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23 February 2022

To whom it may concern,

Thank you for the opportunity to provide a response to proposed BASIX higher standards.

Renew is a national, not-for-profit organisation that inspires, enables and advocates for people to live sustainably in their homes and communities. Established in 1980, Renew provides expert, independent advice on sustainable solutions for the home to households, government and industry.

We support lifting energy standards in BASIX.

We support the proposal to lift energy standards for new homes through BASIX by improving thermal efficiency and a 'whole of home' energy budget.

Better thermal efficiency means lower energy bills, more comfortable homes, more resilience at times of extreme weather, and lower carbon emissions. It furthermore reduces pressure on the energy grid, reducing infrastructure costs and enabling the broader transition from centralised fossil fuel-powered electricity systems to renewables and distributed energy resources.

The upfront costs of higher thermal performance are significantly outweighed by benefits to households. Analysis by Renew has found that the additional monthly mortgage payments on a 7-Star home are typically less than the bill savings, meaning that households are financially better off from day one.

We furthermore support the intention of higher energy standards in BASIX to align with the National Construction Code and meet expected increased standards when the NCC is updated in 2022. Nationwide, research by ClimateWorks Australia and ASBEC shows that delaying cost-effective improvements to energy efficiency requirements in the NCC would cost $2 billion in wasted household energy bills to 2030, while locking in 15 million tonnes of carbon emissions.

An increase in standards to the equivalent of 7 Stars is the bare minimum that should be considered. In many scenarios higher thermal efficiency is cost effective and beneficial to households. The built environment is critical in reaching and bringing forward the goal of net zero emissions. Further improvements are required to transition from residential gas to renewables-powered all-electric homes.

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A.B.N: 57 533 056 318
Reg. No. A0017411T
552 Victoria St
North Melbourne VIC 3051
61 (3) 9639 1500
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Households are better off under higher standards

Renew has conducted independent modelling to analyse the costs and benefits to households of lifting energy standards.

Using the *Sunulator* energy simulation platform, we have compared the energy use of homes under a range of energy scenarios. Using local retail tariffs, appliance costs, thermal shell improvement costs, and emissions factors, we were able to assess in detail household energy bills and savings.

To account for differences in climate and tariffs, we assessed one home in eastern Sydney (NatHERS climate zone 17) and one home in western Sydney (NatHERS climate zone 28). Our analysis is of a detached home of 200m^2.

We have compared a business-as-usual home (a dual fuel home with thermal efficiency equivalent to a 6-Star NatHERS rating) with a similar all-electric home; a dual fuel home with higher thermal efficiency, efficient appliances and solar PV; and an all-electric home with higher thermal efficiency, efficient appliances and solar PV.

The scenarios we examined are as follows:

	6-STAR BASIC DUAL FUEL	6-STAR BASIC ALL-ELECTRIC	7-STAR EFFICIENT DUAL FUEL WITH SOLAR	7-STAR EFFICIENT ALL-ELECTRIC WITH SOLAR
NatHERS rating	6	6	7	7
Hot water	Gas instantaneous	Heat pump	Gas instantaneous	Heat pump
Heating	Gas (wall furnace)	Heat pump (basic)	Gas (wall furnace)	Heat pump (efficient)
Cooling	Heat pump (basic)	Heat pump (basic)	Heat pump (efficient)	Heat pump (efficient)
Cooking	Gas	Induction	Gas	Induction
Other appliances	Electric	Electric	Electric	Electric
Solar	None	None	6.6 kW	6.6 kW

