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Report

Limiting energy bills by getting off gas

All-electric homes after the 2022 energy crisis

November 2022

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Project funded by Boundless Earth

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Renew is a national member-based non-profit organisation providing expert, independent advice and sustainable solutions to households, government, and industry.

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Executive Summary

Unprecedented wholesale energy prices are leading to serious increases in retail tariffs paid by households for both electricity and gas. The Federal Budget projected retail tariff increases of 56% for electricity and 44% for gas by 2024.

Renew has conducted independent modelling of the impacts of these projected price increases on household energy bills.

This report uses current and projected retail tariffs to calculate the costs of household energy bills. Household energy use is modelled using Renew's energy simulation platform *Sunulator*, measuring usage of gas and electricity across a range of household appliance and efficiency scenarios. 8 capital city locations are modelled, using local climate data and retail tariffs.

Two analyses are presented. First, an analysis of **total household energy bills** for a medium-large detached home. The following scenarios are modelled:

SCENARIO	1: BASIC GAS	2: BASIC ALL-ELECTRIC	3: BASIC ALL-ELECTRIC WITH SOLAR	4: 7-STAR GAS	5: 7-STAR ALL-ELECTRIC	6: 7-STAR ALL-ELECTRIC WITH SOLAR
Heating	Gas	Heat pump	Heat pump	Gas	Heat pump	Heat pump
Cooling	Heat pump	Heat pump	Heat pump	Heat pump	Heat pump	Heat pump
Hot water	Gas instant	Heat pump	Heat pump	Gas instant	Heat pump	Heat pump
Cooking	Gas	Induction	Induction	Gas	Induction	Induction
Solar	-	-	6.6kW	-	-	6.6kW
NatHERS rating	3	3	3	7	7	7
Size	200m^2	200m^2	200m^2	200m^2	200m^2	200m^2
Type	Detached	Detached	Detached	Detached	Detached	Detached

Second, an analysis of the **cost of heating a space in a typical rental home**. The following scenarios are modelled:

SCENARIO	HEATER	NATHERS RATING
Gas heater (no insulation)	Gas	1.4
Inefficient electric heater (no insulation)	Electric panel (2.4kW)	1.4
Reverse cycle air conditioner (no insulation)	Heat pump	1.4
Gas heater (insulation)	Gas	4.1
Inefficient electric heater (insulation)	Electric panel (2.4kW)	4.1
Reverse cycle air conditioner (insulation)	Heat pump	4.1

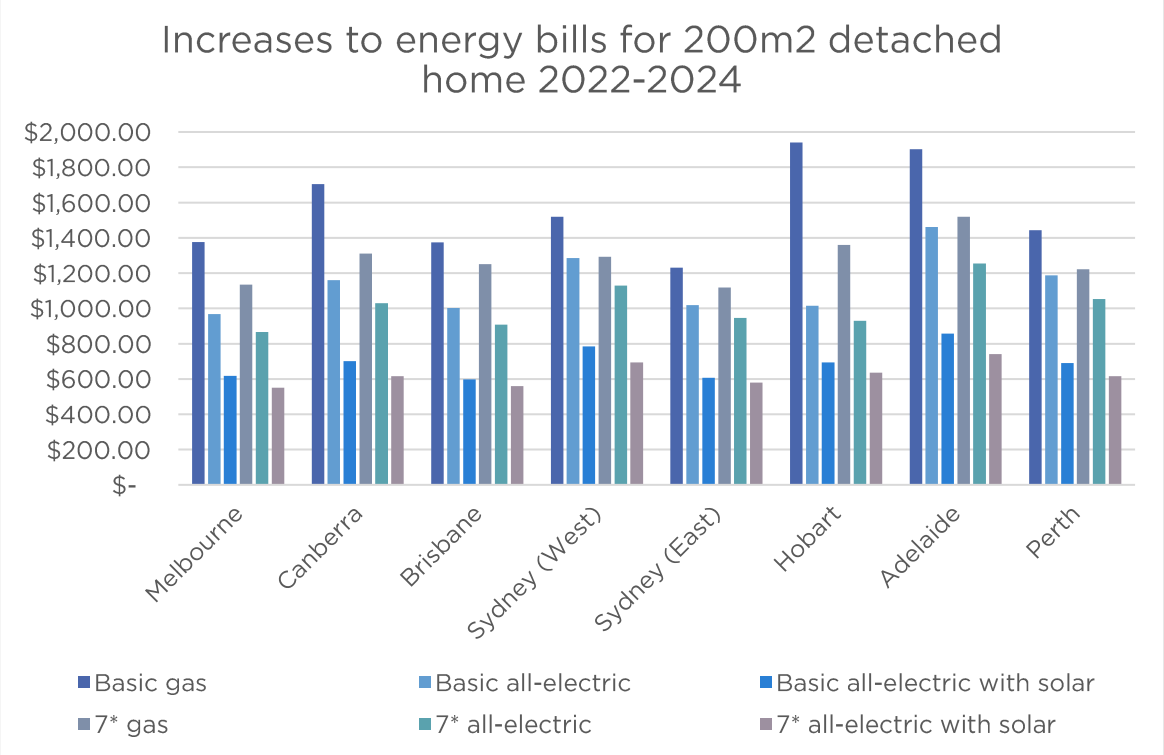
Findings

Our analysis finds that **household energy bills** will increase most for households that are connected to gas.

Increases were still expected for all-electric homes, but these increases are smaller than those of dual fuel homes. All-electric homes with solar are expected to experience the lowest overall energy bill increases in all locations; thermal efficiency further limits expected cost increases.

Increases to energy bills 2022 – 2024: total household energy bills

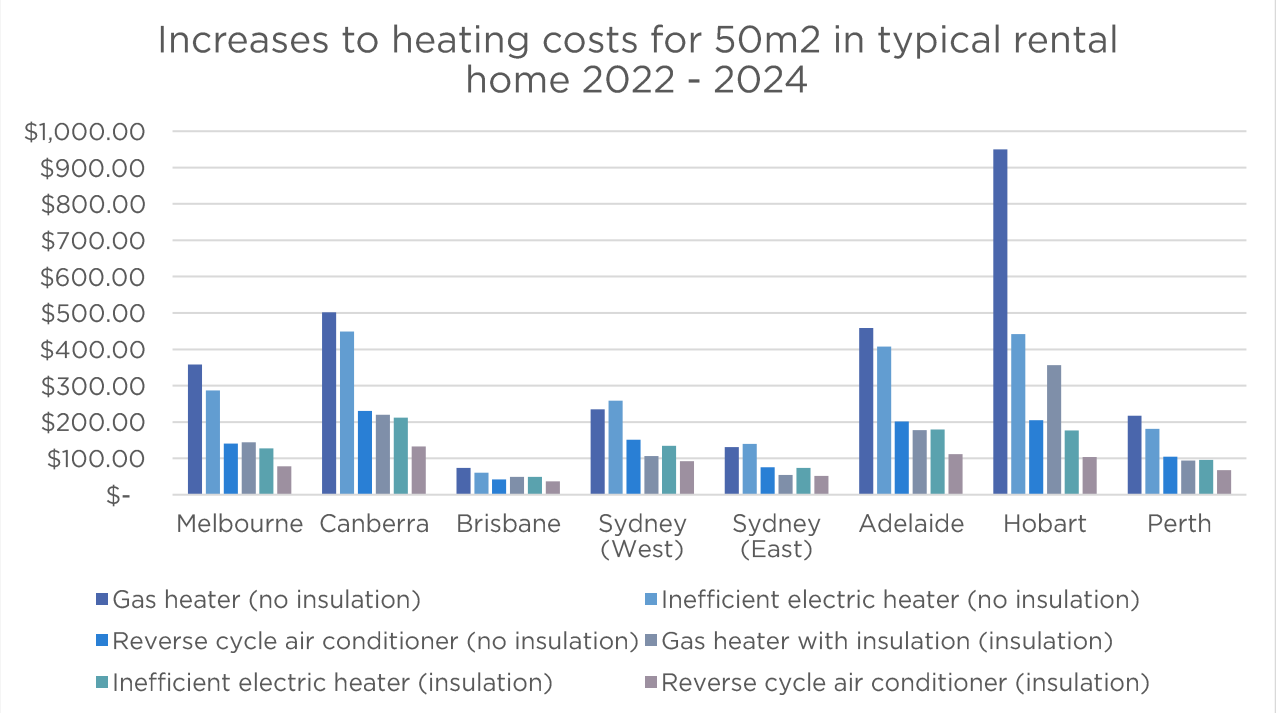
House type	Melbourne	Canberra	Brisbane	Sydney (West)	Sydney (East)	Hobart	Adelaide	Perth
Basic gas	$1,376.63	$1,705.40	$1,374.58	$ 1,518.95	$1,231.72	$1,939.81	$1,901.84	$1,444.01
Basic all-electric	$967.28	$1,159.84	$1,002.09	$ 1,285.00	$1,018.18	$1,015.08	$1,461.44	$1,188.12
Basic all-electric with solar	$617.02	$701.53	$597.67	$ 783.98	$606.66	$693.45	$857.63	$689.48
7* gas	$1,134.27	$1,310.33	$1,251.87	$ 1,293.31	$1,117.90	$1,360.16	$1,519.84	$1,222.63
7* all-electric	$866.28	$1,029.91	$908.35	$ 1,129.50	$945.35	$929.99	$1,254.03	$1,053.38
7* all-electric with solar	$550.14	$615.10	$560.08	$ 694.66	$579.18	$635.75	$741.52	$615.42



Similarly for the cost of **space heating in a typical rental home**, households using gas heating are found to face the highest bill increases from 2022 – 2024 in most locations. In Sydney the cost increases for inefficient electric heaters are higher than gas. The cost of heating is expected to increase for all scenarios modelled, however these cost increases are most modest for homes using reverse cycle air conditioners. Insulation significantly reduces the expected cost increases regardless of heater type.

Increases to cost of space heating in typical rental home 2022 -2024

Heating	Melbourne	Canberra	Brisbane	Sydney (West)	Sydney (East)	Adelaide	Hobart	Perth
Gas heater (no insulation)	$358.51	$502.19	$73.80	$234.99	$130.91	$458.70	$949.68	$216.93
Inefficient electric heater (no insulation)	$286.47	$448.60	$60.78	$258.75	$139.55	$407.35	$441.57	$181.50
Reverse cycle air conditioner (no insulation)	$141.06	$230.18	$42.24	$151.09	$75.61	$201.44	$204.65	$104.59
Gas heater with insulation (insulation)	$143.77	$219.84	$49.00	$106.74	$54.22	$177.23	$356.17	$93.97
Inefficient electric heater (insulation)	$127.56	$211.70	$48.93	$134.09	$73.39	$179.80	$176.78	$95.36
Reverse cycle air conditioner (insulation)	$78.37	$132.73	$36.57	$91.91	$51.71	$111.91	$103.42	$67.68



Detailed information is presented for all locations on energy bills, projected savings from electrification, and the carbon emissions associated with energy used for heating.

Introduction

Australian households are dangerously exposed to rising energy prices.

2022 has seen an unprecedented crisis in Australia's energy system. Soaring international gas prices, climate-driven floods, and years of government failure to plan for the replacement of ageing coal infrastructure with renewables have led to huge price spikes on the wholesale market. Households are only partially sheltered from the leap in wholesale prices.

The 2022-23 Federal Budget projected that retail electricity costs are set to rise by up to 56% by 2024, and retail gas costs by up to 44%.

Without government intervention, these price shocks are set to put households under serious pressure.

This report provides a unique insight into the cost pressures faced by households.

Renew has modelled the costs to households of energy in 2022, 2023 and 2024.

Using Renew's *Sunulator* energy simulation platform and Treasury's projected tariff increases, we have analysed the possible impacts on household bills across a range of locations and household scenarios. Our modelling compares homes that use gas for heating, cooking and hot water with all-electric homes. We also compare the impact on household bills of rooftop solar and better energy efficiency.

In a complementary analysis, we furthermore have modelled the cost of heating typical rental homes that should be subject to minimum energy efficiency standards.

Our analysis shows that bills will go up most for homes that depend on gas.

Both gas and electricity prices are rising, but the impact of rising tariffs will make the savings from getting off gas even bigger. All-electric appliances and solar are already saving households money – and the savings will grow.

Our findings show that:

- Efficient, all-electric homes with solar already reduce energy bills in all locations
- Annual energy bills are projected to rise for homes using gas by $1,231 - $1,939 by 2024
- Bill increases will be smaller for all-electric homes, with increases limited to $550 - $741
- Renters will face bill increases for space heating, but the impacts are significantly reduced with reverse cycle air conditioning and insulation
- Emissions from energy are falling for electric heating but remaining high for gas heating

Our findings show that households are set to face serious pressure from rising energy prices – and putting homes at the centre of the energy transition should be a key part of the response. Where possible, households can limit the impact of price rises with solar, energy efficiency, and getting off gas. Government policy responses to rising prices should include action to electrify homes and must not lock households into the ongoing cost of rising gas prices.

Methodology

Energy modelling

This analysis uses Renew's energy modelling platform *Sunulator* to simulate the gas and electricity used by a home over the course of one year.

Sunulator simulates the operation of heating and hot water appliances and energy production from solar PV systems on a daily basis, creating half-hourly consumption and generation data over a year to estimate how much solar generation will be consumed onsite versus exported. Specific detailed climate data files are used to calculate heating and hot water requirements and solar generation across the range of locations.

The tool allows for detailed configuration of appliances, thermal efficiency and solar generation. Energy consumption of heating and hot water appliances is calculated from the gas or electricity input required to generate the same heat energy output. Unlike FirstRate and AccuRate, Sunulator doesn't simulate heat flows to model a building's thermal performance. Instead it mimics such modelling by simulating the operation of air conditioners and reconciling total annual energy consumption to the results published by NatHERS.

Scenarios

This report provides the findings of two analyses: **total home energy bills** for a detached home; and the **cost of heating a space in a typical rental home**.

Total household bill modelling

We have modelled total annual energy costs for 200m^2 detached homes in each location. The household scenarios modelled were as follows:

SCENARIO	1: BASIC GAS	2: BASIC ALL-ELECTRIC	3: BASIC ALL-ELECTRIC WITH SOLAR	4: 7-STAR GAS	5: 7-STAR ALL-ELECTRIC	6: 7-STAR ALL-ELECTRIC WITH SOLAR
Heating	Gas	Heat pump	Heat pump	Gas	Heat pump	Heat pump
Cooling	Heat pump	Heat pump	Heat pump	Heat pump	Heat pump	Heat pump
Hot water	Gas instant	Heat pump	Heat pump	Gas instant	Heat pump	Heat pump
Cooking	Gas	Induction	Induction	Gas	Induction	Induction
Solar	-	-	6.6kW	-	-	6.6kW
NatHERS rating	3	3	3	7	7	7
Size	200m^2	200m^2	200m^2	200m^2	200m^2	200m^2
Type	Detached	Detached	Detached	Detached	Detached	Detached

Single space heating

We have modelled the annual cost of heating one 50m^2 space (equivalent to a medium-large living space). This analysis was conducted to provide a representative picture of costs for rental homes with low energy efficiency.

The scenarios modelled were as follows:

SCENARIO	HEATER	NATHERS RATING
Gas heater (no insulation)	Gas	1.4
Inefficient electric heater (no insulation)	Electric panel (2.4kW)	1.4
Reverse cycle air conditioner (no insulation)	Heat pump	1.4
Gas heater (insulation)	Gas	4.1
Inefficient electric heater (insulation)	Electric panel (2.4kW)	4.1
Reverse cycle air conditioner (insulation)	Heat pump	4.1

Locations

We have modelled energy usage and bills in the following capital cities:

- Melbourne
- Canberra
- Brisbane
- Sydney (West)
- Sydney (East)
- Adelaide
- Hobart
- Perth

Due to limited gas use in Darwin (including minimal heating) we have not modelled Darwin homes.

The geography of Sydney means there is a significant difference in climate and heating and cooling requirements between eastern and western suburbs; tariffs also differ depending on location and servicing network. To account for these differences, we have modelled eastern and western suburbs separately. Climate data for Sydney (East) is drawn from near the Sydney CBD, while climate data for Sydney (West) is drawn from Richmond.

Appliances

In the **total household bill** modelling, all-electric homes (scenarios 2, 3, 5, and 6) were assumed to use split-system reverse cycle air conditioners (heat pumps) with a heating Coefficient of Performance (COP) of 4.4. Homes with a gas connection (scenarios 1 and 4) were assumed to use gas heating with a COP of 0.7; this figure represents a marginally lower heat loss rate than gas ducted heating systems but marginally higher than many non-ducted systems.

All homes are assumed to be cooled with split-system reverse cycle air conditioners (heat pumps). We assumed an energy efficiency rating of 4 Stars.

Homes with gas connections were assumed to use gas instantaneous hot water, while all-electric homes were assumed to use heat pump hot water. Similarly, homes with gas connections were assumed to use gas cooking appliances, while all-electric homes were assumed to use induction stovetops and electric ovens.

Homes with solar were assumed to have a 6.6kW system installed.

In the **single space heating** modelling, inefficient electric heaters were assumed to be 2.4kW panel heaters with a Coefficient of Performance of 1, while reverse cycle air conditioners were assumed to be 6kW split systems with a Coefficient of Performance of 4.4. No cooling costs were included.

Our calculations do not include the relatively small amount of electricity typically required for gas ducted heating systems. This may add approximately $50-100 a year in running costs to a typical gas ducted heating system.

Gas heating is most common in Victoria and moderately common in NSW, ACT, SA and WA. Gas pricing varies by region and is uncompetitive in some locations. Mains gas is likewise not available in all locations: for example, gas connection and usage for heating in Hobart is limited to a relatively small number of households.

Temperatures

Sunulator uses detailed half-hourly climate data in each location across the 365 days of the year.

We have assumed an ideal indoor temperature on 21 degrees Celsius. Sunulator allows for seasonal and regional variation on ideal temperatures, reflecting acclimatisation. As such, minor differences to the assumed ideal temperature apply in our modelling.

We have assumed that heating will be used when indoor temperatures fall more than 3 degrees below the ideal temperature during the daytime, and more than 4 degrees below the ideal temperature during sleeping hours. Similarly, we assume that cooling will be used when temperatures rise more than 5 degrees above ideal temperatures during the daytime, and more than 3 degrees above the ideal temperature during sleeping hours.

In practice, households do not always maintain an ideal or healthy temperature. Maintaining colder temperatures in winter or hotter temperatures in summer will reduce bills from the findings presented in this analysis, however also may result in negative health and comfort impacts.

Thermal efficiency

The analysis uses assumed NatHERS energy efficiency ratings to determine the heating and cooling loads required to maintain a comfortable temperature. Higher ratings mean that less energy is required.

For our analysis of **total household bills**, we have modelled detached houses with a NatHERS rating of 3 Stars (scenarios 1-3) and 7 Stars (scenarios 4-6). These ratings have been chosen to approximately represent existing and new homes. Based on existing data, the average *existing* home rating in Australia is understood to be approximately 3 Stars (with many older homes understood to have a lower rating). From 2023, 7 Stars will be the regulated minimum rating for newly built homes in most locations.

For our analysis of **single space heating**, uninsulated homes were assumed to have a NatHERS rating of 1.4 Stars and insulated homes were assumed to have a NatHERS rating of 4.1 Stars. These figures were determined by modelling of existing older homes in Adelaide using FirstRate5 software. The impacts of insulation or other design features would vary somewhat

across locations, however this variance is not calculated in our model. We have selected these scenarios as a fair representation of rental homes that may be subject to minimum energy efficiency standards under future regulation.

Tariffs

This analysis is conducted using retail tariffs offered in each location by major retailers.

For 2022 tariffs, we sought three representative retail tariff offers in each location, calculating an average of the offers to determine the tariff used in our model. Retail tariffs for usage, daily connection fees, and solar feed-in tariffs were collected. Listings of the selected tariffs are provided in the report Appendix.

Projected tariffs in 2023 and 2024 were calculated based on the increases projected in the *Federal Budget 2022-2023*. The Budget papers state:

> However, this rise in wholesale electricity and gas prices can be expected to flow through to higher consumer prices as wholesale contracts are renewed.
>
> **Treasury has assumed retail electricity prices will increase by an average of 20 per cent nationally in late 2022**, contributing to higher forecast CPI in 2022–23. Given forward wholesale contract prices for electricity remain elevated, **retail electricity prices are expected to rise by a further 30 per cent in 2023–24**. Higher electricity prices will have both a direct and indirect impact on inflation, increasing input costs across the CPI basket. Commonwealth and state government actions to accelerate the uptake of renewables and modernise the grid are expected to put downward pressure on wholesale electricity prices over time.
>
> Domestic wholesale gas prices remain more than double their average prior to Russia's invasion of Ukraine. **Retail gas prices are expected to increase less than wholesale prices, by up to 20 per cent in both 2022–23 and 2023–24**, as major gas retailers are somewhat insulated from spot prices, either through long-term contracts or investment in gas supplies. Nevertheless, sharply higher spot and forward prices suggests a sizable increase in wholesale costs.[1]

In line with these Treasury assumptions, we use the following formula to calculate tariffs applied in the analysis of 2023 and 2024 bills:

	2022	2023	2024
Gas	Current retail tariffs	2022 figure + 20%	2023 figure + 20%
Electricity imports	Current retail tariffs	2022 figure + 20%	2023 figure + 30%
Electricity feed-in tariffs	Current retail rates	2022 figure + 5%	2023 figure + 5%

The increases are applied to both usage charges and daily connection fees.

