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Sustainable Household Scheme (SHS) Review

Environment, Planning and Sustainable Development Directorate (EPSDD), Chief Minister, and the Treasury and Economic Development Directorate (CMTEDD)

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Executive Summary

This report provides an overview of the findings of a short, targeted review of the Sustainable Household Scheme (Scheme), a program to provide zero interest loans (up to $15,000) to ACT households for carbon and bill saving upgrades.

The Scheme was launched in July 2021 and $150 million was publicly committed to fund the program for five years. The Scheme supports three overarching ACT Government goals: to improve bill savings, emissions reductions, and comfort for existing ACT homes. The Scheme aims to achieve these goals by providing interest free loans for a mix of upgrades related to either increased onsite solar PV or electrification of gas appliances or electric vehicles (EVs). The uptake rate of funding under the Scheme has been much higher than initially anticipated and a further $50 million has been committed to it, bringing Scheme funding to $200 million in total. At the current high uptake rates, the Scheme is forecast to run out of funding in 2023, three years earlier than originally envisaged.

Common Capital has been engaged to conduct this review and to understand the impact of any amendments to Scheme parameters to improve Scheme outcomes and the long-term financial sustainability of the program.

The Scheme has experienced high uptake rates, however the majority of Scheme expenditure is going to solar-related activities

As of 13 December 2022, approximately 11,000 loan applications had been received from ACT households and 8,000 loans had been settled for a total of $89.7 million for solar, battery and electrification upgrades of their homes, and EV purchases to help reduce energy bills and carbon emissions. Solar-only installations made up 55% of Scheme expenditure and 71% when including solar plus battery installations.

The remaining 29% of Scheme expenditure has been spent on reverse cycle heating and cooling appliances (18%), battery storage for homes with existing solar systems (6%), hot water heat pumps (3%), new and used EVs (1% each), EV charging infrastructure (<1%), and electric stove tops and ovens (<1%).

Due to high uptake rates, funding for the Scheme is forecasted to run out in September 2023 (assuming no changes are made to the Scheme) and will subsequently require additional funding to continue until February 2025. The sooner that Scheme amendments can be implemented, the less additional funding will be required as existing funding will last longer. Conversely, the later that changes to the Scheme are implemented, the more funding will be required.

Solar-related activities are delivering the majority of bill savings while electrification activities are delivering the majority of carbon savings

Each of the different Scheme goals are being delivered by distinctly different activity categories.

Because the ACT electricity grid is currently considered to be zero emissions, emission reductions are not attributed to solar and battery upgrades in the short-term. This means 100% of carbon emission reductions attributed to the Scheme are being delivered by electrification activities. Of this, 96.5% of carbon emission reductions are attributed to reverse cycle heating

and cooling appliance upgrades, 3.3% from hot water heat pumps, and 0.2% to electric stove tops and ovens. However, the electrification of gas appliances will increase electricity demand in the ACT and require the Government to fund additional Power Purchase Agreements (PPAs) to retain a long-term zero emissions status. Therefore, in the medium to long term, increased residential solar PV can contribute to maintaining a zero emissions grid and reduce the amount of electricity use that needs be offset through PPAs.

Conversely, 92% of bill savings under the Scheme come from solar-related activities. This reflects both the dominance of solar in the Scheme and higher electricity prices when compared with gas. However, if households undertaking electrification activities have excess solar generation, then their bill savings will be higher. Many of the vendors interviewed who sell electrification products emphasised that the installation of solar is a key enabler of demand for electrification activities (including the purchase of Electric Vehicles (EVs)).

There is not presently an objective empirical measure of home comfort. However high efficiency heating and cooling activities and insulation directly improve comfort, and bill saving activities indirectly increase the affordability of maintaining comfort. Therefore, uptake of both these activities can be taken as a proxy for improved comfort.

Therefore, if the Government wishes to change the relative contribution of the Scheme to carbon emission reductions versus bill savings outcomes, it needs to change the proportion of activity types delivered.

There is no evidence of significant freeriding under the Scheme

During interviews, vendors of all upgrade types indicated that the volume of installations has increased significantly compared with business as usual since the introduction of the Scheme. This is particularly the case for solar. Reports from vendors were corroborated by Access Canberra and Clean Energy Regulator solar installation data. Vendors also reported that a significant percentage of customer enquiries have come through Brighte's Scheme portal. So the Scheme is increasing the uptake rate of solar, electrification and EVs in the ACT, not just supporting purchases that would have occurred anyway (i.e. there is limited "freeriding").

The Scheme is tied closely to other ACT programs

There are four other ACT programs which are complementary to the Scheme. These include the Home Energy Support Program (HESP), Sustainable Home Advice Program, Next Gen Energy Storage Program and the Energy Efficiency Improvement Scheme (EEIS). Most interviewees believed these complementary programs are having a positive influence on Scheme uptake, explaining that this is likely because the benefits of one program can be used in conjunction with another (as is the case for HESP and the Next Gen Energy Storage Program).

Vendors interviewed all partially attributed high demand for electrification and solar PV to very high customer awareness, resulting from broader ACT Government promotion through a range of ACT initiatives, not limited to the Scheme.

Data provided on the HESP program reveals that there have only been $445,000 in loans provided in conjunction with a HESP rebate (as of 6 December 2022). This data suggests that

whilst the Scheme is an important part of HESP, HESP plays a smaller part in the Scheme – 0.5% of Scheme expenditure is tied to a HESP rebate.

The median Unimproved Value (UV) is centred around the middle of home values

The median UV of participating households in the Scheme is $324,303 – $354,710. This suggests there is an equitable distribution of uptake with no skew towards higher valued properties.

High uptake of loans reflects the attractiveness, ease of communication and streamlined administration of the Scheme.

Vendors interviewed were on balance very positive about the design and management of the scheme. This related to both the vendor experience of participation and their perspectives on customer experience. Vendors were generally positive about all Scheme design settings (loan terms, eligible products and eligible customers, and the ease of promotion and delivery through Brighte).

Whilst Scheme demand varies by product, interviews identified three overarching aspects that appear to be having a material impact on supporting demand for the Scheme. These include:

- **Customer attributes and behaviour** – a high level of ACT-specific customer literacy and understanding of solar and electrification benefits is driving demand for the Scheme. In addition, solar products appear to be an enabler of electrification activities driving the demand for products that will have very low running costs when coupled with solar.
- **Program design** – firstly, the simple program design makes it easy for vendors to communicate the Scheme to customers. Secondly, the 0% interest rate appears to be a key driver of demand for the Scheme.
- **Brighte's Scheme administration** – vendors applauded Brighte's quick and low friction process for both vendors and customers which means vendors want to be involved in the Scheme and actively encourage their customers to get involved.

High numbers of new vendors entering the ACT market across product types were identified by interviewees as facilitating the rapid growth in installations. However incumbent ACT vendors perceive this as a risk, rather than an advantage. Some vendors interviewed referred to a potential long-term reputational risk rather than a short-term commercial impact on their businesses (of which their sales were growing due to the Scheme). However, it is important to note that the Scheme vendor with the most electrical safety defects (as identified by Access Canberra inspectors) is an ACT-owned and operated business.

Conversely, three characteristics appear to be limiting demand for Scheme loans. That is, in the absence of these Scheme aspects, more customers might request a loan and customers may request more than the current $15,000 limit. These include:

- **Maximum loan amount** – The loan amount of $15,000 appears to prevent additional uptake in the Scheme. Vendors reported that there was competition between products because it would cost households significantly more than $15,000 to undertake all possible upgrades. This results in trade-offs between the types of benefits delivered, as these differ between solar and electrification activities.

- **Limit of one loan per household** (rather than per person) – eligibility predicated on only one loan per person and per household is potentially limiting Scheme uptake as people who own more than one property in the ACT must choose how to allocate the maximum loan of $15,000 between their properties. This is a potential issue for rental properties; however, an analysis of home ownership type was not in scope for this project.
- **Limited list of approved products** – vendors were generally content with the product categories available for provision under the Scheme. However, they would prefer a broader list of approved products. Several vendors' views were that the product register currently used for the Scheme (Victorian Energy Upgrade product registry) is not a comprehensive list of the most effective and efficient hot water heat pumps available. For example, no new hot water heat pump products that are appropriate for zone 5 (i.e. suitable for the ACT) have been added to the registry since 2018. This may limit demand if a customer's preference is not eligible for installation under the Scheme.

There are three main policy options likely to have a material impact on activity uptake and rebalancing scheme benefits across policy goals

Changing the product mix by significantly reducing the demand for solar would likely ensure long-term financial sustainability for the Scheme and rebalance the bill savings and carbon emission reductions delivered under the Scheme.

We qualitatively investigated a broad range of possible Scheme settings changes to achieve these goals. As per the scope of our engagement, these include variations across loan amounts, terms, interest rates, products, and household eligibility. However, interviewees were unable to provide insights on whether changes to most of these levers would have a material impact on Scheme demand.

We identified three main levers that we could, with sufficient confidence, quantitatively assess the direction and order of magnitude of impacts on the demand for solar. These were prioritised and investigated further based on assumptions about the order of magnitude impact on demand, which we were able to draw from interviews[1]. But it is important to note that the benefits described below are intended to show the relative outcomes between different options, rather than predict the exact level of demand. Our modelling was predicated on external factors holding equal, particularly demand for non-solar activities. In practice, non-modelled factors like interest rate increases could dampen demand or increased advertising could increase it beyond the influence of Scheme design.

Our modelling compares the outcomes of three policy options based on the $200 million currently allocated to the Scheme, comprising the initial $150 million plus the recently approved additional $50 million. Each option has been modelled assuming a start date of 1 July 2023.

The three modelled policy options analysed are:

1. **Removing solar as an eligible activity under the Scheme** – this option would have the biggest impact on ensuring the financial sustainability of the Scheme (continuing the Scheme with the current $200 million in funding until March 2024). This option would result

[1] The modelling approach and assumptions are detailed in Appendix 1

in the highest lifetime carbon emission reductions (372,481 tonnes of CO_2-e) but delivers the lowest lifetime bill savings ($362,034,263). This option takes advantage of an opportunity to maximise carbon emissions reductions by refocusing the Scheme on electrification activities. However, by reducing the uptake of solar, electrification activities become less financially attractive for households that don't have existing solar. This risks inadvertently excluding households without solar from the private bill savings benefits of decarbonisation delivered by the Scheme. Under this option, an additional $71 million would be required to extend the Scheme till February 2025. Of the three options, this is the smallest amount of additional funding required.

2. **Place a cap on the individual funding available for solar loans** – placing a cap on solar loans would reduce the uptake of solar under the Scheme as customers may need to make co-payments (depending on the total cost of the system). The analysis has been based on a monetary cap of $5,000 per loan, however a cap could also be placed on the system size which would limit the cost and Scheme uptake. Given the average solar unit costs $7,929[2], a $5,000 cap will likely still support solar demand whilst also still making electrification activities attractive. Based on estimates, this option would extend Scheme funding until October 2023 (using the assumptions outlined in Appendix 1). This option would deliver $419,688,290 of lifetime bill savings and 273,190 tonnes CO_2-e of lifetime carbon emission reductions within existing Scheme funding levels. Under this option, an additional $196 million would be required to extend the Scheme until February 2025.
3. **Apply a nominal interest rate on loans for solar** – applying an interest rate to solar loans would reduce the uptake of solar under the Scheme as there would be a cost associated with the loan, where previously there was none. The analysis has been based on an interest rate of 3.44% (the Government bond rate) however, the Government should also consider pricing in the administration costs and cost of default payments if this option is implemented. Based on estimates, this option would extend Scheme funding until September 2023 (using the assumptions outlined in Appendix 1). This option would deliver $422,770,758 of lifetime bill savings and 254,979 tonnes CO_2-e of lifetime carbon emission reductions within existing Scheme funding levels. At $265 million, this option would require the largest amount of additional funding to extend the Scheme until February 2025.

Summarised in Table 1 below are the outcomes of these options when compared with a business-as-usual (BAU) forecast based on current policy settings. Each option has been modelled assuming a start date of 1 July 2023.

[2] This is based on ACT Government Scheme data of the average loan size for solar systems and corroborated by interviewees.

Table 1 – Comparison of Scheme benefits delivered under each policy option (based on $200 million of total funding)

Scenario	Lifetime bill savings	Lifetime carbon savings (t CO_2)	Lifetime solar generation (MWh)	Last full month current $200m funding would be exceeded	Additional funding required to extend the Scheme until February 2025
BAU growth	$427,957,849	254,979	2,411,198	September 2023	$288,712,473
Option 1: No Solar	$362,034,263	372,481	1,937,422	March 2024	$71,384,685
Option 2: Cap solar to $5,000	$419,688,290	273,190	2,128,413	October 2023	$195,798,230
Option 3: Nominal interest rate	$422,770,758	254,979	2,386,550	September 2023	$265,352,946

Table 1 shows that the level of solar uptake reduces in order from BAU, Option 3, Option 2 to the lowest at Option 1, as solar is replaced by electrification activities. Bill savings are also linked to the level of solar uptake given the difference between electricity and gas prices. Conversely, the carbon benefits increase as the proportion of solar uptake reduces across these options.

The model forecasts the increased Scheme lifetime based on available funding under each option. This is because as solar uptake reduces, the rate of expenditure slows, resulting in the Scheme's funding lasting longer. This assumption is based on interview findings wherein interviewees stated that the underlying demand for electrification activities is not as high as that for solar. (Refer to Table 17 in Appendix 1 for more details) All options include the benefits of solar and electrification activities implemented to date, as well as those from forecasted future upgrades.

