied to appliance failure or home renovations (figure 3).
- The stock of appliances in the ACT is ageing. The average age of gas heaters is roughly 10 years, with many expected to come up for replacement over next five years.
- When appliances fail:
  - more than half of households intend to switch to electric appliances, regardless of what's happening with gas prices and rebates.

  - for roughly three in 10 households, the choice between new gas and electric appliances depends on the relative costs.
  - around one in 10 households have a strong preference for gas due to appliance quality and will not switch even with financial incentives.
- Some households are intending to switch to electric appliances within the next four years, before their gas appliances fail. Roughly 1 in 10 households are intending to do this regardless of relative costs. Environmental concerns are a stronger driver among this group. A further one third of households would consider it at higher gas prices and/or replacement rebates.
- Switching is more difficult for commercial customers than for residential customers. Only around 1 in 5 commercial customers have formed an intention to disconnect from gas by 2045.
- However, 4 in 10 commercial customers are intending to reduce their gas usage by a half or more by 2045.
- Only around one third of commercial customers indicated the timing of their gas usage reductions/disconnections would be affected by gas price increases.

3 Overview of residential consumer preferences



Data source: CIE analysis

Disconnection forecasts

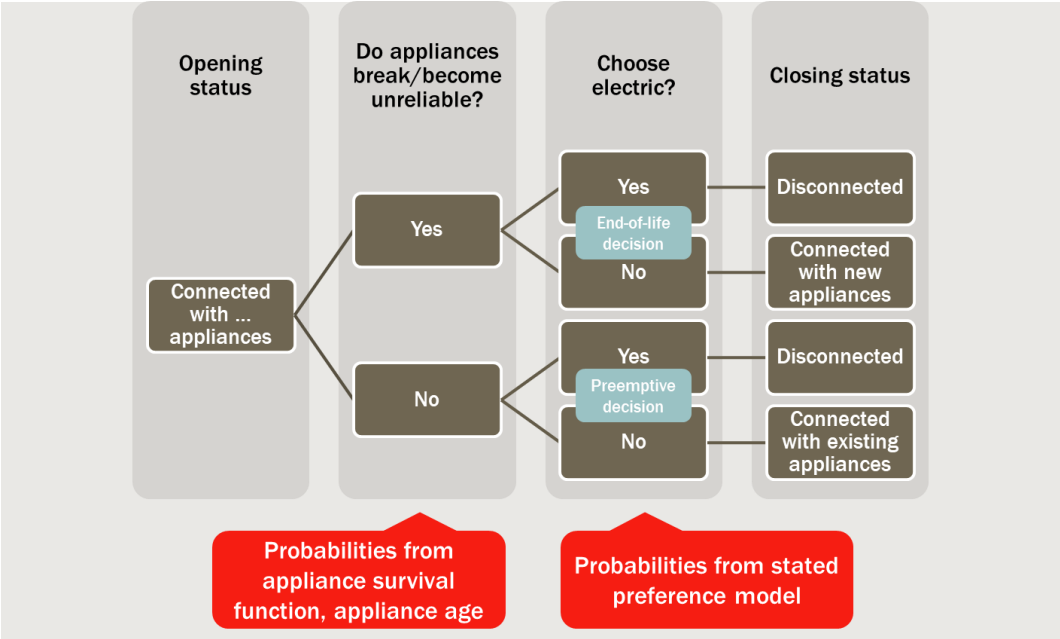
A forecasting model was developed to estimate the probability of electrification in 75 400 different choice situations defined by:

- the two decision types — pre-emptive or appliance end of life
- 1885 customers, accounting for individual preferences, appliance types, and a range of household characteristics influencing appliance usage and replacement cost, and
- 20 years (2025/26 to 2044/45).

These modelled decisions are used to estimate the statistical expectation of the number of customers with each of three types of status each year (figure 4):

- Connected with existing appliances (all sampled customers have this status at the opening of year 1)
- Connected with new gas appliances, or
- Disconnected.

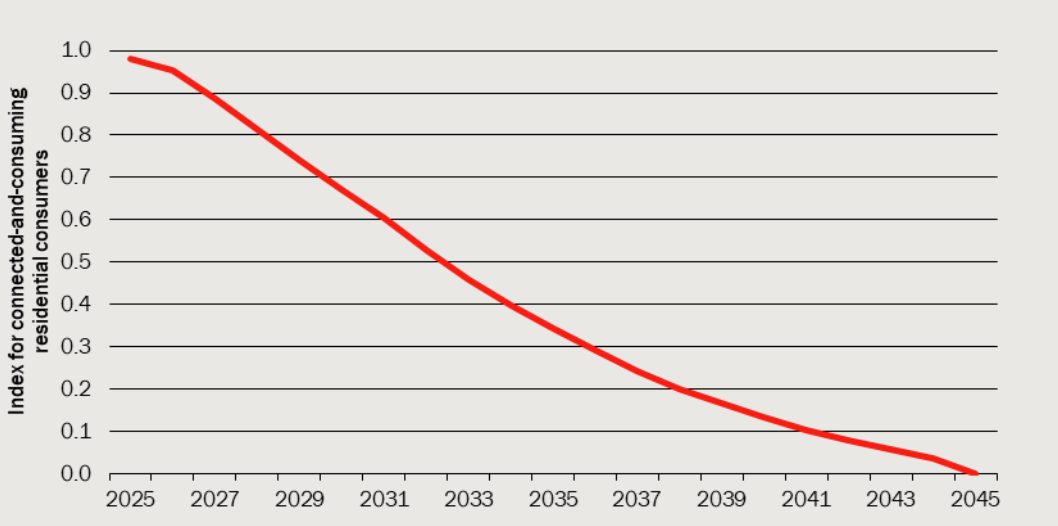
4 The decisions modelled for each sampled customer in each year



Data source: CIE

Using detailed assumptions about energy prices, appliance consumption, installation costs, rebates, power supply upgrade costs, gas disconnection charges, interest-free loans, as well as assumptions about delays in disconnection relative to stated intentions, this model estimates 38 per cent of residential customers existing at the end of the 2024 financial year will have disconnected by the end of 2031 (figure 5).

5 Index for forecast connected-and-consuming residential customers



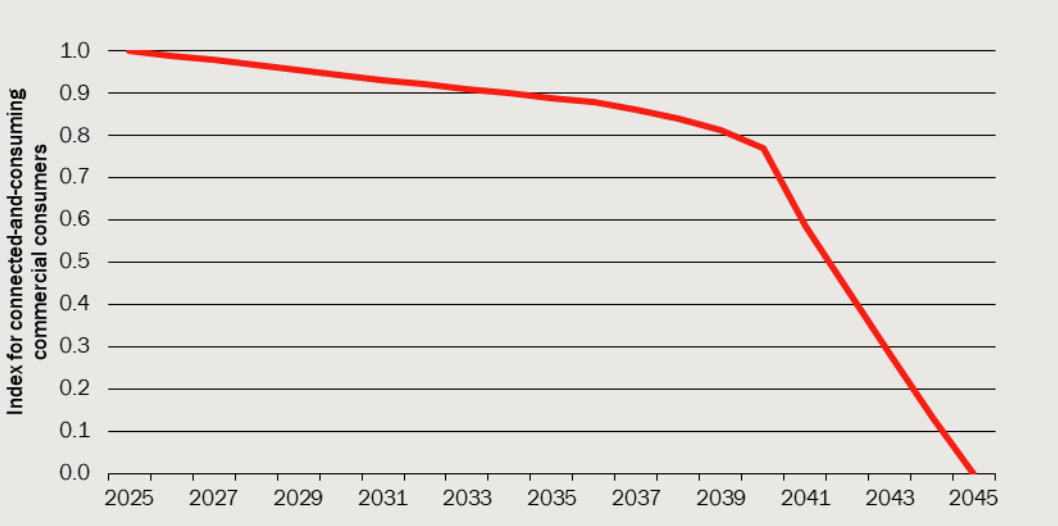
Data source: CIE gas demand forecasting model

Analysis of the forecast by customer segment indicates:

- Middle-income households are likely to disconnect sooner than both low- and high-income households
- Households with decision makers aged over 60 are likely to disconnect sooner than households with younger decision makers
- Owner-occupied households are likely to disconnect sooner than rented dwellings
- Disconnection rates are likely to be highest in North Canberra and Belconnen and lowest in Woden Valley and, especially, Queanbeyan (NSW).

Based on the small sample of commercial customers surveyed, we estimate that commercial connections will decrease over the 2026 access arrangement period by around 1.1 per cent per year (figure 6).

6 Forecast connected-and-consuming commercial customers



Data source: CIE demand forecasting model

Price elasticity of demand for gas connections

Demand for gas connections is relatively price inelastic. The retail price elasticity of demand for residential gas connections increases with the period of time over which the response to an increase in price is measured. It increases from around -0.022 for the response to 2031, to -0.045 for the response to 2036, and to -0.061 for the long-term response to 2041. An elasticity of -0.022 means that connections decrease by 0.22 per cent in response to a 10 per cent increase in price.

Analysis of the price elasticity of demand for gas connections by customer segment indicates that:

- Higher-income households are more responsive to price than lower-income households
- Younger households are more responsive to price than older households
- Households in North Canberra are more responsive to price than households in South Canberra or Tuggeranong.

1 Introduction

Evoenergy commissioned the CIE to forecast the number of disconnections from its gas network and reductions in gas usage per customer over the next 20 years and to estimate how these forecasts would be impacted by a range of gas and electricity price scenarios.

Most of Evoenergy's network is located in the Australian Capital Territory (ACT). The ACT Government has committed to phasing out fossil fuel gas by 2045 as part of its broader strategy to achieve net zero greenhouse gas (GHG) emissions. This report will inform important decisions and strategic considerations as part of the ACT's energy transition, including setting network prices for 2026–31.

The most significant impacts on demand for gas result from appliance replacement decisions. Appliance replacement decisions are complex and depend not only on expectations about the relativity of gas and electricity prices, but on the age of existing appliances, household preferences for reducing their own GHG emissions, the relative quality and costs of installing new gas or electric appliances, and any government incentives. Traditional forecasting approaches, such as those based on financial net present value analysis, assume that decision makers make appliance replacement decisions based solely on financial considerations. This assumption does not reflect all of the relevant motivations, especially for early adopters of technology that reduces GHG emissions, such as solar photovoltaic systems.[1]

There is some existing stated preference evidence of the electrification intentions of residents and commercial businesses in the ACT, but it does not quantify how those intentions would be affected by changes in energy prices and financial incentives.[2] Evidence of price elasticity of demand for gas in other jurisdictions is difficult to translate to the ACT context because of differences in climate and, particularly, willingness to pay for GHG emission reductions.

This study uses a large-sample choice modelling (or discrete choice experiment) survey approach for residential customers, which quantifies the relationship between future gas disconnections and energy prices/incentives, without limiting the decision criteria to financial considerations.

The project also analyses:

- the electrification intentions of non-residential customers with annual gas consumption of less than 10 TJ, based on small-sample survey, and

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1 Simpson, G. and Clifton, J., 2017. Testing diffusion of innovations theory with data: financial incentives, early adopters, and distributed solar energy in Australia. Energy Research & Social Science, 29, pp.12-22.

2 Sagacity Research, 2024. Demand for natural gas — Understanding future demand. Evoenergy. April.

- the electrification intentions of non-residential customers with annual gas consumption of more than 10 TJ, based on in-depth interviews.

This report is set out as follows:

- Chapter 2 describes the survey methodology
- Chapter 3 describes the fieldwork and the characteristics of the sample of gas customers participating in the study
- Chapter 4 provides the results for survey questions other than the discrete choice experiment, including questions about gas appliances and attitudes related to fuel preference
- Chapter 5 provides the results of the discrete choice experiment, including a statistical model of residential choice, and responses to debriefing questions
- Chapter 6 sets out a forecast of residential gas disconnections based on the statistical model in Chapter 5 and shows how the forecast varies across customer segments
- Chapter 7 uses the forecasting model set out in Chapter 6 to estimate the price elasticity of demand for residential gas connections by timeframe and by customer segment
- Chapter 8 sets out a forecast of non-residential gas disconnections, including measures of price elasticity, and
- Appendices provide full transparency in relation to survey and forecasting methodology and assumptions.

2 Methodology

This chapter sets out the methodology for the survey instruments, including the steps taken to review and test the questionnaires.

Residential survey

Structure of the questionnaire

The primary objective of the survey was to assess how changes in gas prices influence consumers' decisions about replacing household appliances.

The questionnaire follows the following structure:

- Screening questions to ensure respondents were residents of the ACT or Queanbeyan, aged 18 years or over, and owned and/or lived in a property connected to mains gas
- Questions about existing energy use, appliance mix including age and any existing solar photovoltaic systems
- Questions about the size and structure of respondents' dwellings and their working and stay-at-home patterns[3]
- Information about the process of electrification/appliance replacement
- Choice questions about appliance replacement under various upfront and running cost scenarios (see below for further discussion)
- Debriefing questions to assess respondents' understanding of the choice questions, and
- Additional respondent and household characteristics.

A text version of the questionnaire is provided at Appendix B.

Choice questions

Respondents were asked about their electrification intentions under two types of choice questions:

- Pre-emptive appliance replacement: Intentions to switch from gas appliances to electric appliances before their existing gas appliances break, and
- End-of-life appliance replacement: Intentions to switch from gas appliance to electric appliances when their existing gas appliances break.

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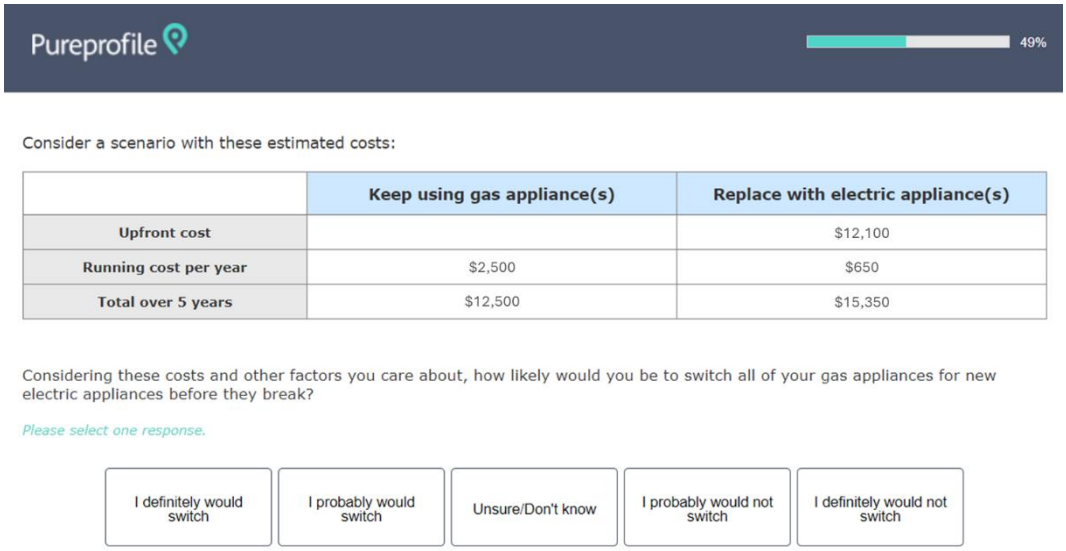
3 Dwelling size, structure and stay-at-home patterns are used along with appliance mix to inform the cost levels presented in the choice questions.

Each respondent answered four of each type of question; that is, eight choice questions in total. An example of a choice question involving pre-emptive disconnection is provided in chart 2.1.

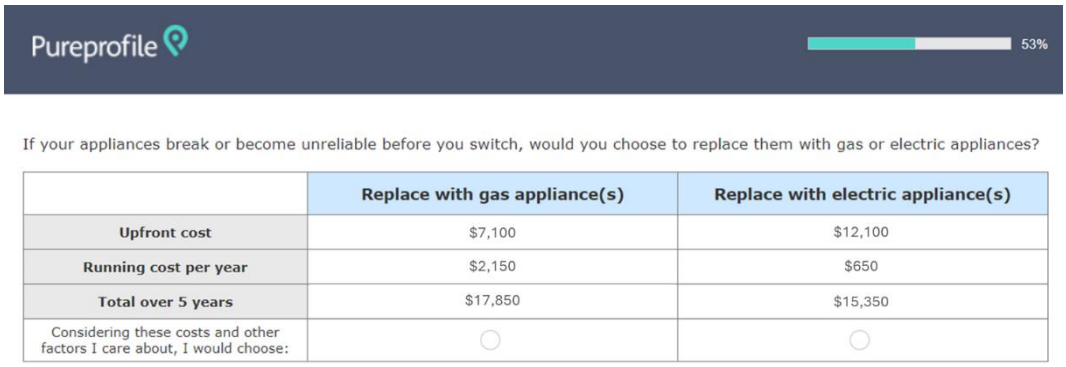
2.1 Example of choice question, pre-emptive disconnection



Data source: CIE, Pureprofile.

An example of a choice question involving end of life disconnection is provided in chart 2.2.

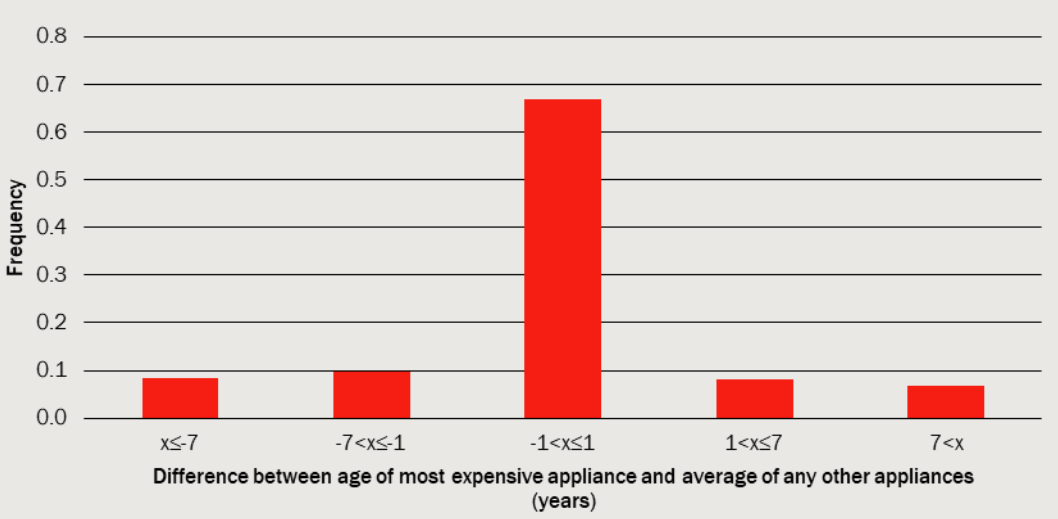
2.2 Example of choice question, end of life disconnection



Data source: CIE, Pureprofile.

To keep the survey exercise manageable, electrification of appliances was treated as a single decision, even for respondents with multiple gas appliances. The age of gas appliances had a strong tendency to be similar to the age of other gas appliances within a household (figure 2.3). Nevertheless, Evoenergy may wish to consider making a separate, post-model adjustment for potential staging of electrification (as we have done in the forecast in Chapter 6).

2.3 Similarity of ages of gas appliances within a household



Note: All answers of 'Don't know' in relation to appliance age were treated as an age of 16 years.
Data source: CIE

The rate of gas disconnections over the past five years has not been as high as surveys conducted for Evoenergy five years ago had predicted. While it is possible the COVID-19 pandemic and subsequent cost-of-living pressures played a role in this difference, it is also possible survey respondents were overly optimistic about the timeframes within which they would electrify and disconnect from gas. We also note the Australian Energy Regulator has expressed concern about the potential for hypothetical bias in surveys.[4] We took several measures to counter this potential bias, as summarised in Box 2.4.

4 Australian Energy Regulator, 2021, Final Decision: Evoenergy Access Arrangement 2021 to 2026 AER - Final decision - Evoenergy access arrangement 2021-26 - Attachment 12 - Demand - April 2021 .pdf.

2.4 Techniques used to mitigate hypothetical bias

A reminder was provided of the practical inconveniences that may lead to consumers delaying replacement. The following information was provided: "The process of installing an appliance will typically include arranging a quote from one or more installers, deciding on the type of appliance, and arranging a day for a power supply upgrade, if needed, and a day for installation. If you are having a ducted system installed, tradespersons may require access to every room of the dwelling."

A 'cheap talk' script was also included: "Research has shown that decisions like appliance replacement tend to take longer than people say they will in surveys. Please bear this in mind and try to be realistic about how soon you will replace appliances, taking account of all of the potential practical challenges (e.g. disruption from installation works) and your other priorities."

A five-point certainty scale was used in questions about pre-emptive (prior to end of life) appliance replacement. This would allow a conservative approach to be taken in which only a 'I definitely would switch' response would be treated as a decision to electrify (and responses of 'I probably would switch' would be treated as a decision to continue using existing gas appliances).

After every pre-emptive replacement choice, a question was included about the likely length of time it would take before pre-emptive electrification would be completed.

Later in the survey a follow-up question asked whether, considering how long previous renovations and home projects have taken, whether it is likely electrification would take longer than stated in the survey.

Cost levels

The upfront and running cost levels in the choice questions varied across questions and across respondents based on the gas appliances and other characteristics specific to that household. The cost levels were designed by setting a baseline cost level for each of 84 different household types and then varying those cost levels over 12 different price scenarios.

The 84 household types comprised every possible combination of the following characteristics:

- Mix of gas appliances (seven categories)
- Dwelling structure type (three categories)
- Solar (two categories)
- Time spent at home (two categories).

The four questions answered by each household type (for each decision type — pre-emptive or EOL) were drawn from a set of 12 possible questions for the household type. These 12 questions were constructed by making all possible combinations of multiplying

baseline gas running costs by a factor of 0.8, 1.0, 1.5, or 3.0 and multiply upfront electric appliance costs by a factor of 0.25, 0.75, or 1.0.

Baseline estimates of upfront costs were sourced primarily from Frontier Economics (2022) and Acil Allen (2024).[5] [6] New electric appliances are significantly more expensive in terms of upfront cost compared to replacing existing gas appliances.

Baseline annual running costs were based on current gas and electric prices and appliance consumption sourced from Alternative Technology Association (2018) and Sustainability Victoria.[7] [8] Heaters are generally the most expensive appliance to run, with the cost increasing with the size of the home. Electric heating (reverse cycle air conditioning) is significantly cheaper to run than ducted gas heating and new gas appliances were assumed to be on average 8 per cent more efficient than existing gas appliances. Households who spend a significant portion of their week at home were shown gas heater running costs that were 8 per cent higher and electric heating running costs that were 12 per cent higher than the amounts shown to other households. Households with solar panels were shown electricity running costs that were 34 per cent lower than those shown to other households.

The range of cost levels used for each combination of gas appliances and dwelling size are shown in table 2.5.

5 Frontier 2022. Cost of switching from gas to electric appliances in the home. A report for the Gas Appliance Manufacturer's Association of Australia. 24 June. (https://gamaa.asn.au/wp-content/uploads/2022/07/Frontier-Economics-Report-GAMAA.pdf).

6 Acil Allen 2024. Review of Jemena Gas Network's demand forecasts. For the Australian Energy Regulator. 8 November. (https://www.aer.gov.au/system/files/2024-11/ACIL%20Allen%20-%20JGN%20demand%20review%20report%20-%20November%202024.pdf).

7 Alternative Technology Association (2018). Household fuel choice in the National Energy Market. Final Report. Revised July. pp. 41, 48, 50. (https://renew.org.au/wp-content/uploads/2018/08/Household_fuel_choice_in_the_NEM_Revised_June_2018.pdf, accessed 18/06/2025).

8 Sustainability Victoria, Calculate heating running costs (https://www.sustainability.vic.gov.au/energy-efficiency-and-reducing-emissions/save-energy-in-the-home/heat-your-home-efficiently/calculate-heating-costs).

