



Appendix B: How to halve renters' energy bills

The case for minimum energy efficiency standards for rental properties

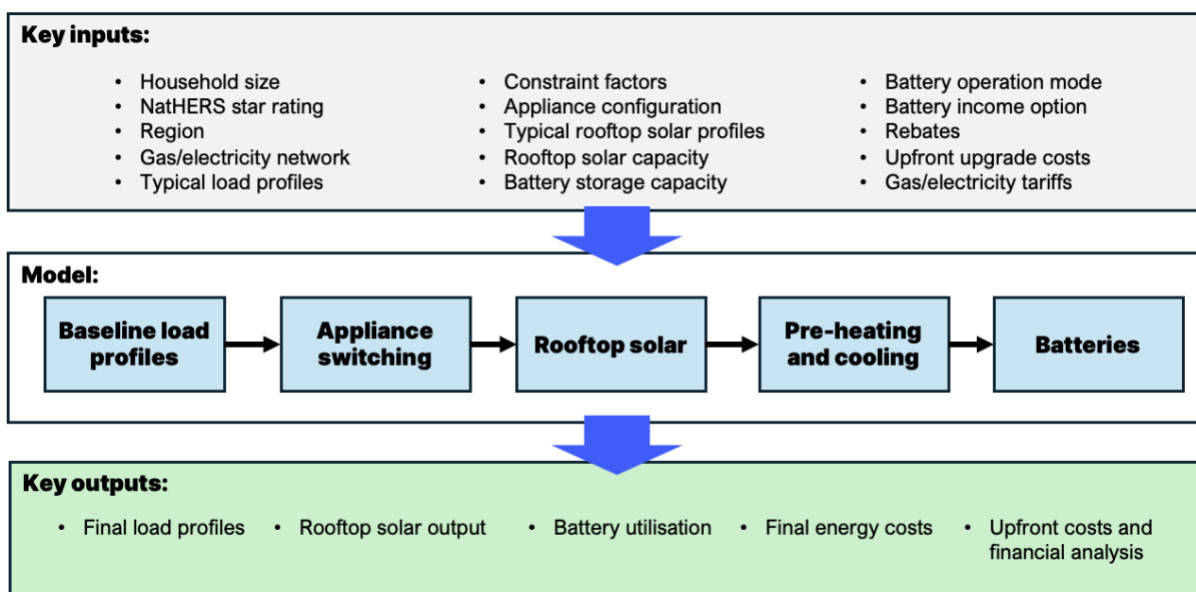
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Appendix B: Analytical method

The modelling in this report is based on IEEFA's household energy model, which is described in detail in the technical appendix to *A focus on homes, not power plants, could halve energy bills*.¹ A conceptual diagram of the model is shown in Figure 1.

Figure 1: Conceptual diagram of modelling approach



As part of this report, we have updated retail electricity and gas tariffs based on actual plans available in February 2026.

The analytical approach can be described in four key stages:

1. Modelling the full potential household-level savings from home energy upgrades.
2. Modelling the home energy upgrades required to halve renters' energy bills.
3. Aggregating the costs and savings of upgrading rental properties.
4. Estimating the peak demand impacts of upgrading rental properties.

The detailed approach and key assumptions for each of these stages are outlined below.

¹ IEEFA. [Technical appendix: A focus on homes, not power plants, could halve energy bills](#). 9 July 2025.

Stage 1: Modelling the full potential of household savings

We modelled the potential energy bill savings that could be achieved by undertaking a series of home energy upgrades for individual rental properties.

The modelling was undertaken based on a large number of household archetypes, which are intended to represent the diversity of the rental housing stock in Australia.

Table 1 lists the key parameters used to break down these households. This resulted in 2,160 unique archetypes of households to model. Each was assigned a weighting to reflect the expected proportion of the rental property stock in each region that could be represented by that archetype, for aggregation in later stages.