While our intention has been to analyse the impact of tariff increases as projected in the 2022-23 Federal Budget, no projection is made in the Budget for the rates of residential solar feed-in tariffs. The long-term trend for feed-in tariff rates is decreasing. However, feed-in tariffs have increased in many locations following the rise in electricity wholesale prices in 2022; feed-in tariffs are expected to continue to reflect high wholesale prices in the medium term. To account

[1] Budget 2022-23, Budget Paper no 1, p57. https://budget.gov.au/2022-23-october/content/bp1/download/bp1_2022-23.pdf (accessed 15/11/2022)

for this, we have conservatively assumed a 5% increase in feed-in tariff rates in both 2023 and 2024.

These prices are indicative and for the purposes of analysis only. In practice, any increases in tariffs may vary according to a range of factors and are unlikely to be uniform across all locations and retailers. Further government measures may limit or alter the nature of tariff increases; at time of publication, consideration is being given to measures to limit increases in retail tariffs. Consumers may also be able to access further retailer offers or discounts that are not reflected in the analysis.

Emissions

In our analysis of single space heating costs, we have furthermore calculated the annual carbon emissions from energy used for heating.

This calculation assumes that a home is drawing energy from the electricity grid or gas network, rather than distributed energy resources such as rooftop solar or storage.

We apply the National Greenhouse Accounts Factors by location to determine the carbon intensity of energy used by the household. Scope 1 and Scope 3 emissions are included for gas appliances, while Scope 2 and Scope 3 emissions are included for electric appliances.

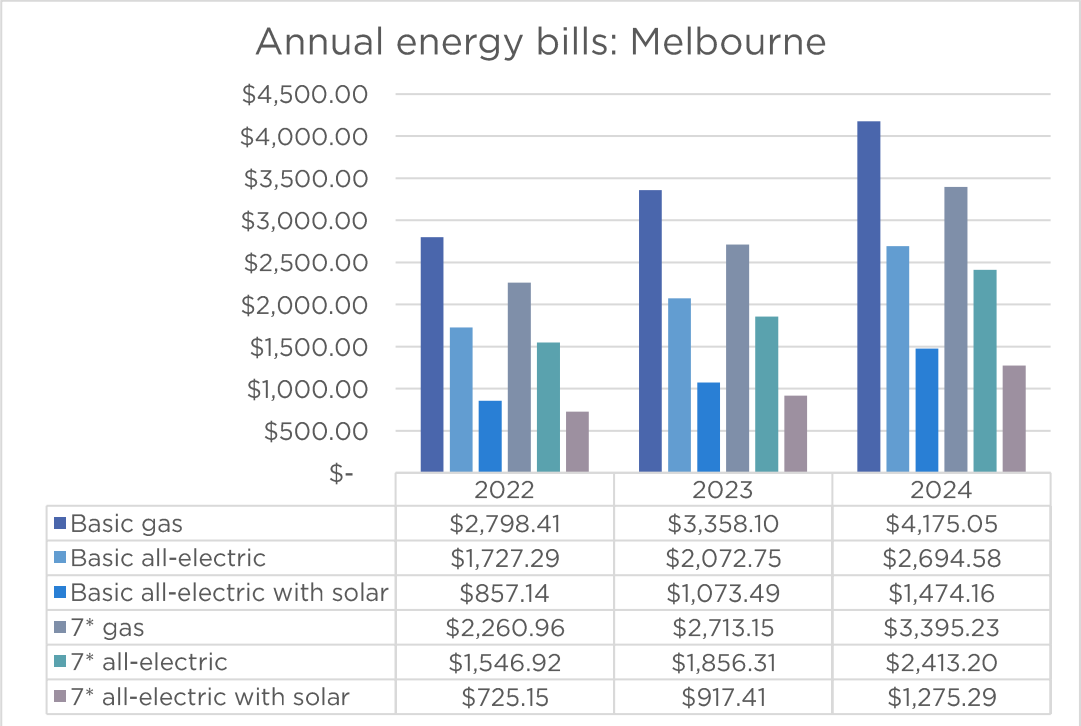
To show the change in emissions over time, we have calculated emissions using actual 2014 and 2022 emissions intensity factors. We have furthermore projected the 2030 emissions intensity for electricity, in line with the AEMO 'step change' scenario of 83% renewables by 2030. We have assumed a uniform national rate of emissions intensity reduction; in practice this assumption may understate reductions in some states while overstate reductions in others.

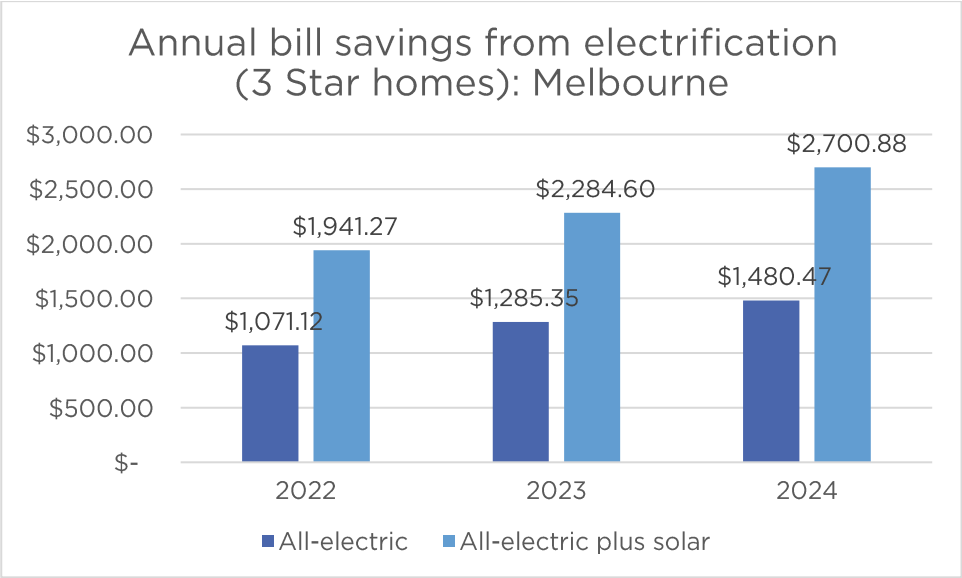
Findings: household energy bills

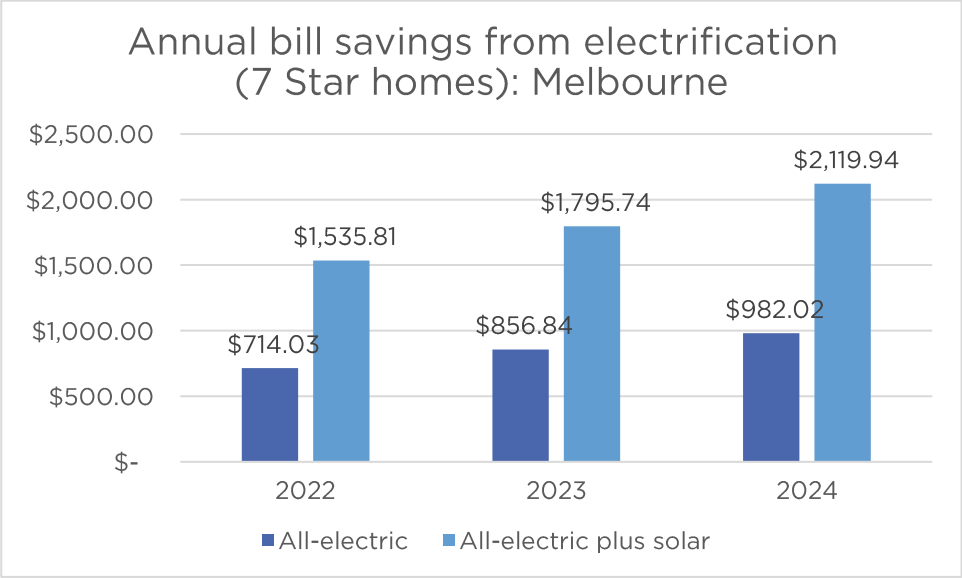
Melbourne

The analysis of annual household energy bills for Melbourne found as follows:

Year	Bill	Basic gas	Basic all-electric	Basic all-electric with solar	7* gas	7* all-electric	7* all-electric with solar
2022	Gas bill	$1,587.35	$-	$-	$1,098.87	$-	$-
	Electricity bill	$1,211.07	$1,727.29	$857.14	$1,162.09	$1,546.92	$725.15
	Total bill	**$2,798.41**	**$1,727.29**	**$857.14**	**$2,260.96**	**$1,546.92**	**$725.15**
2023	Gas bill	$1,904.82	$-	$-	$1,318.64	$-	$-
	Electricity bill	$1,453.28	$2,072.75	$1,073.49	$1,394.50	$1,856.31	$917.41
	Total bill	**$3,358.10**	**$2,072.75**	**$1,073.49**	**$2,713.15**	**$1,856.31**	**$917.41**
2024	Gas bill	$2,285.78	$-	$-	$1,582.37	$-	$-
	Electricity bill	$1,889.26	$2,694.58	$1,474.16	$1,812.86	$2,413.20	$1,275.29
	Total bill	**$4,175.05**	**$2,694.58**	**$1,474.16**	**$3,395.23**	**$2,413.20**	**$1,275.29**



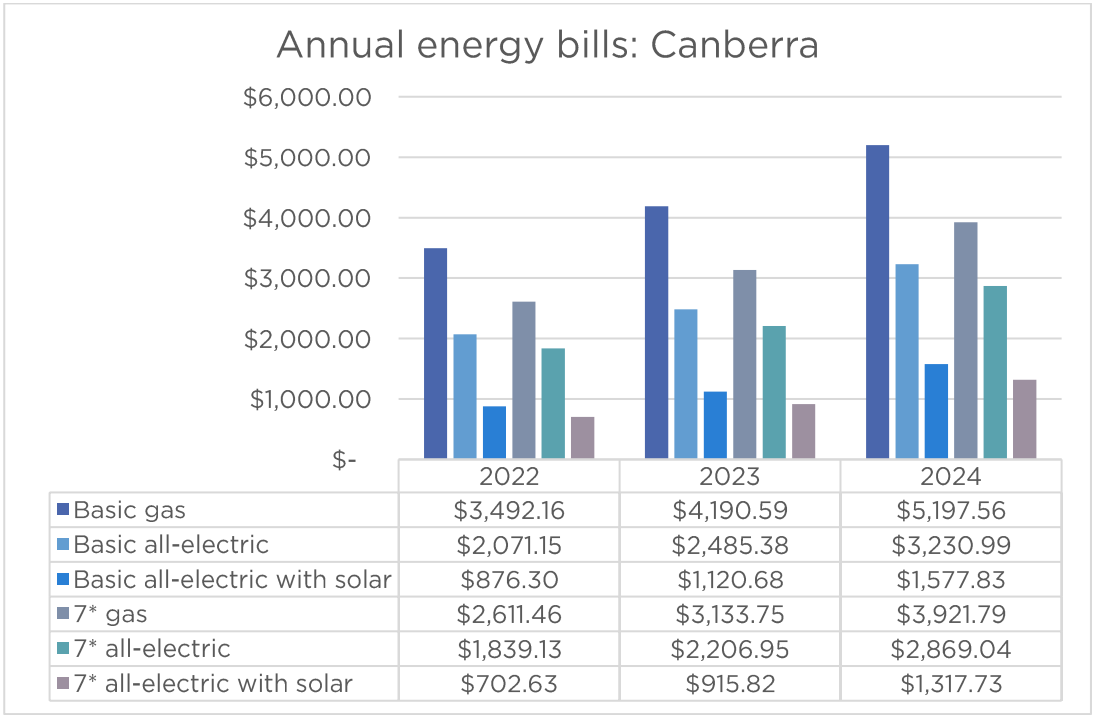

Annual bill savings from electrification (3 Star homes): Melbourne
$3,000.00
$2,500.00
$2,000.00
$1,500.00
$1,000.00
$500.00
$-
$1,071.12
$1,941.27
$1,285.35
$2,284.60
$1,480.47
$2,700.88
2022
2023
2024
All-electric
All-electric plus solar

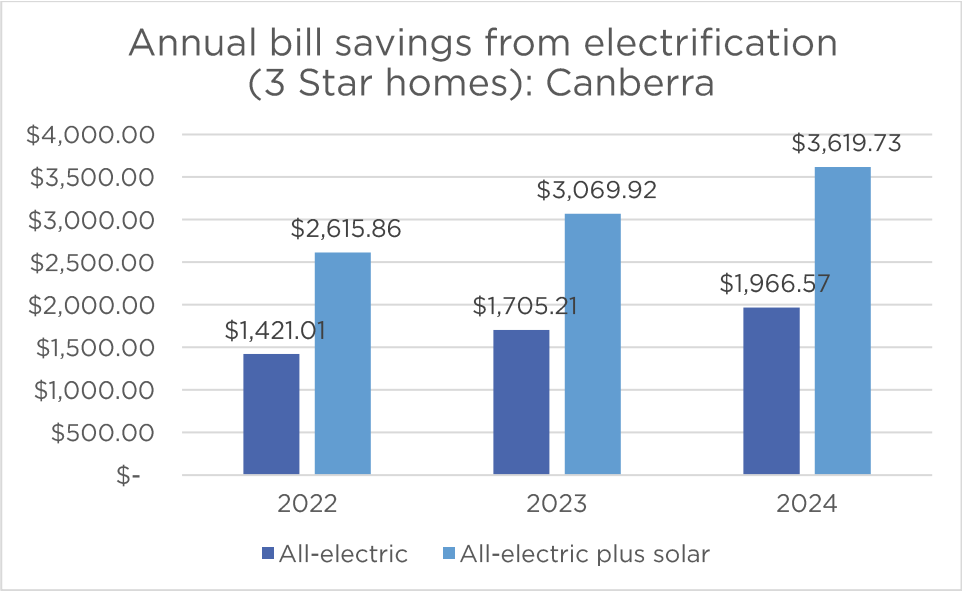

Annual bill savings from electrification (7 Star homes): Melbourne
$2,500.00
$2,000.00
$1,500.00
$1,000.00
$500.00
$-
$714.03
$1,535.81
$856.84
$1,795.74
$982.02
$2,119.94
2022
2023
2024
All-electric
All-electric plus solar

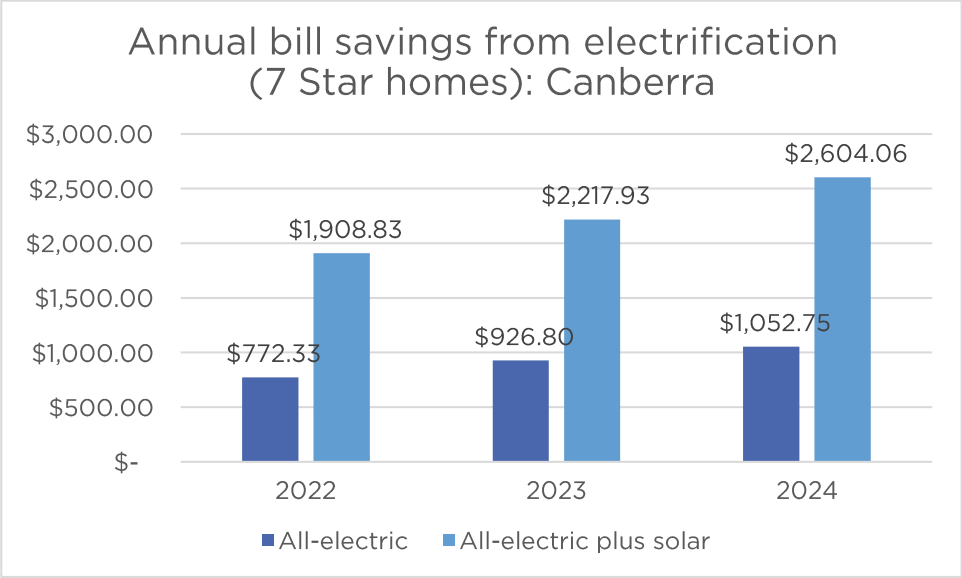
Canberra

The analysis of annual household energy bills for Canberra found as follows:

Year	Bill	Basic gas	Basic all-electric	Basic all-electric with solar	7* gas	7* all-electric	7* all-electric with solar
2022	Gas bill	$2,085.08	$-	$-	$1,267.38	$-	$-
	Electricity bill	$1,407.08	$2,071.15	$876.30	$1,344.08	$1,839.13	$702.63
	Total bill	**$3,492.16**	**$2,071.15**	**$876.30**	**$2,611.46**	**$1,839.13**	**$702.63**
2023	Gas bill	$2,502.09	$-	$-	$1,520.86	$-	$-
	Electricity bill	$1,688.50	$2,485.38	$1,120.68	$1,612.89	$2,206.95	$915.82
	Total bill	**$4,190.59**	**$2,485.38**	**$1,120.68**	**$3,133.75**	**$2,206.95**	**$915.82**
2024	Gas bill	$3,002.51	$-	$-	$1,825.03	$-	$-
	Electricity bill	$2,195.05	$3,230.99	$1,577.83	$2,096.76	$2,869.04	$1,317.73
	Total bill	**$5,197.56**	**$3,230.99**	**$1,577.83**	**$3,921.79**	**$2,869.04**	**$1,317.73**



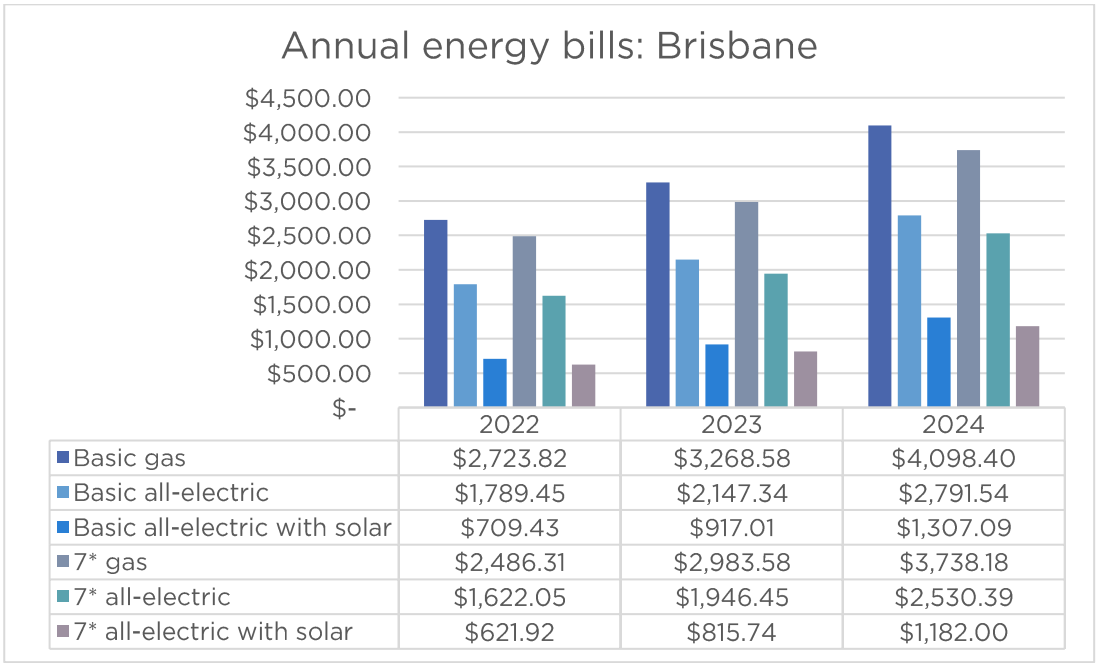

Annual bill savings from electrification (3 Star homes): Canberra
$4,000.00
$3,500.00
$3,000.00
$2,500.00
$2,000.00
$1,500.00
$1,000.00
$500.00
$-
$1,421.01
$2,615.86
$1,705.21
$3,069.92
$1,966.57
$3,619.73
2022
2023
2024
All-electric
All-electric plus solar