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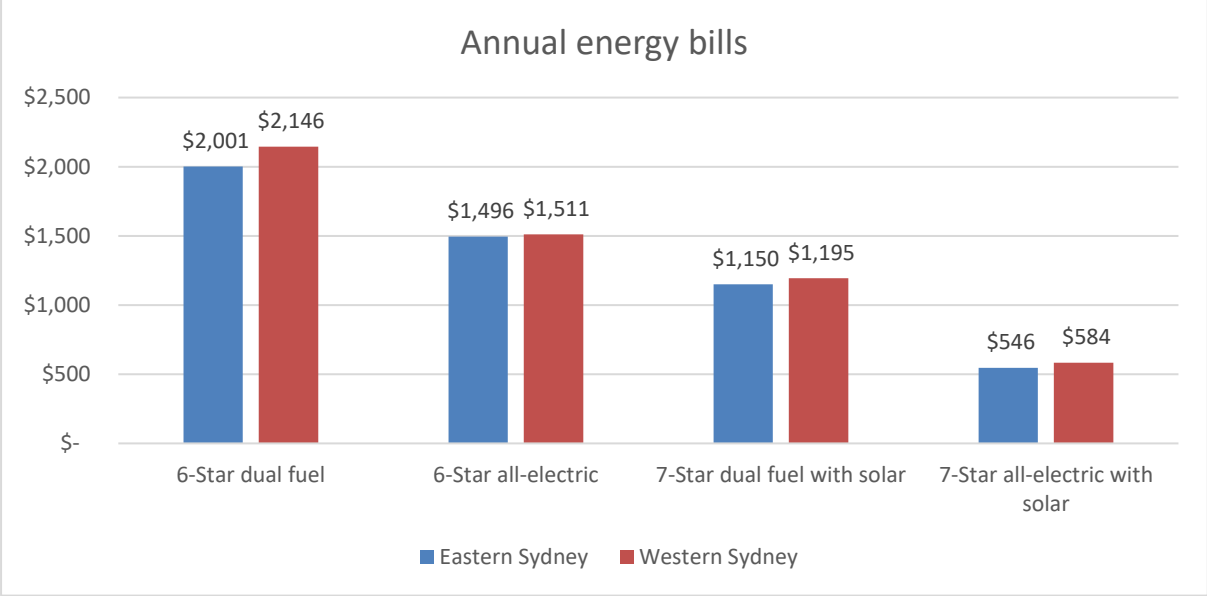
Further information and methodology for this analysis is available in Renew's 2021 report *Households Better Off: lowering energy bills with the 2022 National Construction Code*[1]. A similar methodology was followed for this analysis, with updated tariffs and appliance selections.

Findings

Our findings show that more efficient homes reduce bills. Lifting the thermal efficiency of a dual fuel home and adding solar and efficient appliances was found to cut bills by 43% in eastern Sydney and 44% in western Sydney. Meanwhile, all-electric homes led to greater savings: a 7-Star all-electric home with efficient appliances and solar cut bills by 73% in both locations.



The net present value of the scenarios when compared to the 6-Star dual fuel home as a baseline were positive in all cases. We calculated the NPV over 20 years at a 2% discount rate. Reflecting lower bills and removing the need for the upfront cost of gas appliances and connections, the all-electric scenarios were found to have the highest value.

[1] https://renew.org.au/advocacy/climate-resilient-homes/households-better-off-lowering-energy-bills-with-the-2022-national-construction-code/

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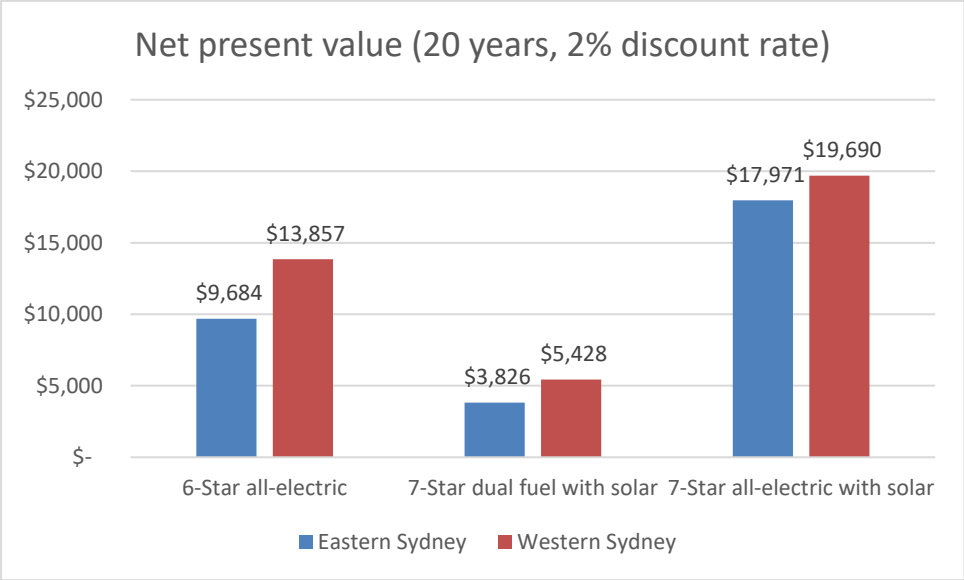