Table 1: Key parameters used to break down rental property stock

Parameter	Explanation
Region	One region from each state and mainland territory, based on its capital city.
Dwelling type	Either a detached house or an apartment. Apartments were assumed to have 21% lower energy consumption than detached houses, and 25% higher upfront upgrade costs. ² Proportions of dwellings by structure type were based on 2021 Census data for each state/territory, filtered by rented dwellings. ³ Semi-detached houses were grouped with detached houses.
Household size	1, 2, 3, 4 or 5+ persons. Energy consumption varies by household size. ⁴ Proportions of households by size were based on 2021 Census data for each state/territory, filtered by rented dwellings. ⁵
Baseline thermal efficiency rating	Grouped by NatHERS star rating: <5 stars, 5-5.9 stars, 6+ stars. Proportions of dwellings falling into each group were determined by comparing ABS dwelling completions data against timelines for the introduction of minimum thermal-efficiency standards for new dwellings in each state/territory. ^{6,7} Dwellings in the “<5 stars” group were assigned a NatHERS star rating equivalent to 2, or 3 in the ACT. ⁸

² Energy consumption multiplier based on [Roberts et al. \(2019\)](#). Upfront cost multiplier is a high level estimate recognising the additional physical and administrative constraints often faced when upgrading apartments.

³ Dwelling structure (STRD) by Tenure type (TEND) extracted via [ABS TableBuilder](#). Excludes ‘Not applicable’ tenure type.

⁴ Frontier Economics. [Simple electricity and gas benchmarks – From June 2021](#).

⁵ Number of persons usually resident in dwelling (NPRD) by Tenure type (TEND) extracted via [ABS TableBuilder](#). Excludes ‘Not applicable’ tenure type.

⁶ Australian Bureau of Statistics (ABS). [Building Approvals, Australia](#). 4 May 2026.

⁷ Sources: [National Construction Code 2019](#), [Australian Department of the Environment and Energy 2017](#), [Alam et al. 2009](#), [NSW Department of Planning and Environment 2023](#), [Queensland Government 2008](#), [WorkCover Tasmania 2007](#).

⁸ The average NatHERS rating of older Australian dwellings is estimated at [1.8 stars](#), however evidence suggests this may be closer to [3 stars in the ACT](#), where mandatory point-of-sale energy rating disclosure has been in place for some years.

Parameter	Explanation
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Nine appliance configurations were modelled based on the assumed heating, hot water and cooking appliance installed before upgrades:

	1	2	3	4	5	6	7	8	9
Heating	IE	EE	IE	EE	IE	EE	IE	EE	G
Hot water	IE	IE	IE	IE	G	G	G	G	G
Cooking	IE	IE	G	G	IE	IE	G	G	G

(G = gas; IE = inefficient electric; EE = efficient electric)

While not exhaustive, these appliance configurations were found to cover a large majority of households when compared against survey data from Energy Consumers Australia (ECA).⁹

We excluded heat pump hot water systems and induction cooktops from these configurations, as we considered it unlikely that a material number of rental properties would have these appliances.

Baseline appliance configuration

Proportions of dwellings with each configuration were based on the ECA survey data. As this data reported a surprisingly high portion of renters with air conditioners compared with other estimates, we combined this with a range of other sources to estimate that 31-41% of renters have an existing reverse-cycle air conditioner that is also used for heating.¹⁰

The specific appliances assumed in the configurations are noted below:

	Gas (G)	Inefficient electric (IE)	Efficient electric (EE)
Heating	Gas room heater in most cases, or gas ducted heater for detached houses in Victoria and the ACT.	1 fixed resistive electric heater, or 2 in Tasmania and the ACT. No heating in Darwin.	2 reverse-cycle air conditioners, or 3 for detached houses in Victoria and the ACT.
Hot water	Gas continuous flow hot water system.	Resistive electric storage hot water system (uncontrolled load profile).	<i>Not included in baseline configurations</i>
Cooking	Gas cooktop	Resistive electric cooktop	<i>Not included in baseline configurations</i>

⁹ ECA. [Consumer Energy Report Card data](#). 4 December 2025.