2.5 Range of cost levels used in the residential choice questions

	Keep using gas appliance(s)		Replace with electric appliance(s)		Replace with electric appliance(s)		Replace with gas appliance(s)		Replace with gas appliance(s)	
	Running cost		Upfront cost		Running cost		Upfront cost		Running cost	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
	$ p.a.	$ p.a.	$	$	$ p.a.	$ p.a.	$	$	$ p.a.	$ p.a.
Small dwelling with Heater Hot water Cooktop	1 900	6 850	3 800	15 300	350	600	2 900	11 700	1 650	5 850
Small dwelling with Heater Hot water	1 800	6 650	3 300	13 200	350	550	2 600	10 300	1 600	5 600
Small dwelling with Heater Cooktop	1 750	6 300	2 700	10 700	300	450	2 400	9 400	1 500	5 350
Small dwelling with Hot water Cooktop	450	1 150	1 700	6 800	150	200	900	3 600	450	1 100
Small dwelling with Heater	1 700	6 050	2 100	8 500	250	400	2 000	8 100	1 450	5 100
Small dwelling with Hot water	400	900	1 200	4 600	100	150	600	2 200	400	850
Small dwelling with Cooktop	300	550	500	2 200	50	50	300	1 400	300	500
Medium dwelling with Heater Hot water Cooktop	2 550	9 550	5 200	20 800	500	800	2 900	11 700	2 200	8 100
Medium dwelling with Heater Hot water	2 500	9 350	4 600	18 500	450	750	2 600	10 300	2 150	7 850
Medium dwelling with Heater Cooktop	2 350	8 800	4 000	16 200	400	650	2 400	9 500	2 000	7 400
Medium dwelling with Hot water Cooktop	550	1 400	1 700	7 000	150	250	900	3 600	500	1 300
Medium dwelling with Heater	2 300	8 600	3 500	13 800	350	600	2 000	8 100	1 950	7 200
Medium dwelling with Hot water	450	1 150	1 200	4 600	100	150	600	2 200	450	1 050
Medium dwelling with Cooktop	300	550	600	2 300	50	50	400	1 400	300	500

	Keep using gas appliance(s)		Replace with electric appliance(s)		Replace with electric appliance(s)		Replace with gas appliance(s)		Replace with gas appliance(s)	
	Running cost		Upfront cost		Running cost		Upfront cost		Running cost	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
	$ p.a.	$ p.a.	$	$	$ p.a.	$ p.a.	$	$	$ p.a.	$ p.a.
Large dwelling with Heater Hot water Cooktop	3 600	13 850	5 400	26 400	650	1 100	3 100	12 500	3 100	11 650
Large dwelling with Heater Hot water	3 550	13 600	6 000	24 100	600	1 050	2 800	11 100	3 000	11 400
Large dwelling with Heater Cooktop	3 300	12 600	5 500	21 800	500	900	2 600	10 300	2 800	10 550
Large dwelling with Hot water Cooktop	650	1 950	1 700	6 900	200	300	900	3 600	650	1 800
Large dwelling with Heater	3 250	12 400	4 900	19 500	500	800	2 200	8 900	2 750	10 350
Large dwelling with Hot water	600	1 700	1 200	4 600	150	200	600	2 200	600	1 550
Large dwelling with Cooktop	300	550	600	2 300	50	50	300	1 400	300	500

Source: CIE application of price and government rebate scenarios to baseline costs based on Frontier 2022. Cost of switching from gas to electric appliances in the home. A report for the Gas Appliance Manufacturer's Association of Australia. 24 June. (https://gamaa.asn.au/wp-content/uploads/2022/07/Frontier-Economics-Report-GAMAA.pdf); Acil Allen 2024. Review of Jemena Gas Network's demand forecasts. For the Australian Energy Regulator. 8 November. (https://www.aer.gov.au/system/files/2024-11/ACIL%20Allen%20-%20JGN%20demand%20review%20report%20-%20November%202024.pdf); Alternative Technology Association (2018). Household fuel choice in the National Energy Market. Final Report. Revised July. pp. 41, 48, 50. (https://renew.org.au/wp-content/uploads/2018/08/Household_fuel_choice_in_the_NEM_Revised_June_2018.pdf, accessed 18/06/2025); Sustainability Victoria, Calculate heating running costs (https://www.sustainability.vic.gov.au/energy-efficiency-and-reducing-emissions/save-energy-in-the-home/heat-your-home-efficiently/calculate-heating-costs).

Experimental design

The 12 questions in the design were assigned to three blocks of four questions by minimising the correlation of blocking assignment with attribute levels. Each respondent answered one block of questions. Each question had a pre-emptive choice version and an EOL choice version. The pre-emptive choice involved existing gas appliance running costs and no upfront gas appliance cost. The EOL choice involved new (more efficient) gas running costs with upfront appliance replacement costs. The electric appliance upfront and running costs were the same in the two types of question. To mitigate the risk of order effects, the order in which questions were presented to respondents was randomised.

Residential in-depth interviews

Once a draft survey instrument had been developed, it was tested using four in-depth interviews. The questions that were asked in the in-depth interviews are provided in Appendix A. The test interviews identified some important refinements to the questionnaire to improve clarity. The two most noteworthy revisions were:

- reframing the choice questions to specify running costs under the 'do nothing' option in pre-emptive choice questions, rather than showing only the *difference* between upfront and ongoing costs under a decision to electrify, and
- adding additional signposting to clarify that the purpose of asking repeated choice questions is not to trick or test respondents, but to understand how their choices might be affected by future changes in gas prices and government rebates.

Separate questions for renters

The choice questions discussed above were asked only of property owners (owner occupiers and landlords). Renters were asked a different set of questions, since they don't directly make decisions about replacement of fixed appliances. These questions focused on the role of appliance fuel when choosing between dwellings and the actions the respondent would take if gas prices were to significantly increase.

Commercial survey

A separate survey was used to gather evidence from commercial businesses with gas consumption of less than 10 TJ. This survey was designed to be much shorter and simpler than the residential survey to maximise engagement with business customers who are generally less willing to spend time completing surveys. In relation to electrification intentions and the impacts of price on those intentions, businesses were asked:

- how their gas usage is likely to change by 2031, taking account of any specific planned actions

- the share of current gas usage they think they will be able to switch to electric usage by 2045
- the expected date of disconnection, if any
- whether switching away from gas would be a single project or a staged approach
- the main factors influencing the timing of reductions in gas usage
- how the timing of gas reductions/disconnection would be affected by an expectation that:
  - gas price increases would be limited to consumer price index (CPI) increases out to 2031 (no real changes in prices)
  - gas prices would double by 2033 (increases of roughly 10% each year), and
  - gas prices would double by 2030 (increases of roughly 20% each year).

A text version of the questionnaire is provided at Appendix C.

Large-customer discussions

In-depth interviews were conducted with roughly half of Evoenergy's Demand Tariff customers, defined as customers with annual gas consumption of 10 TJ or more. These interviews covered similar topics to those outlined above in the commercial survey, but the in-depth conversational nature of the delivery mode enabled more detail to be collected.

A text version of the questionnaire is provided at Appendix D.

3 Sampling

This chapter describes the fieldwork and the characteristics of the sample of gas customers participating in the study described in Chapter 2.

Residential sample

Approach

The residential survey fieldwork was conducted online in October and November 2024 with two separate samples of ACT households:

- Households recruited through online panels, managed by Pureprofile (n=876 completes)
- Households recruited through email invitations sent out to a random sample of Evoenergy customers (n=1528 completes)

The panel sampling involved more screening out of respondents, primarily due to not having a gas connection. The client sample had a lower completion rate once qualifying for the survey (table 3.1).

3.1 Survey screening and completion

	Panel Sample	Client Sample	Total
Terminated	463	164	627
Partial completion	58	894	952
Completed	876	1528	2404
Total	**1397**	**2586**	**3983**

Source: CIE

Of the 2404 respondents who completed the survey, 519 were not shown the detailed choice questions because they were renters (n=457, see table 3.2) or indicated they had no gas appliances (n=62). This left a sample of 1885 households for detailed choice analysis (table 3.3).

3.2 Survey completions by tenure type

	Panel Sample	Client Sample	Total
Landlord	249	266	515
Owner occupier	380	1052	1432
Renter	247	210	457

	Panel Sample	Client Sample	Total
Total	**876**	**1528**	**2404**

Source: CIE

3.3 Choice experiment completions by tenure type

	Panel Sample	Client Sample	Total
Landlord	228	254	482
Owner occupier	367	1036	1403
Total	**595**	**1290**	**1885**

Source: CIE

Representativeness of the sample

The sampling approach involved maximising survey participation. We did not apply quotas to screen out respondents for the purpose of achieving a representative sample. It is therefore important to understand how the sample characteristics compare to those of the population and take account of those differences when conducting analysis.

The household characteristics used to determine the representativeness of the choice modelling sample relative to the population of dwellings in the ACT and the Queanbeyan-Palerang SA4 region were:

- dwelling structure, and
- tenure type.

A limitation of this approach is that the full population is not strictly representative of Evoenergy's customer base, since it captures all households in the ACT and Queanbeyan, including those who never connected to gas, those who have already disconnected, and a small number of rural properties that are not connected.

Compared to the population, the following dwelling type-tenure type combinations are underrepresented in the survey sample (table 3.4):

- Townhouse-landlord by 2.04 percentage points, and
- Apartment-landlord by 7.24 percentage points.

The following combinations are overrepresented in the sample:

- Townhouse-owner-occupier by 4.65 percentage points, and
- Detached house-landlord by 3.46 percentage points.

3.4 Comparison of sample and population distributions, by dwelling and tenure type

Dwelling type/tenure type	Owner occupier	Landlord owned
	Per cent	Per cent
Sample distribution		
Detached house	52.25	16.13
Townhouse	13.90	5.57

Dwelling type/tenure type	Owner occupier	Landlord owned
	Per cent	Per cent
Apartment	8.28	3.87
Population distribution		
Detached house	52.26	12.67
Townhouse	9.25	7.31
Apartment	7.40	11.11

Source: Sample distribution based on survey data collected by CIE. Population distribution based on ABS TableBuilder. (2021), 2021 Census - TEND Tenure Type by STRD Dwelling Structure by SA4 (EN), ACT and Queanbeyan (selected dwelling characteristics).

Notwithstanding the potential small differences between the population and Evoenergy's customer base, the under- and over-sampling of these characteristics is sufficiently large to warrant the use of sampling weights to make the generalisation of choice analysis results to Evoenergy's customer base more accurate. The weights were generated such that the characteristics of the weighted sample match those of the population (table 3.5).

3.5 Sampling weights, dwelling and tenure type, ACT and Queanbeyan

Dwelling type/tenure type	Owner occupier	Landlord owned
	Sampling weight	Sampling weight
Detached house	1.00	0.79
Townhouse	0.67	1.31
Apartment	0.89	2.87

Source: CIE, ABS.

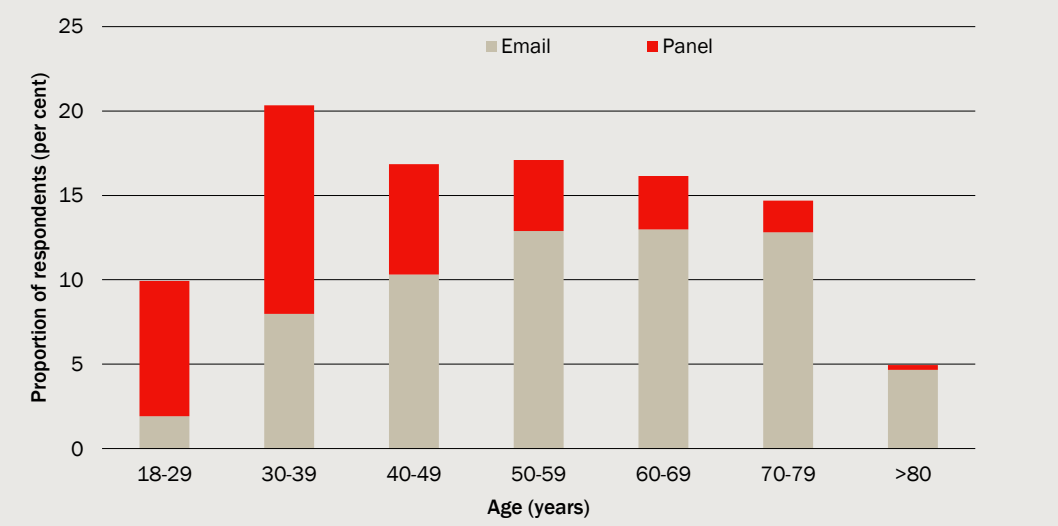
Other characteristics of the sample

Other characteristics, such as age, income and family type, were not used in the calculation of sampling weights due to lack of comparability between sample and population data sets.[9] Charts 3.6, 3.8 and 3.10 show the unweighted sample distributions for age, income and family type. Charts 3.7, 3.9 and 3.11 show the sample distributions after applying weighting to correct for sampling bias in dwelling and tenure types.

In the unweighted sample, panel respondents tended to be younger in age compared to client (email) sample respondents. Over half of email respondents (52.4 per cent) were aged 60 or over, compared to 18.8 per cent of panel respondents (chart 3.6). Since 24 per cent of the adult population in the ACT is aged 60 or over and not all of the adult population would be household decision makers, the two samples somewhat offset their respective sampling biases in relation to age.

9 e.g. for rented dwellings, ABS census data reports characteristics of the persons living in a dwelling, but not of persons who own that dwelling and make appliance replacement decisions.

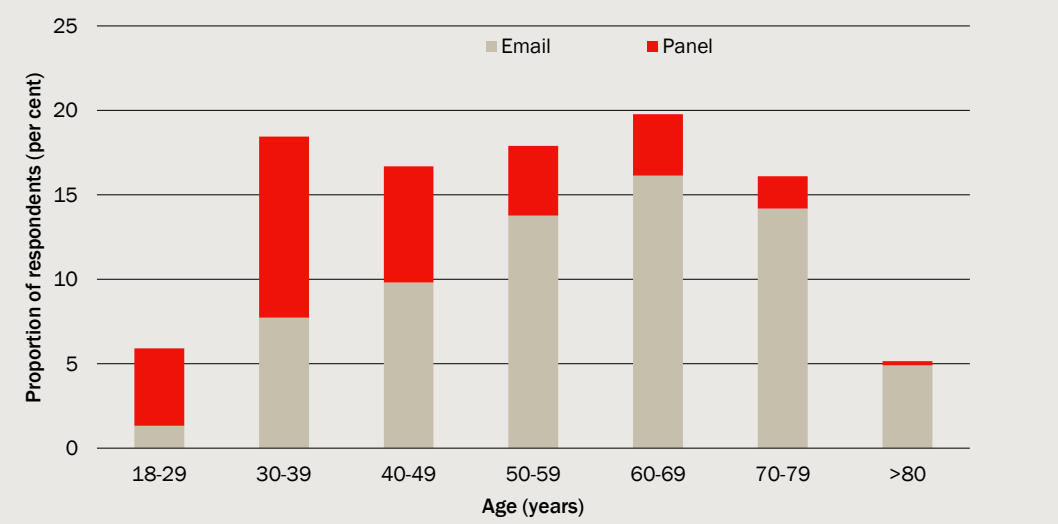
3.6 Distribution of respondent ages, unweighted sample



Data source: CIE.

In the weighted sample, the sample is slightly older and has a higher proportion of client respondents, compared to the unweighted sample (chart 3.7).

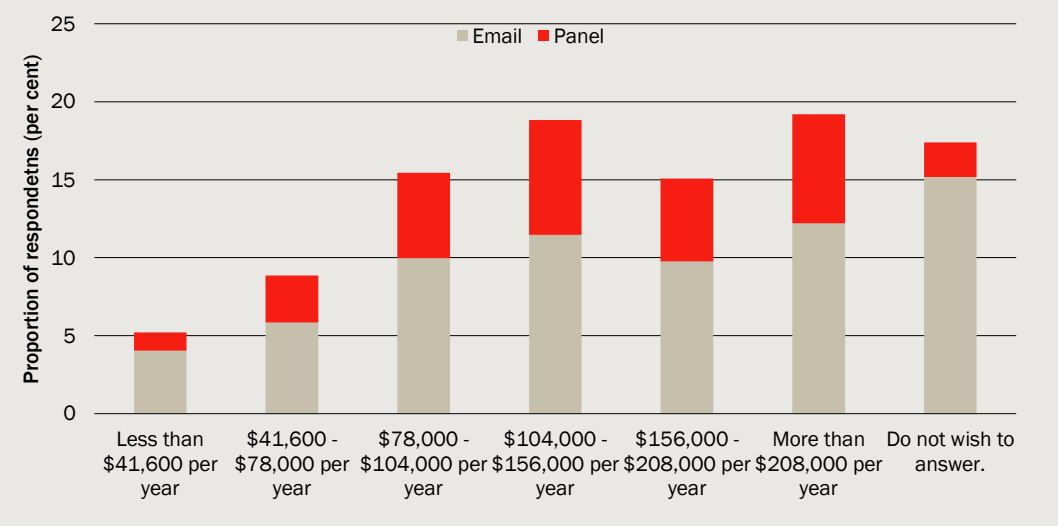
3.7 Distribution of respondent ages, weighted sample



Data source: CIE.

The income distributions are relatively similar between email and panel members, noting, however, that 17 per cent of the sample did not disclose their incomes (chart 3.8).

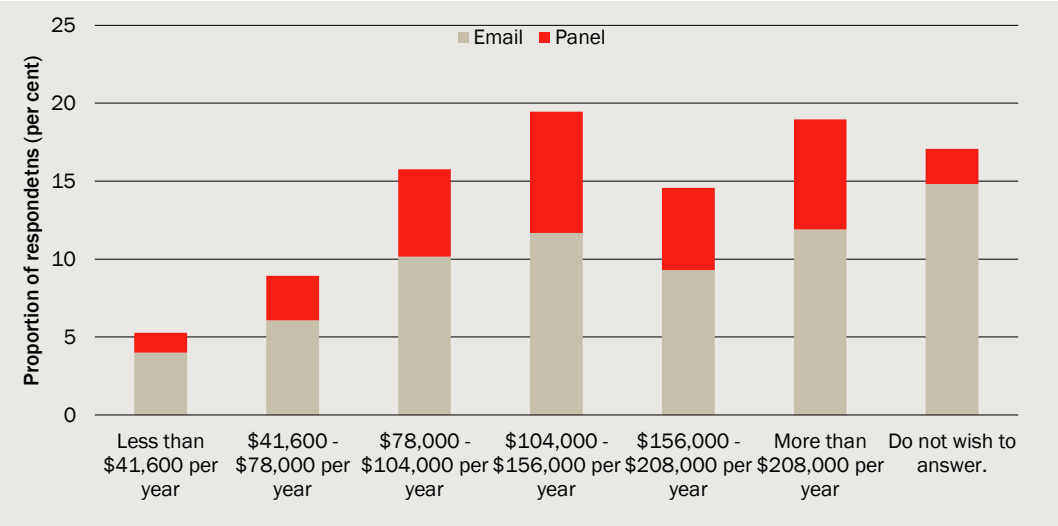
3.8 Distribution of respondent household income, unweighted sample



Data source: CIE.

Applying sample weightings does not significantly change the income distribution of the sample (chart 3.9).

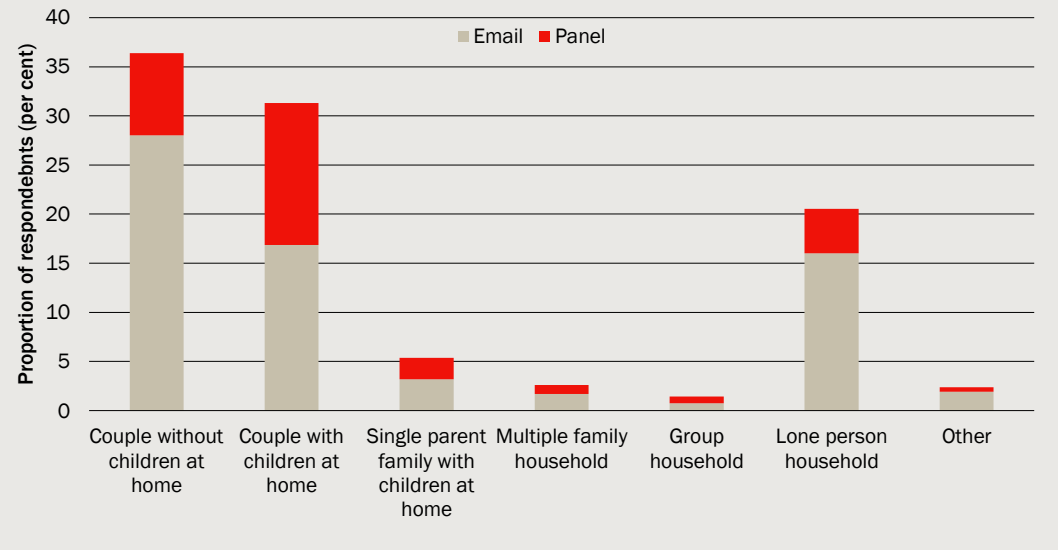
3.9 Distribution of respondent household income, weighted sample



Data source: CIE.

For panel respondents, couples with resident children were the dominant family type. For respondents recruited through email, couples without resident children were the dominant type (chart 3.10).

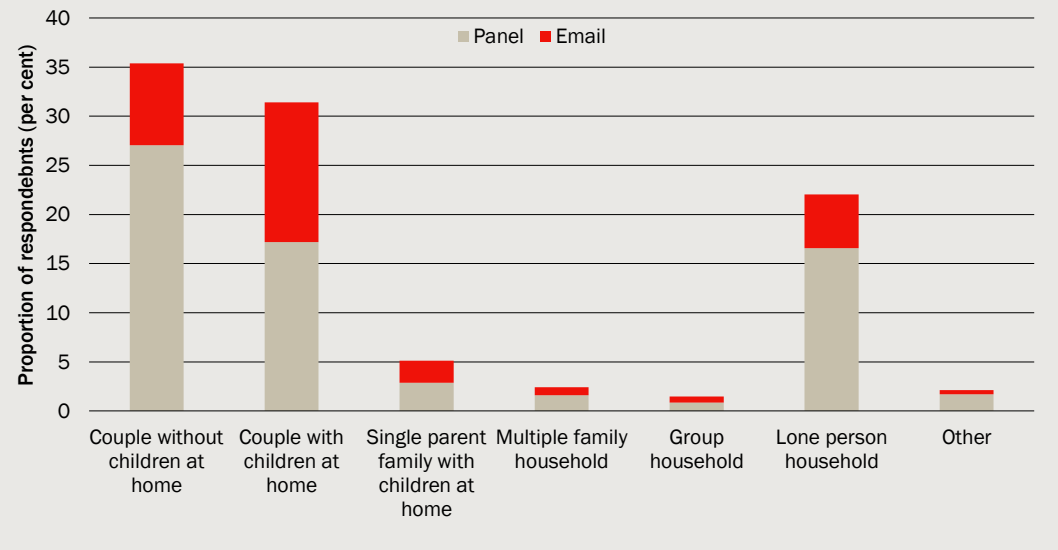
3.10 Distribution of family type, unweighted sample



Data source: CIE.

The distribution of family types across the weighted and unweighted samples are broadly similar (Chart 3.11).

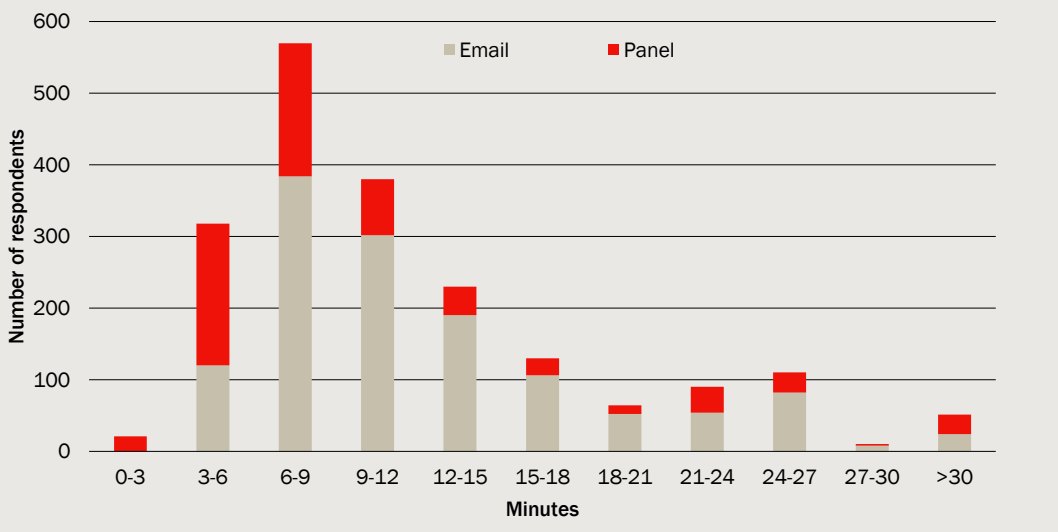
3.11 Distribution of family type, weighted sample



Data source: CIE

Panel members were more likely, on average, to have completed the survey in a shorter period of time compared to respondents recruited through email (chart 3.12). This is not surprising given they are likely to have more experience completing surveys.

3.12 Distribution of length of interview, unweighted sample



Data source: CIE.

Commercial sample

Sampling commercial customers for self-administered surveys is challenging. There were 36 respondents in total who completed the survey. Some 28 of those respondents were decision makers about gas usage and answered questions about gas usage reductions and disconnection. The remaining eight answered a separate set of questions for businesses who lease their premises.