Vendor interview feedback suggests that limiting the uptake of solar is not likely to increase the uptake of batteries. The largest battery vendors under the scheme we interviewed all agreed that given the recent increase in battery prices, coupled with the end of the Next Gen battery storage program, it is likely that the demand for batteries will drop significantly. It is possible that some solar vendors will pivot to providing hot water heat pumps and reverse cycle heating and cooling.

In assessing these options, it is important to consider that the lack of direct carbon benefits for solar activities is because these benefits are instead attributed to the ACT Government's Power Purchase Agreements (PPAs), which aim to offset the emissions from ACT electricity consumption. The ACT's electrification strategy (Powering Canberra) projects that the ACT will require 3,500 GWh of electricity by 2030 [1]. In 2025, renewable energy prices are forecasted to cost $43 per large-scale generation certificate (LGC) (i.e. $43 per MWh) [2]. The benefit of Option 3 is that interest rates could be set so that each MWh delivered by the Scheme is completely cost-neutral to Government. The benefits and costs of measures such as aggregated demand response and neighbourhood batteries will likely also need to be considered in the ACT. These costs are required to manage locationally specific network impacts from mismatches in the timing of supply and demand at higher solar concentrations.

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Background to this report

This report provides an overview of the findings of a short, targeted review of the Sustainable Household Scheme (Scheme), a program to provide zero interest loans (up to $15,000) to ACT households for carbon and bill saving upgrades. The Scheme was launched in July 2021 and $150 million was publicly committed to fund the program for five years. The Scheme supports three overarching ACT Government goals: to improve bill savings, emissions reductions, and comfort for existing ACT homes. The Scheme aims to achieve these goals by providing interest free loans for a mix of upgrades related to either increased onsite solar PV or electrification of gas appliances or electric vehicles (EVs). The uptake rate of funding under the Scheme has been much higher than initially anticipated and a further $50 million has been committed to it, bringing Scheme funding to $200 million in total. At these current high uptake rates the Scheme is forecast to run out of funding in 2023, two years earlier than originally anticipated.

Common Capital has been engaged to conduct this review and to report on the likely impacts of any amendments to Scheme parameters to improve Scheme outcomes and the long-term financial sustainability of the program.

Overview of the Sustainability Household Scheme

This Scheme is a financing program that provides interest-free loans to ACT residents to carry out energy efficiency improvements in their homes. The objectives of the SHS are to reduce the energy bills for Canberra residents, reduce greenhouse gas emissions, provide more comfortable housing and support the development of the renewable energy industry in the ACT. Not-for-profit community groups are also eligible for loans for upgrades to their premises or to purchase EVs, but none have applied.

Each eligible household or community group can receive up to $15,000 in interest free loans, which can be used to cover the full or partial costs of multiple eligible items. Recipients of the loan must borrow at least $2,000, use accredited suppliers, and repay the loan within ten years. The list of eligible items is as follows (with insulation commencing in 2023).

Table 2 – Eligible products by category

Category A	Category B	Category C
• Rooftop solar panels	• Hot water heat pumps	• Used EVs
• Household battery storage systems	• Reverse cycle electric heating and cooling systems	• New EVs
• Electric vehicle charging infrastructure	• Electric stove tops	

The Sustainable Household Scheme (SHS) is now an established program within the ACT Government's complementary energy policy mix, including the Home Energy Support Program (HESP), the Energy Efficiency Improvement Scheme (EEIS), the Sustainable Home Advice Program, and the Next Gen Energy Storage Program (which was closed at the end of 2022).

Brighte was selected to administer the loan and handles the application process, accreditation of vendors and payment to vendors. Loan applications are typically bundled at point-of-quote with vendors who have been pre-approved by Brighte in accordance with the SHS vendor policy. Once a vendor submits evidence of installation of a pre-approved product, Brighte pays the vendor the approved loan amount, which may cover part or all of the upgrade cost. The customer then repays Brighte this amount in equal monthly instalments over up to 10 years. ACT Government capital funds are paid to vendors directly and Brighte is paid a service fee to manage the collection of interest-free repayments to the Government.

Policy context

This report is guided by the ACT's Climate Change Strategy (Strategy) 2019-2025 which provides the pathway and necessary actions to achieve ACT's interim climate and ultimately, net zero emissions by 2045. The SHS was conceived to support the residential transition from gas to electricity – a key priority under the Strategy.

The ACT sources 100% of its electricity from renewable generators [2]. However, in order to achieve net zero emissions, it must transition off gas and other fossil fuels. A transition away from residential gas use relies on homeowners to replace their gas appliances with efficient electric alternatives. This is essentially asking homeowners to allocate any additional funds to upgrading appliances that still perform their primary function, over other spending areas which may deliver higher utility. In addition, as the cost of living continues to increase, reducing energy bills is increasingly important in ensuring ACT residents can afford to live comfortably. However, many of the solutions to transitioning away from gas and reducing grid energy consumption have high upfront costs.

In addition, two recent policy developments include insulation becoming an eligible activity under the Scheme in 2023 and the introduction of minimum standards for insulation in rental properties in 2023.

We were tasked with reviewing existing Scheme parameters

The purpose of this project was to assess the Scheme's parameters, ascertain whether any changes are required to better meet the objectives of the Scheme, and analyse the impacts of any proposed changes on Scheme objectives, rate of loan approvals, and linked programs.

Parameters for consideration in this review include:

- **Eligibility criteria for people and properties** – Currently, only homeowners or people living with homeowners are eligible for home upgrades – renters and businesses are excluded. Certain non-for-profit community organisations are also eligible. Eligible properties for household loans include both standalone residences and unit title properties however they must meet specific Unimproved Value (UV) thresholds. This

threshold is $750,000 for houses, townhouses and non-unit titled dwellings, and $200,000 for multi-storey apartments. For EVs, the person must reside in the ACT and hold a valid ACT driver licence, and consequently renters are able to access loans for EVs.

- **Eligible products available** – Currently, products available for financing under the Scheme include rooftop solar, efficient electric heating and cooling appliances, hot water heat pumps, electric stove tops and ovens, battery storage systems, EV chargers and EVs. Within each product type there is a list of approved suppliers and a set of criteria for products to be eligible. For example, EVs must be powered by a zero emissions mechanism and have a total cost that is less than the luxury car tax threshold for fuel efficient vehicles.
- **Loan terms** – Currently, eligible households can receive a zero-interest loan of $2,000-$15,000 that must be repaid within ten years. To be eligible, households must meet credit criteria. Only one loan per household is allowed but the loan can be split across multiple products. There are no upfront costs or fees in accessing this loan. A household can apply for subsidies and rebates under other programs in addition to the SHS loan.

This review will guide the Government's decision-making on any necessary Scheme changes to these parameters.

This report consists of three sections that answer the questions provided in the ACT Government's RFQ

Table 3 – Project tasks mapped to relevant section of this report

Project tasks	Report section
• Review existing parameters	• Section 1 and Section 2
• Analyse the likely impacts of changes to each parameter on the Scheme objectives and the rate of loan approvals	• Section 3
• Assess the likely impacts of changes to linked programs, particularly the Home Energy Support Program (HESP) rebates for vulnerable households	• Section 3.2
• Provide options and recommendations to ensure the long-term sustainability of the Scheme	• Section 3

Our data collection and analysis methodology

Our data collection and analysis approach consisted of a qualitative workstream and a quantitative workstream to complete the tasks outlined in Table 3 above.

As discussed earlier, the objectives of the SHS are to reduce the energy bills for Canberra residents, reduce greenhouse gas emissions, provide more comfortable housing and support the development of the renewable energy industry in the ACT. The Scheme contributes directly to reducing greenhouse gas emissions through upgrading insulation and heating and cooling appliances. The Scheme also contributes indirectly to reducing energy bills by supporting activities which improve the affordability of heating and cooling ACT homes. However, there is no objective or empirical way to measure housing comfort. Subsequently, this report focuses on uptake, carbon savings and bill savings that are used as a proxy.

The qualitative workstream consisted of desktop research and semi-structured stakeholder interviews

We reviewed all key Scheme documentation and data provided by the ACT Government. This informed our research questions and options development. We performed a detailed review of the eligibility criteria, as well as financial and contractual agreements to understand the key drivers behind the Scheme's uptake. This included aspects such as looking at data on the product types, volume, dollar amount of upgrades and customer type. We then conducted a high-level policy assessment, including policy design, scope and objectives.

In parallel, we conducted thirteen 60-minute interviews with a small cross-section of targeted stakeholders as shown in Table 4 below. These interviews contributed to the development of options to improve the long-term sustainability of the SHS. Interviews also provided further details on sensitivities to include in the quantitative modelling and provided insights into the likely impacts of uptake levels resulting from Scheme amendments.

ACT Government data on the number of SHS installations, by product, was used to select vendors to interview. This ensured there was a spread of vendors across the product categories. The seven vendors interviewed represent almost 30% of the total product installations under the SHS (as at 13 December 2022).

Table 4 – SHS stakeholder types interviewed and number of interviews completed

SHS stakeholder type	No. of interviews
SHS vendors	7
Insulation vendor (not yet participating in the SHS but due to participate in 2023)	1
Brighte	1
Access Canberra	1
ACT Government Senior Executives	1
Transport Canberra	1
Program Managers of complementary programs in the ACT	1
Total	**13**

The quantitative workstream consisted of modelling energy bill and greenhouse gas savings

To support this project, we developed a model to calculate energy bill and greenhouse gas savings from the Scheme under three scenarios with differing proportions of adoption of the various eligible products.

For each product eligible under the Scheme, we used estimates of reduced energy use (gas, electricity and/or petrol) based on the difference between pre-upgrade energy use for that activity (e.g. driving, heating, etc) and the post-upgrade energy use for a representative ACT home. For each activity we then calculated the carbon savings based on the difference between the emissions intensity of the fuels (e.g. gas/petrol vs nominally zero emission electricity). We calculated the bill savings based on the before and after energy costs for each activity, considering the load profile of each activity and the different energy tariffs based on time of use/generation. Bill savings are calculated by using retail prices in the ACT and residential peak period electricity costs. Forecasts used the average solar system size (9.22 kW) installed under the Scheme (up until 13 December 2022) to predict the MWh that would be generated by solar installations under each option.

For uptake rates we forecast business-as-usual (BAU) uptake by product based on a linear projection from historical trends up to December 2022 for existing products, except for insulation.

Note, we typically use “s-curves” to model activity uptake, consistent with academic findings on patterns of innovation adoption [3]. These involve a slow adoption, then rapid acceleration and flattening again at market saturation. However, we adopted a more conservative approach for this project due to the very short timeframes of the forecasts involved and lack of readily available data to assess where each product was in its adoption cycle.

We then developed alternative forecasts for three modelled policy scenarios, using a multiplier on each product type to increase or reduce the uptake rate based on insights drawn from interviews. Our assumptions for each option are:

- Option 1: solar uptake was assumed to decrease to zero from 1 July 2023 as solar is removed completely from the Scheme.
- Option 2: Scheme uptake growth rate for solar activities was assumed to be 33% of the BAU (100%) scenario, which represents a moderate flattening of the current accelerating growth of solar uptake, in line with insights from interviews. Regardless of this growth rate, government expenditure per system installed is also capped at $5,000 and an average system costs more than $7,500. This will increase the amount of solar installed for every government dollar spent.
- Option 3: the growth rate was assumed to be 15% of the BAU (100%) scenario as during interviews, vendors were confident that an interest rate would slow the uptake of solar under the Scheme but were unable to state whether it would have a small, moderate or large impact. We therefore tested the impacts of a 40%, 85% (central scenario) and 120% reduction to show the impacts at these different levels of uptake and selected the centre scenario as the base case.

For all options, we have assumed that the growth rate of non-solar activities continues growing at a rate based on historical trends – independent of changes in demand for solar. It is possible that some activities may grow at a faster rate due to the reduction of solar uptake under the Scheme, however, interviews did not provide clear enough insights to model a significant acceleration in the uptake of non-solar activities.

The assumptions used to develop the forecasting model are detailed further in Appendix 1.

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SECTION 1

Historical and forecasted Scheme performance

This section analyses Scheme performance to date, and forecasts future uptake and benefits. It also discusses the level of freeriding.

1.1 The Scheme has been successful in delivering benefits but may require changes to ensure its sustainability

High levels of Scheme uptake has been mostly driven by the demand for solar

The SHS has provided approximately $86 million in loans to 12,000 ACT households (as of November 2022). As shown in Table 5, solar is currently accounting for the majority of Scheme spend, with 55% of expenditure spent on solar-only installations. However, when including data from customers who install solar with batteries (this customer data is captured as a separate category to solar-only installations), the proportion of public expenditure is 71%. The next highest proportion of expenditure is for heating and cooling appliance installations which accounts for 18% of total Scheme expenditure. This is followed by battery storage for existing solar panels (6%), hot water heat pumps (3%), new and used EVs (1% each), EV chargers (<1%), and electric stove tops and ovens (<1%).

Figure 1 below shows the monthly expenditure on each product category since the Scheme's inception. The rate of uptake of solar has been growing at the fastest rate (yellow line). EV charging infrastructure has had low uptake from the start, and this has remained consistently low. This is likely due to the relatively low cost of this infrastructure. Many ACT customers are buying these outright as they are already affordable. Other customers who may have wanted to use the loan for this infrastructure have already used the full $15,000 on purchasing an EV or other more expensive products. Reverse cycle heating and cooling installations are growing steadily and relatively quickly, however, not as quickly as solar.