¹⁰ Data from [Opteon](#) (p.13) suggests 65% of rental properties in Victoria have an air conditioner. We adjusted this proportion for other regions based on the ECA survey data. As a high-level estimate, we assumed 25% of air conditioners in rental properties were older, cooling-only units, and 75% of remaining renters are aware their air conditioner can both heat and cool ([JWS research 2021](#); p.51).

For each of the resultant 2,160 household archetypes, we modelled the impacts of the following sequence of household energy upgrades, detailed in [Table 2](#).

- Thermal efficiency upgrades, including:
 - Adding or upgrading ceiling insulation for most under-insulated dwellings
 - Undertaking draught-proofing for poor performing multistorey apartments
- Electrification of gas appliances
- Upgrading inefficient electric appliances to efficient electric alternatives
- Installing rooftop solar
- Installing a battery

These upgrades were chosen as a range of sources, including past analysis by IEEFA, generally finds them to be highly effective at reducing energy bills.¹¹ We have previously noted that modelling specific impacts of thermal upgrades can be a challenge. We therefore chose to focus this analysis on specific upgrades that are widely considered cost-effective, and where there was data available on the likely cost and resultant improvement to household energy rating.

As outlined in the report, this sequence does not reflect a specific preferred order for upgrades. Nonetheless, it can be convenient to conceptualise upgrades in this particular sequence, as undertaking thermal upgrades before appliance upgrades can help ensure the appliances are the right size, and converting to efficient electric appliances can enable households to make the most advantage of rooftop solar and batteries.

¹¹ For example, IEEFA. [A focus on homes, not power plants, could halve energy bills](#). 9 July 2025.

Table 2: Details of modelled upgrades

Upgrade	Details
Thermal efficiency upgrades	<p>Adding or upgrading ceiling insulation:</p> <p>Modelled as an increase to the dwelling's NatHERS star rating. Applies to detached homes and apartments in 1-2 storey blocks.</p> <p>The proportion of existing below 5-star homes with ceiling insulation was estimated from 2010 ABS data, adjusted to reflect the fact rented properties are about half as likely to have ceiling insulation as owner-occupiers.^{12,13}</p> <p>These dwellings were assumed to benefit from upgraded ceiling insulation, while the remainder would benefit from new ceiling insulation. The impact on NatHERS star rating was based on the weighted average of either upgrade, using Insulation Council of Australia and New Zealand (ICANZ) data.¹⁴</p> <p>The proportion of homes with a NatHERS rating of 5-6 stars with ceiling insulation below R4 levels was taken from the Affiliated Insulation Industry Coalition.¹⁵ We assumed these homes would benefit from upgraded ceiling insulation, while the remainder would not require ceiling insulation upgrades.</p> <p>In most cases, this resulted in a weighted impact of less than 1 star improvement for these dwellings. As our model is limited to considering only integer NatHERS star bands, this resulted in no thermal upgrades being modelled for these homes in some regions.</p> <p>We assumed that homes with a NatHERS rating of 6 or more stars would not require ceiling insulation upgrades.</p>
	<p>Undertaking draught-proofing:</p> <p>Modelled as an increase to the dwelling's NatHERS star rating. Applies to apartments in 3+ storey blocks where we assumed ceiling insulation upgrades may not be feasible.</p> <p>We assumed that the proportions of dwellings that could undergo upgrades were equivalent to the above percentages of dwellings that did not have existing ceiling insulation. We assumed that draught-proofing was only relevant for dwellings with an existing NatHERS rating below 5 stars.</p> <p>Draught-proofing was assumed to yield a 0.69 NatHERS star rating improvement, based on study data by Sustainability Victoria.</p> <p>This resulted in the following impacts to NatHERS star ratings:</p>

¹² ABS. Energy in Focus: Energy Efficiency of Australian Homes. [Characteristics of Australian Homes and Implications for Energy Efficiency](#). 30 April 2010.

¹³ NSW DCCEE. [Investigation into minimum energy efficiency rental standards: Consultation paper](#). April 2026. Page 1; ECA. [New research underlines need for minimum energy efficiency standards for Australia's rental properties](#). 4 December 2025.

¹⁴ ICANZ. [The Value of Insulating Existing Homes](#). August 2024. Pages 38 and 45.