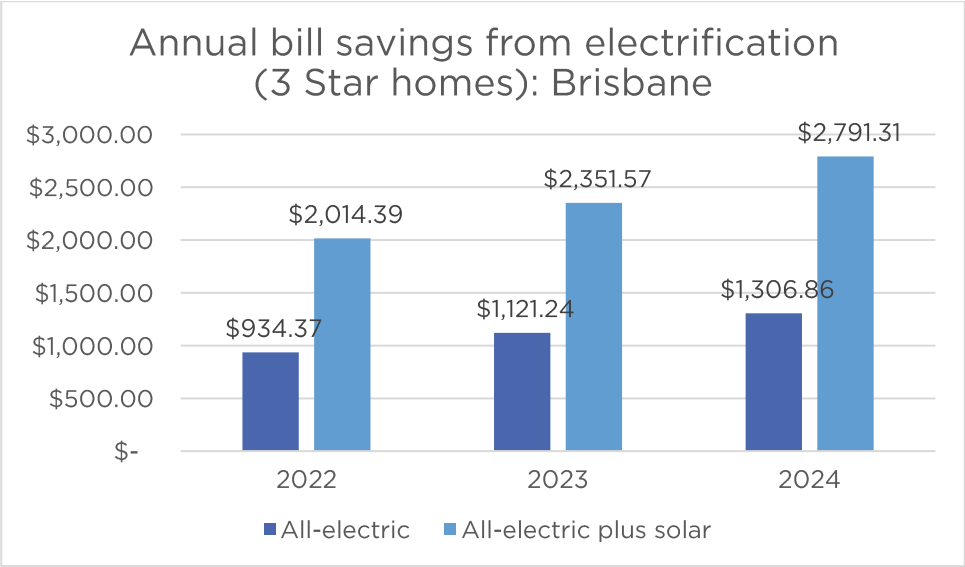

Annual bill savings from electrification (7 Star homes): Canberra
$3,000.00
$2,500.00
$2,000.00
$1,500.00
$1,000.00
$500.00
$-
$772.33
$1,908.83
$926.80
$2,217.93
$1,052.75
$2,604.06
2022
2023
2024
All-electric
All-electric plus solar

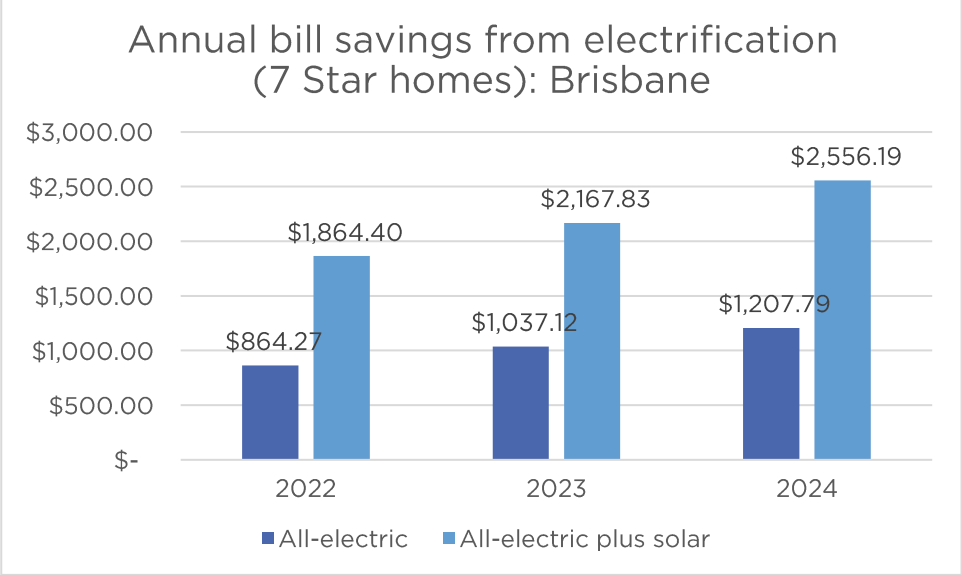
Brisbane

The analysis of annual household energy bills for Brisbane found as follows:

Year	Bill	Basic gas	Basic all-electric	Basic all-electric with solar	7* gas	7* all-electric	7* all-electric with solar
2022	Gas bill	$1,256.30	$-	$-	$1,170.56	$-	$-
	Electricity bill	$1,467.52	$1,789.45	$709.43	$1,315.75	$1,622.05	$621.92
	Total bill	**$2,723.82**	**$1,789.45**	**$709.43**	**$2,486.31**	**$1,622.05**	**$621.92**
2023	Gas bill	$1,507.56	$-	$-	$1,404.67	$-	$-
	Electricity bill	$1,761.02	$2,147.34	$917.01	$1,578.90	$1,946.45	$815.74
	Total bill	**$3,268.58**	**$2,147.34**	**$917.01**	**$2,983.58**	**$1,946.45**	**$815.74**
2024	Gas bill	$1,809.07	$-	$-	$1,685.61	$-	$-
	Electricity bill	$2,289.33	$2,791.54	$1,307.09	$2,052.57	$2,530.39	$1,182.00
	Total bill	**$4,098.40**	**$2,791.54**	**$1,307.09**	**$3,738.18**	**$2,530.39**	**$1,182.00**



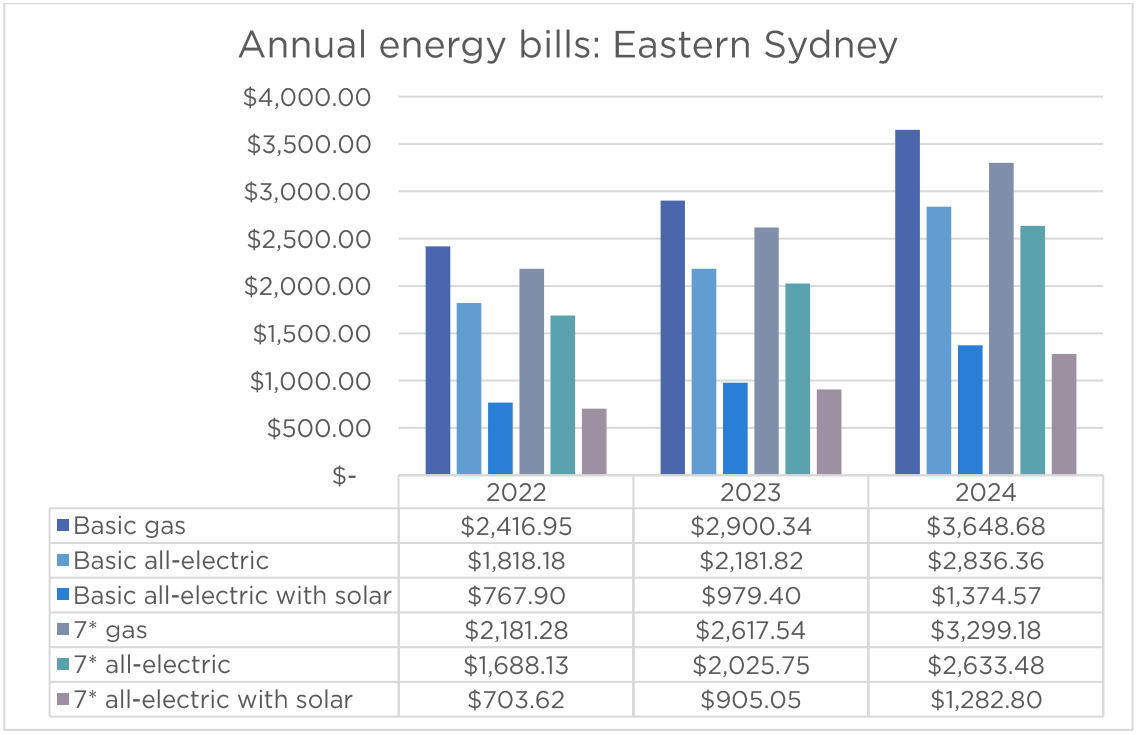

Annual bill savings from electrification (3 Star homes): Brisbane
$3,000.00
$2,500.00
$2,000.00
$1,500.00
$1,000.00
$500.00
$-
$934.37
$2,014.39
$1,121.24
$2,351.57
$1,306.86
$2,791.31
2022
2023
2024
All-electric
All-electric plus solar

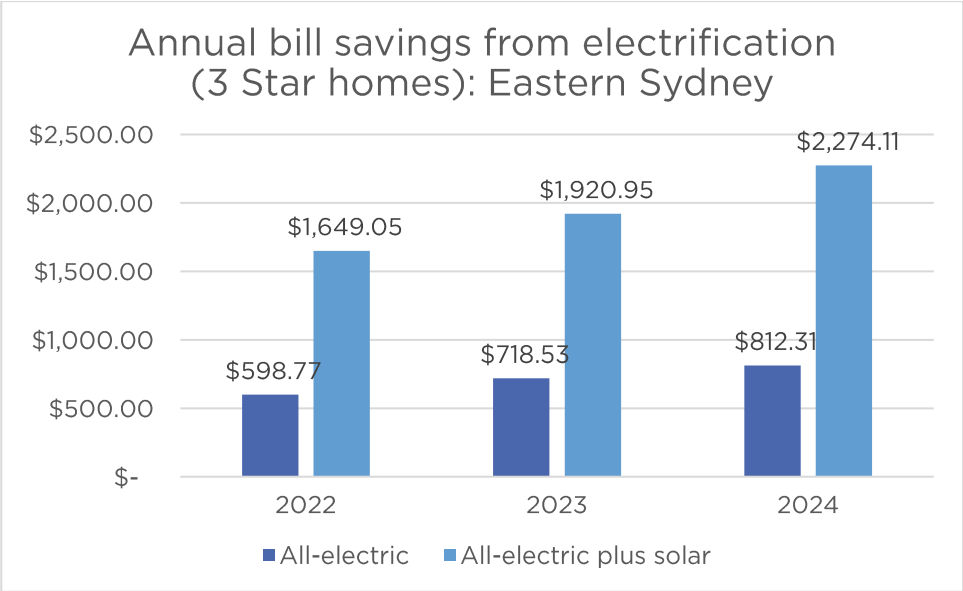

Annual bill savings from electrification (7 Star homes): Brisbane
$3,000.00
$2,500.00
$2,000.00
$1,500.00
$1,000.00
$500.00
$-
$864.27
$1,864.40
$1,037.12
$2,167.83
$1,207.79
$2,556.19
2022
2023
2024
All-electric
All-electric plus solar

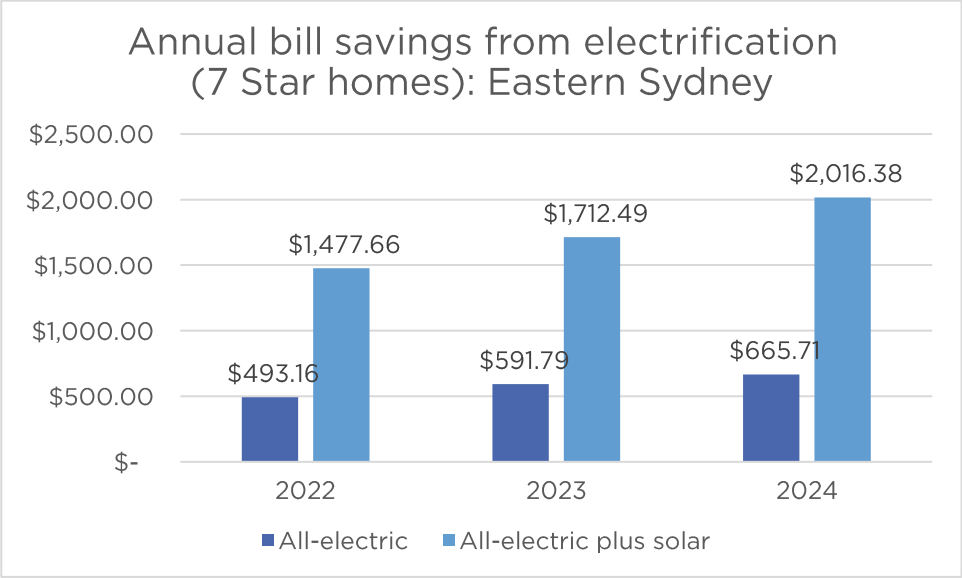
Sydney (East)

Due to differences in temperatures and energy costs, we have modelled homes in the east and west of Sydney separately. The analysis for the eastern suburbs uses climate data from near Sydney CBD. The analysis found annual energy bills for Sydney (East) as follows:

Year	Bill	Basic gas	Basic all-electric	Basic all-electric with solar	7* gas	7* all-electric	7* all-electric with solar
2022	Gas bill	$1,014.75	$-	$-	$863.47	$-	$-
	Electricity bill	$1,402.20	$1,818.18	$767.90	$1,317.81	$1,688.13	$703.62
	Total bill	**$2,416.95**	**$1,818.18**	**$767.90**	**$2,181.28**	**$1,688.13**	**$703.62**
2023	Gas bill	$1,217.71	$-	$-	$1,036.16	$-	$-
	Electricity bill	$1,682.64	$2,181.82	$979.40	$1,581.37	$2,025.75	$905.05
	Total bill	**$2,900.34**	**$2,181.82**	**$979.40**	**$2,617.54**	**$2,025.75**	**$905.05**
2024	Gas bill	$1,461.25	$-	$-	$1,243.40	$-	$-
	Electricity bill	$2,187.43	$2,836.36	$1,374.57	$2,055.78	$2,633.48	$1,282.80
	Total bill	**$3,648.68**	**$2,836.36**	**$1,374.57**	**$3,299.18**	**$2,633.48**	**$1,282.80**



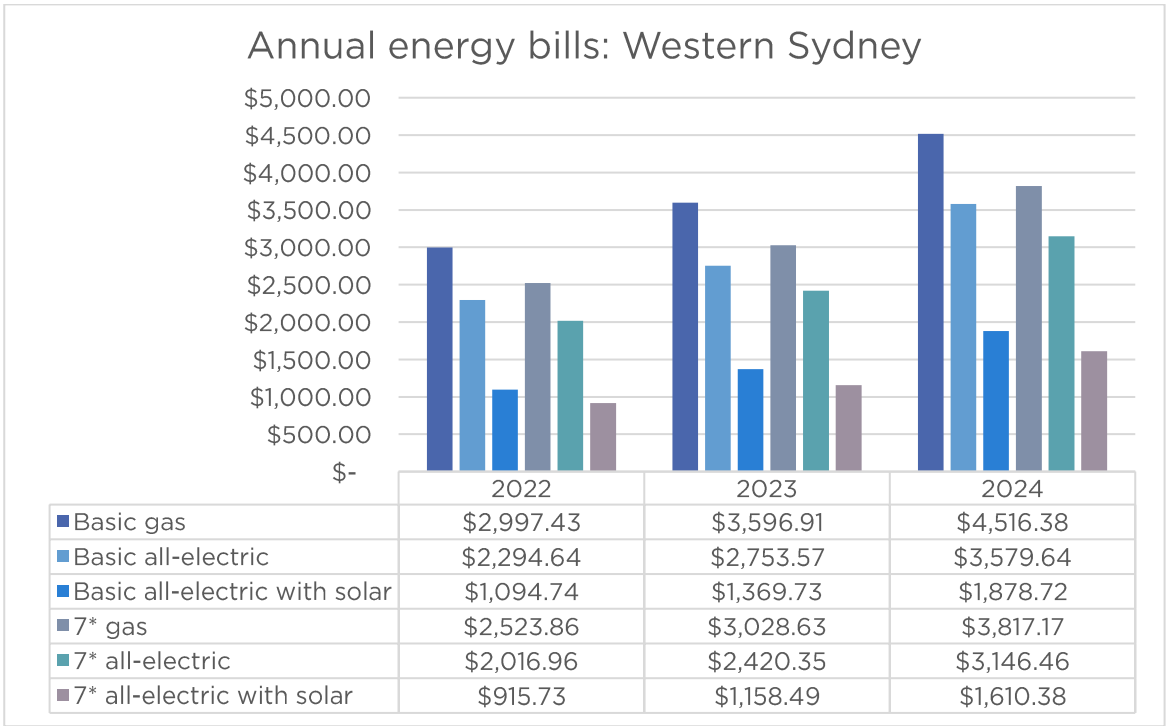

Annual bill savings from electrification (3 Star homes): Eastern Sydney
$2,500.00
$2,000.00
$1,500.00
$1,000.00
$500.00
$-
$598.77
$1,649.05
$718.53
$1,920.95
$812.31
$2,274.11
2022
2023
2024
All-electric
All-electric plus solar

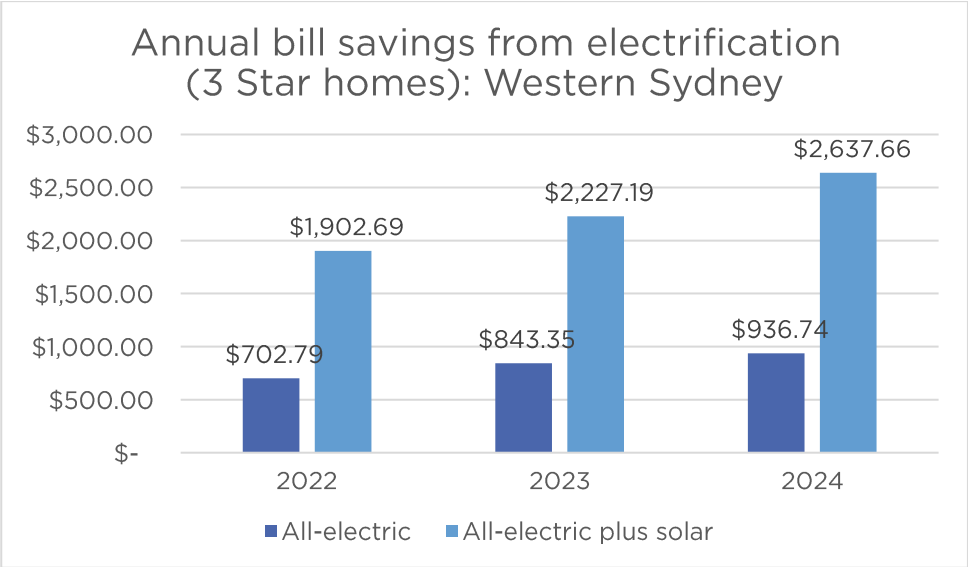

Annual bill savings from electrification (7 Star homes): Eastern Sydney
$2,500.00
$2,000.00
$1,500.00
$1,000.00
$500.00
$-
$493.16
$1,477.66
$591.79
$1,712.49
$665.71
$2,016.38
2022
2023
2024
All-electric
All-electric plus solar

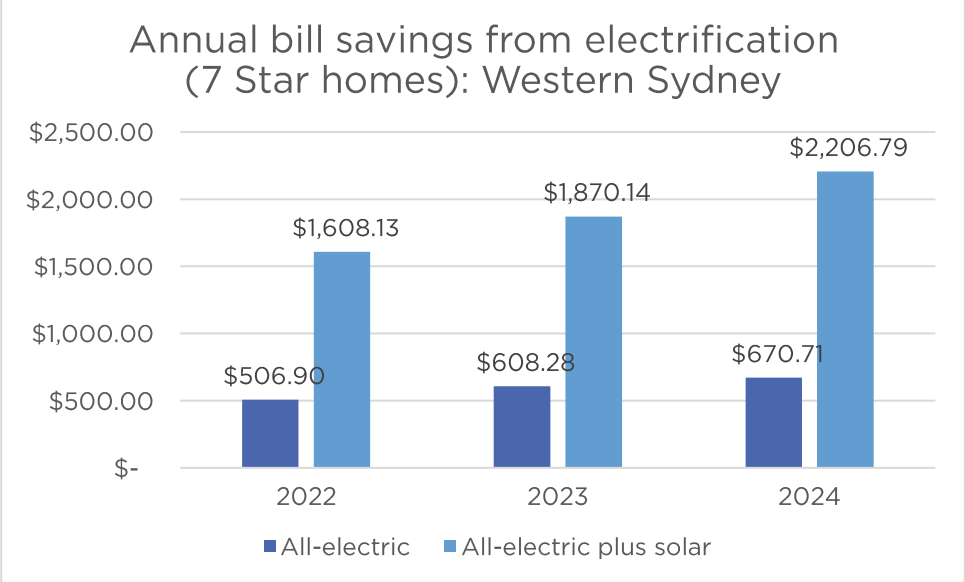
Sydney (West)

Due to differences in temperatures and energy costs, we have modelled homes in the east and west of Sydney separately. The analysis for the western suburbs uses climate data from Richmond (2753). The analysis found annual energy bills for Sydney (West) as follows:

Year	Bill	Basic gas	Basic all-electric	Basic all-electric with solar	7* gas	7* all-electric	7* all-electric with solar
2022	Gas bill	$1,330.09	$-	$-	$1,000.42	$-	$-
	Electricity bill	$1,667.33	$2,294.64	$1,094.74	$1,523.44	$2,016.96	$915.73
	Total bill	**$2,997.43**	**$2,294.64**	**$1,094.74**	**$2,523.86**	**$2,016.96**	**$915.73**
2023	Gas bill	$1,596.11	$-	$-	$1,200.51	$-	$-
	Electricity bill	$2,000.80	$2,753.57	$1,369.73	$1,828.12	$2,420.35	$1,158.49
	Total bill	**$3,596.91**	**$2,753.57**	**$1,369.73**	**$3,028.63**	**$2,420.35**	**$1,158.49**
2024	Gas bill	$1,915.33	$-	$-	$1,440.61	$-	$-
	Electricity bill	$2,601.04	$3,579.64	$1,878.72	$2,376.56	$3,146.46	$1,610.38
	Total bill	**$4,516.38**	**$3,579.64**	**$1,878.72**	**$3,817.17**	**$3,146.46**	**$1,610.38**