Hot water heat pump installations are growing at a very slow rate which could be due to their relatively low cost when compared with solar, batteries and reverse cycle heating and cooling appliances. Customers may choose to access the loan to install the more expensive products as the upfront cost of hot water heat pumps is likely not as prohibitive as the cost of the other products. Customers with solar systems may also prefer a lower cost resistive hot water system when converting from gas, as this achieves significant bill savings at a lower upfront cost. EVs have relatively low uptake, which was not growing as at early December 2022. However, this is to be expected given their high upfront costs (approximately $21k-$63k for a used EV and $70k+ for a new EV). Even with access to the $15,000 SHS loan, customers will still have to gather a majority of the finance required themselves.

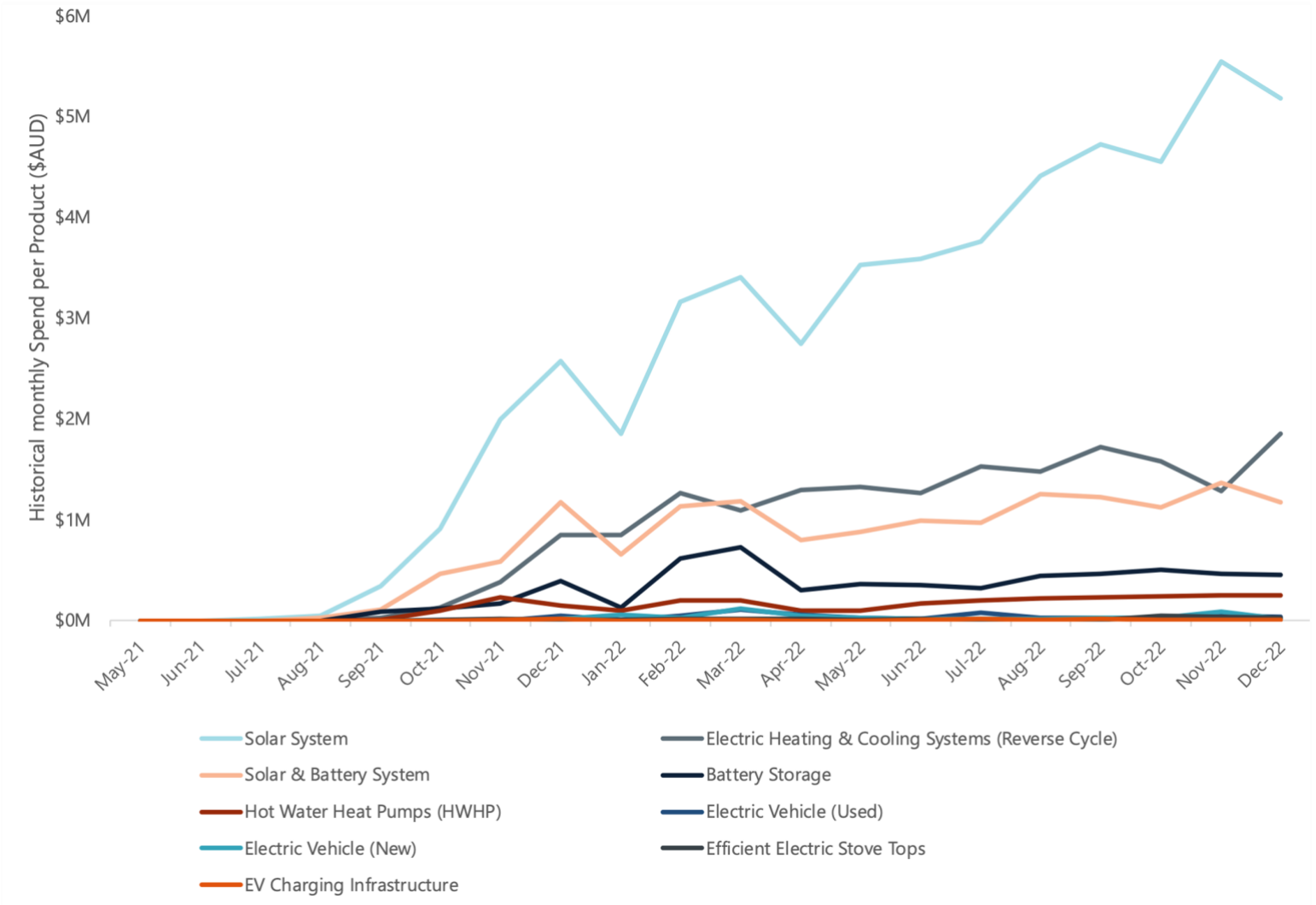

Figure 1: Historical monthly Scheme expenditure per product

Each of the different Scheme goals are being delivered by distinctly different activity categories

The Scheme supports three overarching ACT Government goals: to improve bill savings, emissions reductions, and comfort for existing ACT homes. Optimising for both bill and carbon savings will maximise Scheme benefits.

Currently, solar-related activities are delivering the majority of bill savings while electrification activities are delivering the majority of carbon savings. As demonstrated in Figure 2 below, solar installations are delivering the largest proportion of bill savings, while heating and cooling appliances are delivering the largest proportion of carbon savings. Whilst reverse cycle heating and cooling installations and hot water heat pumps provide some bill savings, solar and battery installations deliver no carbon savings. Because the ACT electricity grid is currently considered to be zero emissions, emission reductions are not attributed to solar and battery upgrades in the short-term. This means 100% of carbon emission reductions attributed to the Scheme are being delivered by electrification activities. Of this, 96.5% of carbon emission reductions are attributed to reverse cycle heating and cooling appliance upgrades, 3.3% from hot water heat pumps, and 0.2% to electric stove tops and ovens. However, the electrification of gas appliances will increase electricity demand in the ACT and require the Government to fund additional Power Purchase Agreements (PPAs) to retain a long-term zero emissions status. Therefore, in the medium-to-long term, increased residential solar PV can contribute to maintaining a zero emissions grid and reduce the amount of electricity use that needs be offset through PPAs.

Conversely, while solar systems, batteries and EV charging infrastructure have no attributable carbon savings, they deliver significant bill savings. 92% of bill savings under the Scheme come from solar-related activities. This reflects both the dominance of solar in the Scheme and higher electricity prices when compared with gas. As shown in Table 5 below, solar systems deliver the highest bill savings per dollar of zero interest loan provided, at $3.12. A solar and battery system delivers $2.42 of bill savings per dollar of zero interest loan provided, however a battery on its own only delivers $0.20 of bill savings. However, if households undertaking electrification activities have excess solar generation, then their bill savings will be higher. Many of the vendors interviewed who sell electrification products emphasised that the installation of solar is a key enabler of demand for electrification activities (including the purchase of Electric Vehicles (EVs)).

EVs deliver relatively high bill savings per dollar of zero interest loan provided, at $2.74 and $1.99 for new and used EVs respectively. This is followed by hot water heat pumps at $0.46. Electric heating and cooling systems on average deliver no bill savings as whilst some households switching their heating and cooling appliances from gas have solar systems powering their homes, some households installing these appliances are still purchasing energy from the grid. Electric stove tops actually increase energy bills by $0.25 per dollar of zero interest loan provided. Electric induction stoves efficiently convert electrical energy into heat energy for the cooked food with relatively low waste compared to gas stoves. Despite this efficiency improvement, the relatively low cost of gas use means the annual running costs of an electric stove are slightly higher than a gas stove. If the stove is the last gas appliance in the home, the home could avoid network connection fees by disconnecting from the gas network. This would change the energy bill impacts for an efficient electric stove top from a loss of

around $80 per year to a savings of $190 per year. We have not modelled this additional saving.

Scheme benefits, such as bill savings and carbon savings, are therefore maximised when the uptake of activities that deliver these benefits are optimised.

There are limitations to the quantitative analysis of bill and carbon savings

A limitation of the quantitative analysis of bill and carbon savings is that, to be conservative, it has been assumed that customers who use the Scheme to install hot water heat pumps and reverse cycle heating and cooling appliances do not have solar. In reality, it is likely that a significant proportion of these customers have rooftop solar given the ACT's high penetration of solar. In addition, the types of customers who electrify their homes are more likely to have installed solar. Subsequently, the bill savings delivered by electrification activities under the Scheme are likely to be higher than those shown in Figure 2.

For example, a typical ACT household that electrifies their ducted gas for heating, gas cooking and gas hot water will annually save an average of $809[3] (in addition to $295 in annual gas savings[4]). If the household installs solar PV, these annual savings increase to $3,103 (when a 9.22 kW[5] solar unit is installed). The difference in savings illustrates why solar is a key enabler for electrification activities.

[3] Total bill savings are based off the average bill savings per appliance installed under the Energy Efficiency Incentive Scheme (EEIS)
[4] Not including gas connection charges
[5] the average system size currently being installed under the Scheme

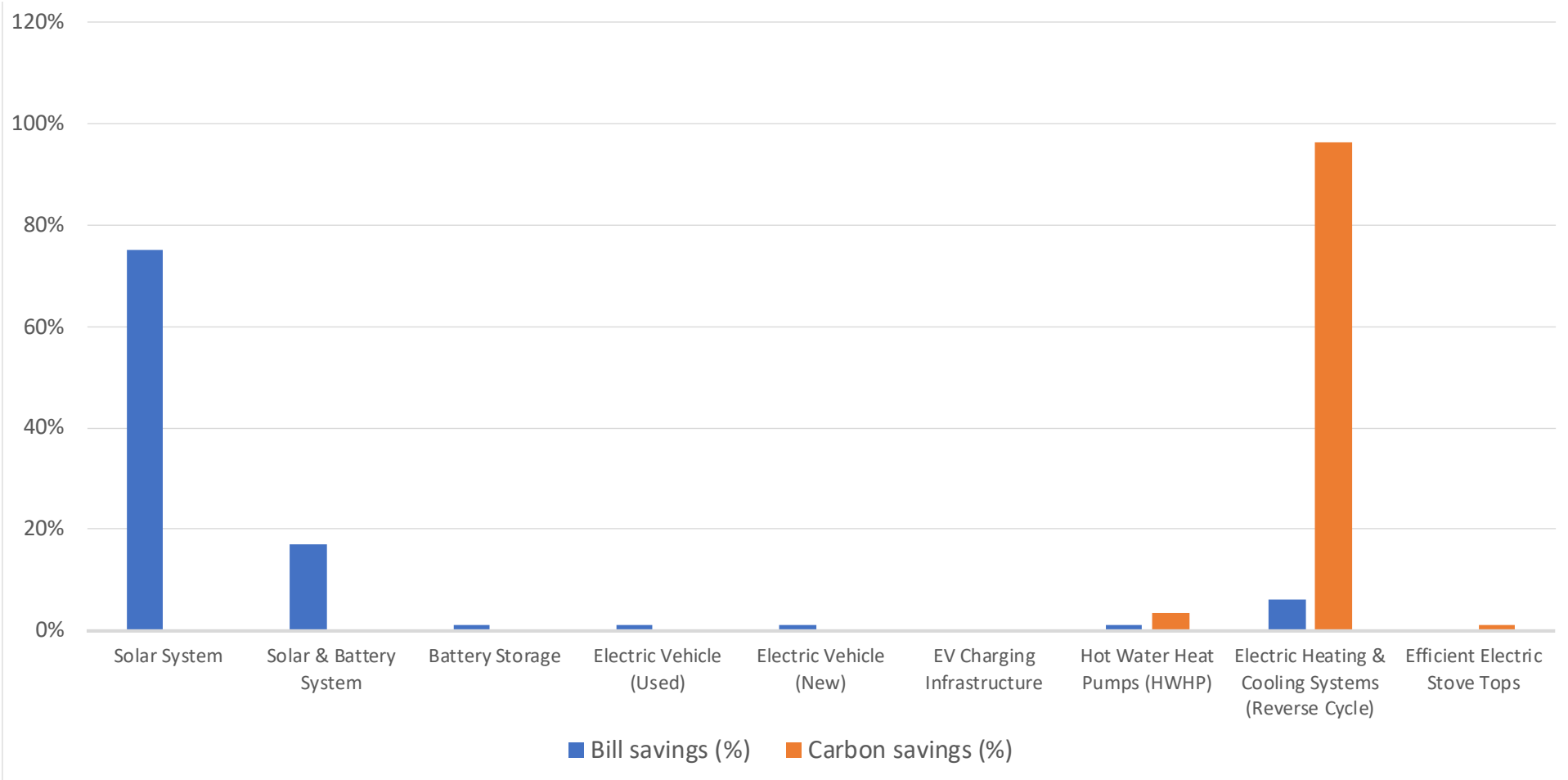

Figure 2: Percentage contribution of Scheme carbon and bill savings by product

Table 5 – Historical Scheme performance (up until 13 December 2022)

Product	Total amount of zero interest loans provided	% of total	Lifetime bill savings ($)	% of total	Carbon savings (tonnes per year)	% of total	Bill savings per $ of zero interest loan provided
Solar System	$49,486,812	55%	$154,606,892	75.9%	N/A	0%	$3.12
Solar & Battery System	$14,358,993	16%	$34,685,726	17.%	N/A	0%	$2.42
Battery Storage	$5,538,661	6%	$1,095,321	0.53%	N/A	0%	$0.20
Electric Vehicle (Used)	$511,614	1%	$1,018,216	0.49%	3.19	0.04%	$1.99
Electric Vehicle (New)	$517,550	1%	$1,416,095	0.69%	3.2	0.04%	$2.74

EV Charging	$75,981	0%	$0	0%	0	0%	$0
Hot Water Heat Pumps (HWHP)	$2,522,057	3%	$1,150,149	0.56%	320.8	3.25%	$0.46
Electric Heating & Cooling Systems	$16,524,094	18%	$9,731,337	4.7%	8,429.8	96.07%	$0
Electric Stove Tops	$198,279	0%	-$49,356	0%	17.8	0.18%	-$0.25
Total	$89,734,041	100%	$203,654,380	100%	8,774.8	100%	$2.27

The distribution of loans is centred around the median UV of ACT homes

Some stakeholders interviewed speculated there was a risk that Scheme uptake could be dominated by wealthier households who had more disposable income to repay zero interest loans. However, analysis of the distribution of uptake by average Unimproved Value (UV) by suburb[6] (which has been used as a proxy for wealth[7]), shows the median UV is centred around the middle of home values at $324,303 – $354,710. This is illustrated in Figure 3 below. In addition, even though households with a UV of up to $750k (as at 2020) are eligible for a loan under the scheme, there is limited uptake at this end of the spectrum. Ultimately, the data shows that Scheme access appears to follow a normal distribution across average UV per suburb, rather than a skewing towards higher UV areas which would indicate issues with distributional equity of bill saving benefits.