¹⁵ Affiliated Insulation Industry Coalition. [Insulation in Australia](#). 2024. Page 14.

Final impacts for detached houses:

NatHERS grouping		Actual NatHERS rating modelled, before/after thermal upgrades							
		NSW	VIC	QLD	SA	WA	TAS	NT	ACT
<5 stars	Before	2	2	2	2	2	2	2	3
	After	4	4	4	4	5	4	4	5
5-5.9 stars	Before	5	5	5	5	5	5	5	5
	After	5	5	5	5	5	5	6	5
6+ stars	Before	6	6	6	6	6	6	6	6
	After	6	6	6	6	6	6	6	6

Final impacts for apartments:

NatHERS grouping		Actual NatHERS rating modelled, before/after thermal upgrades							
		NSW	VIC	QLD	SA	WA	TAS	NT	ACT
<5 stars	Before	2	2	2	2	2	2	2	3
	After	3	3	3	4	3	3	3	4
5-5.9 stars	Before	5	5	5	5	5	5	5	5
	After	<i>No impact modelled</i>							
6+ stars	Before	6	6	6	6	6	6	6	6
	After	<i>No impact modelled</i>							

Electrification of gas appliances

Modelled as an end-of-life appliance upgrade. The following appliance replacements were considered:

- Gas ducted heater replaced with three reverse-cycle air conditioners.
- Gas room heater replaced with two reverse-cycle air conditioners.
- Gas hot water system replaced with heat pump hot water system.
- Gas cooktop replaced with induction cooktop.

We assume that homes no longer have to pay fixed gas network charges after electrification. Gas abolishment costs were included in Victoria and NSW, where this is a regulated reference service.¹⁶

¹⁶ This maintains consistency with [prior IEEFA analysis](#). However, treatment of gas abolishment costs is now a significant point of uncertainty. It is likely that abolishment will become a regulated reference service in further regions. An [AEMC decision](#) in April 2026 determined that the full cost of abolishment should be borne by the end-consumer. This would imply consumers will face a higher cost than the current amount in Victoria and NSW, which is partially socialised across all customers. However, the AEMC also determined that abolishment costs should be contestable, which could lower the cost. Furthermore, while it is not preferred by state regulators for safety reasons, customers can opt for a 'temporary' disconnection at no cost, rather than paying for a full abolishment.

Upgrading inefficient electric appliances to efficient electric alternatives	<p>Modelled as an end-of-life appliance upgrade. The following appliance replacements were considered:</p> <ul style="list-style-type: none"> Resistive electric heater replaced by 2 reverse-cycle air conditioners, or 3 in detached Victorian and ACT houses. Resistive electric hot water system replaced with heat pump hot water system (configured to operate in the middle of the day). <p>We did not require resistive electric cooktops to be upgraded to induction cooktops given the small contribution of these appliances to overall energy demand.</p>
Installing rooftop solar	<p>Modelled as an 8kW solar system for separate houses, and a 2kW solar system for apartments.^{17,18}</p> <p>The modelling assumes a standard rooftop solar installation, while noting that plug-in solar solutions could partially fill this role if relevant regulatory barriers were unblocked.</p>
Installing a battery	<p>Modelled as a 10kWh battery for separate houses and 5kWh for apartments.¹⁹</p> <p>Batteries were assumed to be able to import from and export to the grid when sensible to do so, with import rates reflecting average midday wholesale electricity prices, and export rates based on standard feed-in tariffs.</p>

For each household archetype, we modelled the impact of each upgrade based on every feasible combination of gas and electricity (flat-rate or time-of-use) retail tariffs, based on the primary offerings of major energy retailers in each state and territory. The final energy bill outcomes were averaged across those tariffs. This resulted in 113,400 total scenarios being modelled.

This produced a large set of results describing the energy bill savings that could be achieved via this sequence of upgrades for each of the 2,160 household types. Several example outputs are provided in Figure 2 of the main report.

The average total energy bill reduction that could be achieved for the combination of upgrades was 80% across this combination of households, with many of the most common household types achieving savings of 90% or more.