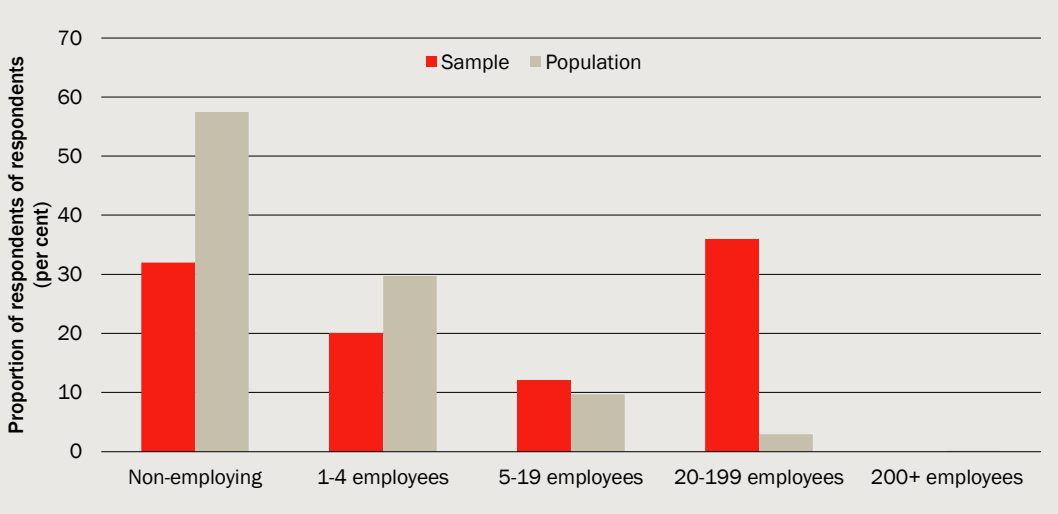
With respect to business size, there are significant differences between the sample and the population of all businesses in ACT and Queanbeyan (chart 3.13), however this population is not representative of Evoenergy non-residential customers since it includes many businesses that do not have a separate non-residential property (e.g. trades that operate from vehicles).

Despite its small sample size, the survey included businesses across a range of industries (chart 3.14).

Large-customer sample

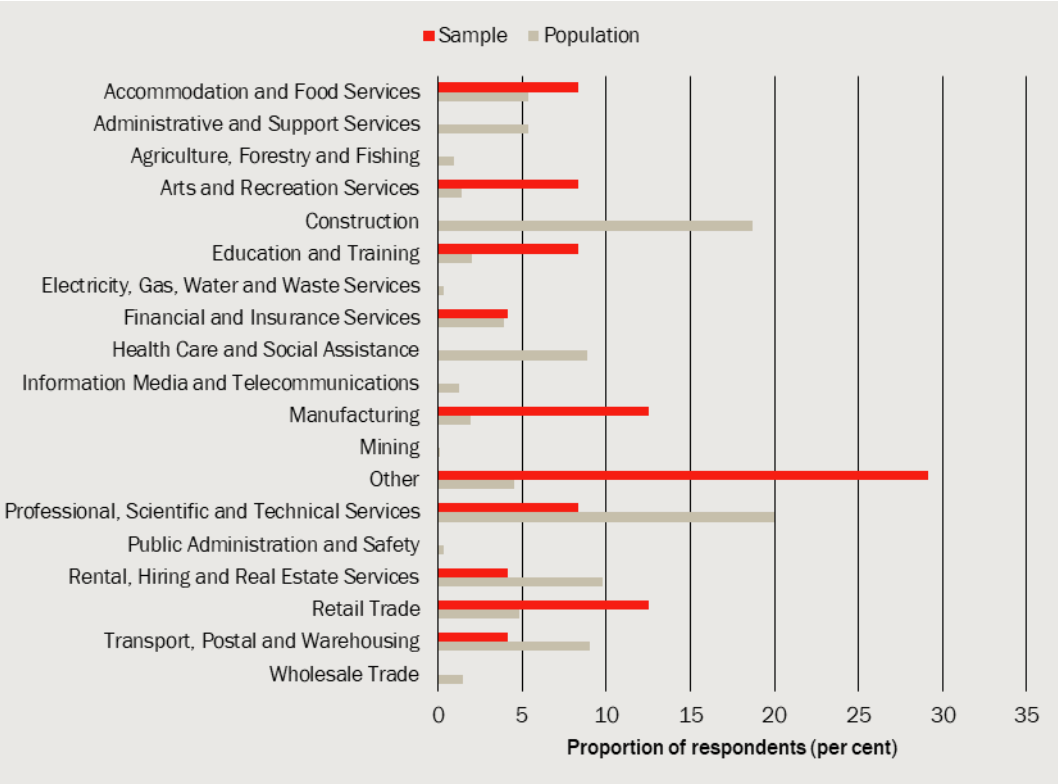
The large customer sample included a diverse mix of organisations, such as universities, research institutes, hospitals, and commercial businesses. Nineteen organisations were interviewed, almost half of the customer base of 43 Demand Tariff customers.

3.13 Distribution of businesses by number of employees



Data source: Sample distribution was based on commercial survey administered and collected by CIE. Population distribution is based on ABS business count data, Australian Bureau of Statistics (ABS). (2024). 8165.0 - Counts of Australian Businesses, including Entries and Exits, June 2020 to June 2024: Businesses by Industry Division by Statistical Area Level 2 by Annualised Employment Size Ranges, June 2024 (a)(b), see https://www.abs.gov.au/statistics/economy/business-indicators/counts-australian-businesses-including-entries-and-exits/latest-release#data-downloads.

3.14 Distribution of businesses by industry



Data source: Sample distribution was based on commercial survey administered and collected by CIE. Population distribution is based on ABS business count data, Australian Bureau of Statistics (ABS). (2024). 8165.0 - Counts of Australian Businesses, including Entries and Exits, June 2020 to June 2024: Businesses by Industry Division by Statistical Area Level 2 by Annualised Employment Size Ranges, June 2024 (a)(b), see https://www.abs.gov.au/statistics/economy/business-indicators/counts-australian-businesses-including-entries-and-exits/latest-release#data-downloads.

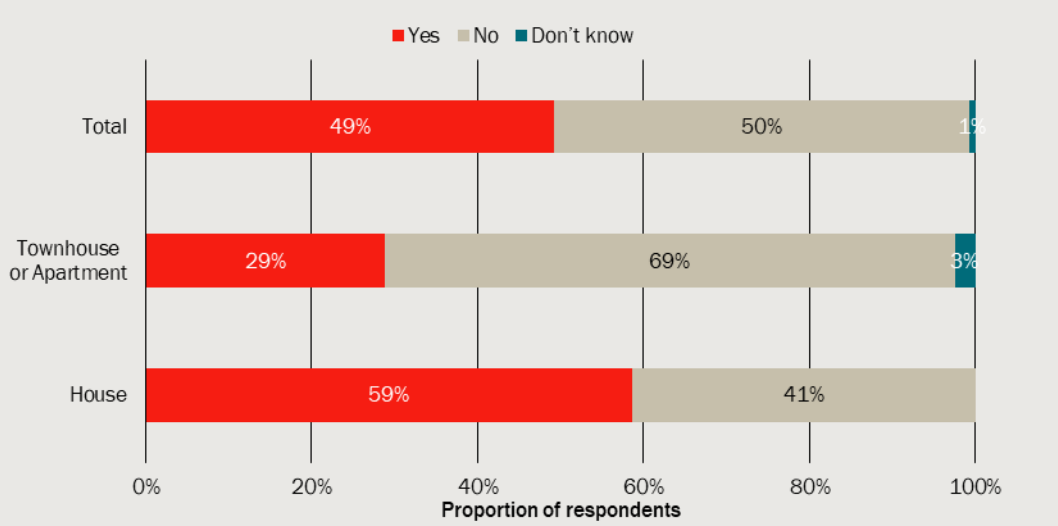
4 Respondent attitudes

This chapter provides the results for survey questions other than the discrete choice experiment, including questions about gas appliances and attitudes related to fuel preference.

Attitudes of owner occupiers and landlords

Approximately one half of respondents who have one or more gas appliances have solar panels on their property (chart 4.1). The rate of solar panel ownership for standalone dwellings was double that of townhouses and apartments.

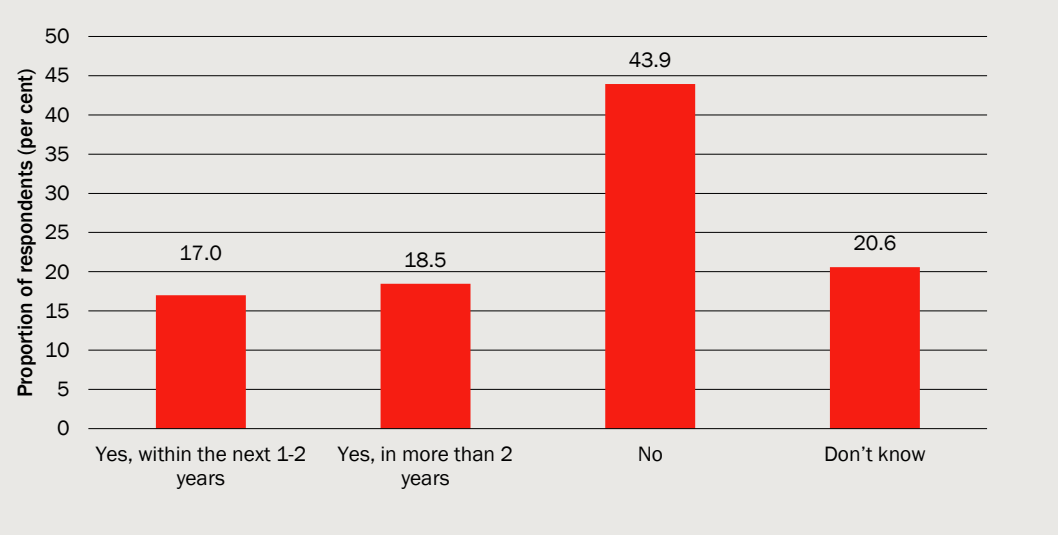
4.1 Solar panel ownership status



Data source: CIE.

Of the respondents who do not have solar panels, over one third intended to purchase in solar panels sometime in the future (chart 4.2).

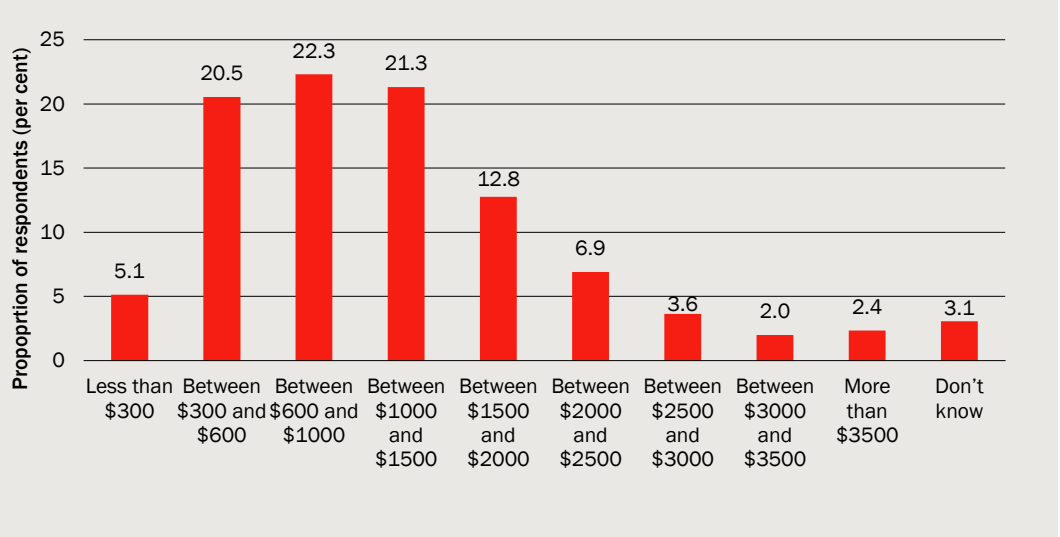
4.2 Solar panel purchase intentions



Data source: CIE.

All respondents were asked about the level of their gas bill over the last year. Most respondents estimated an annual gas bills between $300 and $2 000 (chart 4.3).

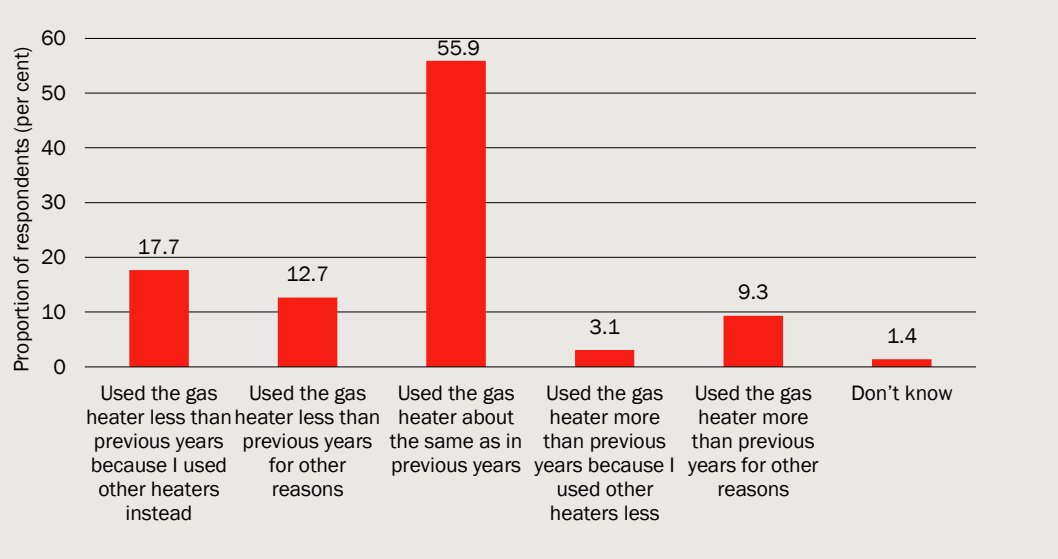
4.3 Level of gas bill over the last year



Data source: CIE.

Respondents with a gas heater were asked about how their gas heater usage over the last year compared to usage in previous years. Around 30 per cent reported using their gas heater less (chart 4.4), with 13 per cent indicating the reduction was not due to switching to another type of heater. This provides some indication of the size of a potentially-temporary reduction in gas usage in response to cost-of-living pressures.

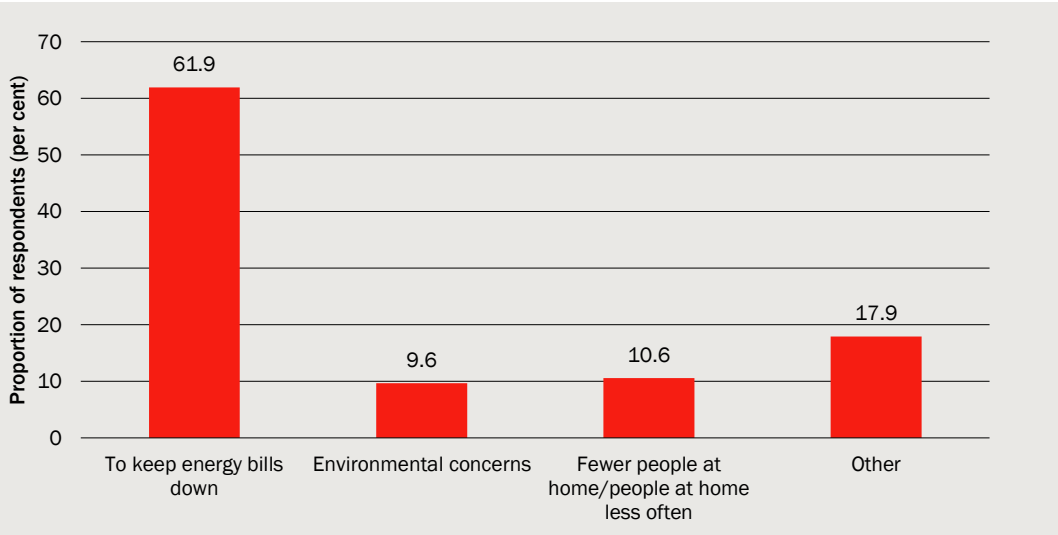
4.4 Gas heater usage over the last year compared to previous years



Data source: CIE.

Of the respondents who reported using their gas heater less over the last year, the majority cited keeping energy bills down as the primary reason (chart 4.5).

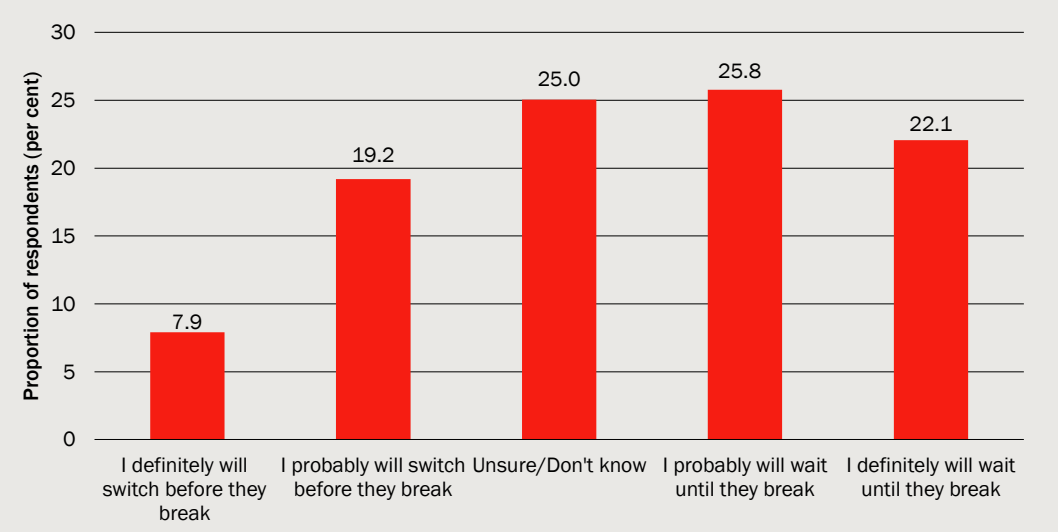
4.5 Reasons for using gas heater less



Data source: CIE.

The electrification intentions of respondents were elicited based on their current expectations of future gas prices (chart 4.6). Only 8 per cent of respondents indicated a definite intention to electrify before their gas appliances break. However, a further 19 per cent of respondents indicated they will *probably* switch before their gas appliances break.

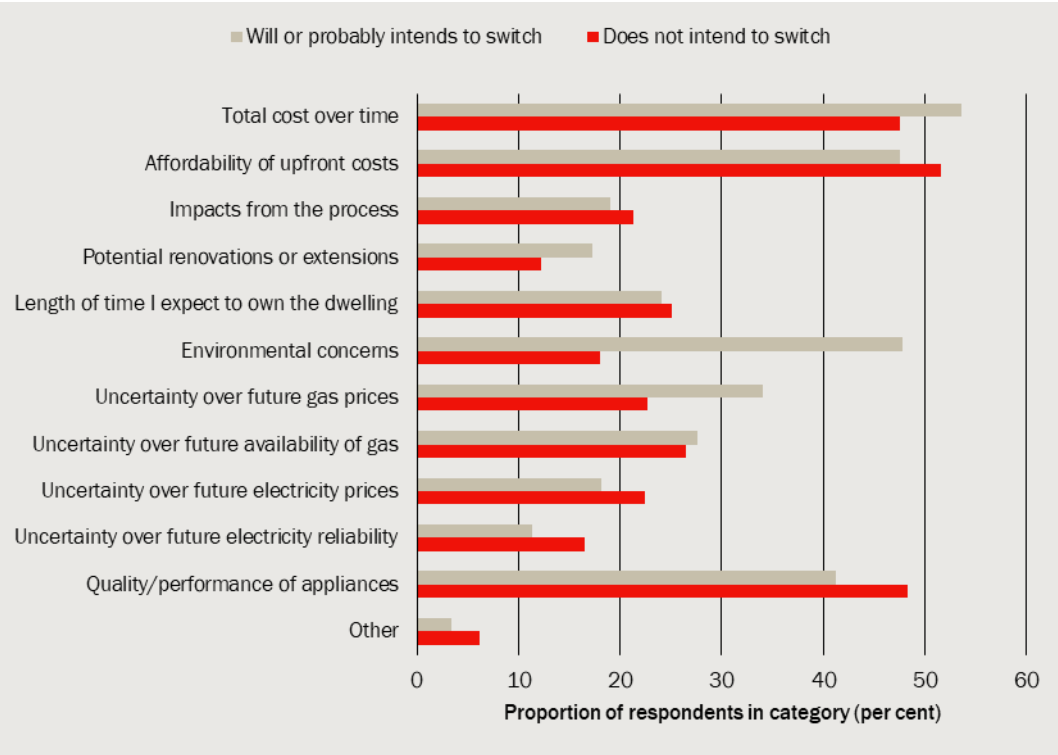
4.6 Appliance replacement intentions



Data source: CIE.

Respondents were asked about the most important factors in appliance replacement decisions. Their responses are shown in chart 4.7, by whether they indicated some likelihood of electrifying before appliances break (in the question discussed above). Many respondents cited costs and affordability as factors. Environmental concerns were more important to respondents who intended to electrify, while quality and performance of appliances were more important to respondents who intended to remain with gas.

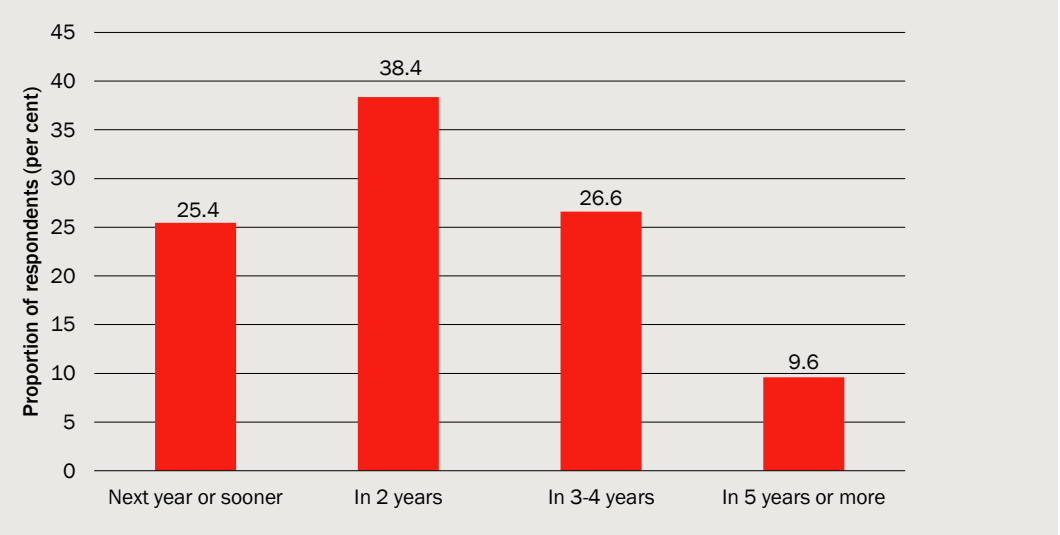
4.7 Most important factor for replacement decisions, by intention



Data source: CIE.

Of the respondents who intended to pre-emptively disconnect from using gas, the majority intended to do this sometime over the next four years (chart 4.8).

4.8 Timing of appliance replacements

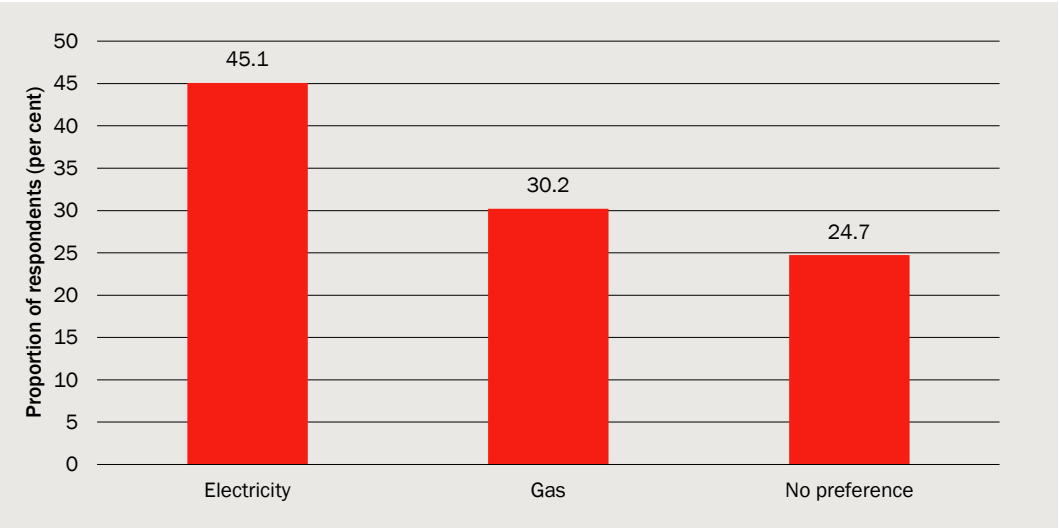


Data source: CIE.