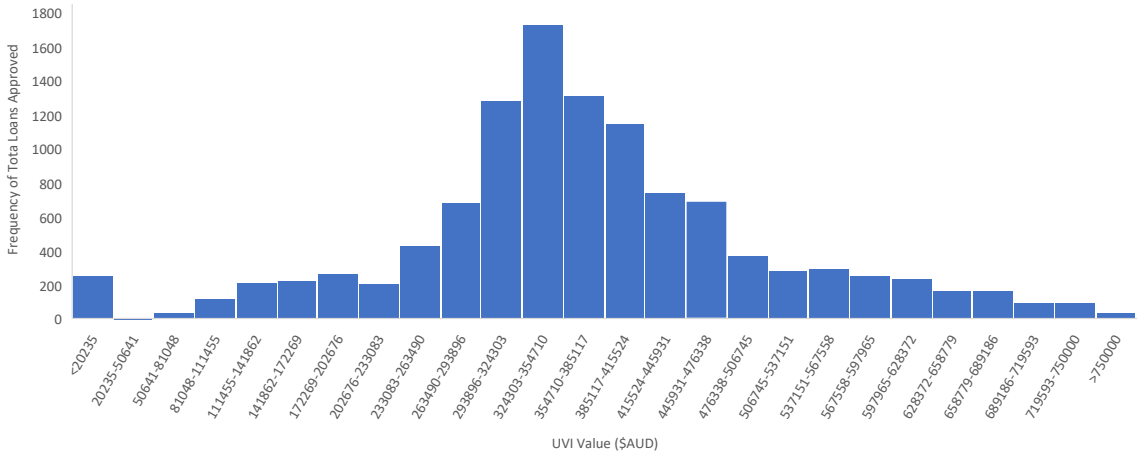

Figure 3: distribution of Scheme uptake by UV

Similarly, when analysing the distribution of Scheme uptake for solar-only installations, uptake rates follow a very similar trend. As shown in Figure 4 below, the median UV is centred around the middle of home values at $324,303 – $354,710. The highest uptake group is the same as in Figure 4, likely because solar installations are currently accounting for the majority of Scheme expenditure.

[6] Household-specific UV and income data was not made available for this analysis.
[7] Note that the average UV per suburb is only a crude proxy for wealth equality. For example, residents with low incomes and high asset values.

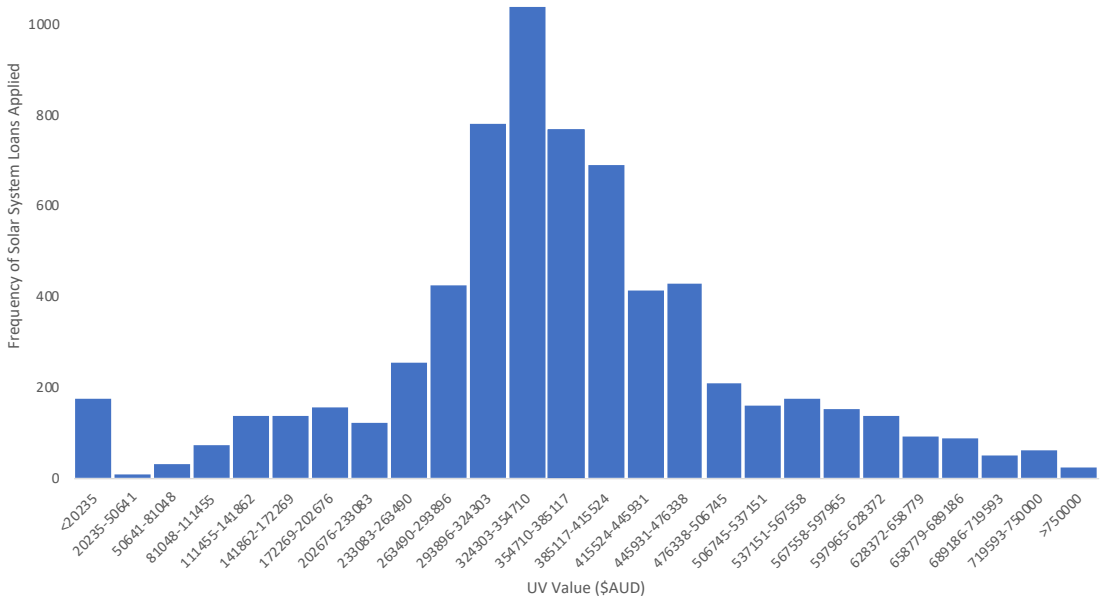

Figure 4: distribution of solar uptake by UV

1.2 There are likely to be low levels of freeriding under the SHS

The Scheme is increasing the uptake rate of solar, electrification and EVs in the ACT, not just supporting purchases that would have occurred anyway (i.e. there is limited "freeriding"). The level of freeriding under each product category in the SHS was explored during interviews. Overall, vendors of all upgrade types indicated that volume of installations has increased significantly compared with business as usual since the introduction of the SHS. This is particularly the case for solar. Reports from vendors interviewed are corroborated by Access Canberra and Clean Energy Regulator solar installation data. Vendors interviewed also reported that a significant percentage of customer enquiries have come through Brighte's SHS portal. The level of freeriding under each product category is discussed below and supported with evidence from interviews.

Rooftop solar

The solar vendors interviewed all expressed a view that underlying residential demand for solar in the ACT was very high. Most vendors believed that the SHS has resulted in additional demand for solar. One vendor stated that their volumes have increased by three times since the SHS started and have gone from a 4-week lead time to a 12-week lead time.

"It [the SHS] has definitely stimulated the ACT industry [for solar]… we're not pushing it [the scheme]…once they've accepted a quote then we'll ask them about the Scheme"

Another vendor agreed that the Scheme has resulted in additional demand for solar, however also believed that there would be sufficient demand in the market without the Scheme. They raised concerns for the sharp increase in demand for solar that may be

providing short-term financial benefits for their business but will ultimately be detrimental to the ACT solar industry in general. This is because the Scheme may cause a "boom bust" effect. That is, the market is currently experiencing exponential growth and many new suppliers are entering the market, however once the market is saturated then the ACT solar market will potentially collapse.

"No shortage of demand for solar, if anything there is too much demand for solar and the market can't service it. We are booked 4-5 months in advance for solar which is pretty silly lead times"

"Most people have it [solar] or are talking about getting it, or their friends have it…I question whether it needed to be in the scheme in the first place"

These estimated low levels of freeriding are corroborated with data from the Australian Bureau of Statistics and the Clean Energy Regulator. As shown in Figure 5 below, following a few months of ramping up after the Scheme started, in December 2021 solar installations as a proportion of households has more than doubled in the ACT. This reveals an underlying demand that is reasonably consistent with other jurisdictions, however, also shows significant growth as the loan became available. Anecdotally, solar vendors confirmed a drop in demand before the Scheme started as ACT residents waited to access the SHS loan.

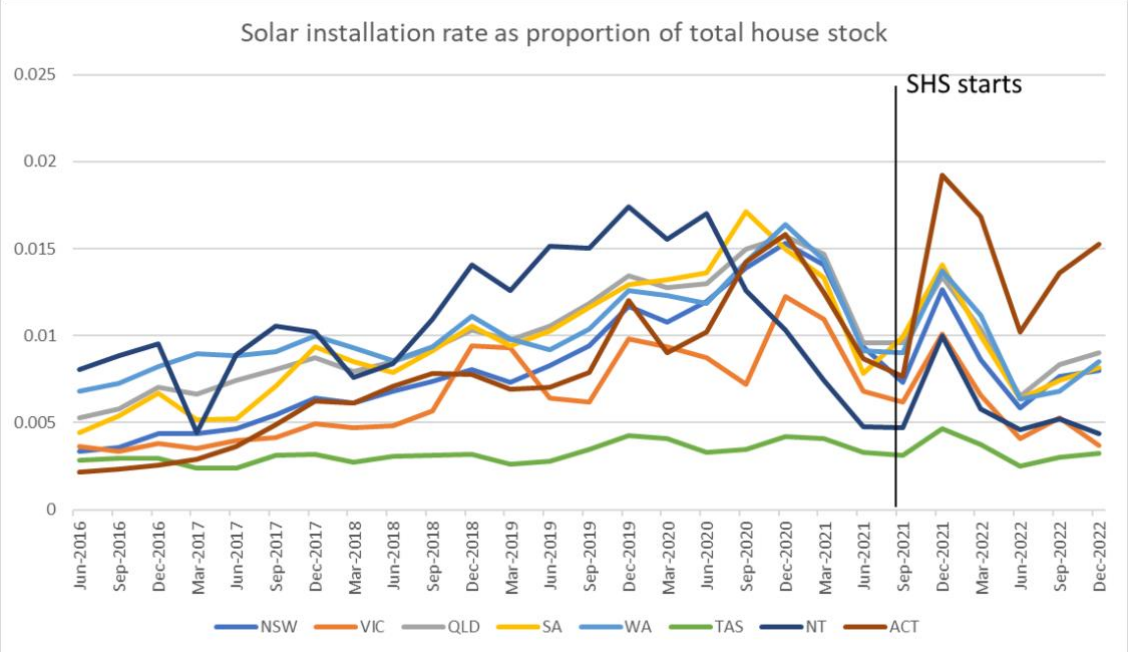

Figure 5: rate of solar installations by jurisdiction (source: Australian Bureau of Statistics and Clean Energy Regulator)

In addition, Access Canberra has reported a sharp increase in the number of solar installations. Prior to the Scheme's inception, Access Canberra forecasted an additional 227 installations a month. As shown in Figure 6 below, inspection requests for new solar installations peaked at 930 in August. This suggests the Scheme is having a strong influence on solar demand. There are implications of this rapid growth in the demand for solar, e.g., safety and quality issues with the installations.

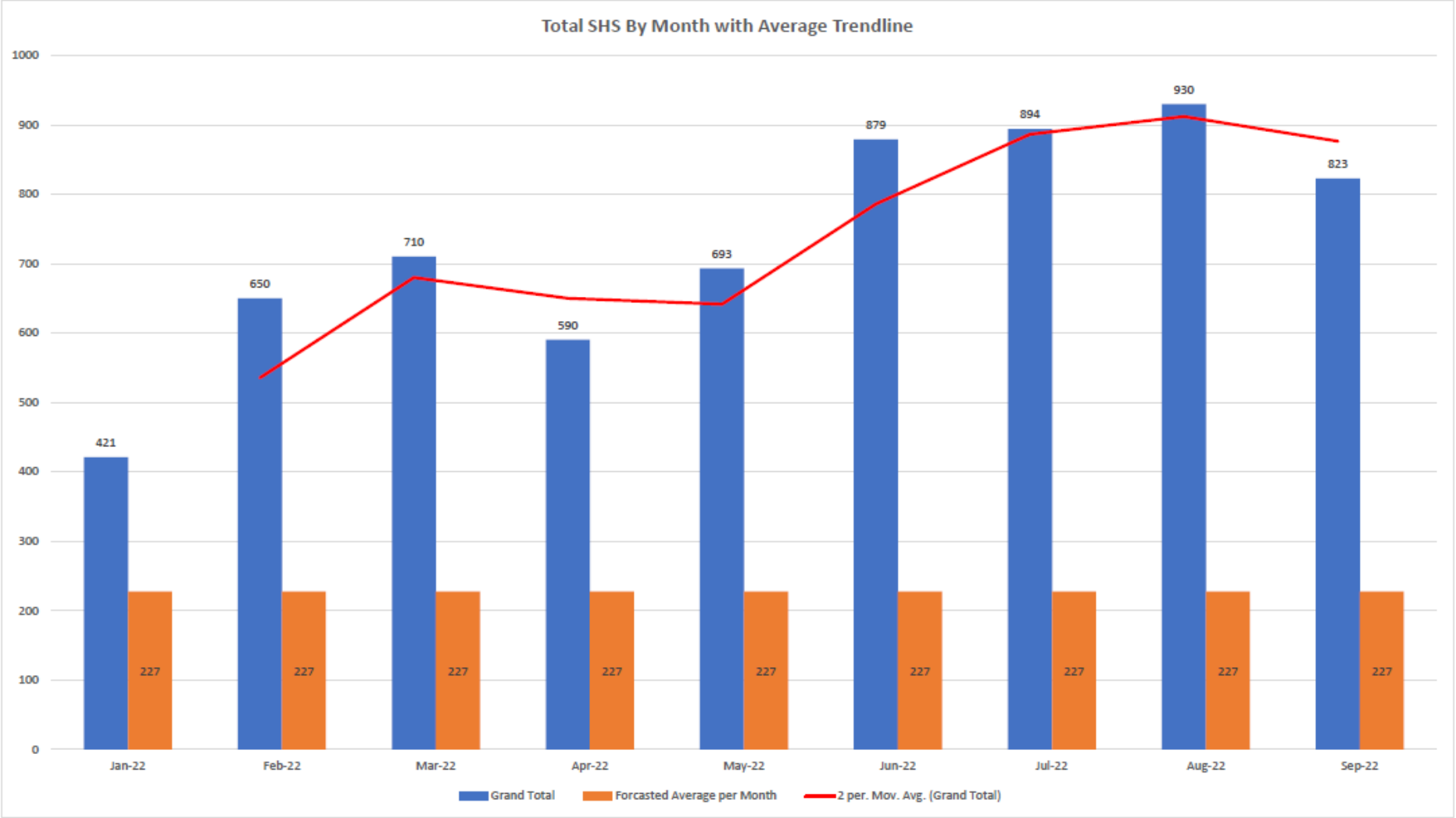

Figure 6: Total number of solar inspection applications versus forecasted average (source: Access Canberra)

Battery storage

One vendor explained that the demand for batteries has remained consistent despite an increase in the price of batteries. They believed that without the Scheme loan, this would have resulted in decreased demand for batteries. Subsequently, this vendor believes that the Scheme is resulting in battery installations that would likely not have happened without the Scheme.