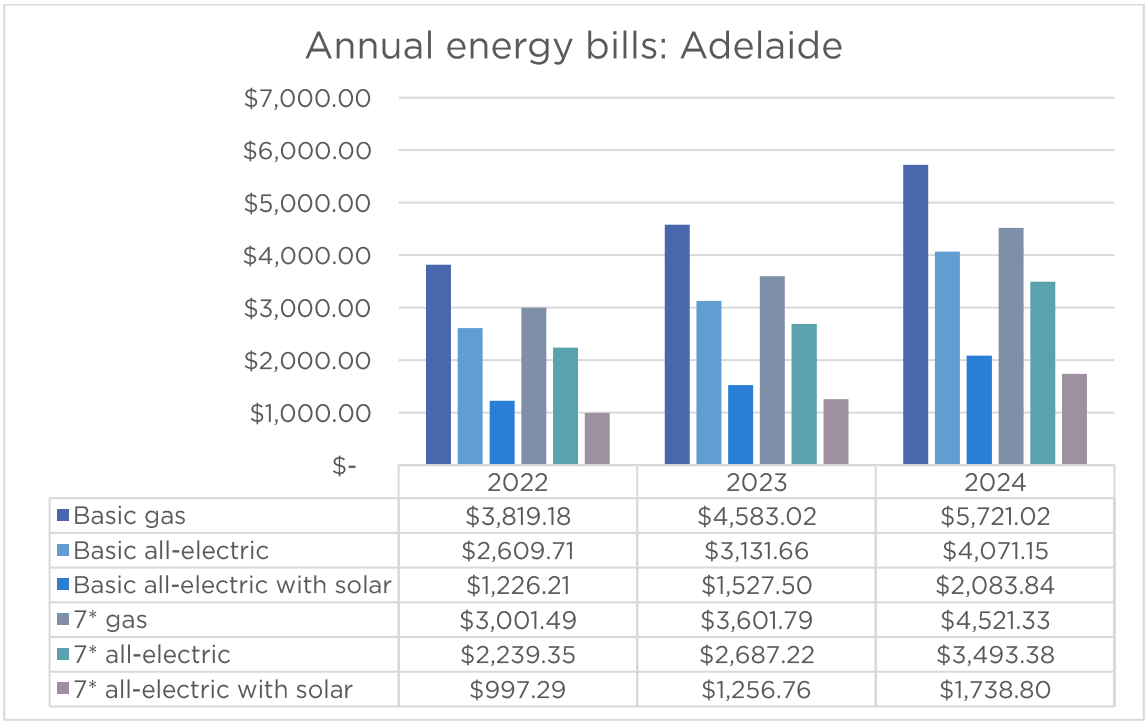

Annual bill savings from electrification (3 Star homes): Western Sydney
$3,000.00
$2,500.00
$2,000.00
$1,500.00
$1,000.00
$500.00
$-
$702.79
$1,902.69
$843.35
$2,227.19
$936.74
$2,637.66
2022
2023
2024
All-electric
All-electric plus solar

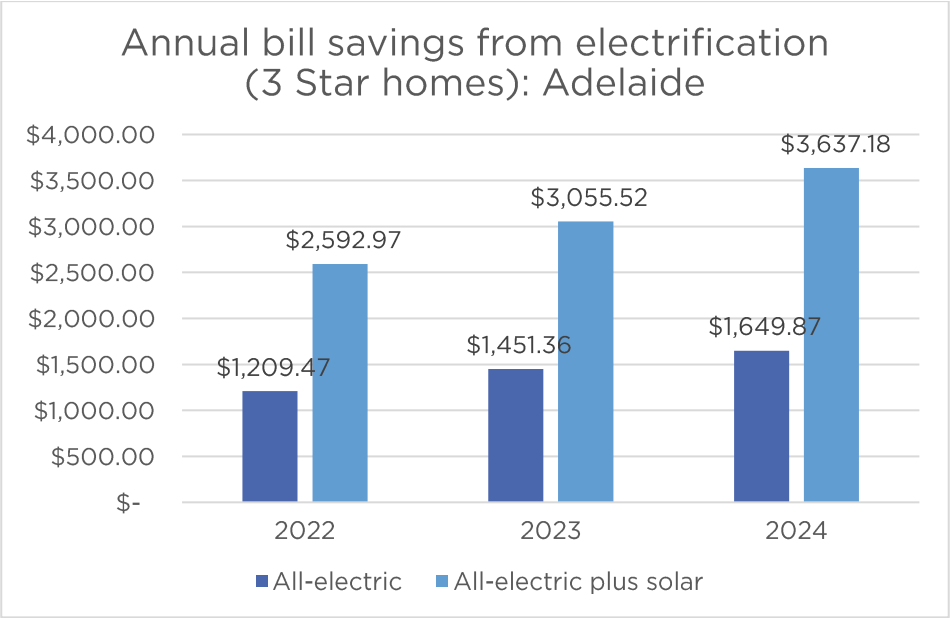

Annual bill savings from electrification (7 Star homes): Western Sydney
$2,500.00
$2,000.00
$1,500.00
$1,000.00
$500.00
$-
$506.90
$1,608.13
$608.28
$1,870.14
$670.71
$2,206.79
2022
2023
2024
All-electric
All-electric plus solar

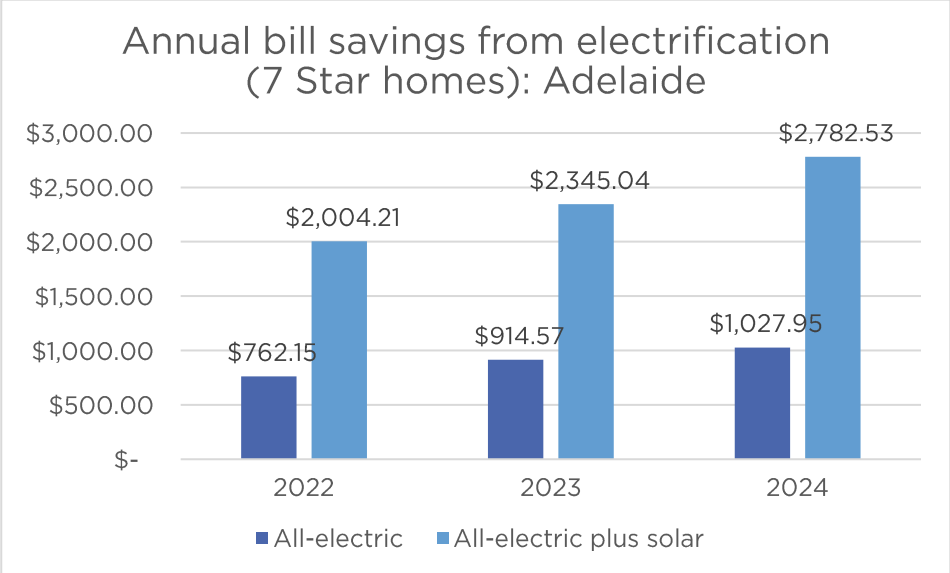
Adelaide

The analysis of annual household energy bills for Adelaide found as follows:

Year	Bill	Basic gas	Basic all-electric	Basic all-electric with solar	7* gas	7* all-electric	7* all-electric with solar
2022	Gas bill	$1,974.18	$-	$-	$1,341.67	$-	$-
	Electricity bill	$1,845.00	$2,609.71	$1,226.21	$1,659.82	$2,239.35	$997.29
	Total bill	**$3,819.18**	**$2,609.71**	**$1,226.21**	**$3,001.49**	**$2,239.35**	**$997.29**
2023	Gas bill	$2,369.01	$-	$-	$1,610.01	$-	$-
	Electricity bill	$2,214.00	$3,131.66	$1,527.50	$1,991.78	$2,687.22	$1,256.76
	Total bill	**$4,583.02**	**$3,131.66**	**$1,527.50**	**$3,601.79**	**$2,687.22**	**$1,256.76**
2024	Gas bill	$2,842.82	$-	$-	$1,932.01	$-	$-
	Electricity bill	$2,878.20	$4,071.15	$2,083.84	$2,589.32	$3,493.38	$1,738.80
	Total bill	**$5,721.02**	**$4,071.15**	**$2,083.84**	**$4,521.33**	**$3,493.38**	**$1,738.80**



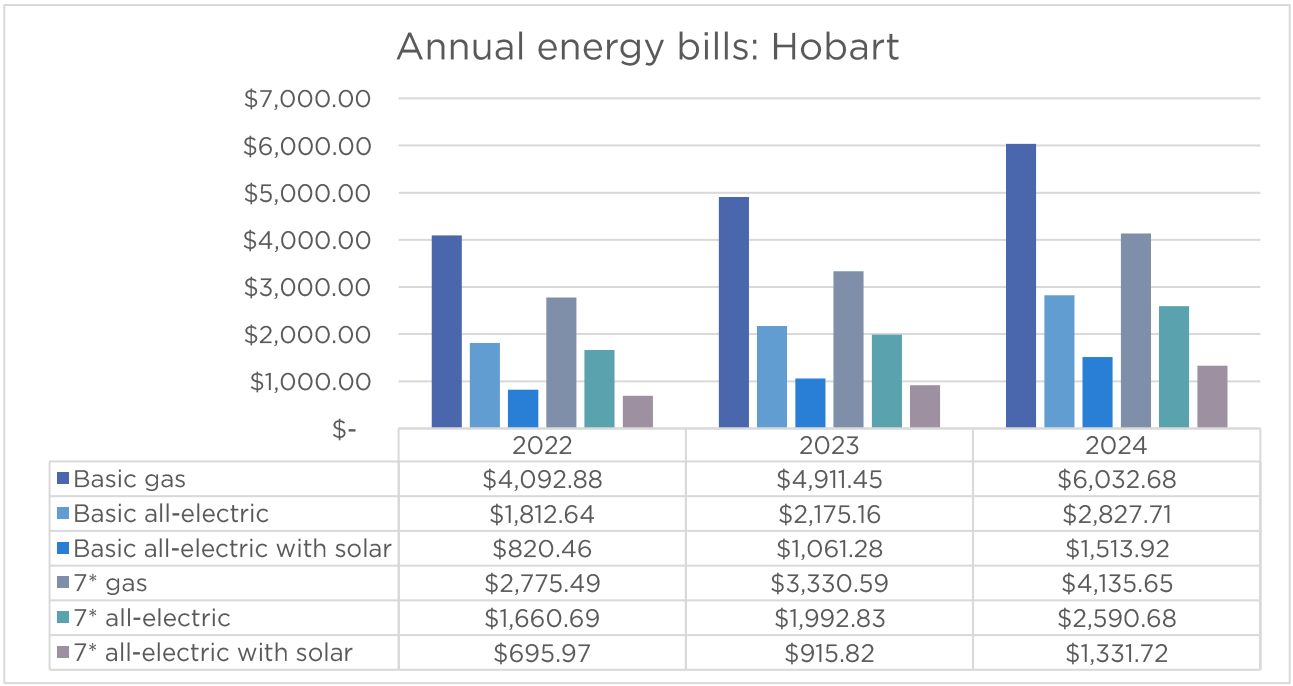

Annual bill savings from electrification (3 Star homes): Adelaide
$4,000.00
$3,500.00
$3,000.00
$2,500.00
$2,000.00
$1,500.00
$1,000.00
$500.00
$-
$1,209.47
$2,592.97
$1,451.36
$3,055.52
$1,649.87
$3,637.18
2022
2023
2024
All-electric
All-electric plus solar

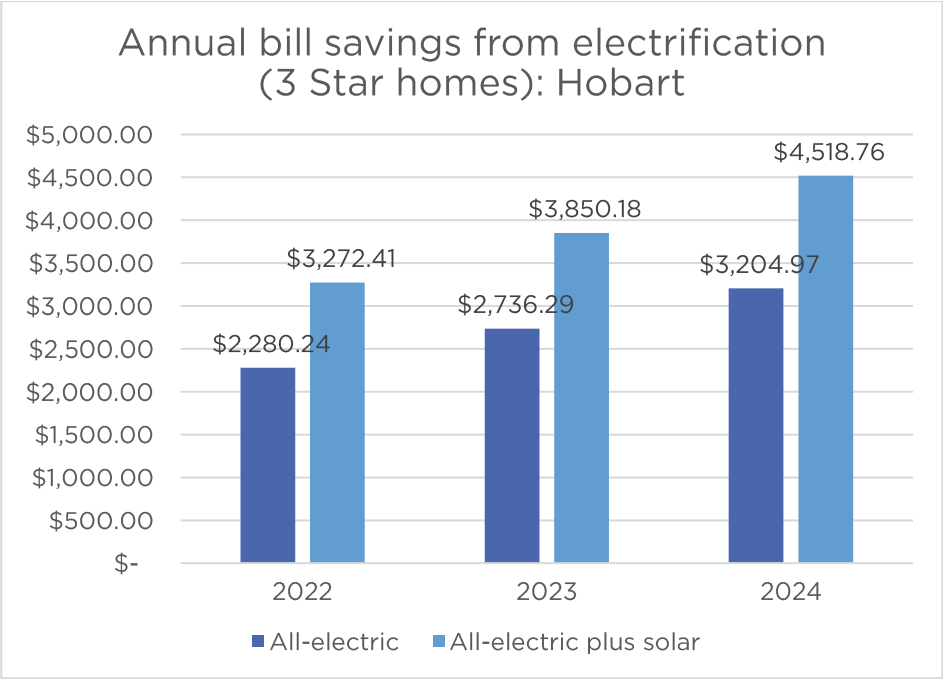

Annual bill savings from electrification (7 Star homes): Adelaide
$3,000.00
$2,500.00
$2,000.00
$1,500.00
$1,000.00
$500.00
$-
$762.15
$2,004.21
$914.57
$2,345.04
$1,027.95
$2,782.53
2022
2023
2024
All-electric
All-electric plus solar

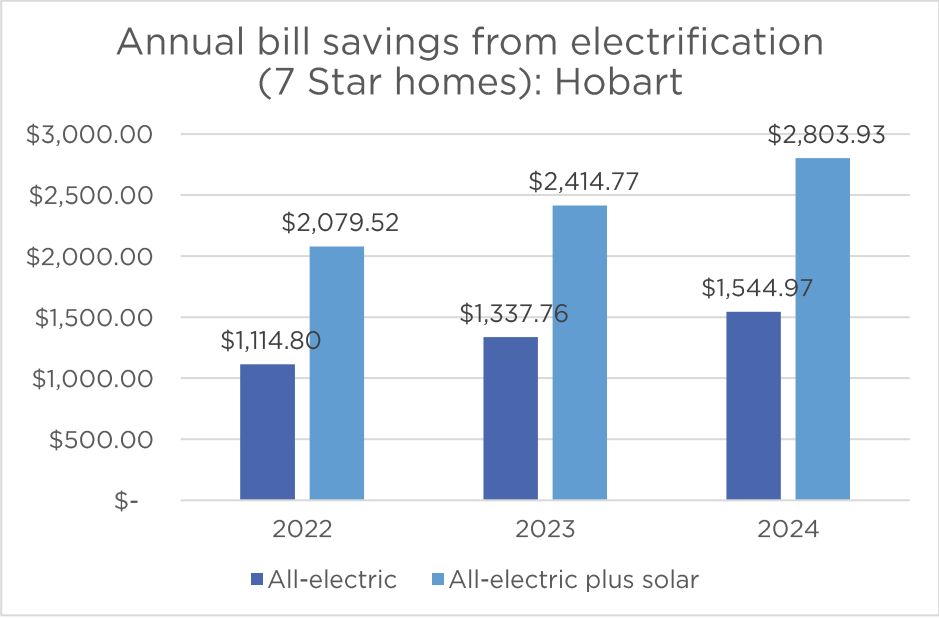
Hobart

Tasmania sets residential electricity tariffs at differentiated rates depending on use, with a lower rate for heating and hot water than for other household usage such as plug-in appliances and lighting. These tariffs are taken into account in our analysis. Relatively few Hobart residents are connected to mains gas for heating. The analysis of household energy bills for Hobart found as follows:

Year	Bill	Basic gas	Basic all-electric	Basic all-electric with solar	7* gas	7* all-electric	7* all-electric with solar
2022	Gas bill	$2,935.03	$-	$-	$1,617.65	$-	$-
	Electricity bill	$1,157.84	$1,812.64	$820.46	$1,157.84	$1,660.69	$695.97
	Total bill	**$4,092.88**	**$1,812.64**	**$820.46**	**$2,775.49**	**$1,660.69**	**$695.97**
2023	Gas bill	$3,522.04	$-	$-	$1,941.18	$-	$-
	Electricity bill	$1,389.41	$2,175.16	$1,061.28	$1,389.41	$1,992.83	$915.82
	Total bill	**$4,911.45**	**$2,175.16**	**$1,061.28**	**$3,330.59**	**$1,992.83**	**$915.82**
2024	Gas bill	$4,226.45	$-	$-	$2,329.42	$-	$-
	Electricity bill	$1,806.23	$2,827.71	$1,513.92	$1,806.23	$2,590.68	$1,331.72
	Total bill	**$6,032.68**	**$2,827.71**	**$1,513.92**	**$4,135.65**	**$2,590.68**	**$1,331.72**



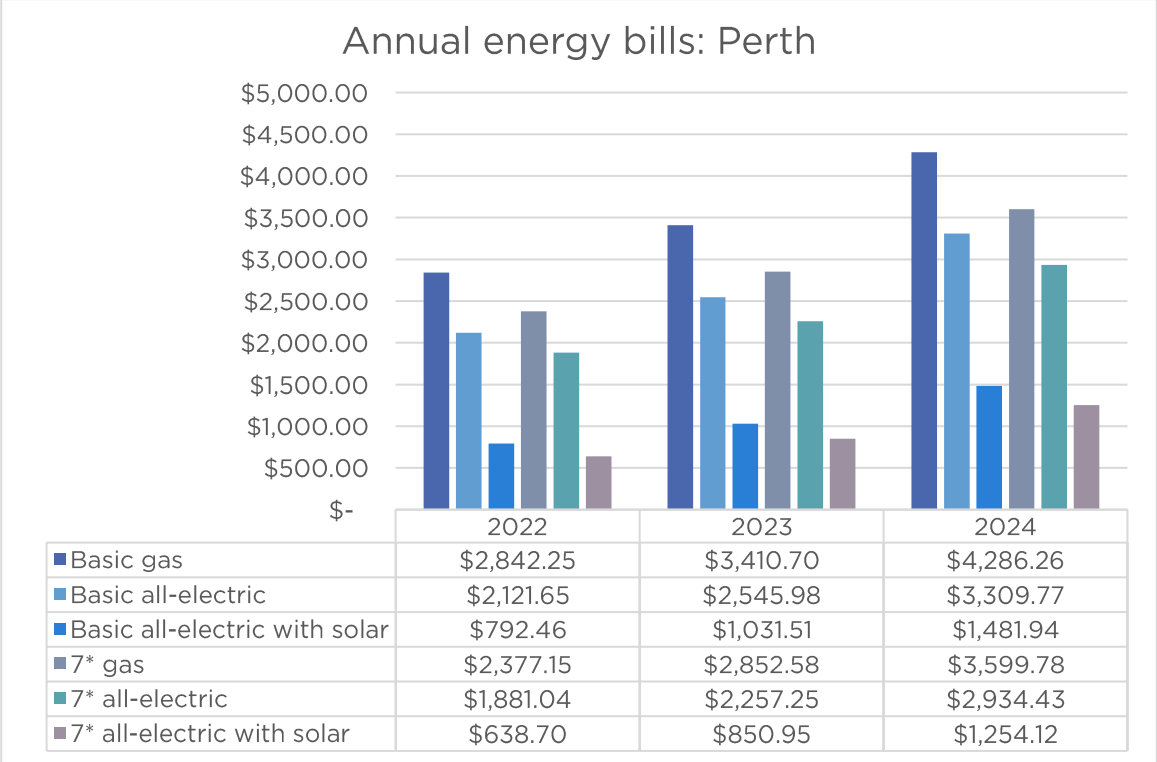

Annual bill savings from electrification (3 Star homes): Hobart
$5,000.00
$4,500.00
$4,000.00
$3,500.00
$3,000.00
$2,500.00
$2,000.00
$1,500.00
$1,000.00
$500.00
$-
$2,280.24
$3,272.41
$2,736.29
$3,850.18
$3,204.97
$4,518.76
2022
2023
2024
All-electric
All-electric plus solar