Stage 2: Modelling the actions required to halve energy bills

It was not considered useful or realistic to model the aggregated costs and benefits of all rental properties undertaking the full sequence of upgrades above, given that relatively few owner-occupiers in Australia have upgraded their properties to this depth.

¹⁷ Based on the low end of the range of average installed rooftop solar sizes, 2025 ([Australian Energy Council 2025](#), p.4)

¹⁸ Based on the range of rooftop solar potential per dwelling for apartment buildings in [APVI](#) (2024, p.45).

¹⁹ While 10 kWh is well below typical battery sizes installed under federal rebate programs, [previous IEEFA analysis](#) identified it was suitable for a typical home with efficient electric appliances. We consider landlords less likely to purchase batteries that are larger than needed for the dwelling's consumption. A smaller size was assumed for apartments due to space constraints.

However, we have previously highlighted that household energy upgrades could form the basis of a plan to address energy affordability concerns by halving energy bills. As energy affordability remains a key concern for policy makers in Australia, we considered it useful to model the impacts of a series of upgrades that would aim to halve renters' energy bills.

To do so, we analysed the full set of results produced in the previous stage, identifying the combination and level of household energy upgrades that would enable each of the 2,160 households to halve their energy bills. For the vast majority of cases, this involved a combination of thermal-efficiency upgrades, efficient electric appliances, and some level of rooftop solar (as shown in Figure 2 of the main report). In a minority of cases, a small battery was also needed to achieve the 50% reduction.

Next, we identified that it was appropriate to consider a number of exceptions for certain types of households, where we would relax our target of a 50% energy bill reduction. These are outlined in Table 3.

Table 3: Exceptions where a specific 50% energy bill reduction was not targeted

Exception	Treatment
Households with existing energy efficient characteristics (e.g. an efficient electric heater)	These households were expected to reach the same benchmark as an equivalent home that did not have that energy efficient characteristic. This resulted in relative energy bill savings below 50% from these homes.
Households that would require a battery to achieve a 50% saving	These households were assumed to not require the battery upgrade, as the additional costs involved for a small battery were not proportionally justified by its contribution to the overall savings. This was found to disproportionately impact high-occupancy apartments, which represent only a very small proportion of the overall housing stock.
Households where the necessary upgrades included an unrealistically small solar system	In some cases, the capacity of rooftop solar system that was required to achieve a 50% energy bill reduction was below 2kW, which we considered was likely uneconomical and unrealistic to install as a permanent rooftop solar system. We fixed the minimum size of rooftop solar system to 2kW for detached homes. No minimum constraint was applied to apartments, where it is possible that individual apartments could be allocated a small portion of capacity from a much larger overall system.

The modelling in this stage produced an updated set of results for each of the 2,160 household types, that specifically targeted the sequence and level of upgrades we determined would result in a 50% reduction in energy bills, subject to the exceptions noted above.

Stage 3: Aggregating the savings and costs

In this stage, we aimed to aggregate the household-level savings and costs that were modelled in the previous stage to a state and territory (and subsequently national) level.

This required us to develop a trajectory for the implementation of the rental property upgrades. We considered there were three logical timing points that were likely to influence this trajectory, outlined in below.

Table 4: Key timing points considered in the rental property upgrade trajectory

Timing point	Explanation
When appliances reach end of life	<p>This is the most economic point in time to upgrade a gas or inefficient electric appliance to an efficient electric alternative.</p> <p>The effective upfront cost of the upgrade can be considered the difference in cost between the efficient appliance, versus a like-for-like replacement.</p> <p>As noted in previous IEEFA analysis, targeting appliance upgrades at this point can also avoid considerable cost lock-in.²⁰</p>
Between property leases	<p>For upgrades that require modifications to the dwelling or some form of disruption to tenants – for example, some thermal upgrades – it may be convenient to undertake these upgrades in the break between leases.</p> <p>Administratively, this can also be a convenient timing point to target – as it can be achieved by introducing a requirement that properties entering new residential leases from a certain date must meet the requirements.</p>
By a fixed deadline	<p>It is also possible to set a deadline by which all properties must meet particular energy performance requirements.</p> <p>This may be necessary as a backstop measure for any properties not captured by the above requirements. For instance, a small proportion of properties are on long-term leases, and may not benefit from requirements that apply only to new leases.</p>

We determined that a combination of these timing points would likely lead to an optimal trajectory for rental property upgrades. We chose an immediate start year of 2027 to illustrate the impact of the upgrade trajectory.