Using a basic 6-Star dual fuel home as our baseline comparison, we calculate how much of a financial impact each scenario will have on overall monthly household cash flow. For each scenario, we calculate the expected monthly mortgage repayment, including any increased costs of higher energy efficiency standards and appliances. (We have conservatively assumed a 25-year loan term at a 5% interest rate.) We then calculate the expected monthly bills for each scenario, which differ according to energy efficiency and fuel choice. If these savings are higher than any additional costs of monthly mortgage repayments, then households are better off overall. For example, a borrower with mortgage repayments that are $20 per month higher than the baseline, but with energy bills that are $50 less than the baseline, is $30 per month better off from day one of their mortgage.

In all cases, households were found to be better off with higher efficiency when compared to the baseline 6-Star dual fuel home. Savings in energy bills outweighed any additional monthly borrowing costs to meet higher upfront construction costs.

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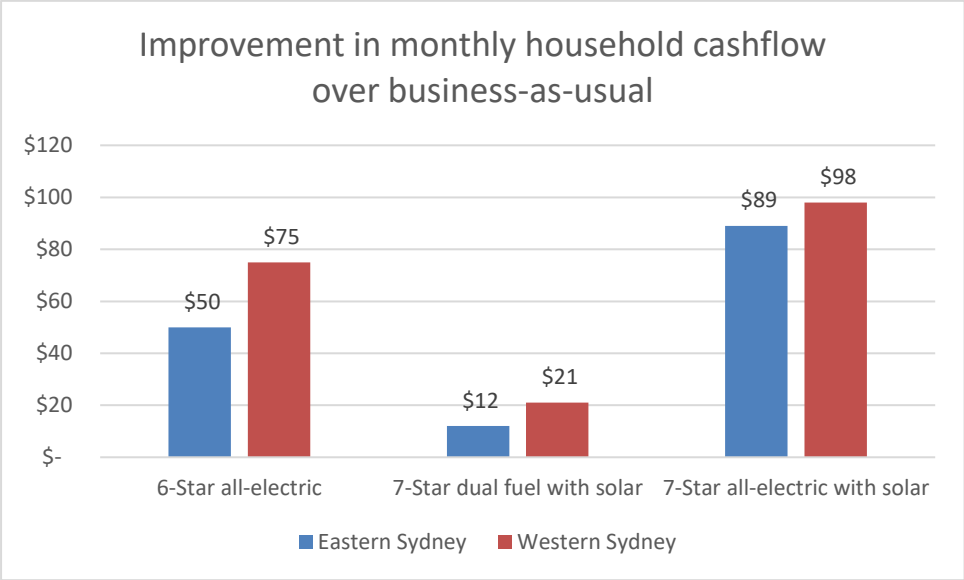

To determine the carbon emissions of homes in each scenario, we calculated the total gas and electricity required to power each home and applied government emissions factors to calculate total annual carbon emissions associated with energy use. To calculate the impact of having a home solar system, we assumed that energy generated onsite replaced energy purchased from the grid. We furthermore assumed that excess renewable energy generated onsite could be exported to the grid and reduced societal consumption. The emissions impacts of the growth of distributed energy resources (DER) such as solar and the changing structure of the electricity grid have not been considered in this analysis but form an important policy context. Embedded carbon emissions are not considered as a part of this analysis.

We found that increasing thermal efficiency and adding efficient appliances and solar significantly reduced emissions. Due to solar exports to the grid – considered here to be negative emissions – homes with solar had strongly net negative emissions.