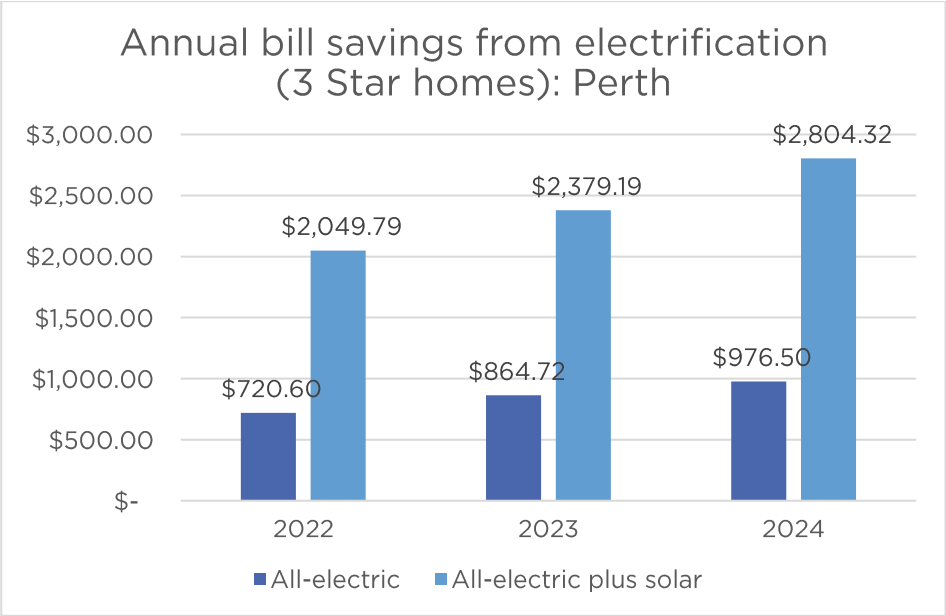

Annual bill savings from electrification (7 Star homes): Hobart
$3,000.00
$2,500.00
$2,000.00
$1,500.00
$1,000.00
$500.00
$-
$1,114.80
$2,079.52
$1,337.76
$2,414.77
$1,544.97
$2,803.93
2022
2023
2024
All-electric
All-electric plus solar

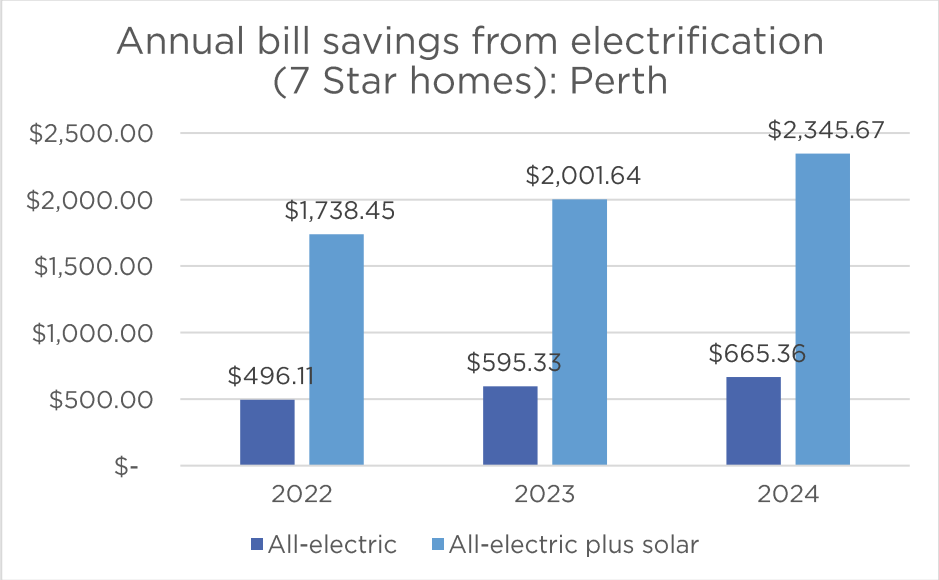
Perth

The analysis of annual household energy bills for Perth found as follows:

Year	Bill	Basic gas	Basic all-electric	Basic all-electric with solar	7* gas	7* all-electric	7* all-electric with solar
2022	Gas bill	$1,230.38	$-	$-	$904.81	$-	$-
	Electricity bill	$1,611.87	$2,121.65	$792.46	$1,472.34	$1,881.04	$638.70
	Total bill	**$2,842.25**	**$2,121.65**	**$792.46**	**$2,377.15**	**$1,881.04**	**$638.70**
2023	Gas bill	$1,476.45	$-	$-	$1,085.77	$-	$-
	Electricity bill	$1,934.25	$2,545.98	$1,031.51	$1,766.81	$2,257.25	$850.95
	Total bill	**$3,410.70**	**$2,545.98**	**$1,031.51**	**$2,852.58**	**$2,257.25**	**$850.95**
2024	Gas bill	$1,771.74	$-	$-	$1,302.92	$-	$-
	Electricity bill	$2,514.52	$3,309.77	$1,481.94	$2,296.86	$2,934.43	$1,254.12
	Total bill	**$4,286.26**	**$3,309.77**	**$1,481.94**	**$3,599.78**	**$2,934.43**	**$1,254.12**



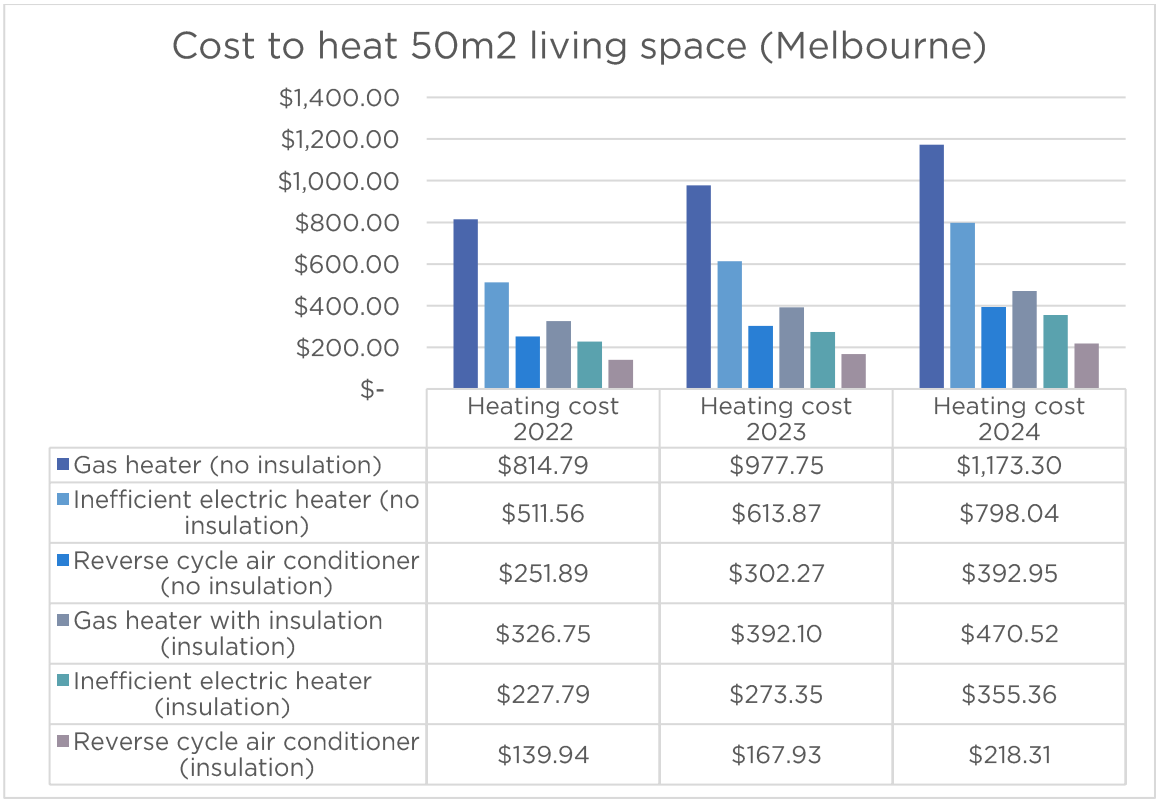

Annual bill savings from electrification (3 Star homes): Perth
$3,000.00
$2,500.00
$2,000.00
$1,500.00
$1,000.00
$500.00
$-
$720.60
$2,049.79
$864.72
$2,379.19
$976.50
$2,804.32
2022
2023
2024
All-electric
All-electric plus solar


Annual bill savings from electrification (7 Star homes): Perth
$2,500.00
$2,000.00
$1,500.00
$1,000.00
$500.00
$-
$496.11
$1,738.45
$595.33
$2,001.64
$665.36
$2,345.67
2022
2023
2024
All-electric
All-electric plus solar

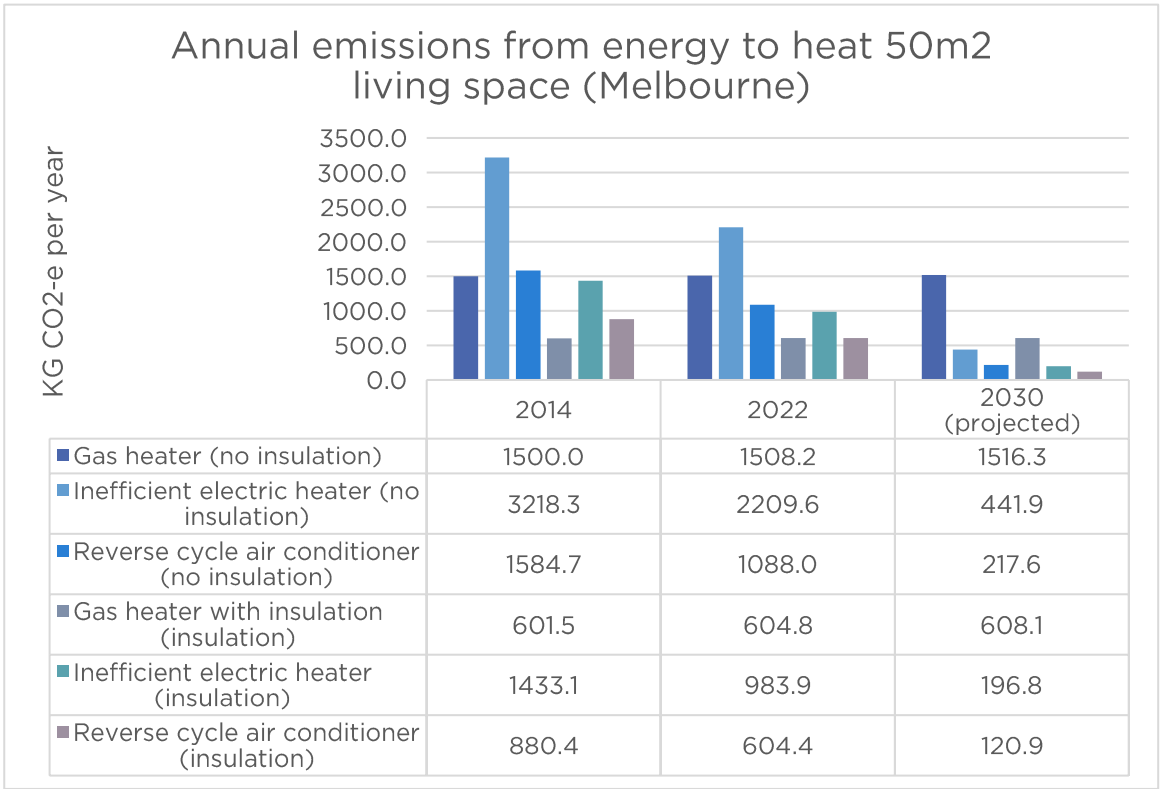
Findings: Single space heating

Melbourne

The results of our analysis for heating costs and emissions in Melbourne were as follows:

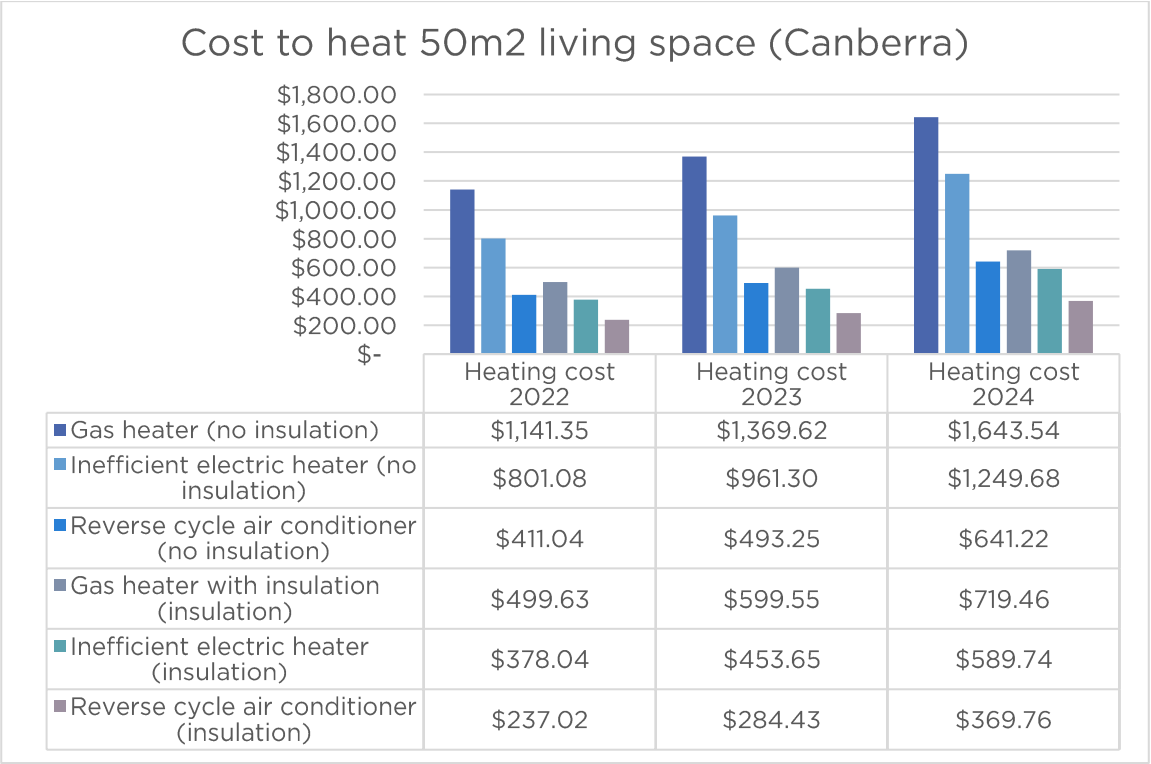


	Heating cost 2022	Heating cost 2023	Heating cost 2024
Gas heater (no insulation)	$814.79	$977.75	$1,173.30
Inefficient electric heater (no insulation)	$511.56	$613.87	$798.04
Reverse cycle air conditioner (no insulation)	$251.89	$302.27	$392.95
Gas heater with insulation (insulation)	$326.75	$392.10	$470.52
Inefficient electric heater (insulation)	$227.79	$273.35	$355.36
Reverse cycle air conditioner (insulation)	$139.94	$167.93	$218.31

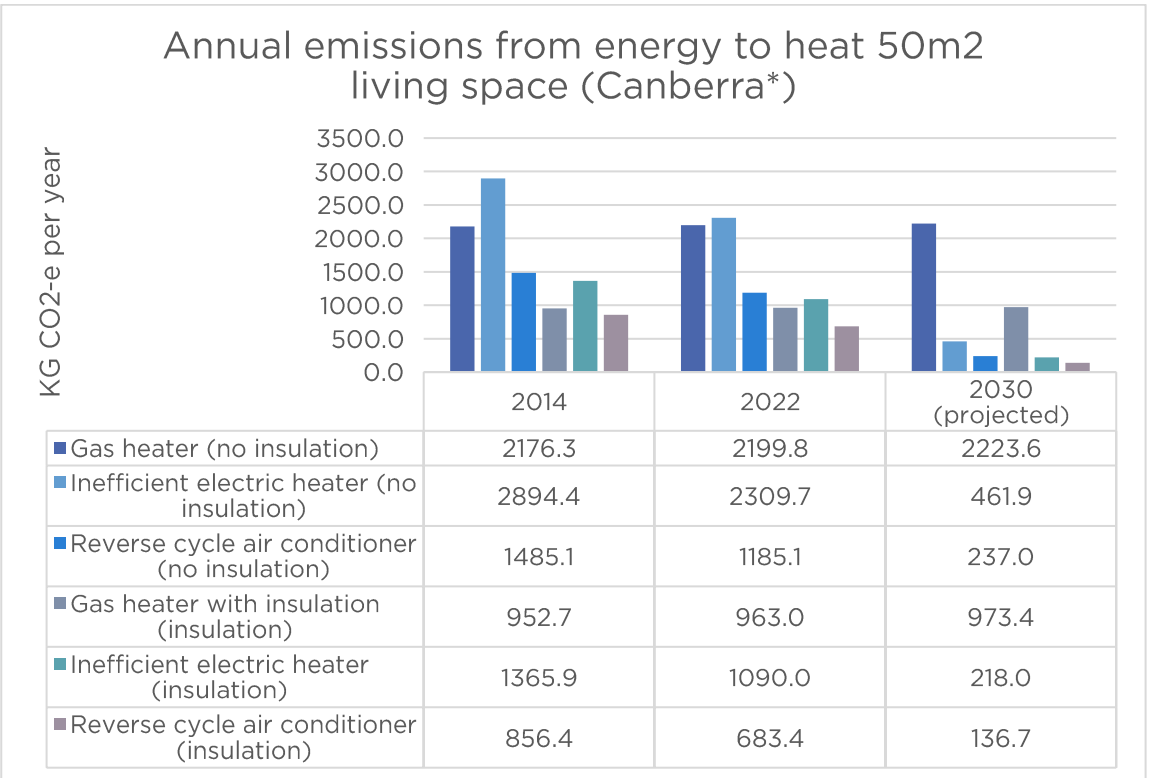


	2014	2022	2030 (projected)
Gas heater (no insulation)	1500.0	1508.2	1516.3
Inefficient electric heater (no insulation)	3218.3	2209.6	441.9
Reverse cycle air conditioner (no insulation)	1584.7	1088.0	217.6
Gas heater with insulation (insulation)	601.5	604.8	608.1
Inefficient electric heater (insulation)	1433.1	983.9	196.8
Reverse cycle air conditioner (insulation)	880.4	604.4	120.9

Canberra



	Heating cost 2022	Heating cost 2023	Heating cost 2024
Gas heater (no insulation)	$1,141.35	$1,369.62	$1,643.54
Inefficient electric heater (no insulation)	$801.08	$961.30	$1,249.68
Reverse cycle air conditioner (no insulation)	$411.04	$493.25	$641.22
Gas heater with insulation (insulation)	$499.63	$599.55	$719.46
Inefficient electric heater (insulation)	$378.04	$453.65	$589.74
Reverse cycle air conditioner (insulation)	$237.02	$284.43	$369.76

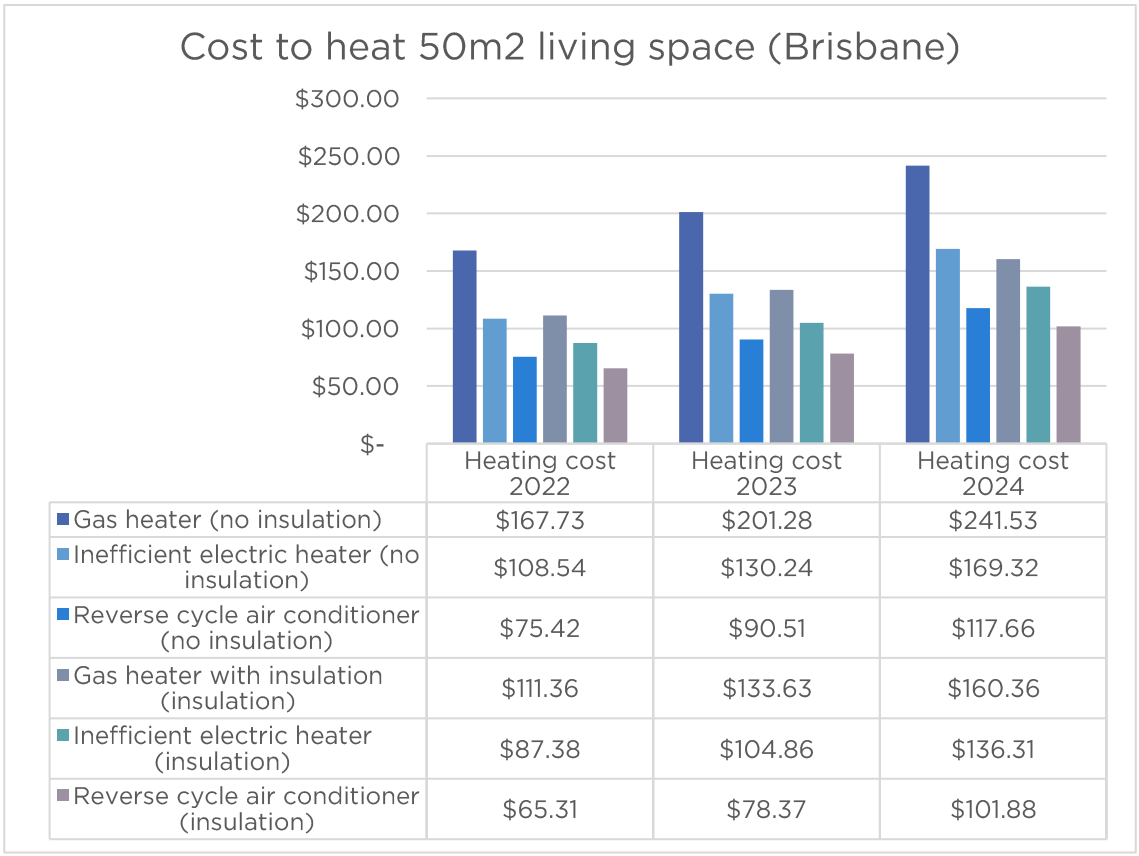


	2014	2022	2030 (projected)
Gas heater (no insulation)	2176.3	2199.8	2223.6
Inefficient electric heater (no insulation)	2894.4	2309.7	461.9
Reverse cycle air conditioner (no insulation)	1485.1	1185.1	237.0
Gas heater with insulation (insulation)	952.7	963.0	973.4
Inefficient electric heater (insulation)	1365.9	1090.0	218.0
Reverse cycle air conditioner (insulation)	856.4	683.4	136.7