²⁰ IEEFA. [Appliance standards are key to driving the transition to efficient electric homes](#). 23 April 2024. Page 5.

Appliance upgrade trajectory

Starting in 2027, we assumed that gas or inefficient electric appliances in rental properties would have to be replaced with efficient electric alternatives when they reach their end of life.

IEEFA has previously modelled the impact of such a policy if applied to the wider appliance stock.²¹ We adapted this appliance stock modelling to estimate the number of rental properties that would undergo appliance upgrades over time.

We adopted a simplified modelling approach where the full benefits of appliance upgrades were modelled for each household in one step. In practice, these upgrades would be staged over the lifetime of different appliances. However, modelling individual appliance upgrades would have generated significant added modelling complexity, relative to the depth of additional insight obtained.

Under this approach, an average lifetime for appliances was assumed for each state and territory (Table 5). The variance in ages is due to different weightings of appliance types in each jurisdiction.²² We assumed a “retirement function” approach as documented in previous analysis, representing the fact that there will be a distribution of actual appliance lifetimes centred on this average.²³

Table 5: Assumed average lifetime of appliances by state/territory

	NSW	Vic	Qld	SA	WA	Tas	NT	ACT
Assumed average appliance lifetime	17.2	16.7	16.6	16.3	16.2	18.1	15.3	16.9
	years	years	years	years	years	years	years	years

Thermal upgrades and rooftop solar trajectory

From 2027, 50% of rental properties entering into a new lease were assumed to undertake the thermal upgrades and rooftop solar installations identified in our Stage 2 modelling.

Rental bond data from NSW was used to estimate the distribution of rental leases across the rental property stock.²⁴ The data indicates the majority of rental property leases last two years or less. This led us to constrain the rental property upgrades to only 50% of new properties, to maintain a feasible number of properties to be upgraded.²⁵

²¹ IEEFA. [Appliance standards are key to driving the transition to efficient electric homes](#), 23 April 2024. Page 5.

²² EnergyConsult. [2021 Residential Baseline Study for Australia and New Zealand for 2000 to 2040](#). 11 November 2022.

²³ IEEFA. Managing the transition to all-electric homes. [Appendix A: Modelling the phase-out of gas appliances](#), 2 November 2023. Page 4.

²⁴ NSW Fair Trading. [Rental bond data: Bond refunds](#). Accessed April 2026.

²⁵ Without this restriction, as many as 1 million rental properties could face upgrades per year in the initial years of the program. While half of this – 500,000 properties per year – is still an ambitious trajectory, it is closer to proven rates from other recent home energy upgrade programs (such as 350,000 small batteries being installed in 10 months under the [Cheaper Home Batteries Program](#)).

Even with this constraint, this leads to a relatively fast trajectory where more than 60% of rental properties are expected to be upgraded after the first three years.

The rental bond data however includes a long tail – with about 3% of properties on leases lasting more than 10 years. To reach these properties, we applied a backstop date of 2033, by which we assumed all rental properties would need to have undertaken these upgrades.