Attitudes of renters

Electric appliances are renters' preferred type of appliance with 45.1 per cent respondents, followed by gas with 30.2 per cent of respondents (chart 4.9). Approximately one quarter of renters had no preference in terms of fuel type in appliances.

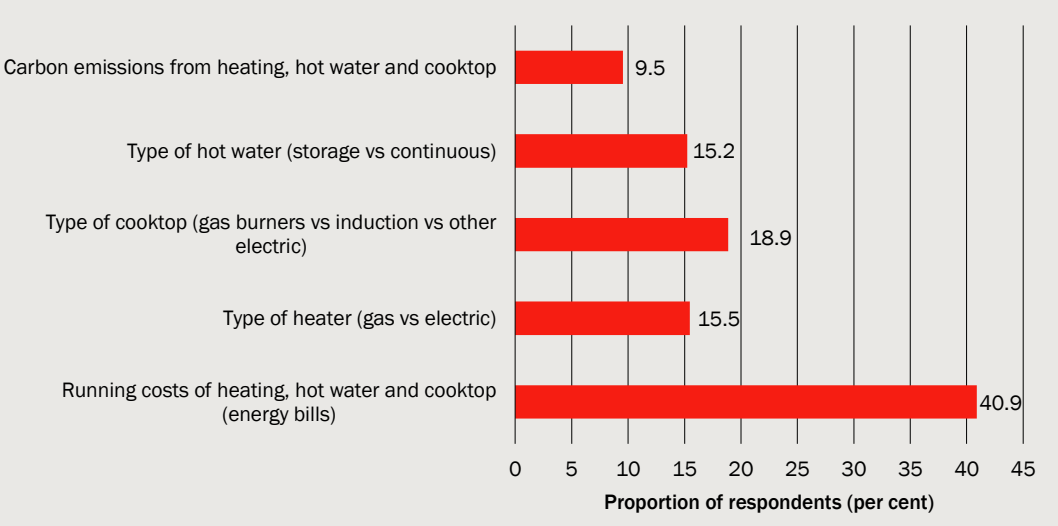
4.9 Fuel type preference when choosing where to live for renters



Data source: CIE.

For renters, the most important factor related to appliances when deciding where to live is running costs (chart 4.10).

4.10 Most important factor related to appliances for renters when choosing where to live, renters

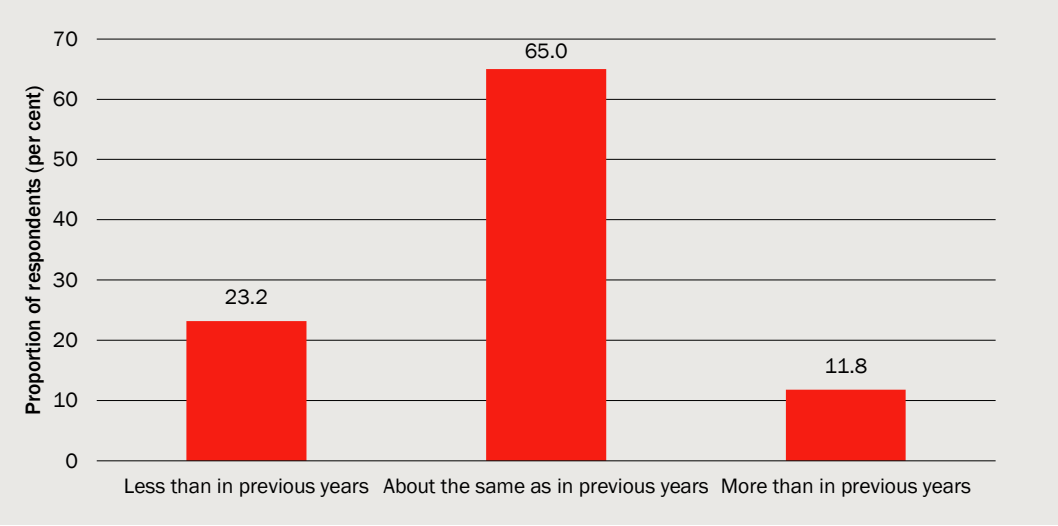


Note: Multiple selection question.

Data source: CIE.

In terms of recent gas consumption, 23 per cent of renters decreased their gas consumption over the last year compared to previous years (chart 4.11). Of this group, 40 per cent cited concerns about gas bills as the main reason for the decrease in gas consumption.

4.11 Gas consumption habits over the last year compared to previous years, renters

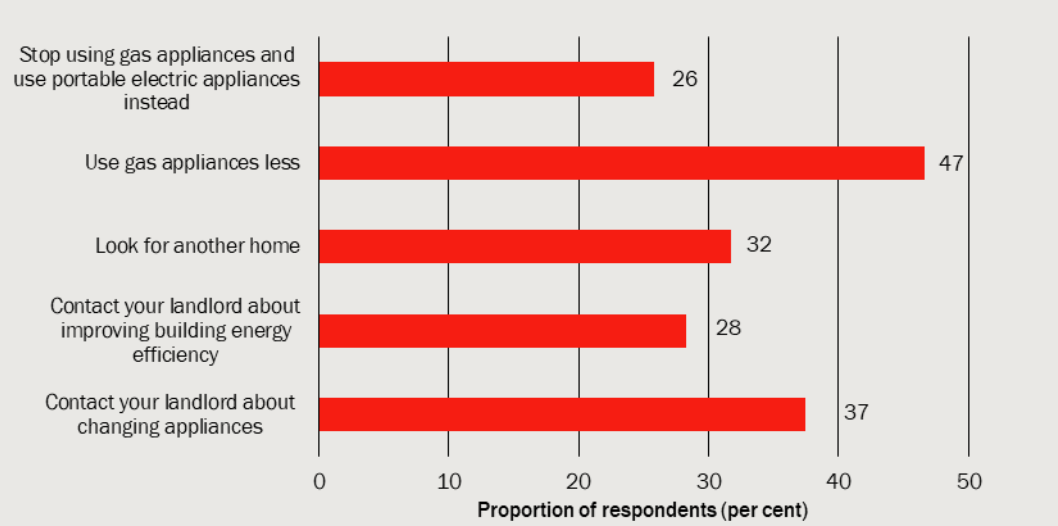


Data source: CIE.

When presented with a hypothetical scenario of annual gas prices increasing by 50 per cent, while electricity prices remained constant, 56 per cent of renters indicated they would contact their landlord about changing appliances and/or look for another home,

actions which, if taken by a significant share of renters, would incentivise electrification by landlords (chart 4.12).

4.12 Response to increase in gas prices by 50 per cent, renters



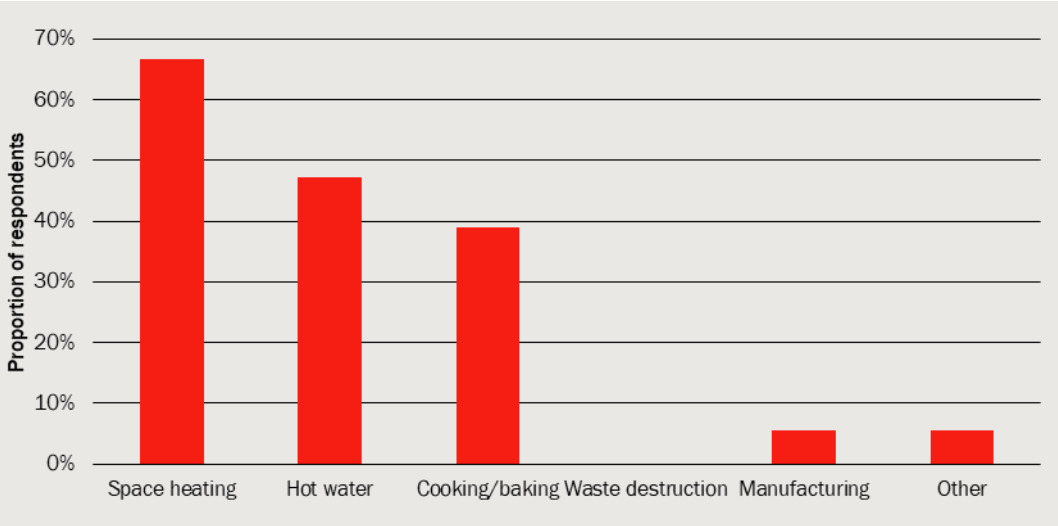
Note: Multiple selection question.

Data source: CIE.

Attitudes of commercial businesses

Most commercial customers surveyed cited space heating and hot water as the primary uses of gas appliances (chart 4.13).

4.13 Main uses of gas, commercial businesses



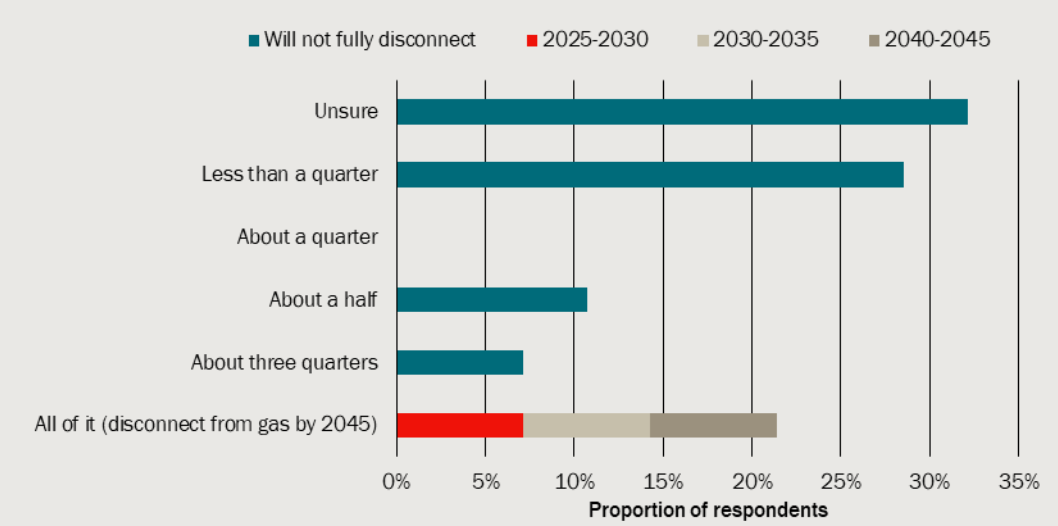
Note: In this question, respondents were able to select multiple answers

Data source: CIE

Some 61 per cent of businesses were aware of the ACT Government's commitment to completely phase out gas by 2045. Only 21 per cent of businesses surveyed have formed

an intention to completely disconnect from the gas network by 2045 (chart 4.14). A further 18 per cent expect to reduce their gas usage by a half or more.

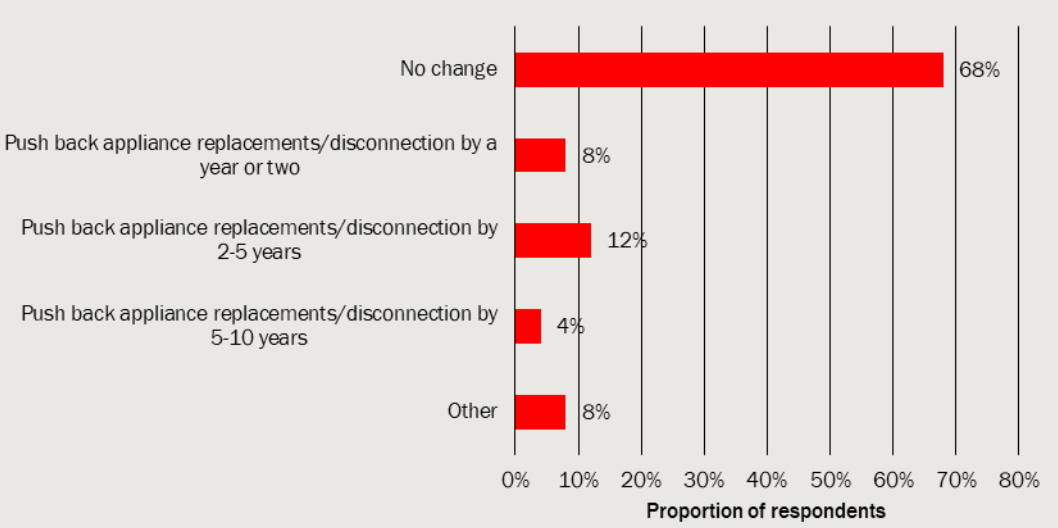
4.14 Gas disconnection intentions, commercial businesses



Data source: CIE

In response to a hypothetical scenario in which there are no real gas price increases through to 2031, a majority of respondents indicated they would maintain their current appliance replacement plans without making any changes (chart 4.15). A minority of respondents indicated that they would push back their appliance replacement decisions.

4.15 Change in gas disconnection intentions, no real change in prices

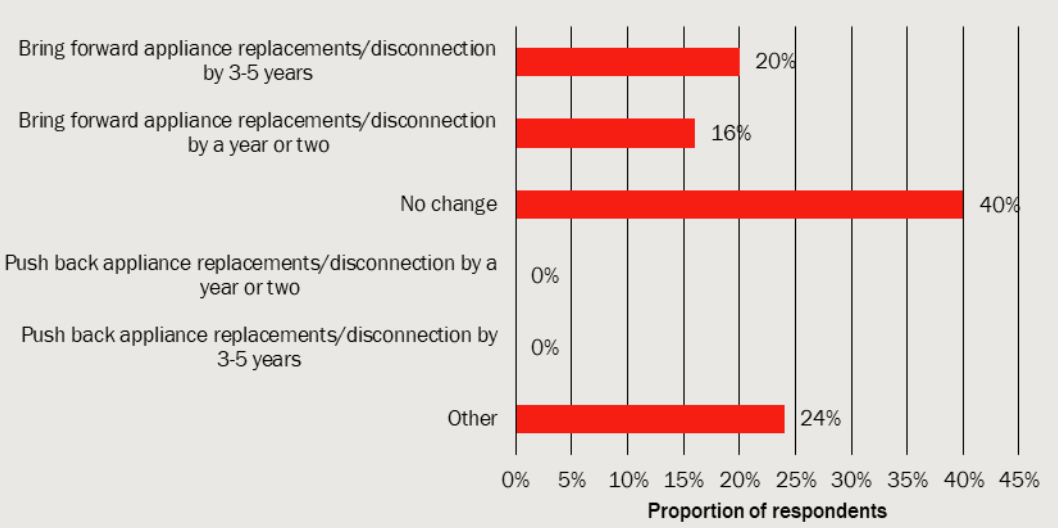


Note: Three respondents skipped this question

Data source: CIE

If nominal gas prices were to increase 10 per cent annually through to 2033, 40 per cent of respondents (53 per cent if we exclude the 'other' category) would not change their appliance replacement plans, while 36 per cent indicated that they would bring forward their appliance replacement plans (chart 4.16).

4.16 Change in gas disconnection intentions, 10% annual increase in prices

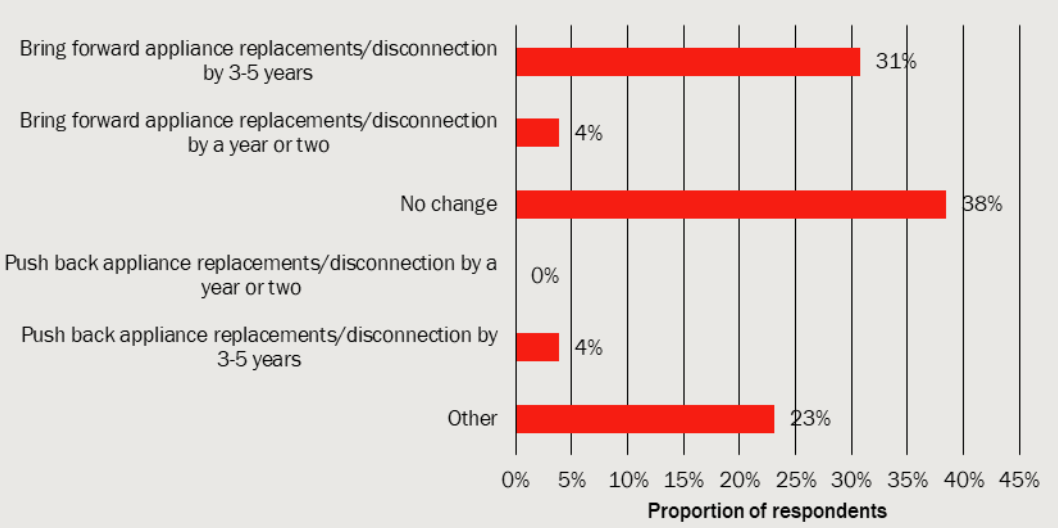


Note: Three respondents skipped this question

Data source: CIE

In response to a 20 per cent annual increase in gas prices through to 2030, effectively doubling prices, approximately 35 per cent of respondents would bring forward their appliance replacement plans (chart 4.17). The impact of this price scenario relative to the previous 10 per cent annual price increase scenario was to increase the period that responsive customers would bring forward their replacements/disconnection, rather than inducing other customers to change behaviour.

4.17 Change in gas disconnection intentions, 20% annual increase in prices



Note: Two respondents skipped this question

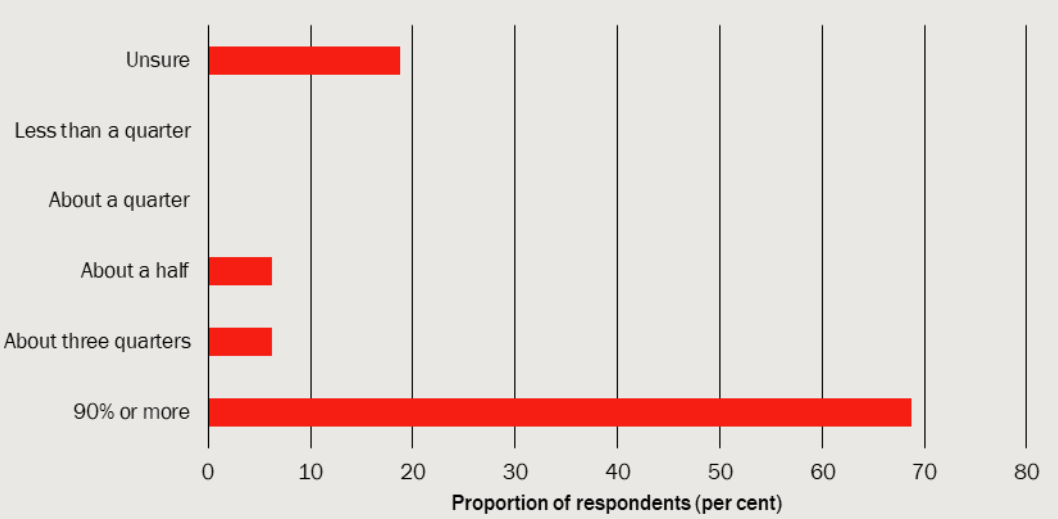
Data source: CIE

Attitudes of large customers

Space heating and hot water are cited as the primary uses of gas appliances by two thirds of Demand Tariff customers interviewed.

Compared to smaller non-residential customers, Demand Tariff customers are much more likely to cite an intention to completely disconnect from gas appliances by 2045 (chart 4.18).

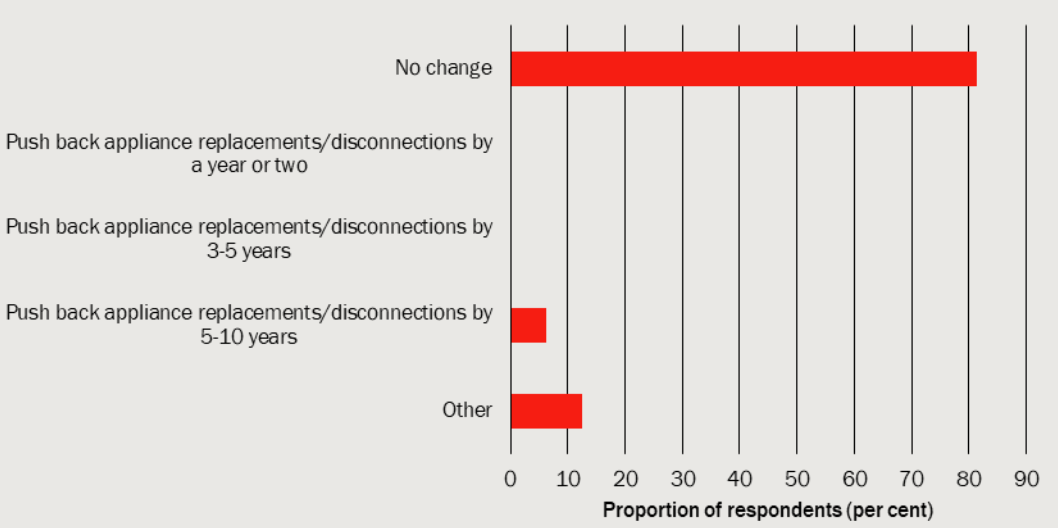
4.18 Large customer expected reductions in gas usage by 2045



Data source: CIE

All of the customers interviewed were aware of the ACT Government's commitment to phase out gas by 2045.Similar to commercial businesses, large customers would not change their plans if gas prices were to remain constant in real terms to 2031 (chart 4.19).

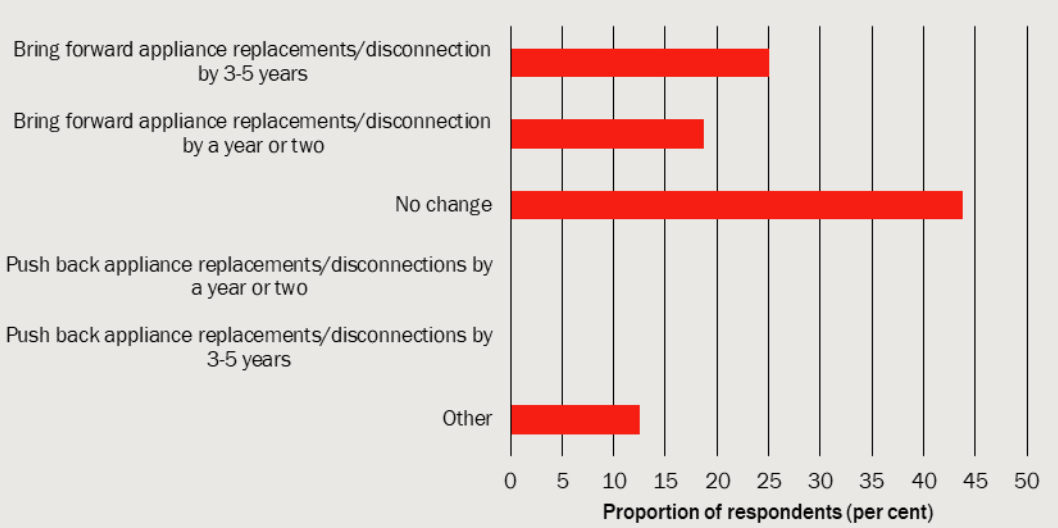
4.19 Change in large customer fuel switching intentions, constant real gas prices



Data source: CIE

If prices were to increase by 10 per cent annually, 44 per cent of large customers would bring forward their electrification plans to some degree (chart 4.20).

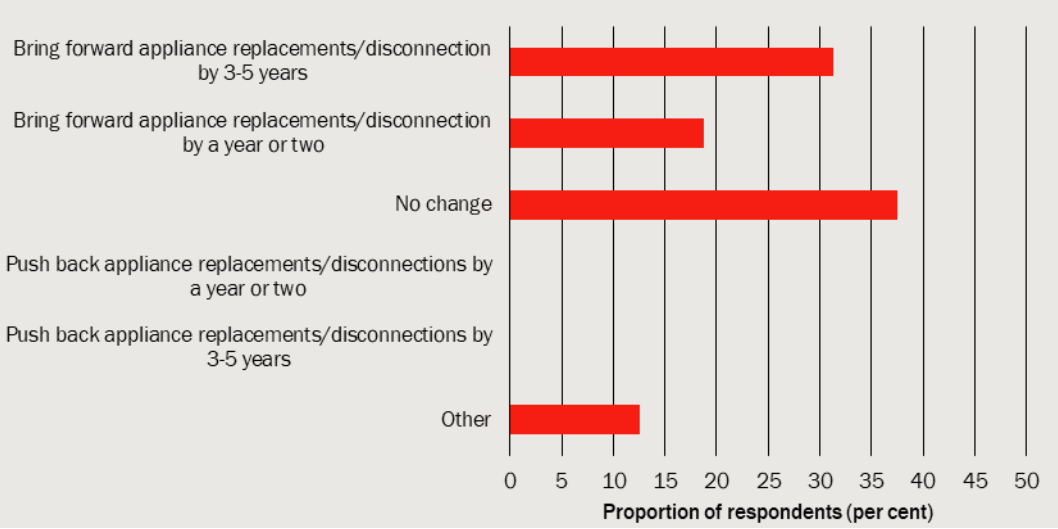
4.20 Change in large customer fuel switching intentions, 10 per cent annual gas price increases



Data source: CIE

If prices were to increase by 20 per annually through to 2030, then one additional customer would bring forward their electrification plans (chart 4.21), relative to the scenario above.