"Battery sales are purely put down to the fact that the loan is available, no one's paying up front for them"

Another vendor agreed and stated that due to the high price of batteries, customers would likely not have gone ahead with the installation without the loan given the high upfront cost. In addition, the Program Manager for the Next Generation Energy Storage Program revealed that research showed that both programs combined have resulted in additional demand for batteries in the ACT:

"Uptake [in the ACT] for battery storage is leading in the nation…it's 3% of all households have battery storage which is more than triple across the nation"

However, a separate battery vendor found it hard to attribute a precise impact, although they speculated that without the Scheme it was likely that battery demand would have dropped off significantly.

EVs

One EV vendor's view was that the Scheme has resulted in additional demand for EVs.

"The loan has increased enquiries…the introduction of the loan as assisted with that [exponential growth] as well as increased awareness of EVs and availability of EVs, particularly in Canberra"

"40% of people probably are driven by the opportunity of the loan. 60% of our clientele are probably more comfortable being independent"

This vendor also explained that the demographic of EV customers has changed since the Scheme began. Previously, this vendor was selling EVs to a mostly older demographic, however now they are servicing a younger group who have previously found the high upfront cost of EVs to be too great a barrier for purchase:

"We certainly still get our older clientele but now we get very young families as well."

Other vendors questioned the additionality of EVs given their high cost, referring to Tesla vehicles. However, Brighte has confirmed that Tesla purchases using the Scheme are growing. Brighte received 10 loan applications for Teslas in November which grew to 16 in December.

"We've doubled the EV volume [since November] and that's been attributed to Tesla…in November 40% of the applications were Teslas"

This suggests Tesla purchases are on the rise due to the availability of SHS financing.

EV charging infrastructure

Qualitative data on EV charging infrastructure products was limited, however one vendor did believe the Scheme had had a significant impact on the demand for EV chargers. This vendor believed that the high cost of the charging infrastructure for EVs was likely a barrier for interested EV customers and that the EV proposition was much more affordable with the Scheme loan.

"We've installed 180 Teslas [EV chargers] for the year which would be unheard of at $14,000"

Efficient electric heating and cooling appliances

Interviews with vendors of heating and cooling appliances suggested that all installs under the Scheme are “pre-end-of-life” upgrades. That is, customers are replacing their ducted gas systems with reverse cycle systems before their gas system breaks. The Scheme vendors interviewed are not doing end-of-life upgrades because of their very long lead times and high demand for pre-end-of-life upgrades. For example, customers with broken gas heating cannot wait several months to install a new system. However, the level of freeriding for heating and cooling appliances under the Scheme is difficult to determine. Interviewees could not provide concrete evidence of additional demand for these systems that has been driven by the Scheme. They believed that whilst demand has increased, this may also be attributable to EEIS marketing and a generally well-educated market that understands the long-term benefits of switching from a gas system to a reverse cycle system.

“The market had already moved to a replacement market [ducted gas to reverse cycle] before the government brought in the Brighte program because of Actew’s strong marketing for the EEIS”
“From ducted gas to reverse cycle it has probably picked up by 100-200%. It’s gone through the roof…a lot of that has got to do with the way the government has marketed [the transition off gas]”
However, one vendor did state explicitly:

“100% the Brighte scheme is driving demand at the moment”
Although, this vendor is currently working through a backlog of customers that may not be upgrading because of the Scheme – they are planning to market the Scheme aggressively next year and believes additionality will improve. This vendor did also explain that there is a rumour going around that ACT customers believe gas will not be available in five years. If true, this would mean customers would be looking to switch from a gas system within five years, regardless of the Scheme’s loan facility.

Hot water heat pumps

The level of freeriding for hot water heat pumps under the Scheme is not clear. One hot water heat pump vendor believes that due to the relatively low cost of a system, customers are happy to pay for this upfront themselves without a loan. This vendor also heard from customers that:
“Some people just don't like being tied into a loan if they don't need to be”

However, this vendor stated that given interest rates are increasing alongside inflation and cost of living, that customers may now need to use the Scheme loan to upgrade their hot water system.
“People were prepared to pay their own money at 2%, but now we're talking sort of five or 6%, it might be a different thing”

Electric stovetops and ovens

There is limited data on the levels of freeriding of electric stovetops and ovens under the Scheme. One vendor explained that due to the many technical difficulties involved with upgrading from a gas stove to an electric stove (e.g. rewiring required to increase capacity to cope with the additional energy requirement), general uptake was very slow and it was hard to know whether the Scheme was driving the little demand they had for these products.

1.3 Without a reduction in solar demand existing funding ($200m) will run out by September 2023

The forecast below is based on a “business-as-usual” scenario wherein no amendments or interventions are made to the Scheme. Forecasts have been conducted for the period between December 2022 until September 2023 (which is when existing Scheme funding of $200 million will run out at the current rate of uptake). This forecast has accounted for the inclusion of insulation in 2023. However, slow rates of uptake for insulation have been assumed given the new minimum rental standards will likely be a key driver for demand under the Scheme, but standards do not come into force until April 2023. In addition, landlords will still have to choose whether to use part or all of their Scheme loan on their rental properties or their own homes. (Refer to Table 14 in Appendix 1 for more details).

As shown in Table 6 below, with no Scheme amendments, solar system and solar and battery system installations are projected to continue to dominate the proportion of total public Scheme spend (albeit decreasing slightly to 69% from 71% predominantly due to the introduction of insulation). The total amount of zero interest loans provided for EVs under the Scheme is forecasted to decrease slightly to less than 1%, hot water heat pump installations under the Scheme will likely remain at 3%, and the installation of reverse cycle heating and cooling appliances is forecasted to decrease slightly from 20% to 19%. With the introduction of insulation as an eligible activity in the Scheme from April 2023, forecasts indicate this activity will represent 3% of total public Scheme spend.

Table 6 – Forecasted Scheme benefits with no amendments (until September 2023 when existing funding ($200m) is projected to run out at current uptake rates)

Product	Total amount of zero interest loans provided	% of total	Lifetime Bill Savings	% of total	Carbon savings (tonnes per year)	% of total	Bill savings per $ of zero interest loan provided
Solar System	$109,879,562	56%	$335,600,712	78%	N/A	0%	$3.05
Solar & Battery System	$26,469,111	13%	$62,748,133	15%	N/A	0%	$2.37
Battery Storage	$10,250,099	5%	$1,949,642	<1%	N/A	0%	$0.19
Electric Vehicle (Used)	$792,793	<1%	$1,484,820	<1%	5	0%	$1.87
Electric Vehicle (New)	$559,044	<1%	$1,547,900	<1%	4	0%	$2.77
EV Charging Infrastructure	$172,368	<1%	$0	0%	0	0%	$0

Hot Water Heat Pumps	$5,381,116	3%	$2,356,910	1%	661	3.4%	$0.44
Electric Heating & Cooling Systems	$38,096,933	19%	$21,445,929	5%	18,726	96%	$0.56
Electric Stove Tops	$540,626	<1%	-$127,690	0%	47	0%	-$0.24
Insulation	$401,1000	2%	$951,492	<1%	77	1%	$0.24
Total	**$196,152,652**	**100%**	**$427,957,849**	**100%**	**19,519**	**100%**	**$2.18**

Without a reduction in solar demand, an additional $289m will be required to ensure the Scheme continues until February 2025

As shown in Figure 7 below, a total of $485 million would be required to continue the Scheme until February 2025 (at the current rate of uptake, which is driven predominantly by solar). While $200 million has been allocated to the Scheme, this is forecasted to only last until September 2023 (three years earlier than anticipated) using current uptake rates. Even if the Scheme could attain an additional $50 million, this is projected to only extend the Scheme until December 2023. In addition, the inclusion of insulation in the Scheme is likely to put further pressure on existing Scheme funds.

There are several issues that can arise from funding ending earlier than committed. Removing funding can cause a “boom bust” effect on the market. This occurs when the Government has intervened to build a market by incentivising local suppliers to increase their servicing capacity and encouraging new suppliers to enter the market. Subsequently, the demand for the products covered under the Scheme is likely to decrease when the funding ends, resulting in a potential market crash. Suppliers may no longer have viable business models and the potential for positive spillover and market transformation is removed.

Subsequently, a continuous increase in the funding envelope for the Scheme is likely not the optimal option. Influencing the uptake rates of the activities included in the Scheme is likely to have a greater impact on the long-term sustainability of the Scheme and the overall benefits delivered.

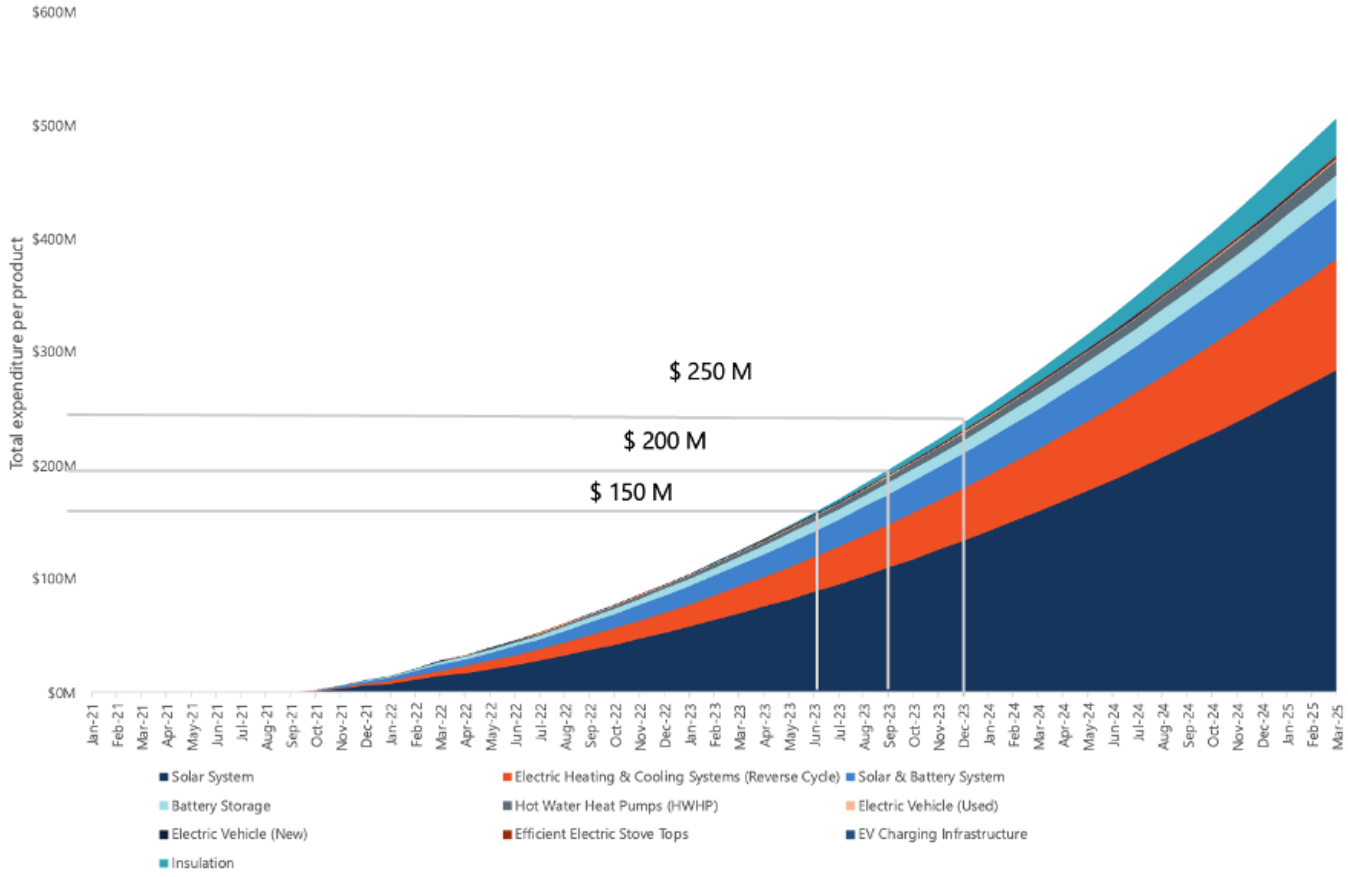

Figure 7: Total forecasted cumulative Scheme expenditure per product under a business-as-usual scenario

1.4 Overall the Scheme is succeeding, with potential to increase benefits and improve sustainability

The Scheme is experiencing continued rapid growth and delivering many benefits, including emissions savings, bill savings and low levels of freeriding. However, this high level of Scheme uptake has resulted in challenges with the availability of funds long-term.