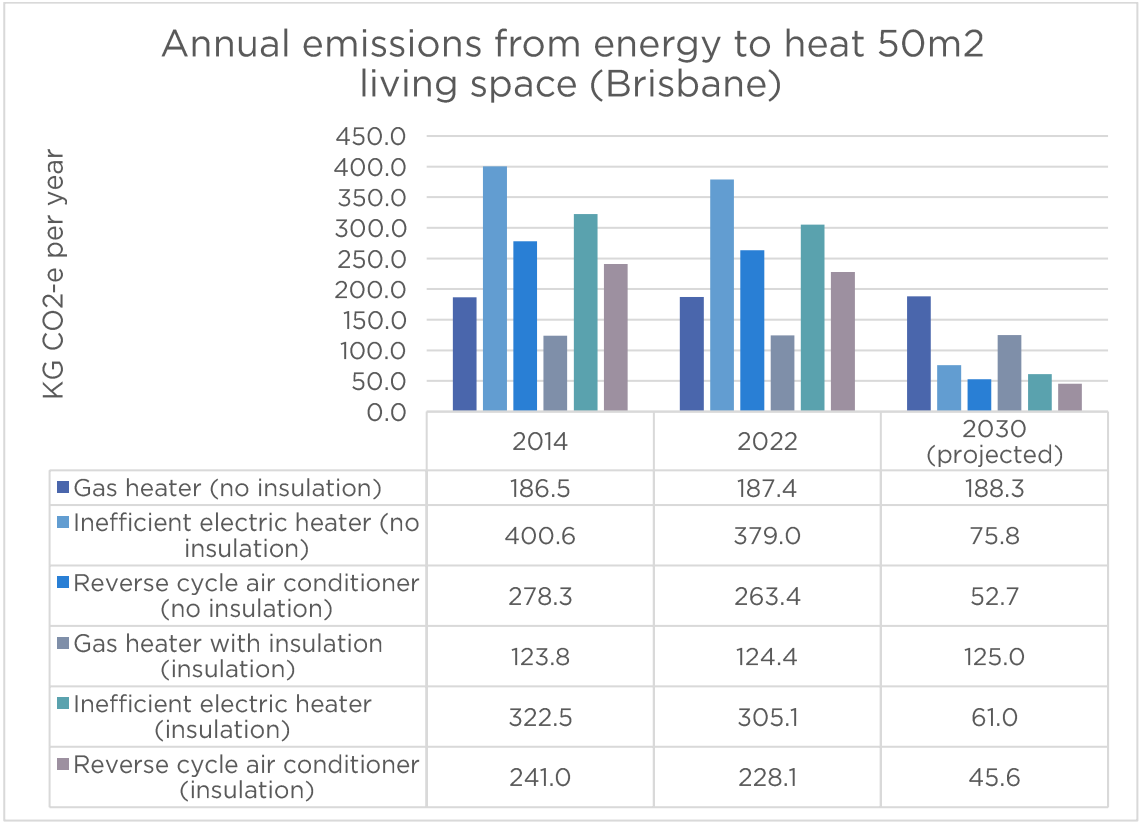
* This report calculates emissions using National Greenhouse Accounts intensity factors, in which ACT emissions intensity is recorded as equal to NSW emissions intensity. Importantly, the ACT now has power purchase agreements for 100% renewables-generated electricity, meaning that current emissions from electricity are significantly overstated by NGA emissions rates. We have chosen to use NGA emissions factors to maintain a consistent methodology.

Brisbane

The results of our analysis for heating costs and emissions for Brisbane were as follows:



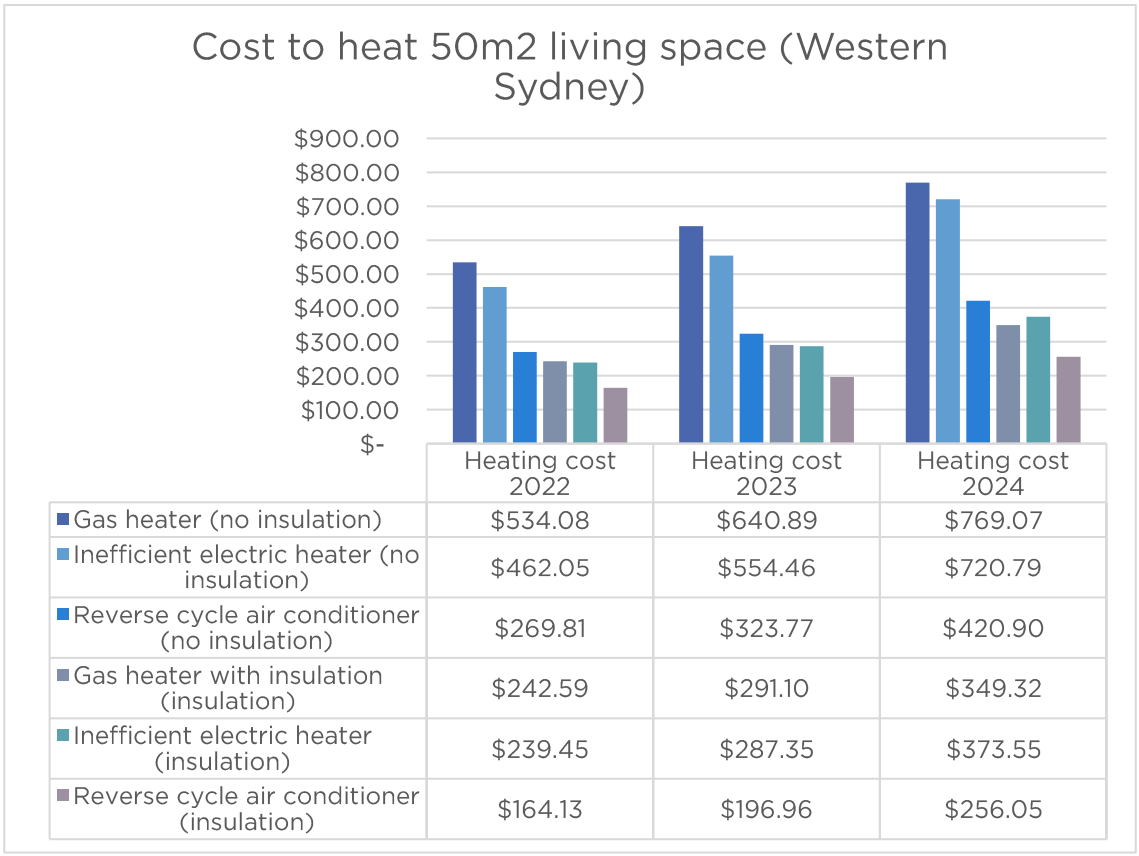
	Heating cost 2022	Heating cost 2023	Heating cost 2024
Gas heater (no insulation)	$167.73	$201.28	$241.53
Inefficient electric heater (no insulation)	$108.54	$130.24	$169.32
Reverse cycle air conditioner (no insulation)	$75.42	$90.51	$117.66
Gas heater with insulation (insulation)	$111.36	$133.63	$160.36
Inefficient electric heater (insulation)	$87.38	$104.86	$136.31
Reverse cycle air conditioner (insulation)	$65.31	$78.37	$101.88



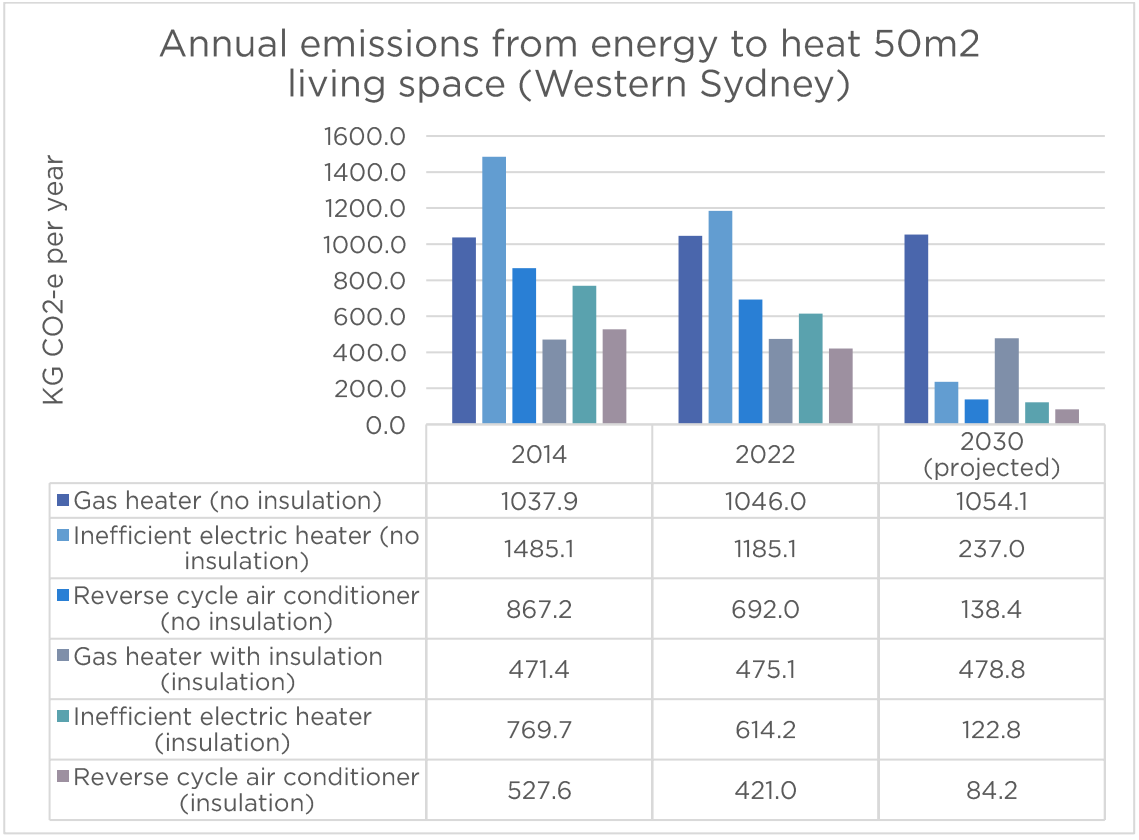
	2014	2022	2030 (projected)
Gas heater (no insulation)	186.5	187.4	188.3
Inefficient electric heater (no insulation)	400.6	379.0	75.8
Reverse cycle air conditioner (no insulation)	278.3	263.4	52.7
Gas heater with insulation (insulation)	123.8	124.4	125.0
Inefficient electric heater (insulation)	322.5	305.1	61.0
Reverse cycle air conditioner (insulation)	241.0	228.1	45.6

Sydney (West)

The results of our analysis for heating costs and emissions for Western Sydney were as follows:



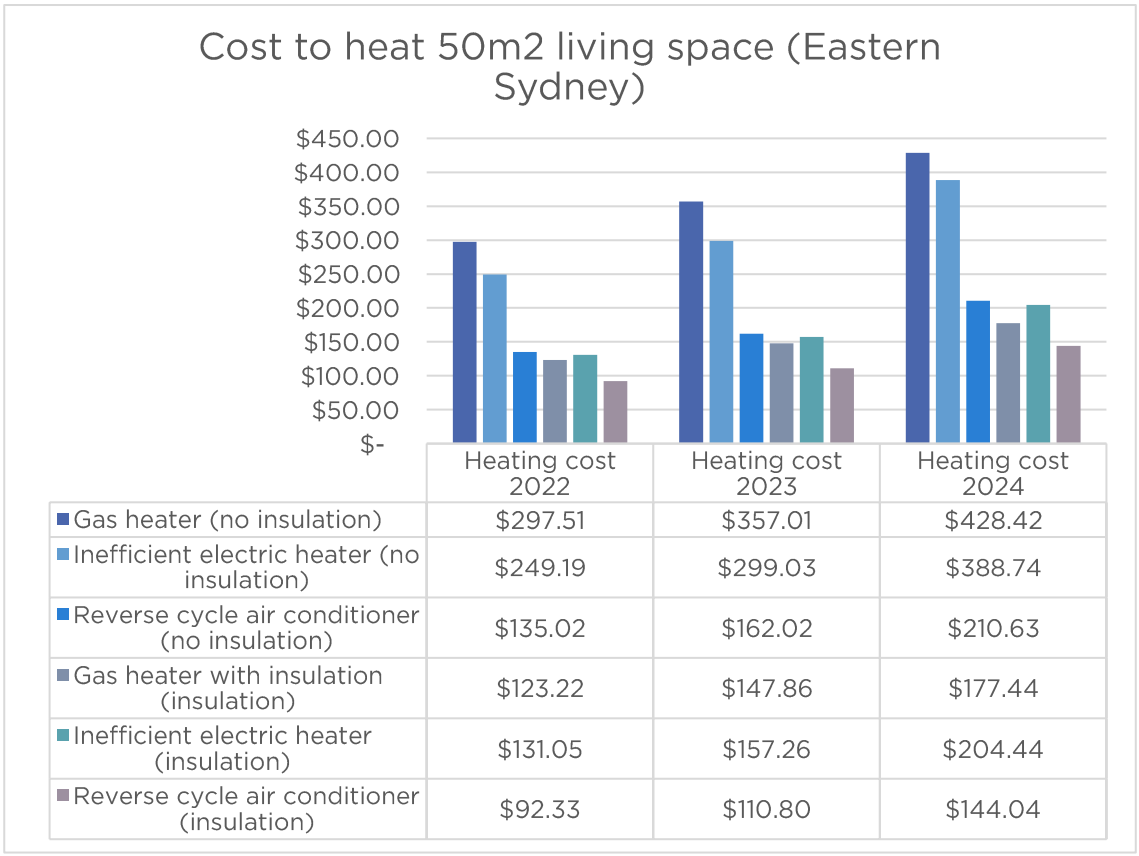
	Heating cost 2022	Heating cost 2023	Heating cost 2024
Gas heater (no insulation)	$534.08	$640.89	$769.07
Inefficient electric heater (no insulation)	$462.05	$554.46	$720.79
Reverse cycle air conditioner (no insulation)	$269.81	$323.77	$420.90
Gas heater with insulation (insulation)	$242.59	$291.10	$349.32
Inefficient electric heater (insulation)	$239.45	$287.35	$373.55
Reverse cycle air conditioner (insulation)	$164.13	$196.96	$256.05



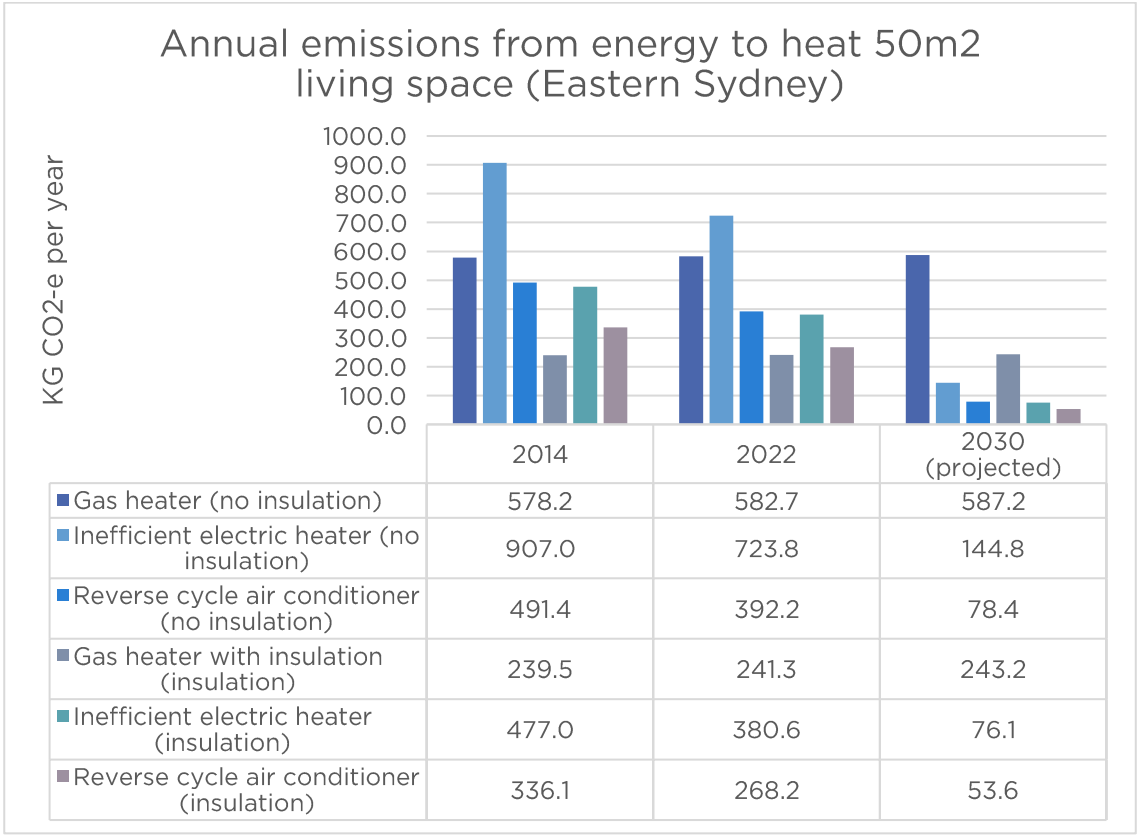
	2014	2022	2030 (projected)
Gas heater (no insulation)	1037.9	1046.0	1054.1
Inefficient electric heater (no insulation)	1485.1	1185.1	237.0
Reverse cycle air conditioner (no insulation)	867.2	692.0	138.4
Gas heater with insulation (insulation)	471.4	475.1	478.8
Inefficient electric heater (insulation)	769.7	614.2	122.8
Reverse cycle air conditioner (insulation)	527.6	421.0	84.2

Sydney (East)

The results of our analysis for heating costs and emissions for Eastern Sydney were as follows:



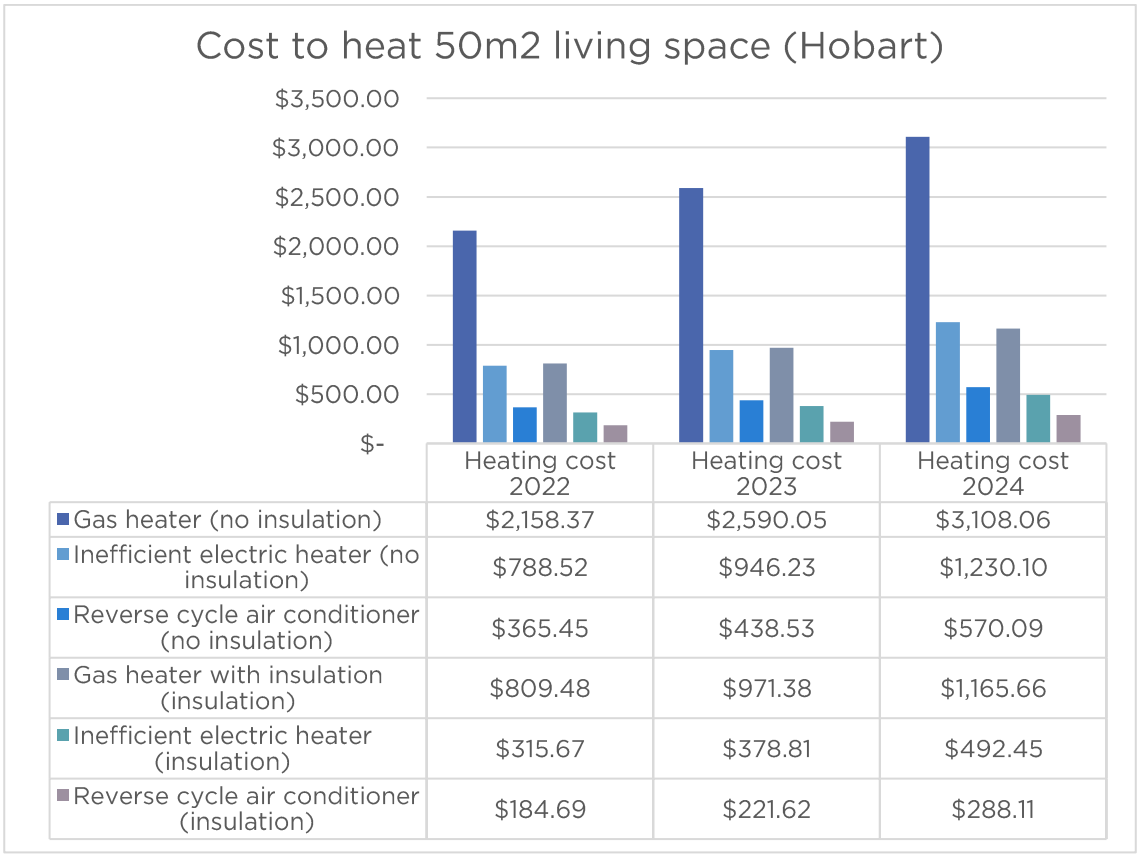
	Heating cost 2022	Heating cost 2023	Heating cost 2024
Gas heater (no insulation)	$297.51	$357.01	$428.42
Inefficient electric heater (no insulation)	$249.19	$299.03	$388.74
Reverse cycle air conditioner (no insulation)	$135.02	$162.02	$210.63
Gas heater with insulation (insulation)	$123.22	$147.86	$177.44
Inefficient electric heater (insulation)	$131.05	$157.26	$204.44
Reverse cycle air conditioner (insulation)	$92.33	$110.80	$144.04



