

# Appendix:

## Methodology for heating and cooling bill savings and emissions reductions in Section 6 of *Tents to castles: building energy efficient, cost-saving Aussie homes*

Note on the methods used to calculate bill savings, emissions reductions and the social cost of carbon in Section 6 of the report

### 1. Heating and cooling bill savings: Comparing 6 and 7-Star homes

Heating and cooling bill savings have been calculated using average Australian house sizes. For each capital city, the difference between 6 and 7-Star homes in the energy required per square metre for heating and cooling was multiplied by the average area in square metres and the average electricity tariff.

We have assumed the same reverse-cycle air conditioner is used for heating and cooling. This allows us to directly convert the number of megajoules (MJ) used for heating and cooling to a number of kilowatt hours (kWh) of electricity. Using this method, the bill savings can be calculated without calculating the total heating and cooling bill, which would require the Coefficient of Performance (COP) of a given air conditioner. These savings were then used to calculate how many years it would take for a homeowner to recoup the potentially slightly higher cost of a 7-Star home (the payback time).

	Avg area of new homes 2020/21 (m <sup>2</sup> ) <sup>1</sup>	Increased cost \$/m <sup>2</sup>	Total cost of ave house \$	Energy Loads [thermal] in MJ/m <sup>2</sup> per annum <sup>3</sup>		MJ change	Saving MJ per annum	Savings kWh	Electricity tariffs \$/kWh	Bill savings	Payback (years)
				6-Star	7-Star						
Sydney	222.5	11.19	2489.8	51	39	12	2670	741.7	0.304	\$225	11.0
Melbourne	238.8	11.18	2669.8	114	83	31	7403	2056.3	0.198	\$407	6.6
Brisbane	231.5	3.94	912.1	43	34	9	2084	578.8	0.2057	\$119	7.7
Adelaide	201.8	10.47	2112.8	96	70	26	5247	1457.4	0.3159	\$460	4.6
Perth	230	6.92	1591.6	70	52	18	4140	1150.0	0.2933	\$337	4.7
Hobart	176.5	13.46	2375.7	155	113	42	7413	2059.2	0.22	\$453	5.2
Darwin	199.5	8.84	1763.6	349	285	64	12768	3546.7	0.26653	\$945	1.9
Canberra	259.3	14.42	3739.1	165	120	45	11669	3241.3	0.22	\$713	5.2
Australia	229.3	10.1	2305	124	95	28	6505	1806.9	0.253	\$457	5.0

<sup>1</sup> CommSec 2021. *Bigger apartments over the past year* [Online] Available at: <https://www.commsec.com.au/market-news/the-markets/2021/commsec-home-size-report-2021.html> [Accessed 04 2022].

<sup>2</sup> Tony Isaacs Consulting 2021. *Cost and Benefits of upgrading building fabric from 6 to 7 stars* [Online] Available at: [https://consultation.abcb.gov.au/engagement/consultation-ris-proposed-ncc-2022-residential/supporting\\_documents/Costs%20and%20Benefits%20of%20Upgrading%20Building%20Fabric%20from%206%20to%207%20Stars%20Tony%20Isaacs%20Consulting.pdf](https://consultation.abcb.gov.au/engagement/consultation-ris-proposed-ncc-2022-residential/supporting_documents/Costs%20and%20Benefits%20of%20Upgrading%20Building%20Fabric%20from%206%20to%207%20Stars%20Tony%20Isaacs%20Consulting.pdf) [Accessed 04 2022].

<sup>3</sup> Department of Industry, Science, Energy and Resources 2022. *Star Band Criteria* [Online] Available at: <https://www.nathers.gov.au/sites/default/files/2019-10/NatHERS%20Star%20bands.pdf> [Accessed 04 2022].

## 2. Emissions reductions and Social Cost of Carbon calculations

Emissions reductions were calculated using electricity savings (kWh) multiplied by emissions factors and the number of stand-alone homes built in each state and territory on average per year (110,000).<sup>4</sup> Emissions were multiplied by 0.9039, to account for the 9.61 percent of stand-alone homes already built to 7 or more Stars.<sup>5</sup>

	Emissions kg CO <sub>2</sub> -e/kWh <sup>6</sup>	Emissions savings per house (kg)	% reduction	Homes built per year/state or territory	Tonnes CO <sub>2</sub> saved
Sydney	0.85	630.42	23.53%	24552	15477.99
Melbourne	1.00	2,056.33	27.19%	34524	70992.852
Brisbane	0.92	532.45	20.93%	21788	11601.0206
Adelaide	0.36	524.68	27.08%	7632	4004.35776
Perth	0.69	793.50	25.71%	16404	13016.574
Hobart	0.16	329.47	27.10%	2228	734.0517333
Darwin	0.58	2,057.07	18.34%	580	1193.098667
Canberra	0.85	2,755.06	27.27%	3480	9587.6175
Australia	0.68	1,221.92	24.64%	111188	126607.5623

The Social Cost of Carbon was calculated using the Australian Carbon Credit Unit price of \$30 and the higher \$457 outlined in the report, which is a recently calculated SCC from the academic literature. These were multiplied by the 2030 emissions reductions, which were based on the total emissions saved for States and Territories, extended out to 2030 using an average rate of decarbonisation of 8 percent per year.<sup>7</sup>

	2023	2024	2025	2026	2027	2028	2029	2030	2030 emissions total based on DISER projections
NSW	46341.3	100097.1	150145.7	200194.3	250242.8	300291.4	350340.0	400388.5	1798041.1
VIC	72680.5	156989.9	235484.8	313979.7	392474.7	470969.6	549464.6	627959.5	2820003.3
QLD	31076.6	67125.5	100688.2	134250.9	167813.7	201376.4	234939.1	268501.9	1205772.3
SA	12761.2	27564.2	41346.3	55128.4	68910.5	82692.5	96474.6	110256.7	495134.4
WA	26873.9	58047.6	87071.4	116095.2	145119.0	174142.9	203166.7	232190.5	1042707.2
TAS	4122.2	8904.1	13356.1	17808.1	22260.1	26712.2	31164.2	35616.2	159943.3
NT	1297.7	2803.0	4204.5	5606.0	7007.5	8409.1	9810.6	11212.1	50350.5
ACT	3145.6	6794.4	10191.7	13588.9	16986.1	20383.3	23780.5	27177.7	122048.2

<sup>4</sup> Australian Bureau of Statistics 2021, Building Activity, Australia [Online] Available at: <https://www.abs.gov.au/statistics/industry/building-and-construction/building-activity-australia/latest-release#data-download> [Accessed 04 2022].

<sup>5</sup> CSIRO 2022. *Energy Rating - National Overview*. [Online] Available at: <https://ahd.csiro.au/dashboards/energy-rating/energy-rating-national-overview/> [Accessed 04 2022].

<sup>6</sup> Department of Industry, Science, Energy and Resources 2022 [Online] Available at: <https://www.industry.gov.au/data-and-publications/national-greenhouse-accounts-factors-2021> [Accessed 04 2022].

<sup>7</sup> Department of Industry Science, Energy and Resources 2021 Australia's emissions projections 2021 [Online] Available at: <https://www.industry.gov.au/data-and-publications/australias-emissions-projections-2021#:~:text=Australia%20measures%20progress%20towards%20its,e%20from%202021%20to%202030> [Accessed 04 2022].