4.21 Change in large customer fuel switching intentions, 20 per cent annual gas price increases



Data source: CIE

5 Statistical model of residential choice

This chapter outlines the statistical models used to analyse responses to the discrete choice experiment questions and presents findings from follow-up questions that explored how respondents interpreted the choice tasks and what influenced their decision-making.

Overview of residential choices

Figures 5.1 and 5.2 provide an overview of the way in which decisions to electrify vary depending on whether appliances have reached EOL and with the levels of upfront and running costs. The costs shown to each respondent varied with their specific characteristics, but these tables collapse that diverse range of costs into the factors used in the experimental design to generate variation in the cost levels shown to each respondent.

5.1 Share of households choosing to disconnect from gas before appliances break

	Lowest electric upfront cost	Moderate electric upfront cost	Highest electric upfront cost
	per cent	per cent	per cent
Lowest gas running cost	6	10	25
Moderate gas running cost	10	9	25
Higher gas running cost	9	15	30
Highest gas running cost	23	26	41

Source: CIE analysis

5.2 Share of households choosing to disconnect from gas when appliances break

	Lowest electric upfront cost	Moderate electric upfront cost	Highest electric upfront cost
	per cent	per cent	per cent
Lowest gas running cost	59	66	80
Moderate gas running cost	83	68	83
Higher gas running cost	74	76	85
Highest gas running cost	83	85	87

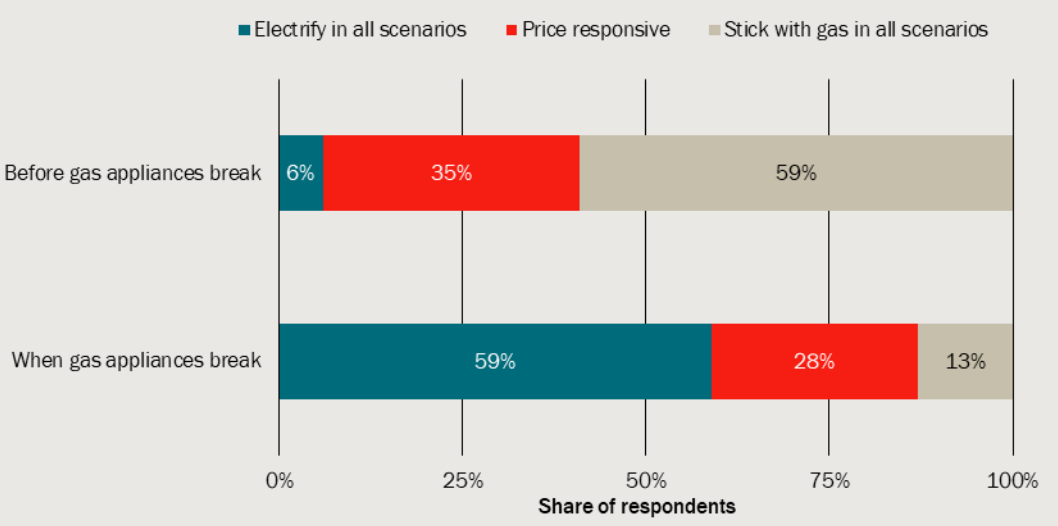
Source: CIE analysis

Some of the key insights from this high-level analysis are:

- Most respondents will not disconnect from gas before their appliances break, but, once their appliances break, most households will disconnect from gas (figure 5.3).

- Around 6-10 per cent of respondents indicated an intention to electrify and disconnect from gas before their appliances break, regardless of financial incentives.
- Around a quarter of respondents chose to remain connected to gas in all of the choice problems presented. In follow-up questions, around half of these respondents indicated they would switch if the financial incentives were large enough, while the other half (11.4 per cent of the total sample) indicated they would never switch, regardless of financial incentives. Respondents in the latter category indicated they want to remain with gas because of the superior quality of gas appliances, particularly for cooking and heating purposes.[10]
- Decisions about disconnecting from gas are sensitive to financial incentives for around one third of households, with disconnections varying across the financial incentive scenarios:
  - from roughly 10 per cent to 40 per cent for pre-emptive disconnections, and
  - from roughly 60 per cent to 90 per cent for EOL disconnections.

5.3 Overview of residential consumer preferences



Data source: CIE analysis

Models of residential choice

Statistical models were estimated on the data from the discrete choice experiment questions to enable prediction of choice across the sample for a range of user-defined upfront and running cost assumptions. The most suitable models for this purpose are multinomial logit (MNL) models,[11] which are grounded in the random utility framework and for which Daniel McFadden was awarded the Nobel Prize in Economic Sciences in

10 Responses to this question were provided as a text response.

11 McFadden, D. (1973) Conditional Logit Analysis of Qualitative Choice Behavior. In: Zarembka, P., Ed., Frontiers in Econometrics, Academic Press, 105-142.

2000.[12] We used a mixed logit (random parameter) variant of the MNL model, in which the probability that alternative k is chosen from a set of alternatives j=1,..,k,..,n by individual i can be expressed as:

$$p_{ik} = \frac{e^{U(X_k, z_i)}}{\sum_{j=1}^{n} e^{U(X_k, z_i)}}$$

where individual i has a vector of characteristics z_i, the alternative has a vector of characteristics X, and

$$U(X_k, z_i) = \beta_i X_k + \alpha z_i X_k$$

where vectors of coefficients α and $\boldsymbol{\beta}_i$ are estimated.

The coefficients from models estimated on pre-emptive choices and EOL choices are set out in tables 5.4 and 5.5, respectively. The models capture heterogeneity in consumer preferences both through variation related to respondent characteristics (as evidenced by the statistically significant interactions between appliance characteristics and respondent characteristics in the models) and through the random parameter, which fits the fuel preference parameter in respondents' utility functions to a normal distribution. Only the mean and standard deviation for the random parameter are provided in the tables, however the forecast of disconnections calculated in the next chapter makes use of respondent-specific parameter estimates.

The main effects of upfront costs, running costs and fuel type are very precisely estimated as evidenced by each having z values greater than 8.[13] The signs and statistical significance of other parameter estimates indicate that, holding other characteristics constant:

- younger respondents tended to be more sensitive to running costs
- higher income respondents and respondents in North Canberra are more likely to electrify pre-emptively
- respondents with a gas cooktop and respondents in Tuggeranong are less likely to electrify pre-emptively.

The statistical significance of the standard deviation of the random parameter for fuel type indicates there is significant variation in preferences across households that is not explained by the observed characteristics included in the model. Some statistically insignificant parameters were included in the model so that a common set of parameters could be used across models with differing treatments of the 'I probably will switch' response.[14]

12 https://www.nobelprize.org/prizes/economic-sciences/2000/mcfadden/facts/

13 Statistical difference from zero at the 95 per cent confidence level occurs at a z value of 1.96.

14 The model in Table 5.4 treats 'I probably will switch' as a decision to not electrify.

5.4 Choice model for pre-emptive disconnection

Parameter	Coef.	Z value
Fixed parameters		
Upfront cost ($)	-0.00093	-13.27
Running cost ($ p.a.)	-0.00332	-10.48
Upfront*heater	0.00055	9.39
Upfront*cooktop	0.00002	0.83
Upfront*landlord	0.00003	1.31
Upfront*Queanbeyan	-0.00007	-1.26
Upfront*detached house	0.00016	3.81
Running*heater	0.00253	8.50
Running*landlord	0.00014	2.30
Running*age 18-39	-0.00013	-2.11
Running*age 40-59	-0.00010	-1.90
Running*South Canberra	-0.00010	-1.17
Running*Woden Valley	-0.00017	-2.07
Running*Weston Creek	-0.00002	-0.24
Running*Belconnen	-0.00012	-1.95
Running*Queanbeyan	0.00001	0.12
Running*Tuggeranong	-0.00010	-1.48
Gas*cooktop	0.64919	2.16
Gas*CALD	-0.04352	-0.13
Gas*income $78k-$156k	-0.95371	-3.14
Gas*income >$256k	-1.83634	-5.19
Gas*age 40-59	0.31637	1.04
Gas*Weston Creek	0.32864	0.61
Gas*Tuggeranong	0.86534	2.20
Gas*detached house	0.29068	0.87
Upfront*North Canberra	-0.00009	-2.17
Running*income >$156k	0.00011	2.01
Running*detached house	0.00036	4.01
Gas*North Canberra	-1.59086	-3.52
Random parameter mean		
Gas (dummy =1 for gas appliance)	3.65016	8.61
Random parameter std. dev.		
Gas	4.00489	19.87

Source: CIE.

The main effects are also highly statistically significant in the model of EOL disconnection, as is the unobserved variation in preferences for fuel type (table 5.5). The signs and statistical significance of other parameter estimates indicate that, holding other characteristics constant:

- landlords are less sensitive to running costs than are owner-occupiers, which is consistent with the fact that landlords do not pay appliance running costs
- households with income between $78 000 and $156 000 per year are more likely to electrify than both lower- and higher-income households
- households with a gas cooktop are less likely to electrify than households without a gas cooktop.

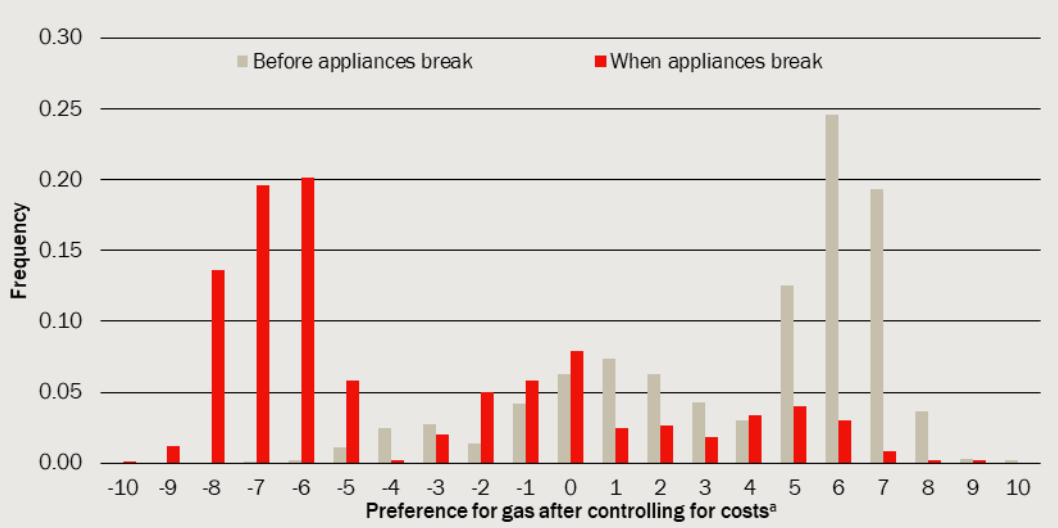
5.5 Choice model for appliance end-of-life disconnection

Parameter	Coef.	Z value
Fixed parameters		
Upfront cost ($)	-0.0020	-14.12
Running cost ($ p.a.)	-0.0056	-12.48
Upfront*Heater ($)	0.0015	11.29
Upfront*Cooktop ($)	0.0003	3.56
Upfront*Heater*Water*Cooktop ($)	-0.0002	-2.50
Upfront*Age 18-39 ($)	0.0002	4.01
Running*Heater ($)	0.0049	11.18
Running*Landlord ($)	0.0004	4.63
Gas*Heater	0.8387	1.99
Gas*Cooktop	1.4327	3.65
Gas*Landlord	0.7633	2.04
Gas*income $78k-$156k	-1.1151	-3.46
Gas*North Canberra	-1.0290	-2.12
Random parameter mean		
Gas (dummy =1 for gas appliance)	-5.2490	-10.97
Random parameter std. dev.		
Gas	5.2872	20.15

Source: CIE.

The distribution over respondents of the effective coefficient on the 'Gas' dummy variable, taking account of the respondent-specific posterior estimate for the random parameter as well as the interactions with respondent characteristic variables, is shown for both models in figure 5.6. A larger positive number indicates a strong preference for a gas appliance (or, in the case of a pre-emptive replacement, a reluctance to replace pre-emptively). It reflects the preferences discussed in the overview of residential choice: that most households will wait until appliances break, but when appliances do break, most households have a preference to replace with electric appliances.

5.6 Preference for gas after controlling for costs



[a] The reduced form coefficient on the 'Gas' dummy variable including both interactions between *Gas* and respondent characteristics and the respondent-specific random parameter estimates.

Data source: CIE analysis

Debriefing questions

Given the relative complexity of DCE questions, it is important to check that respondents understood what was being asked of them.

Respondents generally indicated they comprehended the questions, with 9 per cent disagreeing with the statement 'I understood the questions' and 8 per cent disagreeing with the statement 'I had enough information to give my impression' (table 5.7).

Around 18 per cent of respondents felt that at least one of the options presented to them was not realistic. This is understandable, since we asked about hypothetical scenarios with large changes in costs. However, slightly over half of this group (or 10 per cent of the total sample) was unable to suspend their disbelief and assumed different costs and savings to those shown in the choice problem they found unrealistic. This means there is uncertainty over the relationship between choices and costs for a small segment of the data set. We chose to retain these respondents in the model, since it is possible that finding options unrealistic is related to consumer preferences (for example, respondents with a strong ideological position on the energy transition may have reacted to scenarios showing their preferred fuel type as expensive relative to their expectations) and excluding the respondents would bias the sample.

5.7 Responses to debriefing questions

	Unweighted sample	Unweighted sample
	Count	Per cent
I understood the questions		
1 (strongly disagree)	101	5.36

	Unweighted sample	Unweighted sample
	Count	Per cent
2	64	3.40
3	191	10.13
4	602	31.94
5 (strongly agree)	927	49.18
Total	**1885**	**100.00**
I had enough information to give my impression		
1 (strongly disagree)	58	3.08
2	88	4.67
3	289	15.33
4	705	37.40
5 (strongly agree)	745	39.52
Total	**1885**	**100.00**
The options were realistic		
1 (strongly disagree)	141	7.48
2	200	10.61
3	625	33.16
4	572	30.34
5 (strongly agree)	347	18.41
Total	**1885**	**100.00**

Source: CIE.

6 Residential disconnections forecast

This chapter sets out a forecast of residential gas disconnections based on the statistical model developed in Chapter 5 and shows how the forecast varies across customer segments.

Forecasting model structure

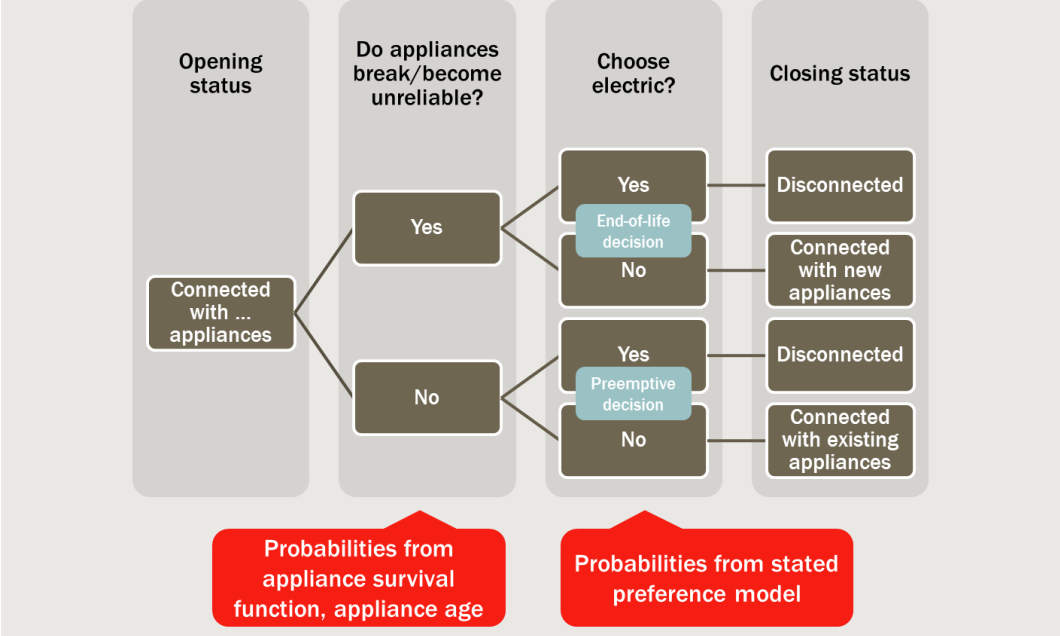
The forecasting model operates at the customer level for the 1885 Evoenergy customers who completed the discrete choice experiment, with sampling weights applied to adjust for under- and over-sampling of some household characteristics (discussed further below). It estimates the probability of electrification in 75 400 different choice situations defined by:

- the two decision types — pre-emptive or appliance EOL
- 1885 customers, accounting for individual preferences, appliance types, and a range of household characteristics influencing appliance usage and replacement cost, and
- 20 years.

These modelled decisions are used to estimate the statistical expectation of the number of customers with each of three types of status each year (figure 6.1):

- Connected with existing appliances (all sampled customers have this status at the opening of year 1)
- Connected with new gas appliances, or
- Disconnected.

6.1 The decisions modelled for each sampled customer in each year



Data source: CIE

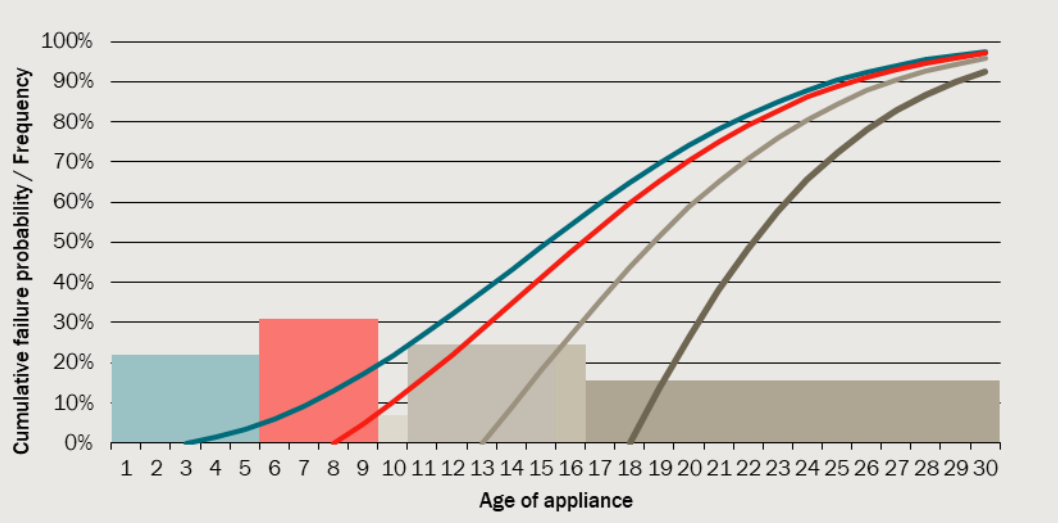
The likelihoods of changes in connection status were estimated as:

- Pr. Preemptive Existing to Disconnected$_t$ = Pr. Opening status 'Existing'$_t$ * (1 – Pr.EOL$_t$|t) * Pr.Electric$_t$
- Pr. EOL Existing to Disconnected$_t$ = Pr. Opening status 'Existing'$_t$ * Pr.EOL$_t$|t * Pr.Electric$_t$
- Pr. Preemptive New to Disconnected$_t$ = Pr. Opening status 'New'$_t$ * (1 – Pr.EOL$_t$|t) * Pr.Electric$_t$
- Pr. EOL New to Disconnected$_t$ = Pr. Opening status 'New'$_t$ * Pr.EOL$_t$|t * Pr.Electric$_t$
- Pr. EOL Existing to New$_t$ = Pr. Opening status 'Existing'$_t$ * Pr.EOL$_t$|t * (1 - Pr.Electric$_t$)

The probability that appliances reach EOL in a given year for a given respondent is a function of the age of the respondent's most costly appliance and an assumed appliance survival function based on UN e-waste statistics (a Weibull function with parameters 2.47 and 18.04, which represents an average life of 16 years).[15] Maximum end of life is set to 2045. Figure 6.2 shows the frequency of appliances within age ranges as reported in the survey and our assumed cumulative probability of failure for each of those cohorts of appliances as they age.

15 Forti, V., Baldé, K. and Kuehr, R., 2018. E-waste statistics: guidelines on classifications, reporting and indicators. Annex 2, UNU key 0103.

6.2 Assumed appliance survival function and distribution of appliance age



Note: Columns represent a histogram of the age of gas appliances in Evoenergy's network. The lines represent conditional cumulative failure probabilities as those appliances age from today.

Data source: CIE elasticity study survey; CIE calculations.

The probability that a given respondent chooses to electrify in a given year is predicted using the mixed MNL models set out in Chapter 5. That model depends on the upfront and running costs of gas and electric appliance alternatives. Our assumptions for those costs are set out in Appendix E. They account for:

- Gas prices, including the impact of the demand forecast on network prices, and including the potential to avoid the fixed charge by disconnecting
- Electricity prices, including the impact of rooftop solar
- Appliance and installation costs
- Electrification rebates
- The cost of three-phase power supply upgrades
- Differences in consumption across types of gas appliances, new and existing gas appliances, dwelling structure type, and the amount of time households spend at home
- The availability of an interest-free loan to eligible households
- The cost of the gas disconnection fee.

The running cost depends in part on gas network prices, which themselves depend on the demand forecast. This model includes an iterative process to deal with this feedback loop. The level of network prices is repeatedly adjusted until Evoenergy's forecast revenue equals its revenue requirement in present value terms over the next four access arrangement periods.

The statistical expectation of the number of customers in the disconnected status category in each year was used to construct an index. Estimated gas consumption from connected customers was estimated based on each respondent's characteristics and was used to generate a similar index for average consumption per connected-and-consuming residential customer. Sampling weights were used in the construction of the indices to account for under- and over-sampling of structure type and tenure type (owner-occupier

vs landlord) to ensure more accurate generalisation to the customer base. These weights ranged from 0.67 to 2.87.

This forecast is not intended to be a comprehensive forecast of gas demand, but rather a forecast of the timing of disconnection for the existing gas customer base. The gas demand drivers that are and are not factored into this forecast are noted in table 6.3. These drivers will need to be considered when utilising this disconnections forecast within a more comprehensive forecast of gas demand in Evoenergy's network.

6.3 Drivers of residential gas demand factored into this model

Measure of demand	Drivers not factored into this model	Drivers that are factored into this model
Number of customers	▪ The level of population growth (in NSW only, since Government policy has prohibited new gas network connections in the ACT from 8 December 2023.[a])	▪ The rate at which gas appliances need replacement, which depends on the age and condition of existing appliances. ▪ Alternative energy sources (and their prices) available to customers for heating, cooking and hot water. ▪ Prices of being connected to and using gas. ▪ Other government policies to encourage electrification, including rebates and interest-free loans. ▪ Customer preferences relating to environmental impacts of gas and alternative fuels.
The amount of gas consumed by each customer	▪ Changes in expected weather over time. ▪ The gas appliances, dwelling structures, and building energy efficiency of new connections. ▪ Short-term changes in usage (e.g. changing the heater thermostat) in response to changes in prices of gas and substitutes, such as electricity or bottled liquid petroleum gas, and economic conditions, such as changes in real income.	▪ The mix of gas appliances used by customers remaining on the network. ▪ The mix of dwelling structures of customers remaining on the network. Apartments and houses use different amounts of gas on average.

[a] ACT Government. 30 November 2023. Regulation to prevent new gas connections starts in December. Available at: https://www.cmtedd.act.gov.au/open_government/inform/act_government_media_releases/rattenbury/2023/regulation-to-prevent-new-gas-connections-starts-in-december#:~:text=A%20regulation%20to%20prevent%20new,to%20transition%20off%20fossil%20fuels.