As at 13 December 2022, 55% of expenditure has been spent on solar-only installations. The uptake of electrification activities has been lower likely due to competition with solar – as customers can only get one $15,000 loan. Approximately 21% of Scheme expenditure has been on electrification activities (compared with 77% on solar and batteries). At the current rates of uptake, Scheme funding ($200 million) would run out by September 2023. Amendments to the Scheme are required to ensure long-term sustainability and availability of funds, and to maximise Scheme benefits.

There are two areas to improve Scheme outcomes and ensure the long-term sustainability of the Scheme

As discussed in this section, the Scheme is delivering significant benefits as a result of high demand for Scheme loans. However, there are two opportunities that might improve Scheme outcomes and ensure the long-term sustainability of the Scheme. These are:

- **Refocusing on electrification activities to maximise carbon benefits** – solar and batteries currently deliver no direct carbon benefit given the ACT has already achieved 100% renewable energy supply. The ACT Government achieving its 2045 net zero emissions target is predicated on the residential sector transitioning off gas. Currently, heating and cooling appliances are delivering the largest carbon benefit, followed by hot water heat pumps and electric stoves.
- **Significantly reduce the demand for solar** – in order for the Government to ensure the demand for Scheme loans is sustainable and sufficient to last until February 2025, the Scheme requires amendments to slow down the rate of uptake. Alternatively, the Government can increase the funding envelope available to the Scheme.

In addition to the two areas outlined above, continuing to support solar PV will deliver indirect benefits. Residential solar remains a cost-effective option for increasing the generation of electricity when compared to signing PPAs. In order for the ACT Government to maintain a zero emissions grid (i.e. 100% renewable energy supply), they will need to continue to sign PPAs for new demand. In addition, many of the vendors interviewed who sell electrification products emphasised that the installation of solar is a key enabler of demand for electrification activities (including the purchase of Electric Vehicles (EVs)).

Section 2 provides details on the key characteristics of the SHS that are, and are not, driving demand for energy efficiency products. Section 2 also qualitatively assesses options that may help the SHS to more effectively achieve its policy goals to ensure the long-term sustainability of the Scheme.

common capital

SECTION 2

Characteristics influencing Scheme performance and uptake

This section discusses overarching Scheme characteristics that are and are not having a material impact on Scheme performance and uptake. It also establishes links between complementary ACT policies and programs to understand the potential impact of Scheme changes.

2.1 There are three main characteristics positively impacting Scheme uptake

Interviews identified three overarching aspects that appear to be having a material impact on Scheme performance and uptake. These include customer attributes and behaviour, program design, and Brighte's Scheme administration. These aspects are described further below and supported with evidence from interviews.

ACT customer attributes and behaviour are resulting in high levels of Scheme uptake

- Due to a **high level of customer literacy** in the ACT, a large proportion of residents are planning to invest in solar eventually. However, the Scheme appears to be catalysing the purchasing decision, meaning that this decision is being made earlier than it would have

in absence of the Scheme. However, one vendor explained that often customers push to install solar when it may be more beneficial to electrify their home first before installing solar. Vendors were sometimes getting pushback on these suggestions; with customers adamant they would like solar installed first.

- There is also a **high level of customer awareness** of the benefits of electrification in the ACT. Whilst this awareness is not as broadly penetrated as solar, there appears to be a meaningful number of ACT customers who are upgrading their gas appliances before the appliance's end-of-life. One vendor attributed this to a rumour they have heard from several customers:

  "They're starting to think the gas is going to be switched off in the ACT in five years"

- **Solar products appear to be an enabler** of other activities. If a customer already has solar, they are more likely to consider an EV given the running costs would be much lower. One EV vendor stated that they had a customer purchase an EV using the loan solely because this customer already had rooftop solar. The loan was not only an enabler to purchasing an EV, having existing rooftop solar catalysed their purchasing decision. Similarly, home appliances such as hot water heat pumps and reverse cycle heating and cooling become a more appealing proposition. Some vendors found that bunding solar with other products was resulting in increased demand for products such as hot water heat pumps or reverse cycle heating and cooling.

  "a lot of people are bundling products, especially if you want to get off gas"

The program design is simple, and the offering is attractive

- Many vendors applauded the **simple program design**. Given the interest rate, loan term, and loan amount is the same for all products, and eligibility criteria are the same for all home installation products, vendors find it easy to explain the Scheme to customers and customers are able to easily understand it.
- The **0% interest rate** appears to be a key driver of Scheme uptake. This is because customers do not need to do any calculations and know exactly what the product upgrade will cost (coupled with no Scheme fees). Although, some vendors believed that a nominal interest rate would reduce, but not remove uptake, as long as the interest rate was below the market rate.

  "I personally think the interest free offer is more attractive to consumers rather than a rebate as it bridges the upfront costs"

  "0% you don't have to think about, but anything other than zero and people have to do a calculation"

  "people either want to pay for it themselves or pay 0% interest…without 0% interest they would prefer to wait [until they could afford it]"

Brighte's administration is having a positive impact on the SHS

- Almost every vendor interviewed applauded **Brighte's quick and seamless application process**. They explained that customers found the online application relatively quick and easy to complete, and often received an approval within 45 minutes. Most vendors also stated they were being paid on the same day as the installation which was advantageous from a cashflow perspective. On the other hand, one of the smaller vendors did explain that given no deposit is taken with the loan, this can be prohibitive from a cashflow perspective. They also explained that given there are no part-payments, if a customer is having more than one product financed under the Scheme, the vendor only receives payment once all products have been installed. This may be weeks, or even months apart, depending on the availability of products and labour.

2.2 There are three aspects that may be limiting Scheme uptake

Competition between products and trade-offs, household eligibility and a limited list of approved products may be limiting demand for SHS loans. That is, in the absence of these Scheme aspects, more customers might request a loan and customers may request more than the current $15,000 limit. These aspects include the maximum loan amount, the limit on one loan per household (rather than one loan per person), and the limited approved product list.

The limit on the loan amount is creating competition between products and trade-offs between bill and carbon savings

The **loan amount** appears to prevent additional uptake in the Scheme. Many vendors interviewed believed that many of their customers would like to borrow more than $15,000 to enable them to fully electrify their homes and transition off gas.

"[some clients] have had a bit of leftover from their approval, they went for the full $15,000 and I think their solar cost them 8…so they had $6,000 and they were happy to still appoint that to a vehicle"

Currently, customers are having to choose one or two products to finance under the Scheme as the total electrification cost is often much higher. This means that there is an inherent competition between products under the Scheme and trade-offs between the products chosen in the form of bill savings and carbon savings.

"Often people don't have the budget to do it all [electrify] at once so they will do them in stages…if they had unlimited money from the SHS they might do it all at once"

"a hot water heat pump might be $6k and a solar system plus a battery might be $30k so if you want to do all these things, there's not enough money available. So you do have to pick and choose and often stage out that deployment and that electrification of the property"

"a lot of people who do come in that do have an awareness of it [the Scheme] that don't go forward with the loan for the EV have put the solar on or they've done other things with the loan"

Several vendors believe that customers would rather use the loan to purchase more expensive products such as solar, batteries or EVs (than purchase electrification products such as hot water heat pumps, electric stoves and reverse cycle heating and cooling appliances). This is despite being advised that it would be more beneficial for the customer to install the electrification products first. Consequently, this competition is likely crowding out electrification products under the Scheme and if products such as solar (which is experiencing the highest uptake) were not included in the Scheme, there may be higher uptake levels of electrification products.

One vendor believed that the minimum loan amount of $2,000 was potentially prohibitive as some products, such as EV chargers can cost less than this. However, this vendor also stated that EV chargers probably do not need to be included in the Scheme given their low cost and the likelihood that the customer who purchases them is likely to have sufficient funds to purchase this outright given they can afford to purchase an EV.

One loan per household, rather than per person, is limiting Scheme demand

Eligibility predicated on only one loan per person and per household is potentially limiting Scheme uptake. This is firstly linked to the point made above, that customers often would like to borrow more than $15,000 to fully electrify their homes.

"90% of those homes with ducted gas are going to have gas hot water and cooking. If they want to switch the gas off and turn it off at the meter, they need to get rid of it all."

In addition, landlords who own an investment property must choose between using the loan to upgrade their own homes, or their investment property. Similarly, if a landlord owns multiple investment properties, they will also have to choose which property to upgrade. Most vendors believed that landlords would always pick to upgrade their own homes first as they prioritise their own comfort and bill savings. Therefore, a change to eligibility requirements wherein one person can get a separate loan for every property they own may help drive the uptake for rental properties under the Scheme. However, this would not help achieve Scheme goals and long-term viability given the Scheme is already experiencing higher-than-anticipated levels of uptake. In addition, minimum energy efficiency standards for rental properties will be enforced from April 2023. This means that landlords may increasingly choose to upgrade their rental properties using Scheme financing to ensure their properties comply, requiring no change to eligibility requirements.

A tailored approved product list could increase Scheme uptake

Vendors were generally content with the product categories available for provision under the Scheme, however they would prefer a broader list of approved products. Currently, hot water heat pump and heating and cooling appliance vendors can only install products listed on the

Victorian Energy Upgrade (VEU) Program's product register. Several vendors' views were that this register is not a comprehensive list of the most effective and efficient products available.

The climate in Victoria is not the same as the ACT and therefore not all products will be suitable (as discussed in Section 1.3). Therefore whilst it is suggested that customers only select products that are suitable for the ACT climate (i.e. hot water heat pumps rated for zone 5 climates), technically unsuitable products could be installed under the SHS as they are on the VEU product registry. This may be having perverse impacts on the quality of products and installations under the Scheme.

2.3 The SHS is closely tied to other ACT programs

There are four other ACT programs which are complementary to the SHS. These include the Home Energy Support Program (HESP), Sustainable Home Advice Program, Next Gen Energy Storage Program, and Energy Efficiency Incentive Scheme (EEIS). Table 7 below highlights the ways in which these programs interact and align with the SHS.

Table 7 – Complementary ACT programs

Program title	Program description and interaction with the SHS
Home Energy Support Program (HESP)	Low-income households that own the home they live in can access a rebate of $2,500 for products from Category A (as described in the Background section of this report) and $2,500 for products from Category B. This rebate can be used in conjunction with the Scheme loan.
Sustainable Home Advice Program	This program helps consumers understand their energy use and provides tailored advice on ways to improve the energy efficiency of their homes. The program runs workshops which are mandatory to complete prior to receiving an Scheme loan (although this requirement is not enforced).
Energy Efficiency Incentive Scheme (EEIS)	Under the EEIS, retailers provide discounts to households and businesses that complete eligible upgrades. Currently only water heaters and heating and cooling upgrades are being delivered under the EEIS however a customer could use the SHS loan to pay the balance on the discounted system.
Next Generation Energy Storage Program	Until January 2023, households and businesses in the ACT could receive a rebate of $3,500 or 50% of the battery price (whichever is lower) to install solar storage batteries. This rebate could be used in conjunction with the Scheme loan. The NextGen program ended in January 2023 and no new applications for rebates are being accepted.

Interviewees believed these complementary programs are having a positive influence on Scheme uptake. This is because often the benefits of one program can be used in conjunction

with another. For example, until January 2023, a customer could receive a battery rebate under the Next Generation Energy Storage Program and pay the balance with the Scheme loan. In addition, one vendor found that ACT customers were highly educated and already understood the benefits of electrification due to EEIS marketing.

"ActewAGL has so strongly promoted [switching from gas] for the last four years"

The Sustainable Home Advice Program also contributes to educating and raising awareness of the benefits of electrification and rooftop solar by running workshops. These workshops are mandatory to attend for customers wishing to receive a loan under the Scheme. However, although attendance is recorded there are no penalties for non-attendance. As such, there may be opportunities for greater integration between these two programs.

On the other hand, one vendor did explain that due to the attractive offering of combining benefits under several ACT programs, there could be negative impacts if programs are discontinued. For example, given the high price of batteries, the Next Generation rebate has been highly influential on SHS uptake rates for batteries. The Government has announced that the Next Generation program has achieved its target and no more rebates will be offered under this program. Vendors are expecting the demand for batteries to decrease.

"We are expecting a pretty significant drop-off…of at least half"

"we are expecting customers who would have done solar plus a battery will now move to doing just solar"

However, another vendor found bundling solar with a hot water heat pump was a popular offering.

"The two most popular bundles would be solar plus a heat pump or battery plus a heat pump"

Therefore, this vendor speculated that with the conclusion of the Next Generation battery rebate, more customers would choose to bundle solar with a hot water heat pump – increasing the demand for hot water heat pumps.

Data provided on HESP reveals that there have only been $445,000 of loans provided in conjunction with a HESP rebate (as of 6 December 2022) which represents approximately 0.5% of total Scheme expenditure. This data suggests that whilst the Scheme is an important part of HESP, HESP plays a smaller part in the Scheme, with the proportion of monthly Scheme expenditure that is supported by a HESP rebate accounting for less than 2% at any point in time.

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SECTION 3

Policy options that maximise Scheme benefits

This section discusses opportunities to maximise benefits and sustainability for the Scheme in the long-term.

This section identifies and assesses three main policy levers related to characteristics identified in Section 2 that maximise the opportunities and solve issues discussed in Section 1.

Section 1 of this report analysed Scheme performance and identified opportunities to improve Scheme outcomes and long-term sustainability. These include refocusing on electrification activities to maximise carbon benefits, significantly reducing the demand for solar to ensure funding lasts or making no changes that influence solar demand given it remains a cost-effective alternative to PPAs.