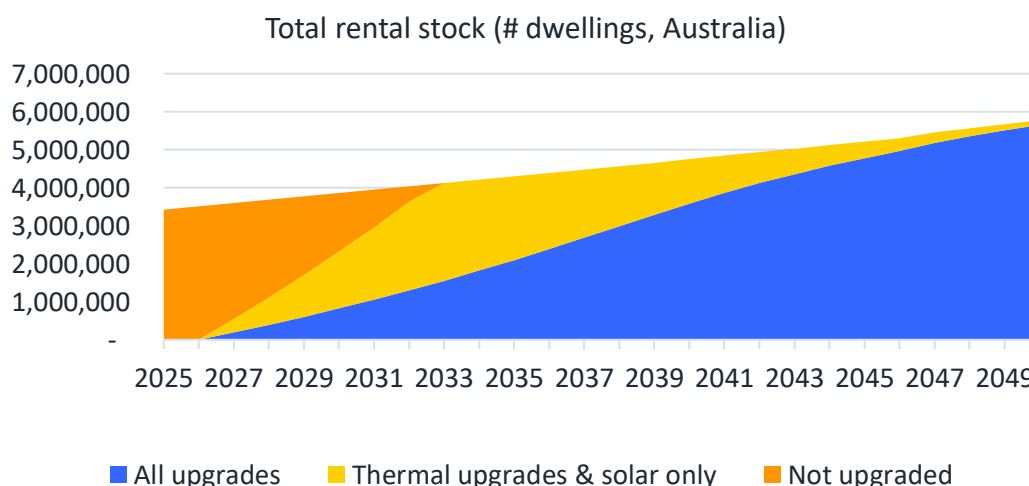
Summary of upgrade trajectory

These approaches led to a relatively fast trajectory for the uptake of thermal upgrades and rooftop solar, and a more gradual trajectory for the uptake of efficient electric appliances. This implies that, in most cases, dwellings are likely to undergo thermal upgrades or solar installations first, and then upgrade to efficient electric appliances later.

For modelling purposes, this can be conceptualised as a three-stage trajectory, where rental properties move from a “non-upgraded” state, to a “thermal upgrades and solar only” state, followed by a “fully upgraded” state. In reality, there may be some properties for which the sequencing of these upgrades differs. However, this is unlikely to have a material impact on the results at a state or territory level.

We overlaid this upgrade trajectory over an estimated projection of rental property stock, based on ABS Series II housing projections ([Figure 2](#)).²⁶

Figure 2: Projected total rental stock, by level of upgrade achieved



²⁶ ABS. [Household and Family Projections, Australia](#). 28 June 2024.

Exemptions

It is likely that if minimum energy-efficiency standards were implemented for rental properties, some properties may face exemptions from certain types of upgrade – for example, where the upgrade is considered physically impossible or difficult.

We have not sought to undertake a full analysis of the likely level of exemptions applied, nor have we provided recommendations on the necessary exemptions. However, we have sought to apply several high-level exemptions with the aim of providing a more conservative and likely estimate of the overall benefits of rental property upgrades. These are outlined in [Table 6](#). The exemptions were applied by adjusting the weightings of any household archetypes affected by the exemptions, such as the total weightings for each state and territory were now lower than 100%.

Table 6: Exemptions from upgrades considered in the modelling

Exemption	Description
Apartments with shared gas hot water systems	These households are exempt from appliance upgrades. This applies to 75% of new apartments (i.e. with NatHERS ratings above 5) and 15% of older apartments. ^{27,28}
Apartments lacking physical space for appliance upgrades	These households are exempt from appliance upgrades. This applies to 50% of apartments without a balcony (about 12% of overall apartments). ²⁹
Apartments in buildings over 8 storeys	These households are exempt from thermal upgrades and rooftop solar, notwithstanding that, in reality, some opportunities may exist for these properties to access those solutions. This applies to 16% of apartments on average, based on state and territory data from the 2021 Census. ³⁰

Aggregated savings

The aggregated energy bill savings were estimated by mapping the energy bill savings modelled in Stage 2 against the trajectory in [Figure 2](#), excluding the exemptions in [Table 6](#).

We assumed that these energy bill savings were maintained at constant levels for each household once the relevant upgrades had occurred, therefore accumulating over time. We did not account for

²⁷ Between 50-100% of new apartment developments were reported to include centralised hot water systems ([Australian Building Codes Board](#), 2024).

²⁸ George Wilkenfield and Associates. [Establishing a Baseline for Impact Evaluation of Water Heater Rules under the Energy Saving Scheme \(ESS\)](#). 30 June 2016. Page 5.

²⁹ Assuming 23% of apartments do not have a balcony, as reported in [Realestate.com.au](#) (21 May 2025).