Source: CIE

Other adjustments

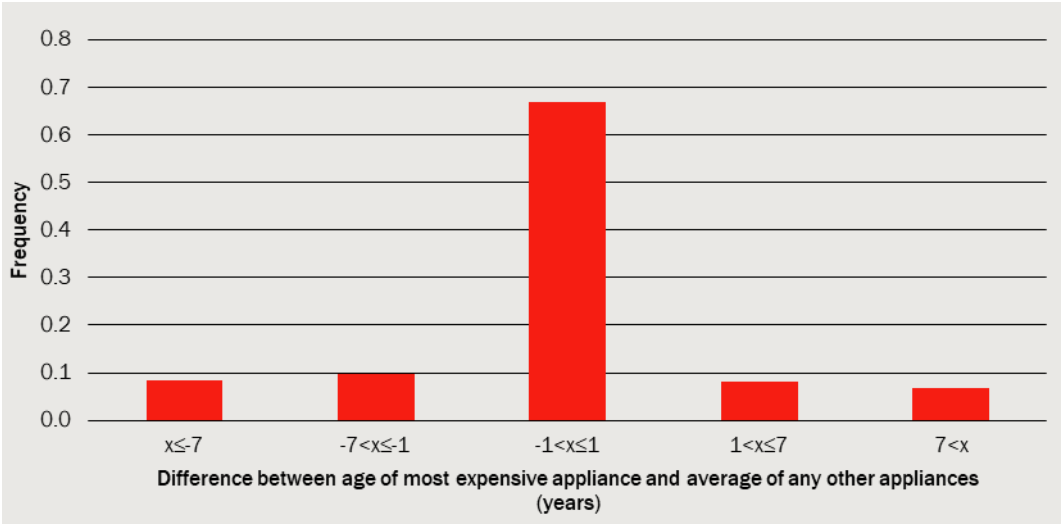
We assume a policy ban on gas appliance installation from 2030. This means that all EOL choices after 2030 are assumed to be electric.

We assume delays in pre-emptive disconnection based on two questions. The first question asked respondents, immediately after the pre-emptive choice question, about the likely timeframe for disconnection. A second question asked respondents, towards the end of the survey, whether past experience suggests they may take longer than intended to complete similar projects and how much longer this might be. The average delay

across the sample was around 3.3 years, but this varied at the customer level from no delay to 10 years.

An additional delay of two years was also applied to both pre-emptive and EOL disconnections for households with multiple gas appliances. A simplifying assumption of the model is that all gas appliances are treated as a group and the EOL probabilities are based on the age and survival curve of the most expensive appliance a household owns. This means that when the most expensive appliance fails, all other appliances are assumed to fail at the same time. Appliances within a household are likely to fail within a few years of each other, since the ages of the most expensive appliances and all other appliances are very similar for most respondents (chart 6.4). Furthermore, the share of customers whose most-expensive appliance is younger than their other appliances is similar to the share of customers whose most-expensive appliance is older than their other appliances. We judge a two-year delay to be a reasonable assumption for the average staging of disconnection relative to the failure of the most-expensive appliance.

6.4 Difference between age of most expensive appliance and average age of any other appliances



Data source: CIE

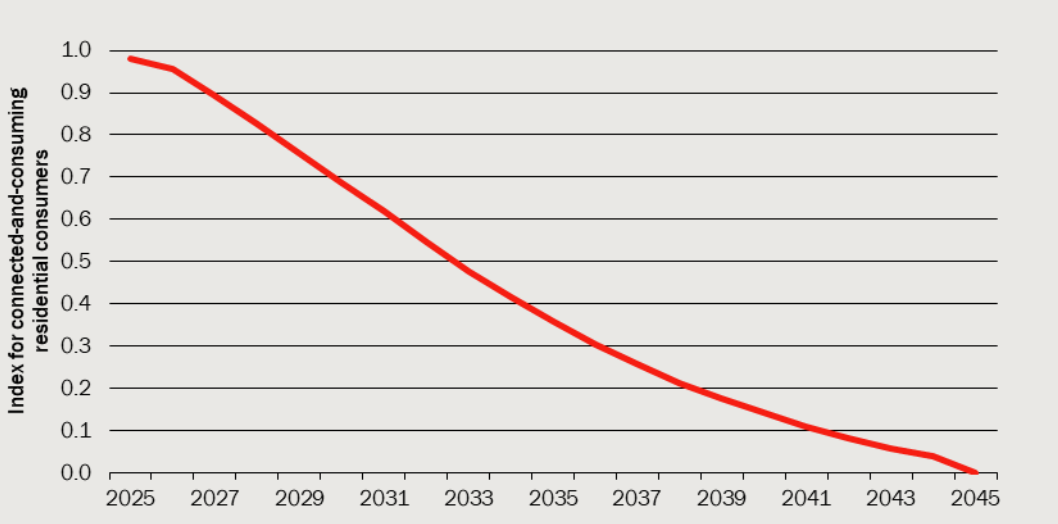
Forecasting model results

The result of this modelling is illustrated in chart 6.5 and table 6.6. The model predicts 38 per cent of customers existing at the end of the 2024 financial year will have disconnected by the end of 2031. Some of the noteworthy drivers of this outcome are:

- the fact that half of gas appliances in the survey sample are more than 10 years old and the assumption of a survival curve with an average appliance life of 16 years mean that almost half of appliances are expected to reach end of life by the end of FY 2031
- the choice model estimated on survey data indicates most households will switch to electric appliances when this happens

- the choice model also indicates an additional 10 per cent of households will disconnect from gas 'pre-emptively' (before appliance failure) by 2031.

6.5 Index for forecast connected-and-consuming residential customers



Data source: CIE gas demand forecasting model

6.6 Index for forecast connected-and-consuming residential customers 2026-2031

	2026	2027	2028	2029	2030	2031
Index	0.95	0.89	0.83	0.75	0.69	0.62

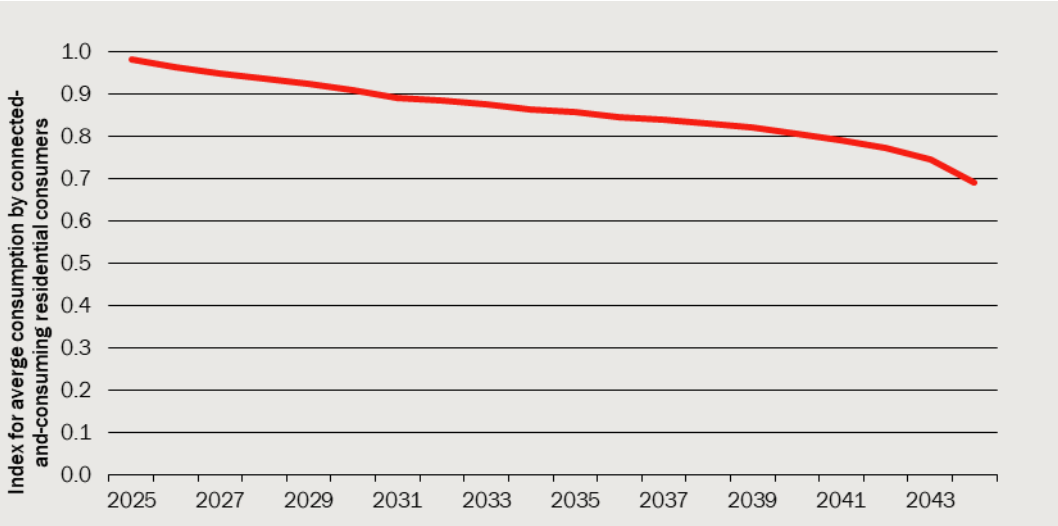
Source: CIE gas demand forecasting model

The forecasting model also produces an index for average consumption (figure 6.7), which captures two main effects:

- The change in the composition of the customer base from differing disconnection rates for customers of various sizes (in terms of gas usage), and
- For customers in the sample with multiple gas appliances, an assumption in the model that disconnection would involve a staged replacement of appliances for two years after the indicated disconnection date.

Note it does not account for changing climate over time, improving building energy efficiency, nor the usage response to changes in price (only the disconnection response to changes in price).

6.7 Forecast impact of appliance replacement and disconnection on average residential consumption



Data source: CIE demand forecasting model

The two forecasts are interdependent. If an assumption was made that staging of appliance replacement would take place over a longer period, it would increase forecast connections and decrease forecast average consumption per connection.

Results for segments of the customer base

The rate of forecast gas disconnections varies across customer segments. Table 6.8 shows how the forecast index of gas connections for various customer segments varies from the full-sample index that was shown in figure 6.5 and table 6.6. For example, the forecast index of gas connections for landlords (rented dwellings) is 5.5 per cent higher in FY 2031 than the forecast index for the full sample. That is, the forecast index for landlords is 0.654, compared to 0.619 for the full sample.

The results indicate that:

- Respondents recruited through the online panel are likely to disconnect sooner than respondents recruited through email by Evoenergy
- Middle-income households are likely to disconnect sooner than both low- and high-income households
- Households with decision makers aged over 60 are likely to disconnect sooner than households with younger decision makers
- Owner-occupied households are likely to disconnect sooner than rented dwellings
- Disconnection rates are likely to be highest in North Canberra and Belconnen and lowest in Woden Valley and, especially, Queanbeyan (i.e. the NSW component of the network).

6.8 Difference in forecast connections relative to full sample by customer segment

	FY 2031	FY 2036	FY 2041
	per cent	per cent	per cent
Sample: Panel	-3.5	-8.0	-9.1
Sample: Email	1.6	3.7	4.2
Income: <$78k pa	0.7	0.9	-1.7
Income: $78k - $156k pa	-4.7	-8.3	-11.2
Income: >$156k pa	0.7	0.9	2.4
Age: 18-39	0.7	0.5	0.5
Age: 40-59	2.3	2.9	4.1
Age: 60+	-2.3	-2.7	-3.7
Tenure: Landlord	5.5	7.4	10.4
Tenure: Owner occupier	-1.9	-2.5	-3.6
Language: Non-English	-1.0	-0.8	-0.7
Language: English only	0.2	0.2	0.1
Location: Tuggeranong	-1.5	-2.2	-3.1
Location: Belconnen	-4.9	-8.2	-11.7
Location: Weston Creek	-1.5	-1.1	-5.1
Location: Woden Valley	6.9	12.8	18.8
Location: South Canberra	4.9	7.5	7.8
Location: North Canberra	-7.2	-12.8	-15.5
Location: Gungahlin	0.6	-0.7	0.0
Location: Queanbeyan	19.2	34.4	47.3

Source: CIE analysis

Note these estimates do not control for correlation between the indicated characteristic and other characteristics. We are not seeking to identify a causal relationship between characteristics and preferences, but rather to identify how preferences vary when the customer base is segmented in different ways. This means, for example, that households in North Canberra have a higher forecast disconnection rate than other locations, but it does not necessarily mean that households in North Canberra would disconnect sooner than a hypothetical set of households in Tuggeranong with income, age, tenure type, dwelling structure, and gas appliances identical to those in North Canberra.

7 *Price elasticity of demand for residential gas connections*

This chapter uses the forecasting model set out in Chapter 6 to estimate the price elasticity of demand for residential gas connections by timeframe and by customer segment.

A baseline was set assuming gas network prices are held constant in real terms from 2025/26. Alternative scenarios were based on various levels of one-off (permanent) real increase in gas network prices in 2025/26.

The results indicate demand for residential gas connections is relatively inelastic (table 7.1). A 10 per cent increase in retail gas prices leads to a 0.2 per cent decrease in residential gas connections in 2031 relative to a baseline forecast with no price increase. This is consistent with the overview of preferences discussed in Chapter 5, which showed less than half of consumers would change their fuel choice in response to changes in relative prices, at least for the range of prices used in this study.

Elasticity increases with the period of time over which the response to a permanent increase in prices is measured. The retail price elasticity of demand for connections increases from around -0.022 for the response to 2031, to -0.045 for the response to 2036, and to -0.061 for the long-term response to 2041.

The long-term price elasticity of gas consumption (associated with appliance replacement, as distinct from the short-term elasticity associated with adjusting heater thermostats, for example) is lower than the price elasticity of connections. This result suggests that smaller users' demand is more elastic than that of larger users. In the baseline forecast, residential consumption reduces more quickly than residential connections, suggesting larger users are more likely to disconnect sooner in the baseline scenario. When prices increase, it appears smaller user disconnections are brought forward more than larger user disconnections, potentially because they have greater scope to do so, given their slower baseline disconnection forecast.

7.1 Estimated price elasticity of demand for residential gas connections

	Price change			Connections			Consumption		
Financial year in which demand response is measured	**2031**	**2036**	**2041**	**2031**	**2036**	**2041**	**2031**	**2036**	**2041**
	per cent	per cent	per cent	elasticity	elasticity	elasticity	elasticity	elasticity	elasticity
Network price elasticity									
Scenario 1	10.0	10.0	10.0	-0.007	-0.014	-0.018	-0.005	-0.010	-0.013
Scenario 2	100.0	100.0	100.0	-0.007	-0.014	-0.019	-0.005	-0.010	-0.014
Scenario 3	300.0	300.0	300.0	-0.007	-0.015	-0.020	-0.005	-0.011	-0.014
Retail price elasticity									
Scenario 1	3.2	3.1	3.0	-0.021	-0.044	-0.060	-0.015	-0.033	-0.044
Scenario 2	31.5	30.9	30.4	-0.022	-0.045	-0.061	-0.016	-0.033	-0.045
Scenario 3	94.5	92.6	91.1	-0.023	-0.048	-0.064	-0.016	-0.034	-0.046

Note: Elasticity is the percentage change in demand over the percentage change in price.

Source: CIE analysis

Analysis of elasticity of demand for gas connections by customer segment (table 7.2) indicates that:

- Respondents recruited through the online panel are more responsive to price than respondents recruited by email from Evoenergy
- Higher-income households are more responsive to price than lower-income households
- Younger households are more responsive to price than older households
- Households in North Canberra are more responsive to price than households in South Canberra or Tuggeranong.

7.2 Gas retail price elasticity of demand for residential gas connections, by customer segment

	2031	2036	2041
Sample: Panel			
Elasticity	-0.025	-0.055	-0.074
Difference to sample (per cent)	13.2	20.8	20.1
Sample: Email			
Elasticity	-0.021	-0.042	-0.056
Difference to sample (per cent)	-5.8	-8.5	-8.1
Income: <$78k pa			
Elasticity	-0.022	-0.041	-0.064
Difference to sample (per cent)	-0.6	-8.7	5.0
Income: $78k - $156k pa			
Elasticity	-0.019	-0.048	-0.068
Difference to sample (per cent)	-13.3	6.3	10.5
Income: >$156k pa			
Elasticity	-0.028	-0.055	-0.069
Difference to sample (per cent)	28.5	21.1	12.0
Age: 18-39			
Elasticity	-0.026	-0.056	-0.072
Difference to sample (per cent)	20.0	22.8	16.6
Age: 40-59			
Elasticity	-0.025	-0.052	-0.070
Difference to sample (per cent)	15.9	14.6	13.5
Age: 60+			
Elasticity	-0.016	-0.034	-0.048
Difference to sample (per cent)	-25.4	-26.1	-21.9
Tenure: Landlord			

	2031	2036	2041
Elasticity	-0.023	-0.044	-0.060
Difference to sample (per cent)	3.2	-3.2	-2.2
Tenure: Owner occupier			
Elasticity	-0.022	-0.046	-0.062
Difference to sample (per cent)	-1.2	1.2	0.9
Language: Non-English			
Elasticity	-0.024	-0.045	-0.062
Difference to sample (per cent)	8.8	-0.2	1.8
Language: English only			
Elasticity	-0.021	-0.045	-0.061
Difference to sample (per cent)	-1.7	0.0	-0.3
Location: Tuggeranong			
Elasticity	-0.017	-0.038	-0.060
Difference to sample (per cent)	-23.1	-15.4	-1.7
Location: Belconnen			
Elasticity	-0.021	-0.050	-0.062
Difference to sample (per cent)	-5.8	9.1	1.6
Location: Weston Creek			
Elasticity	-0.023	-0.042	-0.058
Difference to sample (per cent)	5.9	-7.8	-5.5
Location: Woden Valley			
Elasticity	-0.022	-0.051	-0.069
Difference to sample (per cent)	2.2	11.7	12.4
Location: South Canberra			
Elasticity	-0.017	-0.042	-0.055
Difference to sample (per cent)	-20.8	-7.1	-9.9
Location: North Canberra			
Elasticity	-0.027	-0.051	-0.071
Difference to sample (per cent)	21.6	12.5	15.5
Location: Gungahlin			
Elasticity	-0.026	-0.048	-0.059
Difference to sample (per cent)	21.1	6.1	-4.5
Location: Queanbeyan			
Elasticity	-0.022	-0.041	-0.060
Difference to sample (per cent)	0.4	-8.9	-1.6

Source: CIE analysis

All of the elasticity estimates discussed above relate to gas prices, which impact appliance running costs. Consumers also respond to changes in upfront costs. A scenario was tested in which the assumed government rebates were doubled. That is, the rebates for heaters for small dwellings were assumed to increase from $1750 to $3500, the rebates for hot water systems for medium and large dwellings were assumed to increase from $1500 to $3000, and the rebates for heaters for medium and large dwellings were assumed to increase from $3000 to $6000. These changes reduced the residential connections forecast for 2031 by 3.3 per cent. The forecast for 2036 decreased by 5.2 per cent and the forecast for 2041 decreased by 7.1 per cent.

8 Non-residential disconnections forecast

This chapter sets out a forecast of non-residential gas disconnections, including measures of price elasticity.

Commercial disconnections forecast

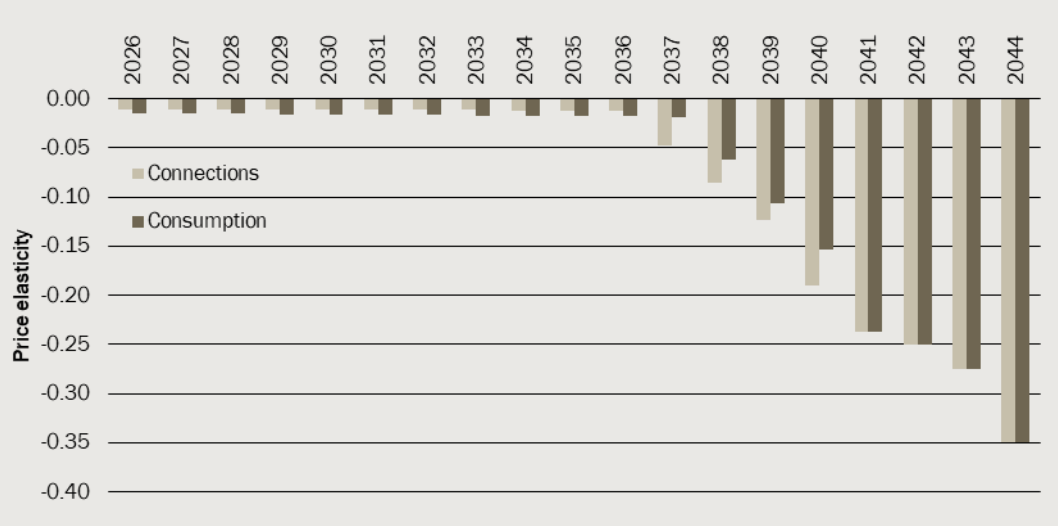
The commercial model was much simpler than the residential model, as it was based on a survey that was necessarily shorter and less detailed. It involved establishing a baseline forecast and a price response.

Based on the survey results, we assume a baseline 1.1 per cent disconnection rate per year until 2040 and a 16.7 per cent disconnection rate between 2040 and 2045. These rates assume disconnections will be uniformly distributed between now and 2045 for the 22 per cent of commercial customers who indicated they are intending to fully disconnect from gas. Disconnections for the remaining 78 per cent are distributed between 2040 and 2045.

Baseline average consumption per customer is forecast to decline by around 0.5 per cent per year based on 11 per cent of survey respondents indicating they would switch half of their gas usage to electric usage by 2045 and 7 per cent indicating they would switch three quarters of their usage.

For some customers, the timing of switching was dependent on prices. The survey question asked about the degree to which disconnection would be brought forward by a doubling in gas retail prices. The implied price elasticities of connection and consumption are shown in figure 8.1. These elasticities were used to estimate commercial customers' price response to forecast changes in gas prices.

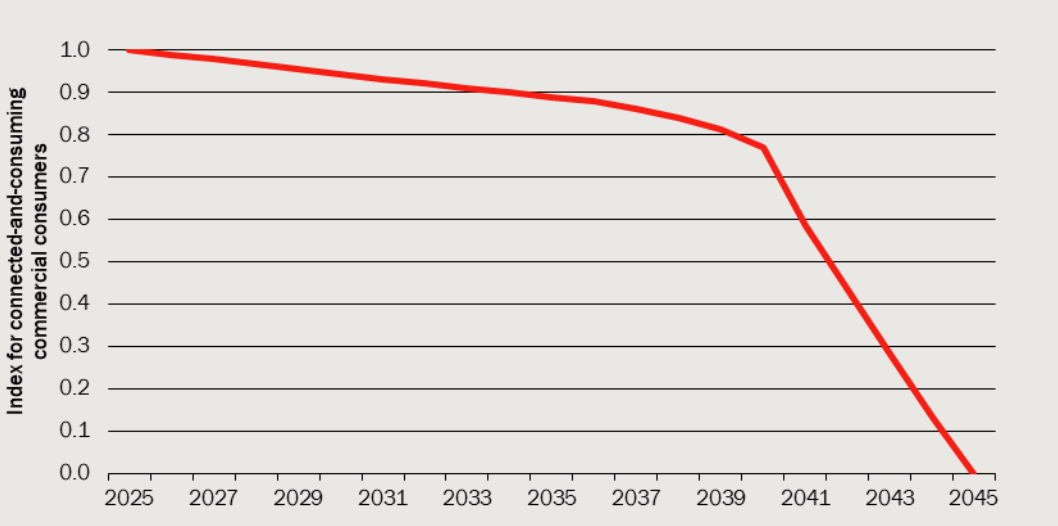
8.1 Effective long-term price elasticity of commercial gas demand



Data source: CIE

Based on these assumptions, and the gas price forecast set out in Appendix E, the forecast proportion of existing connected-and-consuming who will remain consuming is shown for each year to 2045 in figure 8.2. Table 8.3 shows the decrease over the 2026 access arrangement period is around 1.1 per cent per year.

8.2 Forecast connected-and-consuming commercial customers



Data source: CIE demand forecasting model

8.3 Index for forecast connected-and-consuming commercial customers 2026-2031

	2026	2027	2028	2029	2030	2031
Index	0.989	0.978	0.967	0.955	0.944	0.932

Source: CIE gas demand forecasting model

The model also produces an index for average consumption, which captures the indications given by commercial survey respondents about the reductions in gas usage they expect to make without fully disconnecting (table 8.4).

8.4 Index for forecast average usage per connected-and-consuming commercial customer 2026-2031

	2026	2027	2028	2029	2030	2031
Index	0.995	0.991	0.986	0.981	0.975	0.970

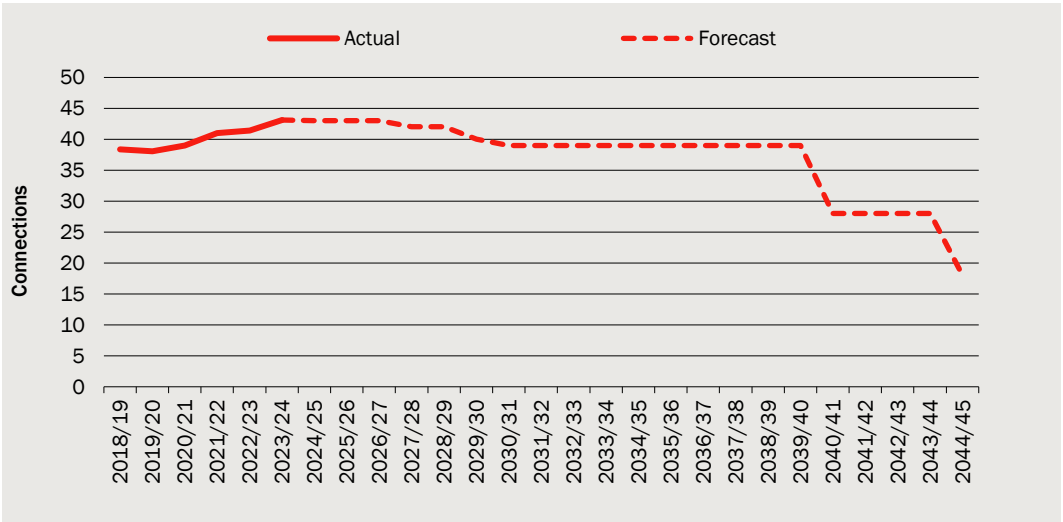
Source: CIE gas demand forecasting model

Tariff D disconnections forecast

Tariff D disconnection and consumption forecasts are made at a customer level and are not detailed in this report due to confidentiality of individual customer data.

There are four customers expected to disconnect or move off the demand tariff by 2031 (chart 8.5). A further four customers expect to reduce their gas usage by 50 per cent or more by 2031 and a further eight customers expect to reduce their gas usage by around one quarter by 2031, as part of staged projects (for example to electrify buildings as they are renovated or redeveloped). The estimated impact of gas price increases on the timing of Tariff D customer usage reductions is very limited, with the forecast gas price increases in Appendix E estimated to reduce 2031 Tariff D consumption by just 0.07 per cent.

