

Methods for calculations in “Smarter energy use: how to cut energy bills and climate harm”

Note on the methods used to calculate bill savings, emissions reductions, and details of other assumptions.

The Smarter Energy Use: how to cut energy bills & climate harm report analysis relies on established methods for assessing the cost of a range of appliances and savings from efficiency upgrades. That said, it is a desktop study. If the data that is publicly available on the efficiency of devices is incorrect, then this would flow through to our analysis. Stated cost savings are generally averages and are likely to vary between houses depending on the behaviour of the people living in those homes.

Built in assumptions

The analysis uses a number of assumptions, which may not apply to all homes. House sizes are Australian averages, and heating loads are based on a Nationwide House Energy Rating Scheme (NatHERS) 1.5 Star rated home – the likely average of homes built before minimum standards were introduced in 2003. The energy efficiency upgrades that were analysed will not apply to all homes and we therefore recommend an energy audit or assessment is performed to determine the best options for your home.

Electricity and gas costs

Prices for gas and electricity were averages for capital cities sourced from Watter, ¹ which compares prices from 53 energy retailers. Prices were gathered on the 7th February 2023. Future prices will have a major impact on the savings and payback periods that are calculated in the report. However, it is not possible to accurately predict given the volatility in both electricity and gas markets.

Table 1. Average electricity and gas tariffs and supply charges in cents

	Adelaide	Brisbane	Canberra	Hobart	Melbourne	Perth	Sydney
Gas (Mj)	4.62	5.77	3.57	4.39	3.87	2.74	3.81
Gas supply charge (day)	58.79	69.61	69.16	59.00	89.19	26.77	62.61
Electricity (kWh)	35.38	25.31	25.46	27.81	21.39	30.06	27.97
Electricity supply charge (day)	104.33	106.66	89.93	99.43	102.09	107.77	86.79

Note: Darwin has not been included because gas prices were not publicly available.

¹ <https://watter.com.au/>

Gas appliance switching savings

Bill savings related to switching out gas appliances for efficient electric options were the same as those used in the previous Climate Council report 'Switch and Save' and can be found [here](#). Savings were updated based on more recent, average electricity and gas prices.

Energy efficiency upgrade savings

Bill savings for energy efficiency upgrades were calculated by applying average reductions in heating and cooling load from previous analyses to NatHERS 1.5 Star rated homes of 186m² in capital cities. Heating and cooling is assumed to be performed by a Reverse Cycle Air Conditioner with a Coefficient of Performance of 3.19- the average CoP across all rated air conditioners in Australia.² The heating and cooling required is then multiplied by the average electricity prices in capital cities.

Table 2. Average reductions in heating and cooling load from different thermal efficiency upgrades

Measure	Average reduction
Sustainability Victoria (2015) values	
Draught sealing	11.95%
Ceiling insulation (easy)	15.58%
Reduce sub-floor ventilation	3.65%
Seal wall cavity	3.05%
Ceiling insulation top-up	6.50%
Wall insulation	13.70%
Other source	
Secondary glazing ³	9.96%

² Greenhouse and Energy Minimum Standards Regulator 2022, Product – Air conditioners, [Online] Available at: https://reg.energyrating.gov.au/comparator/product_types/64/search/?expired_products=on.

³ Bulut, M.B., Wilkinson, S., Khan, A., Jin, X.-H. and Lee, C.L. 2022. Thermal performance of retrofitted secondary glazed windows in residential buildings – two cases from Australia. *Smart and Sustainable Built Environment*. Vol. 11 No. 4, pp. 1182-1192. DOI: <https://doi.org.virtual.anu.edu.au/10.1108/SASBE-03-2021-0050>.

Table 3. NatHERS 1.5 Star heating and cooling loads, average size Australian houses, and total heating and cooling load converted to kWh.

	Heating load (Mj/m ²)	Ave house size (m ²) ⁴	Annual heating load (kWh)
Adelaide	394	186.3	20,389.5
Brisbane	167	186.3	8,642.25
Canberra	657	186.3	33,999.75
Hobart	598	186.3	30,946.5
Melbourne	462	186.3	23,908.5
Perth	311	186.3	16,094.25
Sydney	230	186.3	11,902.5

Note: Sydney's heating and cooling load is for Mascot, which is close to the average between the cities eastern and western suburbs, which experience major differences in average temperatures and thus heating and cooling loads.

Emissions savings

Emissions savings were calculated over a 10-year period, assuming decarbonisation of electricity at a rate in line with the [Australian Energy Market Operator \(AEMO\) 'Independent System Plan'](#) and [Western Australia's 'Whole of System Plan'](#). Emissions were calculated for energy efficiency upgrades using the reduction in kilowatt hours of electricity consumed.

Table 4. Average emissions intensity of grid delivered electricity to 2030.

Average emissions intensity to 2030
WA (Double Bubble): 376.127 kgCO ₂ e/MWh
NSW (Step Change): 309.526 kgCO ₂ e/MWh
QLD (Step Change): 380.095 kgCO ₂ e/MWh
SA (Step Change): 21.119 kgCO ₂ e/MWh
TAS (Step Change): 0.014 kgCO ₂ e/MWh
VIC (Step Change): 413.083 kgCO ₂ e/MWh

⁴ Architecture & Design 2022. *House Sizing Australia: Trends, Averages, and Standards*, Online at: <https://www.architectureanddesign.com.au/features/list/house-sizing-australia-trends-averages-and-standar>.