Importantly, through solar and other renewables, the emissions of the all-electric homes are expected to fall, while the emissions associated with gas consumed in the dual fuel scenarios are locked in. These findings show that, even with the high amount of coal-fired power generation in the current electricity grid, all-electric homes in Sydney already have lower emissions than a home with gas. Over the lifetime of the house and appliances, as more renewable energy enters the grid, the emissions from all-electric homes will drop further.

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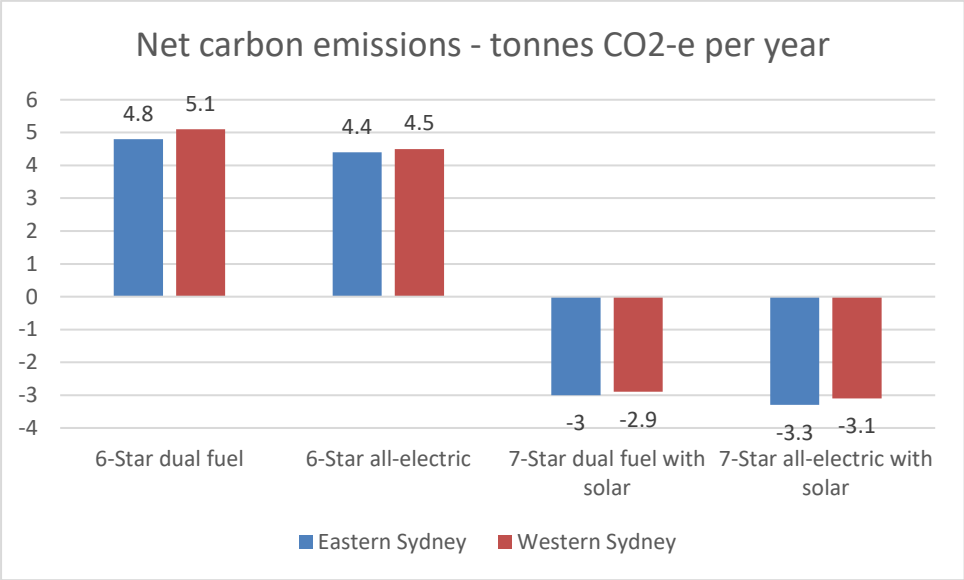

More should be done to transition from residential gas

Our findings demonstrate that households stand to benefit immediately from improved energy standards for new homes.

It is important that alongside improved thermal efficiency, further action is taken to stop new gas connections and transition from residential gas use for heating, hot water and cooking. Our analysis shows that households will benefit financially from all-electric homes. Costs and emissions from all-electric homes will increasingly improve relative to gas as renewables and distributed energy resources expand. We are concerned that gas appliances and connections installed now will need to be replaced, at high cost to residents and governments.

Thank you for the opportunity to respond to this consultation. Our submission has focused on certain aspects of the issues. Lack of comment on other matters does not indicate our position on those matters.

If you have any questions or additional matters you'd like our view on, please contact me at rob.mcleod@renew.org.au.

Sincerely yours,

Rob McLeod
Sustainable Housing Advocate
Renew

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Appendix: assumptions and data for energy modelling

Energy simulation results

The total annual energy usage and bills of each scenario in **eastern Sydney** are as follows:

SCENARIO	6-STAR DUAL FUEL	6-STAR ALL-ELECTRIC	7-STAR DUAL FUEL, STRONG ENERGY BUDGET	7-STAR ALL-ELECTRIC WITH SOLAR
Average daily gas use (MJ)	56.0	0	51.8	0
Annual gas bill ($)	$770	$0	$730	$0
Average daily electricity import (kWh)	11.08	14.20	6.64	7.65
Average daily electricity export (kWh)	0	0	20.13	18.25
Annual electricity bill ($)	$1,231	$1,496	$420	$546
Total annual energy bill	**$2,001**	**$1,496**	**$1,150**	**$546**
Annual bill savings from business as usual	-	*$505*	*$851*	*$1,455*
% savings from business as usual	-	*25%*	*43%*	*73%*

The total annual energy usage and bills of each scenario in **western Sydney (Richmond)** are as follows:

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SCENARIO	6-STAR DUAL FUEL	6-STAR ALL-ELECTRIC	7-STAR DUAL FUEL WITH SOLAR	7-STAR ALL-ELECTRIC WITH SOLAR
Average daily gas use (MJ)	77.0	0	63.7	0
Annual gas bill ($)	$969	$0	$843	$0
Average daily electricity import (kWh)	10.52	14.54	5.83	8.03
Average daily electricity export (kWh)	0	0	20.17	17.90
Annual electricity bill ($)	$1,177	$1,511	$352	$584
Total annual energy bill	**$2,146**	**$1,511**	**$1,195**	**$584**
Annual bill savings from business as usual	-	*$635*	*$951*	*$1,562*
% savings from business as usual	-	30%	44%	73%

Tariffs

Gas and electricity tariffs were sought from major retail providers; the tariffs applied in our modelling was the average of retail offerings of three major providers (Origin, Energy Australia, AGL). Tariffs and connection fees differ by location and network, so different tariffs were applied for eastern and western Sydney. Flat tariffs were assumed. The following electricity and gas tariffs were applied:

LOCATION	ELECTRICITY PRICE ($/KWH)	ELECTRICITY DAILY SUPPLY CHARGE	GAS PRICE ($/MJ)	GAS DAILY SUPPLY CHARGE	ELECTRICITY FEED-IN TARIFF ($/KWH)
Eastern Sydney	$0.233	$0.791	$0.026	$0.654	$0.059

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Western Sydney	$0.228	$0.825	$0.026	$0.654	$0.059

Appliance and upfront costs

We assumed 7-Star homes to have an additional build cost of $2,210 over equivalent 6-Star homes, based on ABCB figures.

Cooling

We modelled heat pump cooling options (with heat pump units being used for heating as well as cooling in the all-electric scenarios). We assumed non-ducted heat pump systems, requiring one large unit in the living area and three smaller units in bedrooms. Based on online research and previous Renew research, we selected the following models:

TYPE	MODEL	HEAT KW	COOL KW	PRICE	INSTALL COST	TOTAL PRICE
Heat pump (large)	Mitsubishi Heavy Industries SRK63ZRA-W	7.1	6.3	$1,569	$800	$2,369
Heat pump (small)	Mitsubishi Heavy Industries SRK20ZSXA-W	2.7	2	$1,190	$650	$1,840

We included an installation cost for each heat pump unit (a total of four units).

Heating

Wall furnace gas heating was assumed. We assumed four heating units required in total, including main living area and bedrooms. Based on industry interviews and previous Renew research, we have assumed a total capital expenditure for purchase and installation of $4,900. All-electric homes used reverse cycle air conditioners for heating as well as cooling, so an additional heating cost was not added.

Gas connection

We assumed a cost to connect the newly constructed home to the gas network, including pipes and meter, at $1,500. This cost was included for all dual-fuel scenarios but not included for all-electric scenarios.

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Hot water

The following options were included:

TYPE	MODEL	PRICE	INSTALLATION	TOTAL
Instantaneous gas	Infinity 26	$1,395	$600	$1,995
Heat pump	Stiebel Eltron 302L	$3,700	$1,000	$4,700 ($3,512) *

* An STC discount of $1,188 was applied to the heat pump hot water option, resulting in a total cost of $3,512.

Cooking

Based on online research of common models, we assumed a gas cooktop to have a purchase cost of $500 and an installation cost of $170, for a total expenditure of $670. We assumed an induction cooktop to have a purchase cost of $750 and an installation cost of $250, for a total expenditure of $1,000.

The baseline cost of a mortgage was based on the average loan amount for a newly built home in Sydney in May 2021 of $669,796.

Carbon emissions

Emissions intensity metrics from the National Greenhouse Accounts Factors[2] were used to calculate the carbon emissions in each scenario. It should be noted that these figures are likely to significantly understate fugitive emission from gas. The emissions intensity applied was an addition of Scope 2 and Scope 3 emissions, as follows:

LOCATION	ELECTRICITY EMISSIONS FACTOR (KG CO2-E / KWH)	GAS EMISSIONS FACTOR (KG CO2-E / GJ)
Sydney	0.85	64.6

[2] https://www.industry.gov.au/sites/default/files/August%202021/document/national-greenhouse-accounts-factors-2021.pdf

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