8.5 Actual and forecast Tariff D connections



Data source: CIE analysis

A Residential in-depth interview questions

- How long did the questionnaire take to complete?
- Were there any parts of the survey that were confusing or unclear?
- Which questions did you need to stop and think most about?
- Were the questions about appliance replacement difficult to answer?
- How do you think about gas appliance replacement? Will you go electric at some point? When do you think that will be? What circumstances might cause you to delay or bring forward?
- The costs and cost savings vary a lot between questions. Were you able to imagine what you would do?
- Did you find any of the cost levels implausible? If so, how did you go about answering the question?
- How did you feel towards the end of the appliance replacement questions? e.g. were you bored of the repetition? Without an interviewer present, would you have dropped out of the survey?
- Do financials affect the timing of when you will replace appliances? Or is it mainly about other factors?
- We asked about gas appliances as a group. Do you want to take different approaches for different appliances and find you weren't able to express that?
- Did you find you were picking the same answers under each of the four cost scenarios? What would it take to see you change the timing of your appliance replacement?
- Did the questionnaire seem neutral and factual (i.e. not biased or leading)?

B Residential questionnaire

Welcome

Thank you for participating in this survey, which is being run by Pureprofile and The Centre for International Economics on behalf of Evoenergy. Evoenergy owns and operates the electricity and gas distribution networks in ACT and surrounding NSW. This survey is about your household's future energy needs. Your input is very important and will help inform the way energy is provided.

The length of the questionnaire depends on your household type and will take up to 15 minutes to complete.

CLIENT LINK VERSION ONLY By participating, you could go into the draw to win one of five $400 Australia Post Mastercard gift cards. (Please note, to enter the draw, you would need to provide contact details for the purpose of contacting prize winners.)

To confirm this is genuine market research being conducted by Evoenergy, visit this page: <URL>. Your survey responses will be anonymous in reporting to Evoenergy.

In the unlikely event of any technical difficulties please click on the technical support e-mail link.

Please keep in mind…

Do not use your Back or Forward browser buttons while you are taking this survey. Once you answer a question, you will not be able to go back and change your answer.

Before we go through to the main study, we would like to ask you some questions to make sure we are surveying a good cross section of people.

1. Do you or a member of your household work for Evoenergy?
    a. Yes TERMINATE
    b. No
2. What is the postcode of your home address? TERMINATE IF OUTSIDE A.C.T., Queanbeyan (2620) and Bungendore (2621)
3. What is your age?
    a. Less than 18 years TERMINATE
    b. 18-29 years
    c. 30-39 years
    d. 40-49 years
    e. 50-59 years
    f. 60-69 years

g. 70-79 years

h. 80 years or over

4. Do you own one or more investment properties in the ACT or Queanbeyan? (Includes mortgages and joint ownership)

a. Yes

b. No **SKIP TO Q6**

5. Does one or more of your investment properties use mains gas (e.g. for heating, hot water, or cooking)?

a. Yes

b. No

IF YES, SHOW TEXT BELOW AND SKIP TO Q13

This survey is about the energy needs in your investment property. If you have more than one investment property, answer for the property with the most gas appliances. We are planning for the future and want to understand:

- your current energy needs
- what your energy needs might look like in a few years' time

6. Do you own the dwelling you live in? (Includes mortgages and joint ownership)

a. Yes

b. No

7. Does your home use mains gas (e.g. for heating, hot water, or cooking)?

a. Yes

b. No **TERMINATE**

IF Q6=a, SHOW TEXT BELOW AND SKIP TO Q13

This survey is about the energy needs in your home. We are planning for the future and want to understand:

- your current energy needs
- what your energy needs might look like in a few years' time

BRANCH OF QUESTIONS FOR RENTERS

8. When choosing where to live, do you prefer a home with heating, hot water and cooktop running on electricity or gas?

   a. Electricity
   b. **Gas**
   c. **No preference**

9. When choosing where to live, which of the following factors are most important? **MULTIPLE RESPONSE**

   a. Running costs of heating, hot water and cooktop (energy bills)
   b. Type of heater (gas vs electric)
   c. Type of cooktop (gas burners vs induction vs other electric)
   d. Type of hot water (storage vs continuous)
   e. **Carbon emissions from heating, hot water and cooktop**

10. Over the past 12 months, have you used your gas appliances…

   a. Less than in previous years
   b. About the same as in previous years
   c. More than in previous years

11. **IF a ABOVE** What is the main reason you used your gas appliances less…

   a. Keeping gas bills down
   b. Fewer people at home
   c. At home less often
   d. Different home to previous years
   e. Other _____

12. If your annual gas bill increased by 50 per cent and electricity bills stayed about the same, would you… (select all that apply) **MULTIPLE RESPONSE**

   a. Contact your landlord about changing appliances

b. Contact your landlord about improving building energy efficiency (e.g. insulation)

c. Look for another home

d. Use gas appliances less (e.g. shorter showers, higher thermostat temperature)

e. Stop using gas appliances and use portable electric appliances instead

SKIP TO Q49 (if Q6=b and Q7=a)

13. Is your dwelling…

    a. A detached house — 3 or fewer bedrooms

    b. A detached house — 4 bedrooms

    c. A detached house — 5 or more bedrooms

    d. A townhouse, terrace, villa, unit or other semi-detached

    e. An apartment

14. Does your dwelling have solar panels?

    a. Yes

    b. No

    c. Don't know

15. IF NO ABOVE Are you planning to get solar panels for your dwelling?

    a. Yes, within the next 1-2 years

    b. Yes, in more than 2 years

    c. No

    d. Don't know

16. Are you likely to do major renovations to your dwelling within the next 2 years?

    a. Yes

    b. No

    c. Don't know

17. Are you likely to sell your dwelling within the next 2 years?

    a. Yes

    b. No

    c. Don't know

18. IF Q7=a Over the past 12 months, roughly how much has your household paid in gas bills? (Note most households get larger bills in winter than in summer)
    a. Less than $300
    b. Between $300 and $600
    c. Between $600 and $1000
    d. Between $1000 and $1500
    e. Between $1500 and $2000
    f. Between $2000 and $2500
    g. Between $2500 and $3000
    h. Between $3000 and $3500
    i. More than $3500
    j. Don't know
19. IF Q7=a How often is someone home during business hours? (We are asking to understand your energy needs)
    a. Almost all of the time
    b. Most of the time
    c. Around half of the time
    d. Some of the time
    e. Rarely
    f. Prefer not to say
20. Does your dwelling have… MULTIPLE RESPONSE
    a. Gas ducted heating (with vents in the floor or ceiling)
    b. Gas room heater
    c. Electric ducted reverse-cycle air conditioning (with vents in the floor or ceiling)
    d. Electric split system air conditioner (wall unit)
    e. Electric underfloor heating
    f. Wood combustion heater (fireplace)
    g. Gas hydronic heating (pipes/radiators)
    h. Electric hydronic heating (pipes/radiators)
    i. None of these
    j. Don't know

21. IF Q20=a or b Roughly, how old is your gas heater?
    a. Less than a year
    b. 1-5 years
    c. 6-10 years
    d. 11-15 years
    e. 16 years or more
    f. Don't know

22. IF Q20=a/b and Q7=a During winter this year I…
    a. Used the gas heater less than previous years because I used other heaters instead
    b. Used the gas heater less than previous years for other reasons
    c. Used the gas heater about the same as in previous years
    d. Used the gas heater more than previous years because I used other heaters less
    e. Used the gas heater more than previous years for other reasons
    f. Don't know

23. IF a,b ABOVE What was your main reason for using your heater less?
    a. To keep energy bills down
    b. Environmental concerns
    c. Fewer people at home/people at home less often
    d. Other _____

24. Does the hot water system in your dwelling mainly run on…
    a. Gas
    b. Electricity
    c. Solar
    d. None of these
    e. Don't know

25. IF a ABOVE Roughly, how old is your hot water system?
    a. Less than a year
    b. 1-5 years
    c. 6-10 years
    d. 11-15 years

e. 16 years or more

f. Don't know

26. Does the cooktop/stove in your dwelling mainly run on…

a. Gas

b. Electricity (including induction, ceramic, radiant coil, solid hotplate)

c. None of these

d. Don't know

SKIP TO Q50 IF NO GAS APPLIANCES SELECTED IN Q20, Q24, Q26

27. **IF Q26=a** Roughly, how old is your cooktop/stove?

a. Less than a year

b. 1-5 years

c. 6-10 years

d. 11-15 years

e. 16 years or more

f. Don't know

We are interested in:

- when you will replace your gas appliance(s), and
- whether you will replace them with gas or electric appliance(s).

There are lots of factors to consider when making these decisions. Sometimes people don't know about all of these factors until they start getting quotes for appliance replacements. For example:

- Depending on the amount of electricity you will be using at your property once you switch from gas, your electrician may let you know you will need to upgrade your electricity supply to a three-phase connection. This would typically cost between $2000 and $6000.
- If you switch all of your appliances from gas to electric, you can disconnect from gas. The cost of disconnecting is $977 for a permanent disconnection. If you disconnect, you will no longer pay the fixed charge for a gas connection, which could save around $238 per year, depending on your gas plan.

- ACT households can get rebates of up to $3000 off the cost of installing electric appliances. The ACT Government is also offering zero-interest loans of up to $15 000 over 10 years.
- The process of installing an appliance will typically include arranging a quote from one or more installers, deciding on the type of appliance, and arranging a day for a power supply upgrade, if needed, and a day for installation. If you are having a ducted system installed, tradespersons may require access to every room of the dwelling.

28. What are the most important factors to you, when thinking about how and when to replace appliances? **MULTIPLE RESPONSE. ROTATE.**

    a. Total cost over time (including all upfront costs, maintenance and ongoing energy bills)
    b. Affordability of upfront costs
    c. Impacts from the process (e.g. disruption, arranging tradespeople, etc.)
    d. Potential renovations or extensions
    e. Length of time I expect to own the dwelling
    f. Environmental concerns
    g. Uncertainty over future gas prices
    h. Uncertainty over future availability of gas
    i. Uncertainty over future electricity prices
    j. Uncertainty over future electricity reliability
    k. Quality/performance of appliances
    l. Other _____

29. Some people have switched all their gas appliances for new electric appliances, without waiting for their gas appliances to break. How likely are you to do this?

    a. I definitely will switch before they break
    b. I probably will switch before they break
    c. Unsure/Don't know
    d. I probably will wait until they break
    e. I definitely will wait until they break

30. IF a,b ABOVE And when do you think you will do this appliance replacement?
    a. Next year or sooner
    b. in 2 years
    c. in 3-4 years
    d. in 5 years or more

<page break>

We're going to ask some more questions about how and when you are likely to replace your gas appliance(s). When answering these questions, please remember:

- Q13 = d,e If appliances are owned by your body corporate, please assume the costs and cost savings are the share you would receive through energy bills and body corporate fees. Answer as you would vote in a body corporate meeting.
- Q5=a Although it may be your tenants rather than yourself benefiting from running cost savings in the short term, consider the possibility that the dwelling will attract higher rents in the medium term after appliance replacement.
- Research has shown that decisions like appliance replacement tend to take longer than people say they will in surveys. Please bear this in mind and try to be realistic about how soon you will replace appliances, taking account of all of the potential practical challenges (e.g. disruption from installation works) and your other priorities.

<page break>

Based on what you've told us about your dwelling and appliances, we have estimated the:

- upfront costs of appliance replacement (including appliance costs, installation costs, power supply upgrades, gas disconnection fees, and government rebates)
- running costs of existing and replacement appliances (including new appliance efficiency and expectations about future gas and electricity prices)

To estimate these costs, we have made assumptions about future energy prices and government rebates.

The ACT Government is planning for all households to switch off gas by 2045. The way gas prices and rebates will change over time is uncertain. So, we want to ask you about a few different scenarios.

HIDDEN QUESTIONS – SELECT BLOCK, RANDOMISE QUESTION SEQUENCE

Consider a scenario with these estimated costs:

Insert table — **SHOW TABLE FOR RELEVANT BLOCK & QUESTION**

31. Considering these costs and other factors you care about, how likely would you be to switch all of your gas appliances for new electric appliances before they break?
    a. I definitely would switch
    b. I probably would switch
    c. Unsure/Don't know
    d. I probably would not switch
    e. I definitely would not switch

32. **IF a,b ABOVE** And when do you think you would do this appliance replacement?
    a. Next year or sooner
    b. in 2 years
    c. in 3-4 years
    d. in 5 years or more

33. If your appliances break or become unreliable before you switch, would you choose to replace them with gas or electric appliances?

    Insert choice task — **matched to table shown above**

<page break>

What if prices and rebates were different? We want to ask you about three other scenarios. These questions look similar to the questions you just answered, but the numbers change. Please pay attention to these.

We are not trying to test you or get a specific response. We just want to know how different increases in gas bills and rebates might affect how and when you replace your appliances.

<page break>

Consider a scenario with these estimated costs:

Insert table — SHOW TABLE FOR RELEVANT BLOCK & QUESTION

34. Considering these costs and other factors you care about, how likely would you be to switch all of your gas appliances for new electric appliances before they break?
    a. I definitely would switch
    b. I probably would switch
    c. Unsure/Don't know
    d. I probably would not switch
    e. I definitely would not switch

35. IF a,b ABOVE And when do you think you would do this appliance replacement?
    a. Next year or sooner
    b. in 2 years
    c. in 3-4 years
    d. in 5 years or more

36. If your appliances break or become unreliable before you switch, would you choose to replace them with gas or electric appliances?

    Insert choice task — matched to table shown above

Consider a scenario with these estimated costs:

Insert table — SHOW TABLE FOR RELEVANT BLOCK & QUESTION

37. Considering these costs and other factors you care about, how likely would you be to switch all of your gas appliances for new electric appliances before they break?

a. I definitely would switch
b. I probably would switch
c. Unsure/Don't know
d. I probably would not switch
e. I definitely would not switch

38. **IF a,b ABOVE** And when do you think you would do this appliance replacement?
    a. Next year or sooner
    b. in 2 years
    c. in 3-4 years
    d. in 5 years or more

39. If your appliances break or become unreliable before you switch, would you choose to replace them with gas or electric appliances?

    Insert choice task — **matched to table shown above**

Consider a scenario with these estimated costs:

Insert table — **SHOW TABLE FOR RELEVANT BLOCK & QUESTION**

40. Considering these costs and other factors you care about, how likely would you be to switch all of your gas appliances for new electric appliances before they break?
    a. I definitely would switch
    b. I probably would switch
    c. Unsure/Don't know
    d. I probably would not switch
    e. I definitely would not switch

41. **IF a,b ABOVE** And when do you think you would do this appliance replacement?
    a. Next year or sooner

b. in 2 years

c. in 3-4 years

d. in 5 years or more

42. If your appliances break or become unreliable before you switch, would you choose to replace them with gas or electric appliances?

    Insert choice task — **matched to table shown above**

43. **IF c-e in Q29, Q31, Q34, Q37 AND Q40** Your responses indicate you are unlikely to switch away from gas appliances while they are still working. Would you switch to electric appliances if financial incentives were large enough?

    a. Yes

    b. No

44. **IF Q43=a** Please provide an example of a financial incentive that would lead you to choose electric appliances.

    a. _____ **ALLOW TEXT**

45. **IF Q43=b** What is the main reason you would keep using your gas appliances when it is more expensive than switching to electric appliances?

    a. _____ **ALLOW TEXT**

46. Thinking about the questions in this survey about appliance replacement, to what extent do you agree with the following statements on a scale from 1 (strongly disagree) to 5 (strongly agree)? **CAROUSEL**

    a) I understood the questions

    b) I had enough information to give my impression

    c) The cost scenarios were plausible

47. **IF Qc) c<3** How did you answer when you saw a scenario that was not plausible?

    a. I imagined the scenario was plausible

    b. I assumed different costs than those shown

48. IF Q31=a,b, OR Q34=a,b, OR Q37=a,b, OR Q40=a,b Thinking about how long you have taken to get around to previous home modifications, is there a chance you will take longer to replace appliances than you have stated in this survey?
    a. No, I am confident in my estimates
    b. There's a good chance it will take up to 2 years longer than I stated
    c. There's a good chance it will take up to 5 years longer than I stated

49. Before today, were you aware of the ACT Government plan to phase out gas by 2045?
    a. Yes
    b. No

50. Are you aware that connecting new dwellings to gas is now banned in the ACT?
    a. Yes
    b. No

Finally, a few questions about your household.

51. Do you speak a language other than English at home?
    a. Yes
    b. No, English only

52. Which of the following best describes your household?
    a. Couple without children at home
    b. Couple with one child at home
    c. Couple with two or more children at home
    d. Single parent with one child at home
    e. Single parent with two or more children at home
    f. Multiple family household
    g. Group or shared household
    h. Single person household

i. Other

53. What is your annual personal IF g ABOVE household OTHERWISE income before tax and superannuation are taken out?
    a. Less than $41,600 per year (less than $800 per week)
    b. $41,600 - $78,000 per year ($800 - $1,500 per week)
    c. $78,000 - $104,000 per year ($1,500 - $2,000 per week)
    d. $104,000 - $156,000 per year ($2,000 - $3,000 per week)
    e. $156,000 - $208,000 per year ($3,000 - $4,000 per week)
    f. More than $208,000 per year (more than $4,000 per week)
    g. Do not wish to answer.

54. Have you used a payment plan or other financial hardship arrangements offered by your electricity or gas retailer at any time in the past five years?
    a. Yes
    b. No
    c. Prefer not to say

55. CLIENT LINK VERSION ONLY Would you be happy to provide an email address or phone number we could use to contact you if you are drawn as a winner of one of five $400 Australia Post Mastercard gift cards?
    a. Yes
    b. No

56. IF YES ABOVE Please provide your contact details below. These will be used only for the purpose of administering the prize draw for this survey.
    a. Name _____
    b. Phone _____
    c. Email _____
    d. I do not wish to enter the prize draw: Yes/No

    REQUIRE RESPONSE TO a&b and d OR a&c and d

57. Thank you for your responses to this survey. Finally, is there any feedback you would like to provide on this survey? **NOT MANDATORY**

_____
_____
_____
_____

Thank you for participating in this survey. Your opinions are very important.

To keep up to date with survey findings and how they are being used by Evoenergy visit https://www.evoenergy.com.au/about-us/about-our-network/gas-five-year-plan

C Commercial questionnaire

Welcome
Thank you for participating in this survey, which is being run by The Centre for International Economics on behalf of Evoenergy. Evoenergy owns and operates the electricity and gas distribution networks in ACT and surrounding NSW.
This survey is about your organisation's future energy needs. Your input is very important and will help inform the way energy is provided.
The survey involves up to 21 questions and should take no more than 10 minutes to complete.
To confirm this is genuine market research being conducted by Evoenergy, visit this page: www.evoenergy.com.au/About-us/Media-centre/2024-11-04-Evoenergy-customer-survey. Your survey responses will be anonymous in reporting to Evoenergy.

1. Does your organisation use mains gas (e.g. for space heating or hot water)?
    c. Yes
    d. No **TERMINATE**
    e. Don't know **TERMINATE**
2. Does your organisation use a premises in the ACT, Queanbeyan or Bungendore?
    a. Yes
    b. No **TERMINATE**
    c. Don't know **TERMINATE**
3. What are your main uses of gas? **MULTIPLE SELECTION**
    i. Space heating
    a. Hot water
    b. Cooking/baking
    c. Waste destruction
    d. Manufacturing
    e. Other _____
4. Are you aware of the ACT Government's plan to end gas use in the ACT by 2045 (the Integrated Energy Plan)?

c. Yes

d. No

e. Partly

5. Does your organisation own a premises in the ACT, Queanbeyan or Bungendore?

   c. Yes, we own more than one premises

   d. Yes, we own one premises

   e. No, we lease our premises **SKIP TO Q18**

   f. Other _____ **SKIP TO Q18**

OWNER/PROPERTY MANAGER BRANCH

6. Which of your gas appliances are most difficult to replace with an electric alternative?

   c. Heaters

   d. Hot water systems

   e. Cooktops

   f. Ovens

   g. Furnaces

   h. Other _____

   i. None are difficult to replace

7. Thinking about any specific planned actions that will influence your gas usage (e.g. replacing plant/equipment, new building, renovations), how much do you expect your gas usage to change by 2031 (in about 7 years' time)? **SLIDING SCALE FROM -100 TO 100**

8. Roughly what share of your current gas usage do you think you will be able to switch to electric usage by 2045?

   a. All of it (disconnect from gas by 2045)

   b. About three quarters

   c. About half

d. About a quarter

e. Less than a quarter

f. Unsure

9. **IF Q8=a** By what date are you expecting to disconnect from gas?

   a. 2025-2030

   b. 2030-2035

   c. 2035-2040

   d. 2040-2045

   e. Unsure

10. **IF Q8=a** Do you expect to switch away from gas…

    a. as part of a single project

    b. using a staged approach (e.g. with renovations of different buildings)

11. **IF b ABOVE** What is the time profile of your staged reductions in gas usage likely to be?

    a. Most reductions happen soon

    b. Steady progress over time

    c. Most reductions happen closer to the disconnection date

    d. Other _____

12. What are the main factors influencing the timing of future reductions in your gas usage? **MULTIPLE SELECTION**

    a. A zero emissions target

    b. Consumer/shareholder expectations

    c. Age and condition of plant/equipment

    d. Building renovation/rebuild timing

    e. Installation of on-site renewable electricity generation

    f. Minimising energy costs

    g. Government financial assistance

    h. Other _____

13. What are your expectations about where gas prices are headed compared with electricity prices?

    a. Gas will go up a lot more than electricity

b. Gas will go up a bit more than electricity

c. They'll be about the same

d. Gas will go up a bit less than electricity

e. Gas will go up a lot less than electricity

f. No expectation

14. If your expectation about gas prices (and therefore the financial business case for switching off gas) changed, could this change the timing of your planned reductions in gas usage?

    a. Yes

    b. No

15. If gas price increases were limited to CPI increases out to 2031, how might that change the timing of your reductions and/or disconnection?

    a. No change

    b. Push back appliance replacements/disconnection by a year or two

    c. Push back appliance replacements/disconnection by 2-5 years

    d. Push back appliance replacements/disconnection by 5-10 years

    e. Other _____

16. What if gas prices were expected to double by 2033 (increases of roughly 10% each year)?

    a. Bring forward appliance replacements/disconnection by 3-5 years

    b. Bring forward appliance replacements/disconnection by a year or two

    c. No change

    d. Push back appliance replacements/disconnection by a year or two

    e. Push back appliance replacements/disconnection by 3-5 years

    f. Other _____

17. What if gas prices were expected to double by 2030 (increases of roughly 20% each year)?

    a. Bring forward appliance replacements/disconnection by 3-5 years

    b. Bring forward appliance replacements/disconnection by a year or two

    c. No change

    d. Push back appliance replacements/disconnection by a year or two

    e. Push back appliance replacements/disconnection by 3-5 years

    f. Other _____

SKIP TO Q26

LEASEHOLDER BRANCH

18. When choosing a premises to lease, which do you prefer?
    a. A premises connected to mains gas
    b. A premises not connected to mains gas
    c. No preference
19. When choosing a premises to lease, which is most important?
    a. Availability of gas connection
    b. Estimated energy bills
    c. Estimated carbon emissions from energy usage
20. Over the past 12 months, has gas usage on your premises been…
    a. less than in previous years
    b. about the same as in previous years
    c. more than in previous years
21. **IF a ABOVE** What is the main reason you used less gas?
    a. Keeping gas bills down
    b. Reduced operating hours
    c. Changes to operations
    d. Changes to property
    e. Change in leaseholder
    f. Other _____
22. Are you aware of any plans your landlord has to replace gas appliances with electric alternatives on your premises?
    a. Yes
    b. No
23. **IF Q22=a** Roughly, what share of your current gas usage will be switched to electricity usage under these plans?
    a. All of it (gas usage will be zero)
    b. About three quarters

c. About half

d. About a quarter

e. Less than a quarter

f. Don't know

24. IF Q22=a When are these plans expected to be completed?

a. Within a year

b. Within 2-3 years

c. By 2030

d. By 2035

e. By 2040

f. By 2045

g. Don't know

25. If your annual gas bill doubled and electricity bills stayed about the same, would you… (select all that apply) MULTIPLE RESPONSE

a. Contact your landlord about changing appliances

b. Contact your landlord about improving building energy efficiency

c. Look for another premises

d. Use gas appliances less (e.g. higher thermostat temperature for heating)

e. Stop using gas appliances and use portable electric appliances instead

f. None of the above

RESPONDENT CHARACTERISTICS

Finally, a few questions about your organisation.