³⁰ Dwelling structure (STRD) by Tenure type (TEND) extracted via [ABS TableBuilder](#).

any changes in gas or electricity prices, or other factors that may affect individual household energy consumption.

Aggregated costs

Similarly, we mapped the upfront costs modelled in Stage 2 against the trajectory in [Figure 2](#), excluding the exemptions in [Table 6](#). As ceiling insulation and draught-proofing costs are not part of our model, these were added post-model, based on ICANZ and Sustainability Victoria data respectively.^{31,32} A 1.25 cost multiplier was applied for upgrades in apartments, which was a high-level assumption reflecting the practical constraints that may increase upgrade costs for these dwellings.

For the purposes of estimating the overall NPV of the upgrades (Figure 4 in the main report), we excluded existing state and federal government rebates from these upfront costs.

However, for the purposes of estimating the overall cash-flow implications of the upgrades (Figure 5 in the main report), we included these rebates. Post-model adjustments were applied to account for the fact that Small-scale Renewable Energy Scheme (SRES) rebates (available for rooftop solar and heat pump hot water systems) are set to decline and cease entirely by 2031.

Stage 4: Estimating the peak demand impacts

Our household energy modelling approach allows us to extract useful insights on the temporal load profile impacts on household energy upgrades. This is largely influenced by the assumed underlying load profiles for various energy end uses.³³

As these load profiles are provided on the basis of an average day in each month of the year, our findings are limited to average-day peak demand impacts in each month, which are likely to differ from absolute peak demand days.

For each of the 2,160 household archetypes, we extracted the grid electricity load profiles before and after each group of upgrades (thermal upgrades and solar only, followed by appliance upgrades), and analysed the maximum grid electricity demand from 3-9pm (the typical evening peak period) in each month of the year before and after upgrades.

This was mapped against the overall trajectory illustrated in [Figure 2](#), with the weighting of household types developed in Stage 1. Most types of upgrade were expected to result in a decrease in that

³¹ ICANZ. [The Value of Insulating Existing Homes](#). August 2024. Pages 40 and 47.

³² Sustainability Victoria. [Energy Efficiency Upgrade Potential of Existing Victorian Houses](#). December 2015. Page 32. Costs adjusted for other regions based on relative differences in ceiling insulation costs from [ICANZ](#).

³³ See IEEFA. [Technical appendix: A focus on homes, not power plants, could halve energy bills](#). 9 July 2025. Page 8.

household's peak demand contribution. However, electrification of gas appliances can be expected to increase electricity demand.

This provided us with insights on the likely impact on average-day peak demand in each month, in each state and territory, for upgrading rental properties, assuming there was no change in household energy consumption behaviour following the upgrades.

However, it is likely that some households may increase their energy consumption following the upgrades we have modelled – particularly if that household was not previously heated or cooled to healthy and comfortable levels. This is described as the “rebound effect” in energy efficiency literature, with a rebound of up to 30% considered likely for developed countries.³⁴

We considered it appropriate to exclude the rebound effect from our financial savings analysis – as it can be considered a discretionary decision by renters to reinvest the savings from their upgrades into more comfortable and healthy homes. However, it is important to give some consideration to rebound effects in the context of electricity demand impacts.

We therefore modelled two additional sensitivities, where we examined the impact of tenants in aggregate reinvesting 15% or 30% of their energy bill savings in increased electricity consumption.

To model this, we took the absolute energy bill savings realised for each group of upgrades and each household archetype. We then determined the marginal cost of additional electricity consumption for each household based on the variable retail charges of the electricity tariffs in our model. Based on this information, we could estimate the total additional electricity consumption that each household could now theoretically afford.

We assumed that this additional consumption would be realised as a proportional increase in energy demand for each hour of the day, based on the household's underlying electricity demand following the upgrades. This allowed us to estimate the total theoretical peak demand offset from the rebound, which could be scaled to 15% and 30% for the purposes of the sensitivity analysis.

³⁴ Energy Policy. [Empirical estimates of the direct rebound effect: A review](#). Sorrell *et al.* Vol. 37. 2009. Pages 1356-1371.