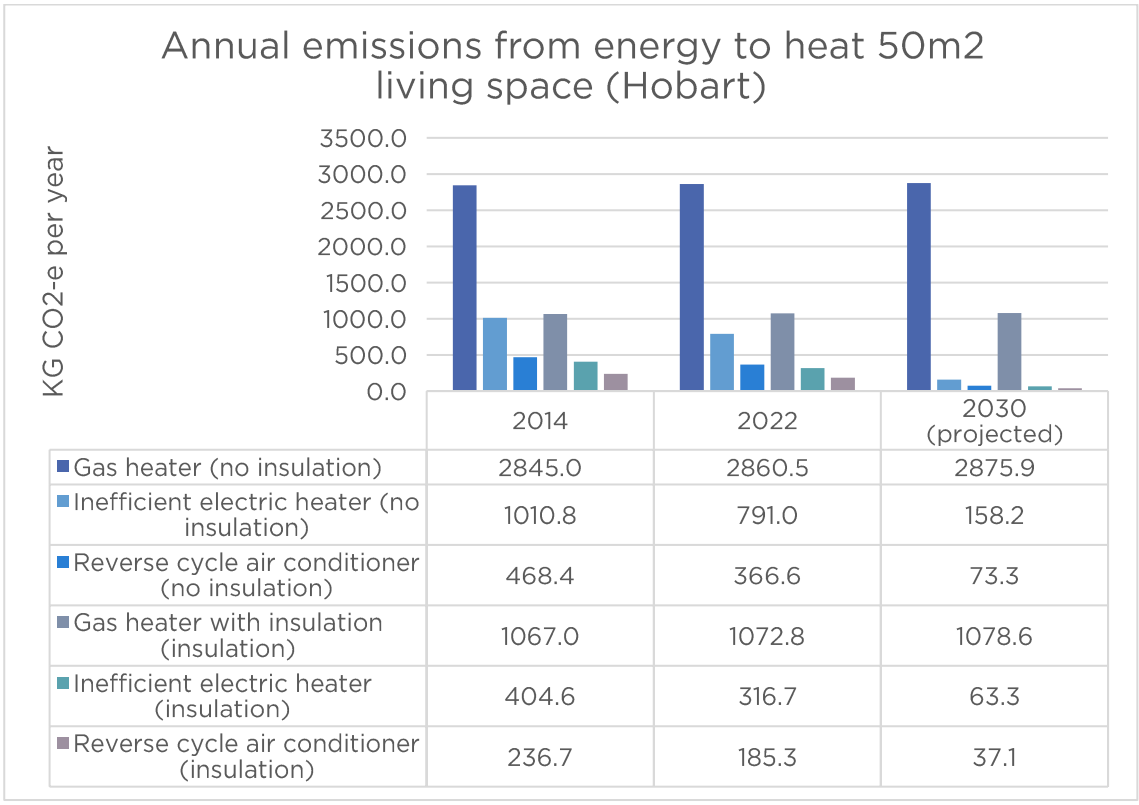
	2014	2022	2030 (projected)
Gas heater (no insulation)	578.2	582.7	587.2
Inefficient electric heater (no insulation)	907.0	723.8	144.8
Reverse cycle air conditioner (no insulation)	491.4	392.2	78.4
Gas heater with insulation (insulation)	239.5	241.3	243.2
Inefficient electric heater (insulation)	477.0	380.6	76.1
Reverse cycle air conditioner (insulation)	336.1	268.2	53.6

Hobart

The results of our analysis for heating costs and emissions for Hobart were as follows. Tasmania sets reduced tariffs for heating and hot water electricity use; this lower tariff has been applied.



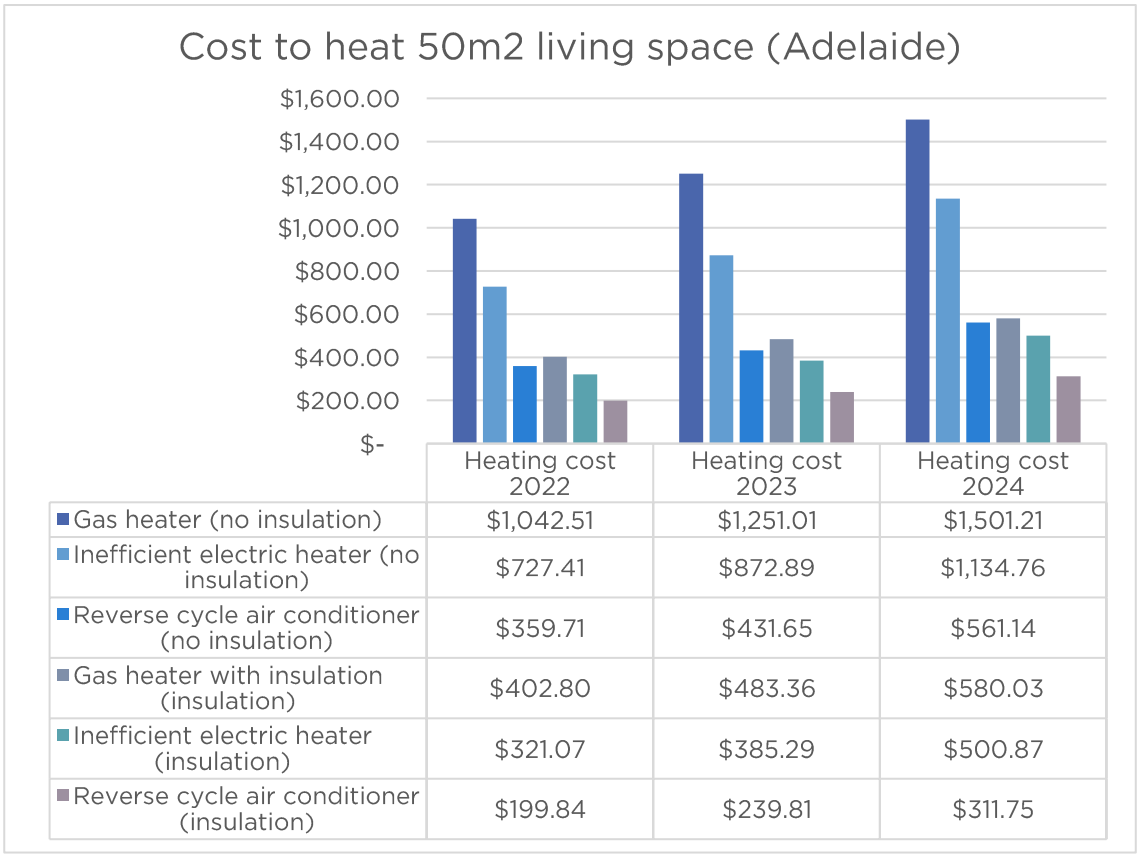
	Heating cost 2022	Heating cost 2023	Heating cost 2024
Gas heater (no insulation)	$2,158.37	$2,590.05	$3,108.06
Inefficient electric heater (no insulation)	$788.52	$946.23	$1,230.10
Reverse cycle air conditioner (no insulation)	$365.45	$438.53	$570.09
Gas heater with insulation (insulation)	$809.48	$971.38	$1,165.66
Inefficient electric heater (insulation)	$315.67	$378.81	$492.45
Reverse cycle air conditioner (insulation)	$184.69	$221.62	$288.11



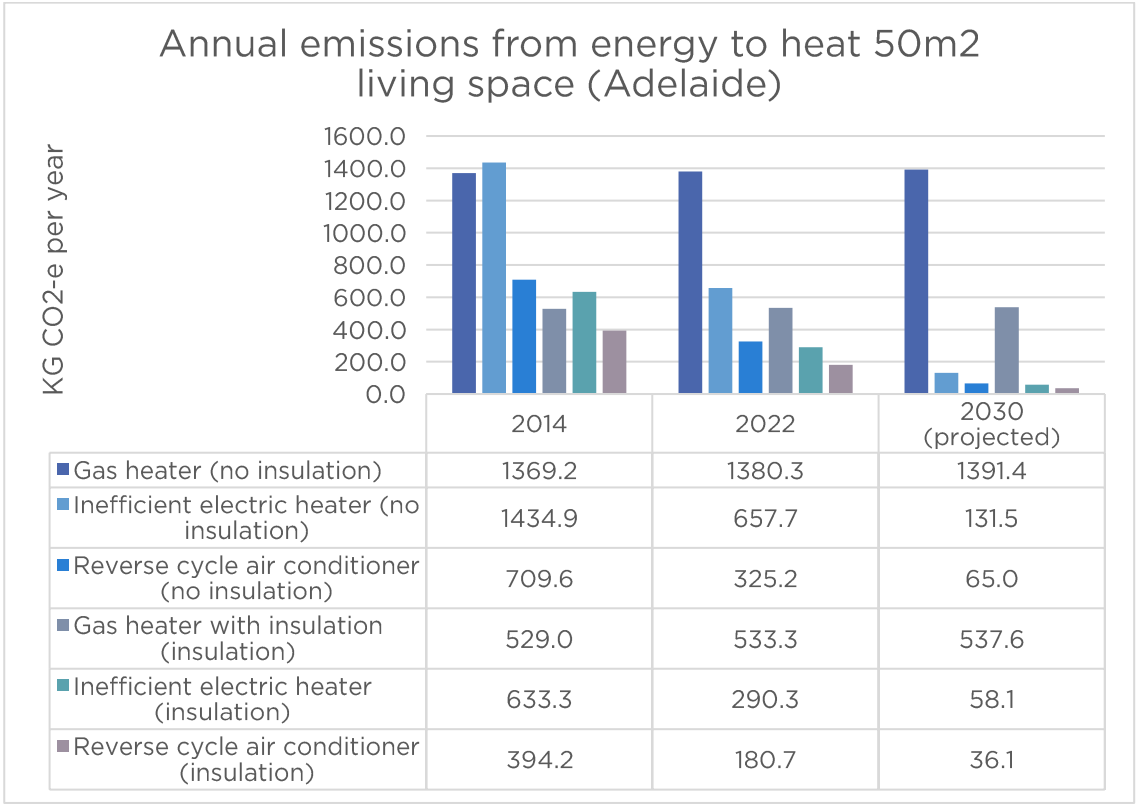
	2014	2022	2030 (projected)
Gas heater (no insulation)	2845.0	2860.5	2875.9
Inefficient electric heater (no insulation)	1010.8	791.0	158.2
Reverse cycle air conditioner (no insulation)	468.4	366.6	73.3
Gas heater with insulation (insulation)	1067.0	1072.8	1078.6
Inefficient electric heater (insulation)	404.6	316.7	63.3
Reverse cycle air conditioner (insulation)	236.7	185.3	37.1

Adelaide

The results of our analysis for heating costs and emissions for Adelaide were as follows:



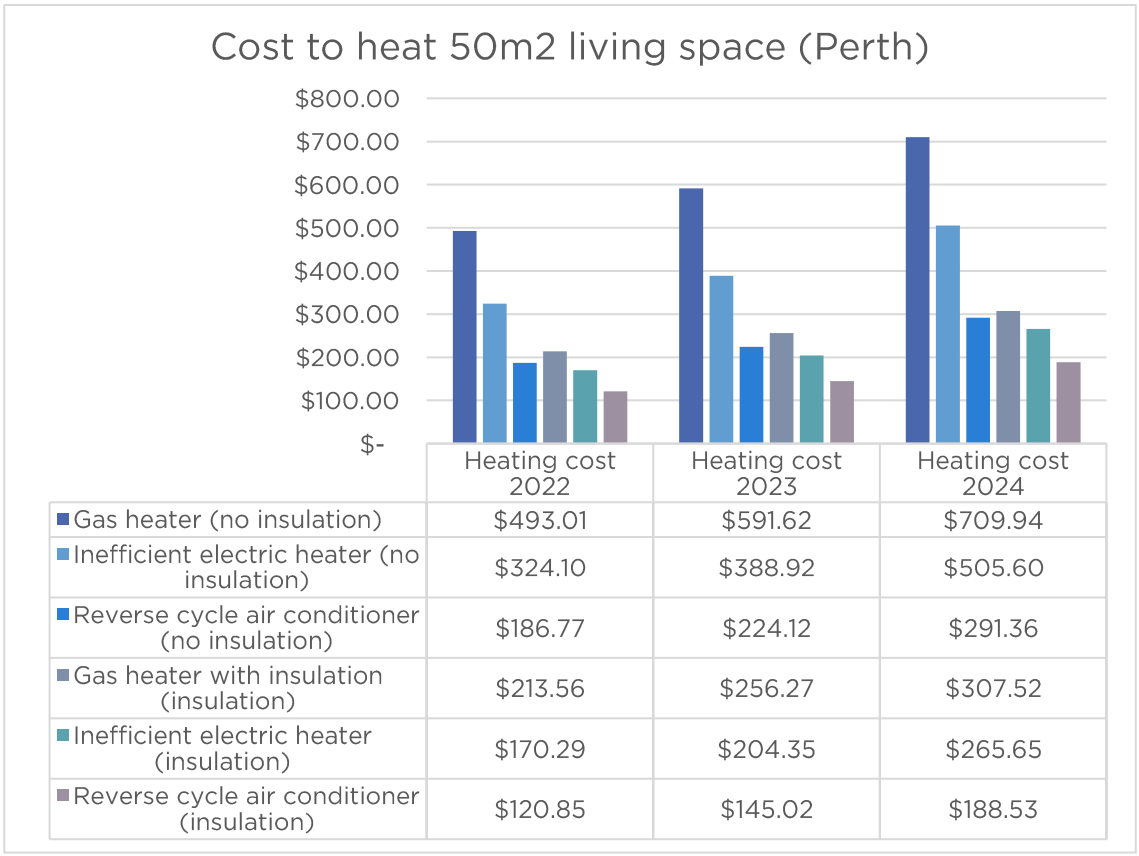
	Heating cost 2022	Heating cost 2023	Heating cost 2024
Gas heater (no insulation)	$1,042.51	$1,251.01	$1,501.21
Inefficient electric heater (no insulation)	$727.41	$872.89	$1,134.76
Reverse cycle air conditioner (no insulation)	$359.71	$431.65	$561.14
Gas heater with insulation (insulation)	$402.80	$483.36	$580.03
Inefficient electric heater (insulation)	$321.07	$385.29	$500.87
Reverse cycle air conditioner (insulation)	$199.84	$239.81	$311.75



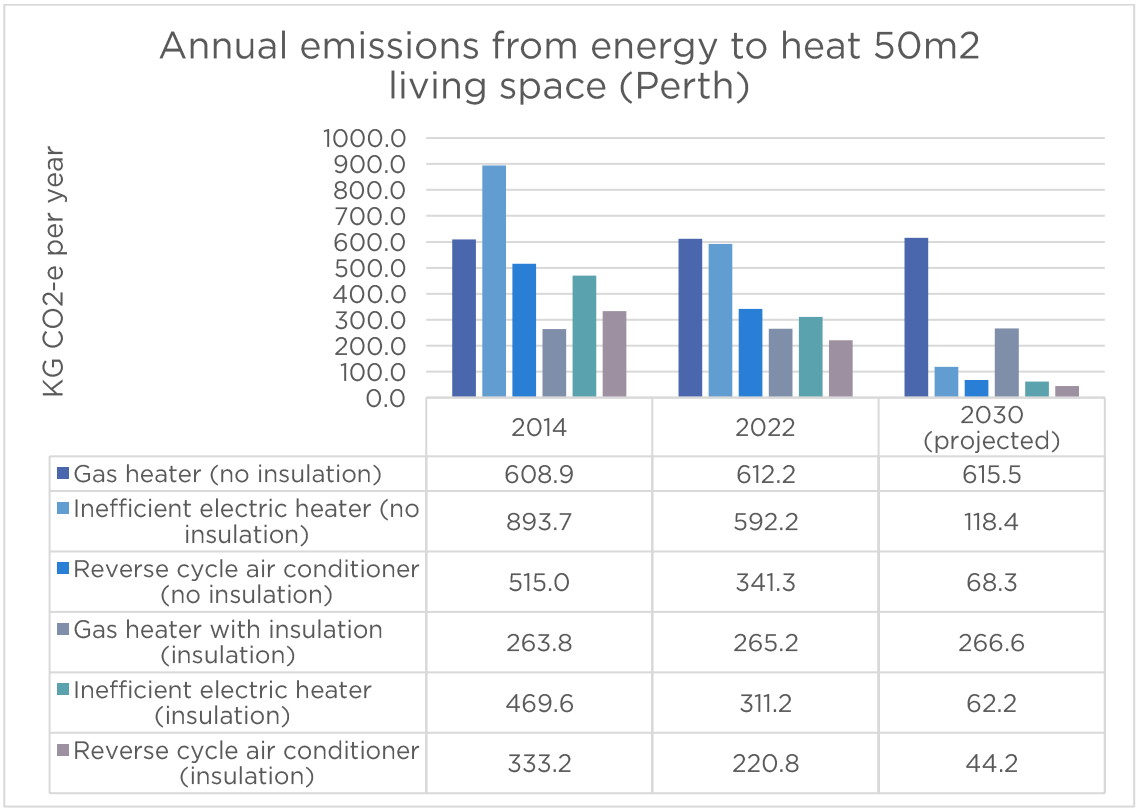
	2014	2022	2030 (projected)
Gas heater (no insulation)	1369.2	1380.3	1391.4
Inefficient electric heater (no insulation)	1434.9	657.7	131.5
Reverse cycle air conditioner (no insulation)	709.6	325.2	65.0
Gas heater with insulation (insulation)	529.0	533.3	537.6
Inefficient electric heater (insulation)	633.3	290.3	58.1
Reverse cycle air conditioner (insulation)	394.2	180.7	36.1

Perth

The results of our analysis for heating costs and emissions for Perth were as follows:



	Heating cost 2022	Heating cost 2023	Heating cost 2024
Gas heater (no insulation)	$493.01	$591.62	$709.94
Inefficient electric heater (no insulation)	$324.10	$388.92	$505.60
Reverse cycle air conditioner (no insulation)	$186.77	$224.12	$291.36
Gas heater with insulation (insulation)	$213.56	$256.27	$307.52
Inefficient electric heater (insulation)	$170.29	$204.35	$265.65
Reverse cycle air conditioner (insulation)	$120.85	$145.02	$188.53



	2014	2022	2030 (projected)
Gas heater (no insulation)	608.9	612.2	615.5
Inefficient electric heater (no insulation)	893.7	592.2	118.4
Reverse cycle air conditioner (no insulation)	515.0	341.3	68.3
Gas heater with insulation (insulation)	263.8	265.2	266.6
Inefficient electric heater (insulation)	469.6	311.2	62.2
Reverse cycle air conditioner (insulation)	333.2	220.8	44.2

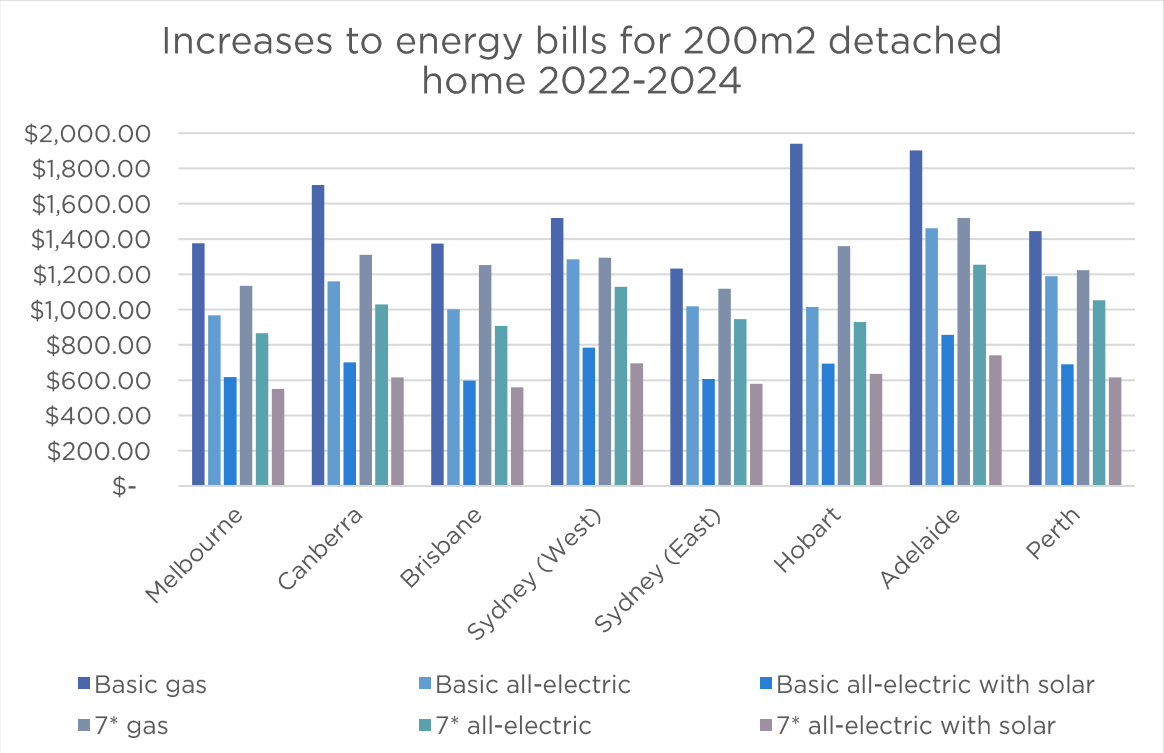
Analysis

Increase in total household energy bills 2022 – 2024

Our analysis finds that household energy bills will increase most for households that are connected to gas.