26. What types of buildings are in your premises in ACT, Queanbeyan or Bungendore? (select all that apply)

a. Office – detached building/office block/business park

b. Office – strata unit

c. Retail – detached building/shopping centre

d. Retail – strata unit

e. Hotel

f. Warehouse/storage/distribution
g. School/university
h. Hospital/medical/laboratory
i. Agricultural building (e.g. greenhouse/abattoir)
j. Religious building
k. Power station/utilities/infrastructure
l. Factory
m. Child care centre
n. Theatre/bowling alley/entertainment
o. Data centre
p. Other _____

27. In which industry does your organisation operate?

a. Agriculture, Forestry and Fishing
b. Mining
c. Manufacturing
d. Electricity, Gas, Water and Waste Services
e. Construction
f. Wholesale Trade
g. Retail Trade
h. Accommodation and Food Services
i. Transport, Postal and Warehousing
j. Information Media and Telecommunications
k. Financial and Insurance Services
l. Rental, Hiring and Real Estate Services
m. Professional, Scientific and Technical Services
n. Administrative and Support Services
o. Public Administration and Safety
p. Education and Training
q. Health Care and Social Assistance

r. Arts and Recreation Services

s. Other _____

28. How many staff does your organisation employ in the ACT, Queanbeyan and Bungendore?

    a. Non-employing

    b. 1-4 employees

    c. 5-19 employees

    d. 20-199 employees

    e. 200+ employees

29. What is your main role in the organisation?

    a. Owner

    b. Executive

    c. Accounting/finance

    d. Property/facilities management

    e. Operations management

    f. Other _____

30. Thank you for your responses to this survey. Finally, are there any further comments you want to make that weren't covered by this survey? **NOT MANDATORY**

    _____
    _____
    _____
    _____

Thank you for participating in this survey. Your opinions are valued and very important.

To keep up to date with survey findings and how they are being used by Evoenergy visit https://www.evoenergy.com.au/about-us/about-our-network/gas-five-year-plan

D Large-customer discussion guide

The following questions were used for all customers. Some specific questions prepared for individual customers are excluded to protect confidential information.

1. Customer Name _____

2. What are your main uses of gas?

- ☐ Space heating
- ☐ Hot water
- ☐ Other: _____

3. Are you aware of the ACT Government plan to end gas use in the ACT by 2045 (the Integrated Energy Plan)?

- ☐ Yes
- ☐ No
- ☐ Partly

4. Which of your gas appliances are most difficult to replace with an electric alternative, and why?

5. The ACT Government has noted there will remain some 'niche' users of gas after most users have switched off gas. Do you think you will be one of these 'niche' users?

- ☐ Yes
- ☐ No
- ☐ Maybe

6. Roughly what share of your current gas usage do you think you will be able to switch to electric usage by 2045?

- ☐ 10% or less
- ☐ About a quarter
- ☐ About half
- ☐ About three quarters
- ☐ 90% or more

7. In the period to 2031, are there specific actions planned that will influence your gas usage—either increases or decreases? (e.g. replacing plant/equipment, new building, renovations, etc.)

8. Roughly, how much of an increase or decrease in your gas usage do you think these changes will amount to by 2031?

- ☐ 100% decrease / disconnect
- ☐ Decrease 75%–99%
- ☐ Decrease 50%–74%
- ☐ Decrease 25%–49%
- ☐ Decrease 0%–24%
- ☐ Increase 0%–10%
- ☐ Increase >10%

9. Is there a date by which you plan to be disconnected from gas?

10. Do you expect to switch away from gas...

- ☐ As part of a single project
- ☐ Using a staged approach (e.g. with renovations of different buildings)

11. What does the profile over time of your staged reductions in gas usage look like?

- ☐ Reductions happen faster early on
- ☐ Steady progress towards disconnection target
- ☐ Reductions happen faster towards the end
- ☐ Other

12. What are the primary drivers of the timing of changes in gas usage and disconnection?

- ☐ A zero emissions target
- ☐ Consumer/shareholder expectations
- ☐ Age and condition of plant/equipment
- ☐ Building renovation/rebuild timing
- ☐ Installation of on-site renewable electricity generation
- ☐ Minimising energy costs
- ☐ Government financial assistance

13. What are your expectations about where gas network prices are headed compared with electricity prices?

- ☐ Gas will go up a lot more than electricity
- ☐ Gas will go up a bit more than electricity
- ☐ They'll be about the same

- ☐ Gas will go up a bit less than electricity
- ☐ Gas will go up a lot less than electricity
- ☐ No expectation

14. If your expectation about gas network prices (and therefore the financial business case for switching off gas) changed, could this change the timing of your planned reductions in gas usage?

- ☐ Yes
- ☐ No

15. If gas network price increases were limited to CPI increases out to 2031, how might that change the timing of your reductions and/or disconnection?

- ☐ No change
- ☐ Push back appliance replacements/disconnection by a year or two
- ☐ Push back appliance replacements/disconnection by 2–5 years
- ☐ Push back appliance replacements/disconnection by 5–10 years
- ☐ Other: _____

16. What if gas prices were expected to double by 2033 (increases of roughly 10% each year)?

☐ Bring forward appliance replacements/disconnection by 3–5 years

☐ Bring forward appliance replacements/disconnection by a year or two

☐ No change

☐ Push back appliance replacements/disconnection by a year or two

☐ Push back appliance replacements/disconnection by 3–5 years

☐ Other: _____

17. What if gas prices were expected to double by 2030 (increases of roughly 20% each year)?

☐ Bring forward appliance replacements/disconnection by 3–5 years

☐ Bring forward appliance replacements/disconnection by a year or two

☐ No change

☐ Push back appliance replacements/disconnection by a year or two

☐ Push back appliance replacements/disconnection by 3–5 years

☐ Other: _____

E Input parameters for demand forecast

Running costs

Energy consumption

The primary source for the energy consumption assumptions used in the demand model is a report by Alternative Technology Association published in 2018 and a previous demand forecast by CIE for Evoenergy in 2020.[16] [17] Energy consumption of existing gas appliances is reported for heaters, water heating and cooktops and varies by home size and whether a household is stay-at-home (table E.1). Differences in energy consumption between existing and new gas appliances were based on annual running costs reported by Sustainability Victoria for appliances with different efficiency ratings.[18] New gas appliances are more efficient, using up to 17 per cent less energy compared to older and existing appliances.

E.1 Gas consumption assumptions, by appliance and household type

Household type	Space heating	Water heating	Cooking
	MJ/pa	MJ/pa	MJ/pa
New gas appliances, away-from-home			
Small home	38 289	4 551	2 000
Medium home	55 671	6 170	2 000
Large home	82 049	9 902	2 000
Factors for gas consumption			
Existing gas appliance	1.21	1.13	1.00
Stay-at-home household	1.08	1.00	1.00

Source: Alternative Technology Association (2018). Household fuel choice in the National Energy Market. Final Report. Revised July. pp. 41, 48, 50. (https://renew.org.au/wp-content/uploads/2018/08/Household_fuel_choice_in_the_NEM_Revised_June_2018.pdf, accessed 18/06/2025); Sustainability Victoria, Calculate heating running costs (https://www.sustainability.vic.gov.au/energy-efficiency-and-reducing-emissions/save-energy-in-the-home/heat-your-home-efficiently/calculate-heating-costs).

16 Alternative Technology Association (2018). Household fuel choice in the National Energy Market. Final Report. Revised July. pp. 41, 48, 50. (https://renew.org.au/wp-content/uploads/2018/08/Household_fuel_choice_in_the_NEM_Revised_June_2018.pdf, accessed 18/06/2025).

17 CIE workings based on annual energy running costs reported by Sustainability Victoria for different energy efficiency levels.

18 Sustainability Victoria, Calculate heating running costs (https://www.sustainability.vic.gov.au/energy-efficiency-and-reducing-emissions/save-energy-in-the-home/heat-your-home-efficiently/calculate-heating-costs).

Energy consumption for new electric appliances varies between 3 252 and 278 kWh per annum, depending on the size of the home and type of appliance (table E.2).

E.2 Final energy consumption inputs, new electric appliances, by appliance type

Household type	Space heating	Water heating	Cooking
	kWh/pa	kWh/pa	kWh/pa
New electric appliances, away-from-home			
Small home	1454	548	278
Medium	2077	648	278
Large home	2908	879	278
Factors for electricity consumption			
Stay-at-home household	1.12	1.00	1.00

Source: Alternative Technology Association (2018). Household fuel choice in the National Energy Market. Final Report. Revised July. pp. 41, 48, 50. (https://renew.org.au/wp-content/uploads/2018/08/Household_fuel_choice_in_the_NEM_Revised_June_2018.pdf, accessed 18/06/2025).

Energy prices

Forecast gas prices are made up of three components:

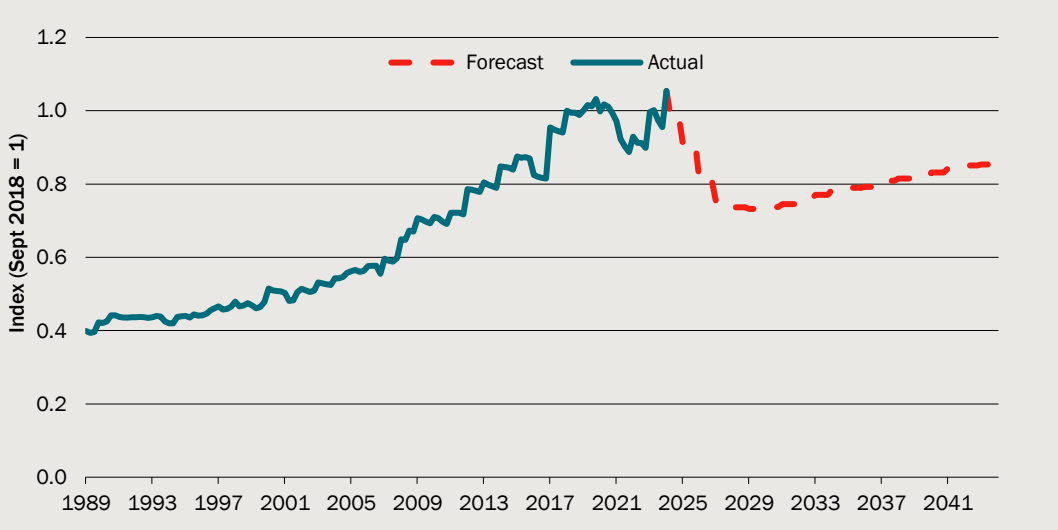
- Forecast wholesale gas prices (36 per cent of the current retail price)
- Forecast gas network prices (28 per cent of the current retail price)
- Forecast retail margin and transmission prices (36 per cent of the current retail price).[19]

We used wholesale gas price forecasts from AEMO's 2024 *Gas Statement of Opportunities* (GSOO), developed by ACIL Allen. We have used residential and commercial customer forecast for the step change scenario as this is identified as the most likely scenario (figure E.3).[20]

19 https://www.climatechoices.act.gov.au/__data/assets/pdf_file/0005/2052482/Retail-price-impacts-of-the-gas-transition-ACT-Government-fact-sheet.pdf

20 AEMO 2024. 2024 Gas Statement of Opportunities. pp 15-16. (https://aemo.com.au/-/media/files/gas/national_planning_and_forecasting/gsoo/2024/aemo-2024-gas-statement-of-opportunities-gsoo-report.pdf?la=en, accessed 21/11/24).

E.3 Forecast wholesale gas price



Data source: CIE analysis of Evoenergy billing data.

Retail margin and transmission network prices were assumed to remain constant in real terms in the absence of a sound basis for forecasting otherwise.

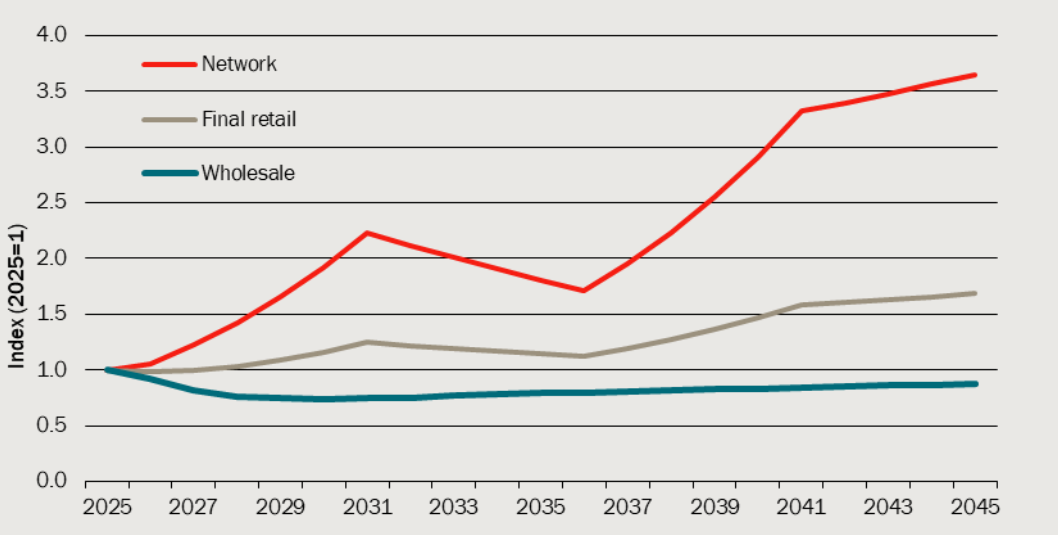
Gas network prices were estimated endogenously within the forecasting model, based on:

- Evoenergy's notional revenue requirement
- Forecast weighted-average cost of capital for use as a discount rate
- Setting x-factors for 5-year regulatory periods to equate the present values of forecast revenue and the notional revenue requirement.

This required an iterative modelling approach, since updating network prices affects gas retail prices, which affects forecast gas demand (both via the short-term price response in the baseline model and the forecast disconnections in the switching model), which affects forecast revenue requiring prices to be updated again to equate revenue with the target.

The prices reached following convergence of the model as shown in chart E.4. While network prices are expected to increase significantly, they currently form less than a third of the total gas bill, and, with wholesale prices expected to fall, final retail price increases are forecast to remain below 50 per cent until 2041.

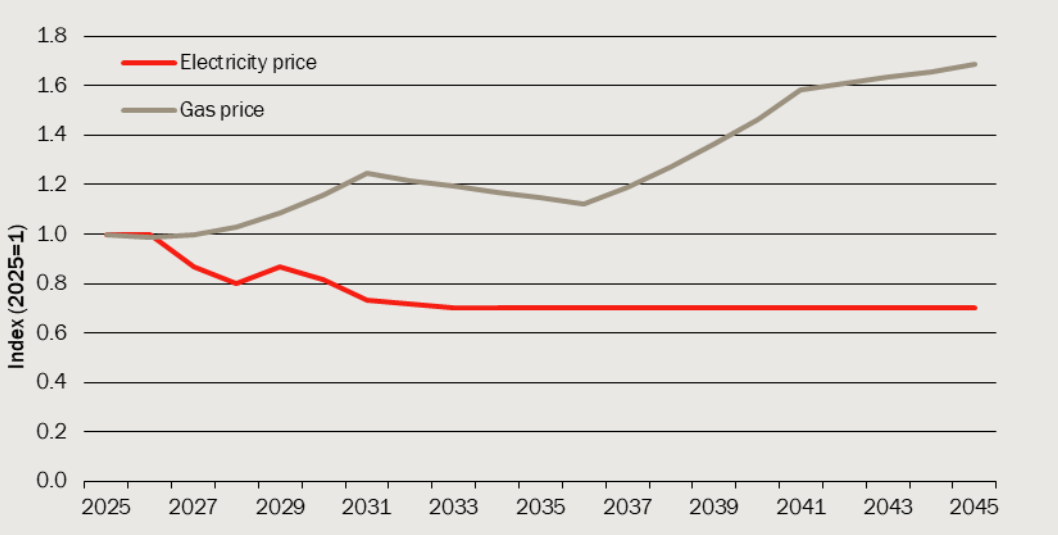
E.4 Forecast gas prices



Data source: CIE demand forecasting model; Wholesale prices are the step change scenario for residential and commercial customers in ACIL Allen forecasts for AEMO's 2024 Gas Statement of Opportunities.

Forecast electricity prices were based on AEMC's 2024 projection for the ACT (figure E.5).

E.5 Forecast gas and electricity prices



Note: Base electricity price is $0.30/kWh. Base gas price is $238 p.a. plus $0.0158/MJ for the first 15 000 MJ p.a., plus $0.0082/MJ for the next 161 400 MJ p.a..

Data source: CIE demand forecasting model; AEMC 2024. Residential electricity price trends. November. p.30. (https://www.aemc.gov.au/sites/default/files/2024-11/Price%20Trends%202024%20Final%20Report.pdf, accessed 23/5/25)

It was assumed that 50 per cent of electricity used by households with solar panels would cost the electricity price above and 50 per cent would be forgone feed-in tariff revenue of 8c/kWh.

Upfront costs

Appliance and installation costs

The appliance and installation cost assumptions for replacing gas appliances with new like-for-like gas appliances are based on costs reported in existing studies (table E.6). Upfront costs for heaters are based on two sources, Frontier (2022)[21] and Acil Allen (2024).[22] Upfront costs for hot water systems and cooktops are based on costs reported in Frontier (2022).

Our assumption is based on a weighted average of the upfront costs reported in the Frontier and Acil Allen reports, where the weights are the proportion of respondents who reported to currently be using split and ducted heating systems in the survey.[23] It is assumed that respondents currently with a ducted system will incur the higher cost across the two sources and households with split systems will incur the lower cost.

E.6 Upfront appliance and installation costs, new (replacement) gas appliances

Household type	Assumption
	$
Heaters	
Small home	3318[a]
Medium home	4410[c]
Large home	6872[d]
Water	
All homes	2230[b]
Cooktop	
All homes	1375[b]

[a] Weighted average based on ducted and split system heating shares reported in survey. Based on typical cost estimate reported for archetype 2 from Frontier report. See https://gamaa.asn.au/wp-content/uploads/2022/07/Frontier-Economics-Report-GAMAA.pdf, pg. 32. Based on cost estimates reported for split system gas heat systems from Acil Allen's report. See https://www.aer.gov.au/system/files/2024-11/ACIL%20Allen%20-%20JGN%20demand%20review%20report%20-%20November%202024.pdf, pg. 24.

[b] Based on typical cost estimate reported for archetype 2 from Frontier report. See https://gamaa.asn.au/wp-content/uploads/2022/07/Frontier-Economics-Report-GAMAA.pdf, pg. 32.

21 Frontier, 2022, Cost of switching from gas to electric appliances in the home, see https://gamaa.asn.au/wp-content/uploads/2022/07/Frontier-Economics-Report-GAMAA.pdf.

22 Acil Allen, 2024, Review of Jemena Gas Network's demand forecasts, see https://www.aer.gov.au/system/files/2024-11/ACIL%20Allen%20-%20JGN%20demand%20review%20report%20-%20November%202024.pdf.

23 For example, 75.98 per cent and 24.02 per cent of respondents with medium homes reported to currently use ducted and split heat systems, respectively. Therefore, the central upfront cost estimate is calculated to be $5203(0.76) + 1900(0.24) = 4410$.

[c] Weighted average based on ducted and split system heating shares reported in survey. Based on typical cost estimates reported for archetype 3 from Frontier report. See https://gamaa.asn.au/wp-content/uploads/2022/07/Frontier-Economics-Report-GAMAA.pdf, pg. 35. Based on cost estimates reported for split system gas heat systems from Acil Allen's report. See https://www.aer.gov.au/system/files/2024-11/ACIL%20Allen%20-%20JGN%20demand%20review%20report%20-%20November%202024.pdf, pg. 24.

[d] Weighted average based on ducted and split system heating shares reported in survey. Based on cost estimates reported for ducted gas heat systems from Acil Allen's report. See https://www.aer.gov.au/system/files/2024-11/ACIL%20Allen%20-%20JGN%20demand%20review%20report%20-%20November%202024.pdf, pg. 24. Based on typical cost estimates reported for archetype 1 from Frontier report. See https://gamaa.asn.au/wp-content/uploads/2022/07/Frontier-Economics-Report-GAMAA.pdf, pg. 31.

The upfront appliance and installation costs of electric appliances were constructed in a similar manner. However, the cost of installing reverse-cycle air conditioners (RCAC) was reduced by 25 per cent on the assumption that:

- half of the cost can be attributed to cooling rather than heating, and
- the household's existing cooling appliance is on average halfway through its useful life, is made obsolete by the new RCAC, and had an undepreciated value equal to half the price of a RCAC.

E.7 Upfront appliance and installation costs, new electric appliances

Household type	Assumption
	$
Heaters	
Small home	10 852[a]
Medium home	12 189[b]
Large home	13 798[c]
Water	
Small home	4 633[c]
Medium home	4 633[c]
Large home	4 600[d]
Cooktop	
Small home	2 157[d]
Medium home	2 347[c]
Large home	2 347[c]

[a] Weighted average of split system and ducted electric heating systems, typical cost estimates from archetype 3 from Frontier report. See https://gamaa.asn.au/wp-content/uploads/2022/07/Frontier-Economics-Report-GAMAA.pdf, pg. 33.

[b] Weighted average of split system and ducted electric heating systems, typical cost estimates from archetype 1 from Frontier report. See https://gamaa.asn.au/wp-content/uploads/2022/07/Frontier-Economics-Report-GAMAA.pdf, pg. 31.

[c] Weighted average of split system and ducted electric heating systems, high cost estimates from archetype 3 from Frontier report. See https://gamaa.asn.au/wp-content/uploads/2022/07/Frontier-Economics-Report-GAMAA.pdf, pg. 35.

[d] Based on typical cost estimate reported for archetypes 2 and 3 from Frontier report. See https://gamaa.asn.au/wp-content/uploads/2022/07/Frontier-Economics-Report-GAMAA.pdf, pg. 33 and 35.

[e] Based on typical cost estimate reported for archetype 1 from Frontier report. See https://gamaa.asn.au/wp-content/uploads/2022/07/Frontier-Economics-Report-GAMAA.pdf, pg. 31.

Power supply upgrade cost

A cost of $5 000 for upgrading power supply to three-phase supply was applied only to large homes switching to electric heating.

Rebates for electrification

Rebate assumptions were based on offerings by ActewAGL Retail, the dominant energy retailer in the ACT, at the time the analysis was conducted (table E.8). ACT Government makes available additional incentives to vulnerable households through the Home Energy Support Program and Access to Electric Program, but we do not account for these additional incentives since we can't determine the eligibility of our sampled customers.

E.8 Rebates on new electric appliances

Household type	Assumption
	$
Heaters	
Small home	1 750
Medium home	3 000
Large home	3 000
Water	
Small home	0
Medium home	1 500
Large home	1 500
Cooktop	
Small home	0
Medium home	0
Large home	0

Source: actewagl.com.au/for-home/energy-efficient-homes/heating-and-cooling-upgrade/heating-and-cooling-upgrade-terms-and-conditions, accessed 4/6/25

Gas disconnection fee

The fee payable when disconnecting from gas was assumed to be $185. This is the current fee for a temporary disconnection. Permanent disconnections currently cost $948. Since gas fixed charges can be avoided by temporarily disconnecting, it is expected that most households will choose this option under the current pricing policy.

Interest-free loan scheme

The ACT Government offers interest-free loans up to $15 000 over 10 years under its Sustainable Household Scheme.[24] This offering effectively shifts some upfront costs into running costs, resulting in a reduced overall cost in present value terms. However, the scheme is available only to ACT owner-occupiers with unimproved land value below $750 000. The scheme has been in place for several years. It also applies to solar,

24 https://www.climatechoices.act.gov.au/__data/assets/pdf_file/0010/1861570/sustainable-household-scheme-guidelines-for-participants.pdf, accessed 4/6/25.

batteries, electric vehicles, and ceiling insulation and the maximum loan of $15 000 is a cumulative maximum across all products.

We estimated 33 per cent of our sample would be eligible for the loan scheme, based on taking the intersection of:

- households in the ACT (92 per cent)
- standalone houses (68 per cent)
- districts with average unimproved land value not exceeding $750 000 (83 per cent)
- households without solar who have income between $78 000 and $156 000 per year (i.e. who are unlikely to have already used the loan scheme for electric cars or solar, which is by far the product most used under the scheme)[25] (69 per cent).

For households assumed to be eligible, we calculated a loan amount equal to the minimum of $15 000 and the total cost of electrification before the loan. This amount was subtracted from the upfront cost of electric options for that household. An amount equal to 6.1 per cent of the loan amount was added to the annual running cost of electric options for that household. This is the annual amount payable each year of the asset's life that is equivalent in present value terms to repaying the $15 000 in equal nominal amounts over 10 years, assuming a real discount rate of 3.70 per cent and an asset life of 16 years.

25 https://www.climatechoices.act.gov.au/policy-programs/sustainable-household-scheme-dashboard, accessed 4/6/25

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