Section 2 provided insights on the policy settings with the greatest impact on Scheme uptake, including ACT customer attributes and behaviour, the simple program design, and Brighte's administration of the Scheme. As discussed, there are only a small number of characteristics that have a material impact and ability to influence Scheme outcomes and the long-term sustainability of the Scheme.

The three main policy levers assessed in this section include removing solar from the Scheme, placing a $5,000 cap on solar loans, and having a nominal interest rate for solar loans (set at the Government bond rate of 3.44%). This section also identifies complementary options that could be implemented alongside any of the aforementioned options as deduced from interviews and consultations for other programs.

3.1 Many options that maximise benefits do not have a material impact on the Scheme

There are numerous feasible levers that could be used to maximise Scheme benefits as identified in Section 2. These include levers of supply, demand and benefits. Below is a qualitative discussion on the options considered in our preliminary analysis. These options have been prioritised based on their ability to have a material impact and contribute towards policy goals. Ultimately, three policy options were selected for further quantitative analysis. These options were chosen based on our confidence in the level of impact on Scheme benefits and policy goals. Options that have been quantitively assessed in Section 3.2 include removing solar from the Scheme, placing a $5,000 cap on solar loans, and having a nominal interest rate for solar loans.

Preliminary analysis ruled out a majority of the options considered

There are several program design options and policy levers that can be used to impact Scheme performance. However, when assessing these options it is important to consider the impacts holistically, rather than in isolation. For example, one option may address uptake levels by reducing demand for certain products and this may have adverse effects on the benefits delivered by the Scheme which may be at odds with Scheme objectives and policy goals. As such, for each option we have considered the impact on uptake rates, Scheme benefits, contribution to meeting Scheme objectives and alignment with overall policy goals.

The options considered and subsequently ruled out in the preliminary analysis include:

- **Have a nominal interest rate for all products** – this would likely reduce the demand for all products under the Scheme, however, the scale of this reduction is unclear. Subsequently the benefits delivered may be drastically reduced. It would be difficult to quantify the impact based on existing data as no interviewees were able to provide any input on this impact.
- **Reduce the UV threshold for all products** – this is one way to reduce Scheme uptake and limit uptake by wealthier households by using UV as a proxy for income. However, as discussed in Section 1.1, it does not appear that Scheme uptake is being dominated by households with higher UVs but rather centred around median property values. The UV threshold would need to be decreased by a significant amount to have a material impact on Scheme uptake which is not aligned with the purpose of the Scheme – to be a broad-based Scheme.
- **Reduce the UV threshold for solar loans only** – similar to the option discussed above, this would likely reduce the uptake of solar under the Scheme, but it is difficult to quantify the reduction in demand. As discussed in Section 1.1, there appears to be a relatively even distribution of solar uptake across UV levels.

- **Reduce the loan term (from 10 years to a shorter period)** – when asked whether reducing the loan term would have a material impact on Scheme uptake, all interviewees believed there would be no material impact on Scheme uptake. There is subsequently no indication that it is not set at the right level.
- **Reduce the maximum loan amount (<$15,000)** – given the high level of demand for the Scheme, reducing the amount available would likely reduce Scheme uptake for all products. However, this would also perversely impact the benefits (i.e. reduce bill savings and carbon savings) delivered by the Scheme rather than optimising Scheme funding to deliver the most benefits.
- **Increase the maximum loan amount (>$15,000)** – whilst vendors believed there would be significant demand for larger loans (above the current limit of $15,000), this has a negative impact on the long-term sustainability of the Scheme as funding would subsequently run out much faster.
- **Expand the list of eligible products by including e-bikes** – adding a product category would further exacerbate the competition between existing products under the Scheme. A survey conducted by Active Travel identified “infrastructure” and “awareness” as key barriers to the uptake of e-bikes – price was not identified as primary barrier. Active Travel was unable to provide data on mode shifting impacts which would be required to calculate the carbon and bill savings that could be delivered if included the Scheme.
- **Require solar to be bundled with other products** – the impact of this option is unclear. Whilst this option is likely to reduce the demand for solar and increase the demand for other products (such as electrification products) it is possible that this option will accelerate Scheme expenditure, rather than reduce it. It would therefore not contribute to the long-term sustainability of the Scheme.
- **Have a separate loan amount for investment properties** – vendors expressed concern that a person that owns two properties will most likely upgrade their own homes, meaning renters are more likely to live in inefficient and uncomfortable homes. However, allowing more than one loan per person would have a perverse impact on the long-term sustainability of the Scheme as it would likely significantly increase the demand for all products under the Scheme. In addition, with the introduction of minimum rental standards in 2023, landlords will be incentivised to prioritise upgrading their investment properties.
- **Increase the funding envelope** – whilst this option would likely increase the bill savings and carbon benefits delivered by the Scheme, Scheme funding cannot be infinitely increased, and it is therefore more efficient to optimise existing allocated funds to maximise Scheme benefits.

Section 3.2 quantitively assesses three additional options that have been prioritised for their ability to impact Scheme performance and achieve policy goals.

3.2 Options analysis

As discussed in Section 3.1, a broad range of possible policy levers were explored. However, interviewees were unable to provide insights on whether changes to most of these levers would have a material impact on Scheme demand. Changing the product mix by significantly reducing the demand for solar would likely ensure long-term financial sustainability for the Scheme and rebalance the bill savings and carbon benefits delivered under the Scheme. Consequently, levers that impact the demand for solar were prioritised and investigated further. These options include removing solar from the Scheme, placing a $5,000 cap on solar loans, and having a nominal interest rate for solar loans.

It is recommended that the rules for HESP customers do not change with options 2 or 3, noting that these customers make up a small proportion of SHS uptake (less than 2%) and require additional support. For example, Option 2 would see a $5,000 cap placed on SHS loans for solar PV. We recommend that HESP customers are still able to access the full $15,000 for solar PV. Similarly, for Option 3 (a nominal interest rate on solar PV products) we recommend no nominal interest rate is applied for HESP customers.

Each option has been assessed using Common Capital's "4Es" policy analysis framework, as discussed in the breakout box below, and includes detail on the impacts, advantages and disadvantages of each option.

Three options have been assessed using Common Capital's "4Es" policy analysis framework

We have identified three options that could address some of the challenges and barriers described in Section 2. Each option has been thoroughly assessed using Common Capital's "4Es" policy analysis framework.

The 4Es include:

- **Efficacy** – how will the policy option help/hinder the desired type, scale and timing of policy goals? This will assess the total impact of implementing that option with regards to total bill savings, carbon savings, freeriding levels, and spillover. Only if efficacy is achieved will an option be measured against the subsequent points.
- **Equity** – What are the implications of the policy option for equity of access and equity of impact? This will consider how priority and vulnerable households will be impacted by any policy changes.
- **Efficiency** – What are the comparative costs to benefits for the policy option? This includes costs for both public and private stakeholders. Focus will be placed on the benefits delivered at each level of public program spend
- **Ease (of implementation)** – What are the implementation considerations, including external political and stakeholder support or opposition (at a ministerial, vendor, and community level), impact on other ACT policies and programs, and internal legislative, operational, funding, and organisational capability and capacity?

Summarised in Table 1 below are the outcomes of these options when compared with a business-as-usual (BAU) forecast based on current policy settings.

Based on the assumptions outlined in Appendix 1 (and as shown in Table 8 below), the option that delivers the most lifetime bill savings is Option 3 ($422,770,758). The option that delivers the least bill savings is Option 1 ($362,034,263) – given that solar, as the largest contributor to bill savings, would be eliminated from the Scheme while for Option 2 and 3, uptake would reduce but not be removed entirely. Option 2 delivers more bill savings than Option 1 ($419,688,290). However, it achieves the second highest carbon savings (273,190 tonnes) behind Option 1 (372,481 tonnes) which delivers more carbon savings than the BAU scenario (254,979 tonnes). Option 3 delivers the same amount of carbon savings (254,979 tonnes) out of the three options (when excluding the BAU scenario).

Consequently, maximising only carbon savings can be achieved through Option 1, while Options 2 and 3 optimise between bill savings and carbon savings to deliver a product mix that maximises the overall benefits for the Scheme, as well as providing additional non-carbon (e.g. additional solar generation) or bill savings-related benefits.

In addition, at current uptake rates, and if no amendments are made to the Scheme, it will likely exhaust the assumed $200 million funding by September 2023 and require $289 million of additional funding to last until February 2025. The only option that extends the Scheme's funding beyond 2023 is Option 1: remove solar from the Scheme – which lasts until March 2024, with an additional $71 million required to make the scheme last till February 2025. Option 2 extends the Scheme until October 2024 with an additional $196 million required to extend the Scheme until February 2025. Since the options are assumed to be implemented by July 2023 (two months before funding is forecasted to be exhausted under BAU, Option 3 does not extend the Scheme beyond September 2023, and requires an additional $265m to extend the Scheme until February 2025 (only slightly less than under the BAU scenario).

Table 8 – Comparison of Scheme benefits delivered under each policy option (based on $200 million of total funding)

Scenario	Lifetime bill savings	Lifetime carbon savings (t CO_2)	Lifetime Solar Generation (MWh)	Last full month current $200m funding would be exceeded	Additional funding required to extend the Scheme until February 2025
BAU growth	$427,957,849	254,979	2,411,198	September 2023	$288,712,473
Option 1: No Solar	$362,034,263	372,481	1,937,422	March 2024	$71,384,685
Option 2: Cap solar to $5,000	$419,688,290	273,190	2,128,413	October 2023	$195,798,230
Option 3: Nominal interest rate	$422,770,758	254,979	2,386,550	September 2023	$265,352,946

Table 8 shows that the level of solar uptake reduces in order from BAU, Option 3, Option 2 to the lowest at Option 1, as solar is replaced by electrification activities. Bill savings are also linked to the level of solar uptake given the difference between electricity and gas prices. Conversely, the carbon benefits increase as the proportion of solar uptake reduces across these options.

The model forecasts the increased Scheme lifetime based on available funding under each option. This is because as solar uptake reduces, the rate of expenditure slows, resulting in the Scheme's funding lasting longer. This assumption is based on interview findings wherein interviewees stated that the underlying demand for electrification activities is not as high as that for solar. All options include the benefits of solar and electrification activities implemented to date, as well as those from forecasted future upgrades.

Vendor interview feedback suggests that limiting the uptake of solar is not likely to increase the uptake of batteries. The largest battery vendors under the scheme we interviewed all agreed that given the recent increase in battery prices, coupled with the end of the Next Gen battery storage program, it is likely that the demand for batteries will drop significantly. It is possible that some solar vendors will pivot to providing hot water heat pumps and reverse cycle heating and cooling.

In assessing these options, it is important to consider that the lack of direct carbon benefits for solar activities is because these benefits are instead attributed to the ACT Government's Power Purchase Agreements (PPAs), which aim to offset the emissions from ACT electricity consumption. The ACT's electrification strategy (Powering Canberra) projects that the ACT will require 3,500 GWh of electricity by 2030 [1]. In 2025, renewable energy prices are forecasted to cost $43 per large-scale generation certificate (LGC) (i.e. $43 per MWh) [2]. The benefit of Option 3 is that interest rates could be set so that each MWh delivered by the Scheme is completely cost-neutral to Government. The benefits and costs of measures such as aggregated demand response and neighbourhood batteries will likely also need to be considered in the ACT. These costs are required to manage locationally specific network impacts from mismatches in the timing of supply and demand at higher solar concentrations.

Option 1: removing solar from the SHS

Given the domination of solar uptake in the Scheme, this option would have the biggest impact on ensuring the financial sustainability of the Scheme (extending Scheme funding to February 2025). It results in the highest lifetime carbon benefits (372,481 tonnes) but delivers the lowest lifetime bill savings ($362,034,263). This option takes advantage of an opportunity to maximise carbon benefits by refocusing the Scheme on electrification activities. However, by reducing the uptake of solar, electrification activities become less financially attractive for households that don't have existing solar.

The quantitative analysis of this option assumes solar would be removed from the Scheme from 1 July 2023. Scheme changes need to balance providing enough notice for the market while avoiding spiking demand as a result of households rushing to install solar before it is removed from the Scheme. Several solar vendors during interviews stated that they have a backlog of work and will therefore likely be able to absorb short-term reductions in demand. Consequently it is recommended to not announce the change under this option.

As shown in Figure 8 below, under this option the forecasted Scheme expenditure for January 2025 is $7.18 million (of which $0 million is spent on solar installations). This is compared to $20 million forecasted under the BAU scenario in January 2025 (of which it is estimated that $11.2 million is spent on solar installations).