Increases were still expected for all-electric homes, but these increases are smaller than those of dual fuel homes. All-electric homes with solar are expected to experience the lowest overall energy bill increases in all locations.

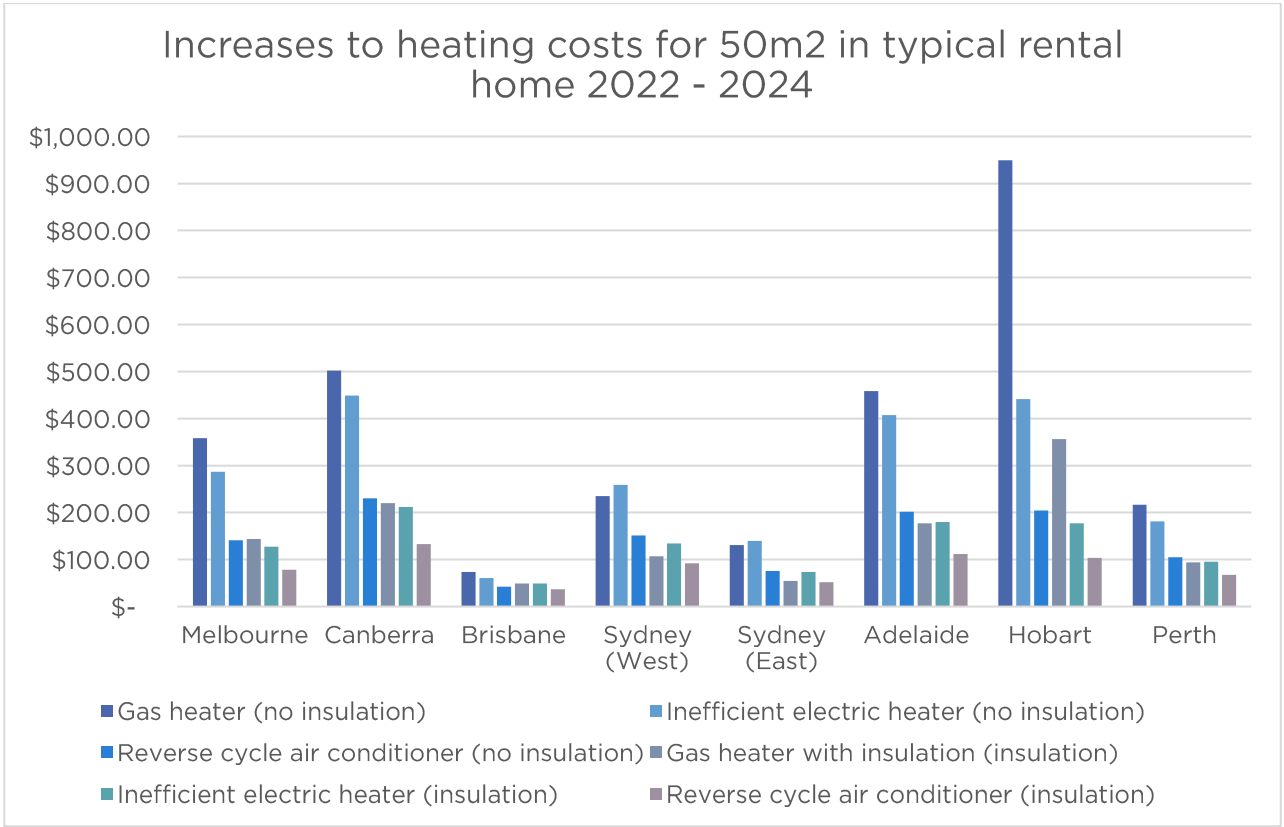
House type	Melbourne	Canberra	Brisbane	Sydney (West)	Sydney (East)	Hobart	Adelaide	Perth
Basic gas	$1,376.63	$1,705.40	$1,374.58	$ 1,518.95	$1,231.72	$1,939.81	$1,901.84	$1,444.01
Basic all-electric	$967.28	$1,159.84	$1,002.09	$ 1,285.00	$1,018.18	$1,015.08	$1,461.44	$1,188.12
Basic all-electric with solar	$617.02	$701.53	$597.67	$ 783.98	$606.66	$693.45	$857.63	$689.48
7* gas	$1,134.27	$1,310.33	$1,251.87	$ 1,293.31	$1,117.90	$1,360.16	$1,519.84	$1,222.63
7* all-electric	$866.28	$1,029.91	$908.35	$ 1,129.50	$945.35	$929.99	$1,254.03	$1,053.38
7* all-electric with solar	$550.14	$615.10	$560.08	$ 694.66	$579.18	$635.75	$741.52	$615.42



Increase in costs to heat space in typical rental home 2022 – 2024

Similarly for the cost of space heating in a typical rental home, bills are expected to increase most for households using gas heating. The cost of heating is expected to increase for all scenarios modelled, however these cost increases are most modest for homes using reverse cycle air conditioners. Insulation significantly reduces the expected cost increases regardless of heater type.

Heating	Melbourne	Canberra	Brisbane	Sydney (West)	Sydney (East)	Adelaide	Hobart	Perth
Gas heater (no insulation)	$358.51	$502.19	$73.80	$234.99	$130.91	$458.70	$949.68	$216.93
Inefficient electric heater (no insulation)	$286.47	$448.60	$60.78	$258.75	$139.55	$407.35	$441.57	$181.50
Reverse cycle air conditioner (no insulation)	$141.06	$230.18	$42.24	$151.09	$75.61	$201.44	$204.65	$104.59
Gas heater with insulation (insulation)	$143.77	$219.84	$49.00	$106.74	$54.22	$177.23	$356.17	$93.97
Inefficient electric heater (insulation)	$127.56	$211.70	$48.93	$134.09	$73.39	$179.80	$176.78	$95.36
Reverse cycle air conditioner (insulation)	$78.37	$132.73	$36.57	$91.91	$51.71	$111.91	$103.42	$67.68



Consumer and policy implications

The findings of our analysis show that gas is not cost effective for households. We further find that gas will become less competitive with all-electric homes in the context of rising energy prices. Even though both gas and electricity retail tariffs are increasing, the savings to all-electric households over homes with a gas connection will increase.

The need for government action to limit the impacts of potential tariff increases on households is critical; this analysis shows that without policy intervention many households will face serious bill increases. Our findings suggest that supporting households to shift away from gas towards all-electric homes can form an important component of the policy response.

There is no reason to connect new homes to gas. Ensuring that new homes are built to high efficiency standards with solar and all-electric appliances will reduce cost pressures for households.

Existing homes can also benefit from electrification, solar, and improvements to energy efficiency such as insulation. At a minimum, this analysis demonstrates that when replacing appliances there are clear benefits to choosing efficient electric appliances such as reverse cycle air conditioning, heat pump hot water, and induction cooking. This finding builds on previous research demonstrating existing benefits to households.[2]

While cost savings on energy bills typically leave households better off over time, the upfront costs of retrofits represent a barrier to many low-income households, and renters and social housing residents are dependent on decisions made by landlords or social housing providers. Further support for households is needed to address barriers to improving energy performance and switching from gas to electricity, with a particular focus on low-income and rental homes.

Our analysis finds that renters are vulnerable to cost increases. On average, rental homes have worse energy efficiency than owner-occupied homes. Fewer rental homes have basic features such as insulation and efficient heating, leaving many renters paying high energy bills or experiencing unhealthy indoor temperatures. Setting minimum energy standards for renters including mandatory insulation and efficient heating should be a priority response to rising energy prices.

A further important finding of our analysis is that the emissions relating to household energy use are lower when combining energy efficiency with all-electric appliances. As the share of renewables in the grid increases, the emissions from electric appliances will decrease, while the emissions caused by gas combustion will remain close to current levels. This trend has already seen emissions from electric heating decrease below the levels of gas heating in most locations, and in all locations when using efficient electric heating. Our analysis finds that electrification and energy efficiency are necessary measures to reduce emissions from the residential sector in line with government commitments.

[2] See Renew 2018, "Household Fuel Choice in the National Energy Market". https://renew.org.au/wp-content/uploads/2018/08/Household_fuel_choice_in_the_NEM_Revised_June_2018.pdf (accessed 23/11/2022)

Appendix: data

Tariffs

Retail tariffs sourced for 2022 prices were as follows. Projected 2023 and 2024 tariffs are calculated with the 2022 tariffs as a reference.

Melbourne

		AGL	Simply	Origin	Average
Electricity	Per kWh	$ 0.2082	$ 0.2169	$ 0.2130	$ 0.213
	Daily	$ 1.1157	$ 1.1623	$ 1.1391	$ 1.139
	FiT	$ 0.0520	$ 0.0520	$ 0.0520	$ 0.052
Gas	per MJ	$ 0.0295	$ 0.0338	$ 0.0278	$ 0.030
	Daily	$ 0.8913	$ 0.8489	$ 0.8200	$ 0.853

Canberra

		ActewAGL	Red Energy	Origin	Average
Electricity	Per kWh	$ 0.2768	$ 0.2420	$ 0.3033	$ 0.274
	Daily	$ 1.0313	$ 0.9350	$ 1.1909	$ 1.052
	FiT	$ 0.0800	$ 0.0800	$ 0.0800	$ 0.080
Gas	per MJ	$ 0.0352	$ 0.0281	$ 0.0384	$ 0.034
	Daily	$ 0.8360	$ 0.6158	$ 0.8127	$ 0.755

Brisbane

		AGL	Alinta	Origin	Average
Electricity	Per kWh	$ 0.2538	$ 0.2439	$ 0.2582	$ 0.252
	Daily	$ 1.2392	$ 1.0953	$ 1.1834	$ 1.173
	FiT	$ 0.0500	$ 0.0800	$ 0.0500	$ 0.060
Gas	per MJ	$ 0.0567	$ 0.0538	$ 0.0507	$ 0.054
	Daily	$ 0.8425	$ 0.7238	$ 0.8248	$ 0.797

Western Sydney

		AGL	EnergyAustralia	Origin	Average
Electricity	Per kWh	$ 0.2946	$ 0.3049	$ 0.3245	$ 0.308
	Daily	$ 1.0747	$ 0.9367	$ 1.6393	$ 1.217
	FiT	$ 0.0500	$ 0.0800	$ 0.0500	$ 0.060
Gas	per MJ	$ 0.0325	$ 0.0372	$ 0.0295	$ 0.033
	Daily	$ 0.7238	$ 0.5830	$ 0.7409	$ 0.683

Eastern Sydney

		AGL	EnergyAustralia	Origin	Average
Electricity	Per kWh	$ 0.2045	$ 0.3056	$ 0.3049	$ 0.272
	Daily	$ 1.2991	$ 0.8774	$ 0.8853	$ 1.021
	FiT	$ 0.0500	$ 0.0800	$ 0.0500	$ 0.060
Gas	per MJ	$ 0.0325	$ 0.0372	$ 0.0295	$ 0.033
	Daily	$ 0.7238	$ 0.5830	$ 0.7409	$ 0.683

Adelaide

		Lumo	Simply	Origin	Average
Electricity	Per kWh	$ 0.3628	$ 0.3598	$ 0.3717	$ 0.365
	Daily	$ 0.9257	$ 1.0979	$ 0.9657	$ 0.996
	FiT	$ 0.0600	$ 0.0600	$ 0.0500	$ 0.057
Gas	per MJ	$ 0.0453	$ 0.0448	$ 0.0520	$ 0.047
	Daily	$ 0.8679	$ 0.6460	$ 0.9033	$ 0.806

Hobart

Tasmania regulates electricity tariffs according to usage, requiring separate tariff levels for heating and hot water. The following prices were applied, in line with the retail flat rate offer of Aurora energy:

		Aurora / Tas Gas	Average
Electricity: Lights and Power	Per kWh	$ 0.2763	$ 0.2763
	Daily	$ 0.9893	$ 0.9893
	FiT	$ 0.0888	$ 0.0888
Electricity: heating and hot water	Per kWh	$0.17943	$0.1794
	Daily	$0.18447	$0.1845
G	per MJ	$ 0.0419	$ 0.0419
	Daily	$ 0.5700	$ 0.5700

Perth

Tariffs applied in Perth were based solely on Synergy retail tariffs.

		Synergy	Average
Electricity	Per kWh	$ 0.3006	0.301
	Daily	$ 1.0777	1.078
	FiT	$ 0.0700	0.070
Gas	per MJ	$ 0.0448	0.045
	Daily	$ 0.2336	0.234

Emissions

Emissions factors applied for the analysis of greenhouse gas emissions are as follows.

	Gas 2014 (kg CO2-e / GJ)	Gas 2022 (kg CO2-e / GJ)	Gas 2030 (kg CO2-e / GJ) - projected	Electricity 2014 (kg CO2-e / kWh)	Electricity 2022 (kg CO2-e / kWh)	Electricity 2030 (kg CO2-e / kWh) - projected
Melbourne	55.23	55.53	55.83	1.34	0.92	0.184
Sydney	64.13	64.63	65.13	0.99	0.79	0.158
Perth	55.33	55.63	55.93	0.83	0.55	0.11
Adelaide	61.73	62.23	62.73	0.72	0.33	0.066
Brisbane	60.03	60.33	60.63	0.93	0.88	0.176
Hobart	55.23	55.53	55.83	0.23	0.18	0.036
Canberra	64.83	65.53	66.24	0.99	0.79	0.158

Sunulator modelling results

The results of Sunulator energy usage modelling are provided below. Figures are given in daily amounts, averaged across a year.

Outputs are:

- Export kWh: daily electricity exports to grid from onsite solar PV (whole home modelling only)
- Import kWh: daily electricity imports from grid
- Gas MJ: daily gas consumption

Melbourne

Whole home

Scenario	Basic gas	Basic all-electric	Basic all-electric with solar	7* gas	7* all-electric	7* all-electric with solar
Export kWh	0	0	15.78	0	0	16.59
Import kWh	10.23	16.87	9.53	9.6	14.55	8.03
Gas MJ	116.53	0	0	71.92	0	0

Space heating

Scenario	Gas (no insulation)	Inefficient electric heater (no insulation)	RCAC (no insulation)	Gas (insulation)	Inefficient electric heater (insulation)	RCAC (insulation)
Electricity (kWh)		6.58	3.24		2.93	1.8
Gas (MJ)	74.41			29.84		

Canberra

Whole home

Scenario	Basic gas	Basic all-electric	Basic all-electric with solar	7* gas	7* all-electric	7* all-electric with solar
Export kWh	0	0	17.31	0	0	18.84
Import kWh	11.66	19.84	11.22	9.87	15.25	8.15
Gas MJ	145.81	0	0	79.92	0	0

Space heating

Scenario	Gas (no insulation)	Inefficient electric heater (no insulation)	RCAC (no insulation)	Gas (insulation)	Inefficient electric heater (insulation)	RCAC (insulation)
Electricity (kWh)		8.01	4.11		3.78	2.37
Gas (MJ)	91.97			40.26		

Brisbane

Whole home

Scenario	Basic gas	Basic all-electric	Basic all-electric with solar	7* gas	7* all-electric	7* all-electric with solar
Export kWh	0	0	20	0	0	21.14
Import kWh	11.3	14.8	7.82	9.65	12.98	7.14
Gas MJ	48.98	0	0	44.63	0	0

Space heating

Scenario	Gas (no insulation)	Inefficient electric heater (no insulation)	RCAC (no insulation)	Gas (insulation)	Inefficient electric heater (insulation)	RCAC (insulation)
Electricity (kWh)		1.18	0.82		0.95	0.71
Gas (MJ)	8.51			5.65		

Sydney (West)

Whole home

Scenario	Basic gas	Basic all-electric	Basic all-electric with solar	7* gas	7* all-electric	7* all-electric with solar
Export kWh	0	0	17.06	0	0	18.15
Import kWh	10.88	16.46	9.11	9.6	13.99	7.73
Gas MJ	89.73	0	0	62.36	0	0

Space heating

Scenario	Gas (no insulation)	Inefficient electric heater (no insulation)	RCAC (no insulation)	Gas (insulation)	Inefficient electric heater (insulation)	RCAC (insulation)
Electricity (kWh)		4.11	2.4		2.13	1.46
Gas (MJ)	44.34			20.14		

Sydney (East)

Whole home

Scenario	Basic gas	Basic all-electric	Basic all-electric with solar	7* gas	7* all-electric	7* all-electric with solar
Export kWh	0	0	17.63	0	0	18.48
Import kWh	10.37	14.56	7.87	9.52	13.25	7.41
Gas MJ	63.55	0	0	50.99	0	0

Space heating

Scenario	Gas (no insulation)	Inefficient electric heater (no insulation)	RCAC (no insulation)	Gas (insulation)	Inefficient electric heater (insulation)	RCAC (insulation)
Electricity (kWh)		2.51	1.36		1.32	0.93
Gas (MJ)	24.7			10.23		

Adelaide

Whole home

Scenario	Basic gas	Basic all-electric	Basic all-electric with solar	7* gas	7* all-electric	7* all-electric with solar
Export kWh	0	0	17.96	0	0	19.23
Import kWh	11.12	16.86	9.28	9.73	14.08	7.76
Gas MJ	97.93	0	0	61.06	0	0

Space heating

Scenario	Gas (no insulation)	Inefficient electric heater (no insulation)	RCAC (no insulation)	Gas (insulation)	Inefficient electric heater (insulation)	RCAC (insulation)
Electricity (kWh)		5.46	2.7		2.41	1.5
Gas (MJ)	60.77			23.48		

Hobart

Whole home

Scenario	Basic gas	Basic all-electric	Basic all-electric with solar	7* gas	7* all-electric	7* all-electric with solar
Export kWh	0	0	15.48	0	0	16.53
Import kWh	9.89	19.32	11.29	9.5	15.48	8.5
Gas MJ	178.31	0	0	92.17	0	0

Space heating

Scenario	Gas (no insulation)	Inefficient electric heater (no insulation)	RCAC (no insulation)	Gas (insulation)	Inefficient electric heater (insulation)	RCAC (insulation)
Electricity (kWh)		12.04	5.58		4.82	2.82
Gas (MJ)	141.13			52.93		

Perth

Whole home

Scenario	Basic gas	Basic all-electric	Basic all-electric with solar	7* gas	7* all-electric	7* all-electric with solar
Export kWh	0	0	21.02	0	0	22.05
Import kWh	11.09	15.73	8.52	9.82	13.54	7.36
Gas MJ	70.02	0	0	50.11	0	0

Space heating

Scenario	Gas (no insulation)	Inefficient electric heater (no insulation)	RCAC (no insulation)	Gas (insulation)	Inefficient electric heater (insulation)	RCAC (insulation)
Electricity (kWh)		2.95	1.7		1.55	1.1
Gas (MJ)	30.15			13.06		

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November 2022