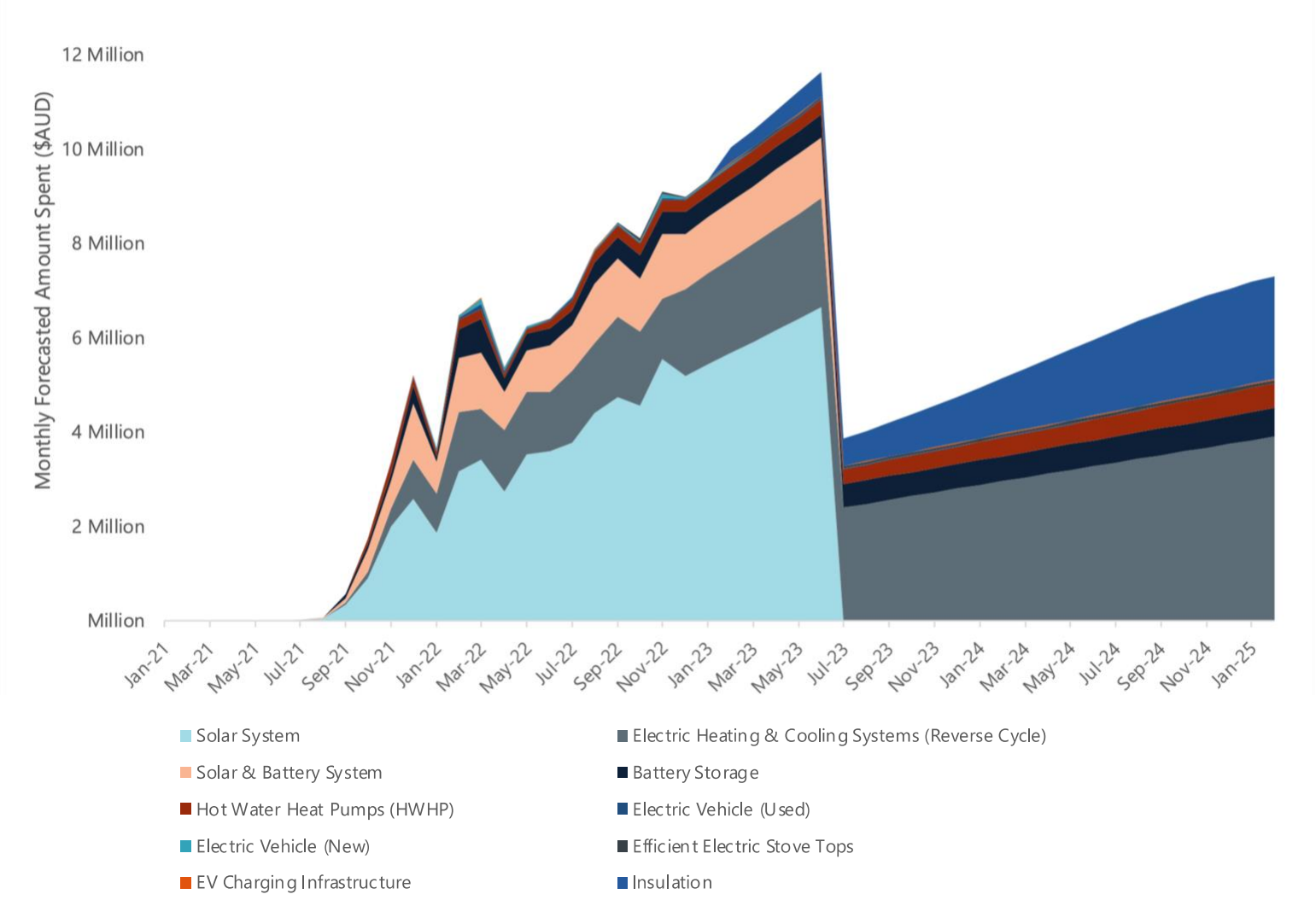

Figure 8: Projected monthly Scheme expenditure under Option 1

Table 9 – 4Es policy options analysis of Option 1 (removing solar from the SHS)

	Advantages	Disadvantages
Efficacy	• There will likely be an increased uptake in electrification activities resulting in increased carbon savings (given solar installations have no direct carbon savings benefit in the ACT)	• Solar is currently delivering the majority of bill savings for the Scheme which would be drastically reduced without solar
Equity	• Vulnerable households would still be able to access solar rebates through HESP	• Vulnerable households are more likely to require a loan to bridge the high upfront costs of solar, whereas wealthier households are more likely to be able to afford to purchase solar outright • Removing solar could have a significant impact on new, small solar installers who rely heavily on Scheme demand[8]
Efficiency	• The least amount of additional funding ($71 million) would be required to ensure the Scheme lasts until February 2025	• Residential solar is a cost-effective alternative to signing new PPAs (which will be required to maintain a zero emissions grid alongside increasing demand for electricity as a result of electrification) • Solar has been identified as a key enabler for other technologies, such as EVs. Solar makes the value proposition much more attractive given running costs will be significantly reduced. Less Government funding would be required to incentivise EV uptake
Ease of implementation	• Simple from a program design perspective as no change to eligibility	• This option is politically less palatable given the Scheme was only started in 2021 and the demand for solar is strong

[8] The scope of this project did not allow for enough interviews to identify if and how many vendors would be affected by this change

requirements or scheme administration

Option 2: place a cap on the individual funding available for solar loans

Placing a cap on solar loans might reduce the uptake of solar under the Scheme given customers may need to make co-payments (depending on the total cost of the system). However, this option may solely reduce Scheme expenditure (without decreasing demand) as households may opt for a smaller sized system than they would have prior to the loan cap.

The analysis has been based on a monetary cap of $5,000 per loan, however a cap could also be placed on the system size which would limit the cost and Scheme uptake. However, given the average solar unit costs $7,929, a $5,000 cap will likely still support solar demand whilst also still making electrification activities attractive. Based on estimates, this option would extend Scheme funding until October 2023 (using the assumptions outlined in Appendix 1) and require an additional $195,798,230.61 to extend the Scheme until February 2025. This option would deliver $419,688,290 of lifetime bill savings and 254,979.09 tonnes of lifetime carbon savings.

This option would likely reduce the demand for solar as a co-payment may be a barrier to some customers. This option would also reduce overall Scheme expenditure for solar as customers can no longer spend the full $15,000 on solar. The quantitative analysis of this option has been based on a monetary cap of $5,000 per loan, however a cap could also be placed on the system size which would limit the cost and Scheme uptake.

As shown in Figure 9 below, under this option the forecasted Scheme expenditure for January 2025 is $15 million (of which it is estimated that $6.2 million is spent on solar installations). This is compared to $20 million forecasted under the BAU scenario in January 2025 (of which it is estimated that $11.2 million is spent on solar installations).

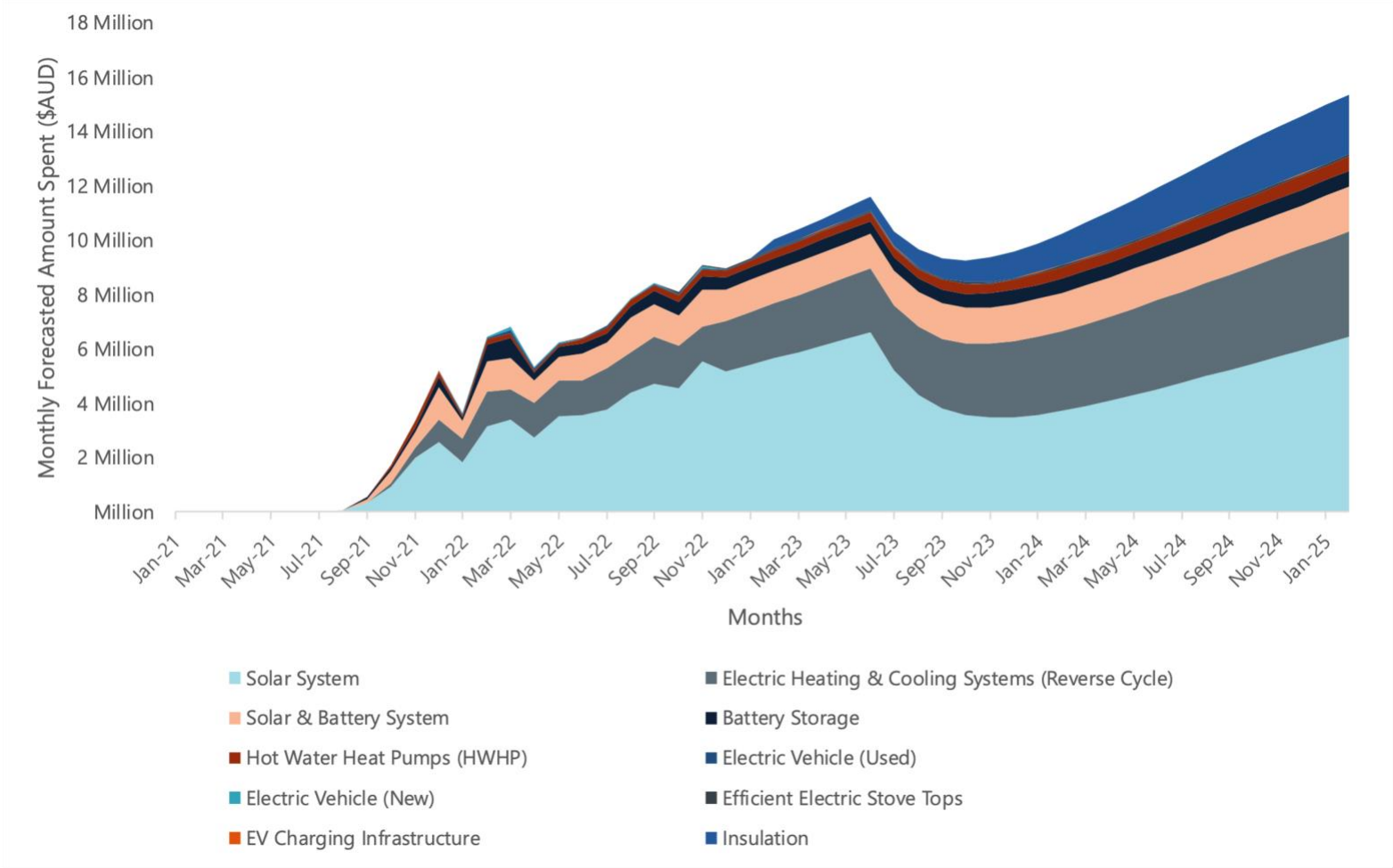

Figure 9: Projected Scheme monthly expenditure under Option 2

Table 10 – 4Es policy options analysis of Option 2 (cap solar loans)

	Advantages	Disadvantages
Efficacy	• This option optimises across both bill and carbon benefits (rather than one or the other) as there will likely be an increased uptake in electrification activities resulting in increased carbon savings (given solar installations have no direct carbon savings benefit in the ACT)	• Solar is currently delivering the majority of bill savings for the Scheme which might be reduced with a lower uptake rate for solar
Equity	• Vulnerable households would still be able to access solar rebates through HESP and $15,000 in zero interest loans through the SHS	
Efficiency	• Slowing the rate of solar uptake will extend existing Scheme funding until October 2023	• Whilst the rate of solar uptake would be reduced, there would still be a strong demand for solar. Consequently, additional funding would be required to ensure the Scheme is operational until February 2025
Ease of implementation	• Most vendors applauded the Scheme's simplicity of design that is easy to communicate to customers. This option maintains this simplicity without introducing too much complexity • Slowing the rate of solar will help mitigate any quality and safety issues for solar installations as it will reduce the number of inspections required by Access Canberra and WorkSafe – allowing them to reduce the delay of inspection and identify defects and non-complying vendors earlier	• This option makes the program design more complex and harder to communicate to customers given different products will have different funding allowances

Option 3: apply a nominal interest rate on loans for solar

Similar to Option 2 (placing a cap on solar loans), applying an interest rate to solar loans would reduce the uptake of solar under the Scheme as there would be a cost associated with the loan, where previously there was none. The analysis has been based on an interest rate of 3.44% (the Government bond rate) however, the Government should also consider pricing in the administration costs and cost of default payments if this option is implemented. Based on estimates, this option would extend Scheme funding until September 2023 (using the assumptions outlined in Appendix 1) and require an additional $265 million to extend the Scheme to February 2025. This option would deliver $422,770,758 of lifetime bill savings and 254,979 tonnes of lifetime carbon savings. While this option is not as effective at delivering direct carbon savings or long-term financial sustainability for the Scheme, it still delivers Scheme benefits while offering the Government a neutral-cost alternative to PPAs required to offset an increase in the demand for electricity.

As shown in Figure 10 below, under this option the forecasted Scheme expenditure for January 2025 is $18.7 million (of which it is estimated that $10 million is spent on solar installations). This is compared to $20 million forecasted under the BAU scenario (of which it is estimated that $11.2 million is spent on solar installations).

During interviews, vendors were confident that an interest rate would slow the uptake of solar under the Scheme but were unable to state whether it would have a small, moderate or large impact. The central scenario for Option 3 (figures shown in Table 8) set the rate of solar uptake at an 85% reduction on the BAU rate. A sensitivity analysis has also been provided for Option 3 based on there being a smaller reduction in solar uptake (40%) and a larger reduction in solar uptake (120%). Table 11 below provides the results of this sensitivity analysis. This analysis shows the scheme lasts until September 2023 under both additional scenarios. However, the total amount spent by February 2025 was lower with a 120% reduction in solar uptake ($346,835,309) when compared with a 40% uptake reduction ($479,605,760). The 120% uptake reduction scenario also requires less additional funding than the modelled scenario and the 40% reduction scenario, to keep the Scheme running until February 2025.

*Table 11 – Sensitivity Assessment of Option 3**

	Small reduction in solar uptake[9]	Moderate reduction in solar uptake (central scenario)[10]	Large reduction in solar uptake[11]
Last full month before spending exceeds $200 million	September 2023	September 2023	September 2023
Total spent by February 2025	$479,605,760	$461,336,403	$346,835,309
Additional funding required	282,861,388	$265,352,947	$151,747,358

**These scenarios are based on a conservative assumption of a gradual reduction in solar uptake. In reality a step change may produce a more immediate result in which funding may last longer than the dates indicated in above.*

[9] 40% reduction on the growth rate of solar uptake under BAU by February 2025
[10] 85% reduction on growth rate of solar uptake under BAU by February 2025
[11] 120% reduction on growth rate of solar uptake under BAU by February 2025

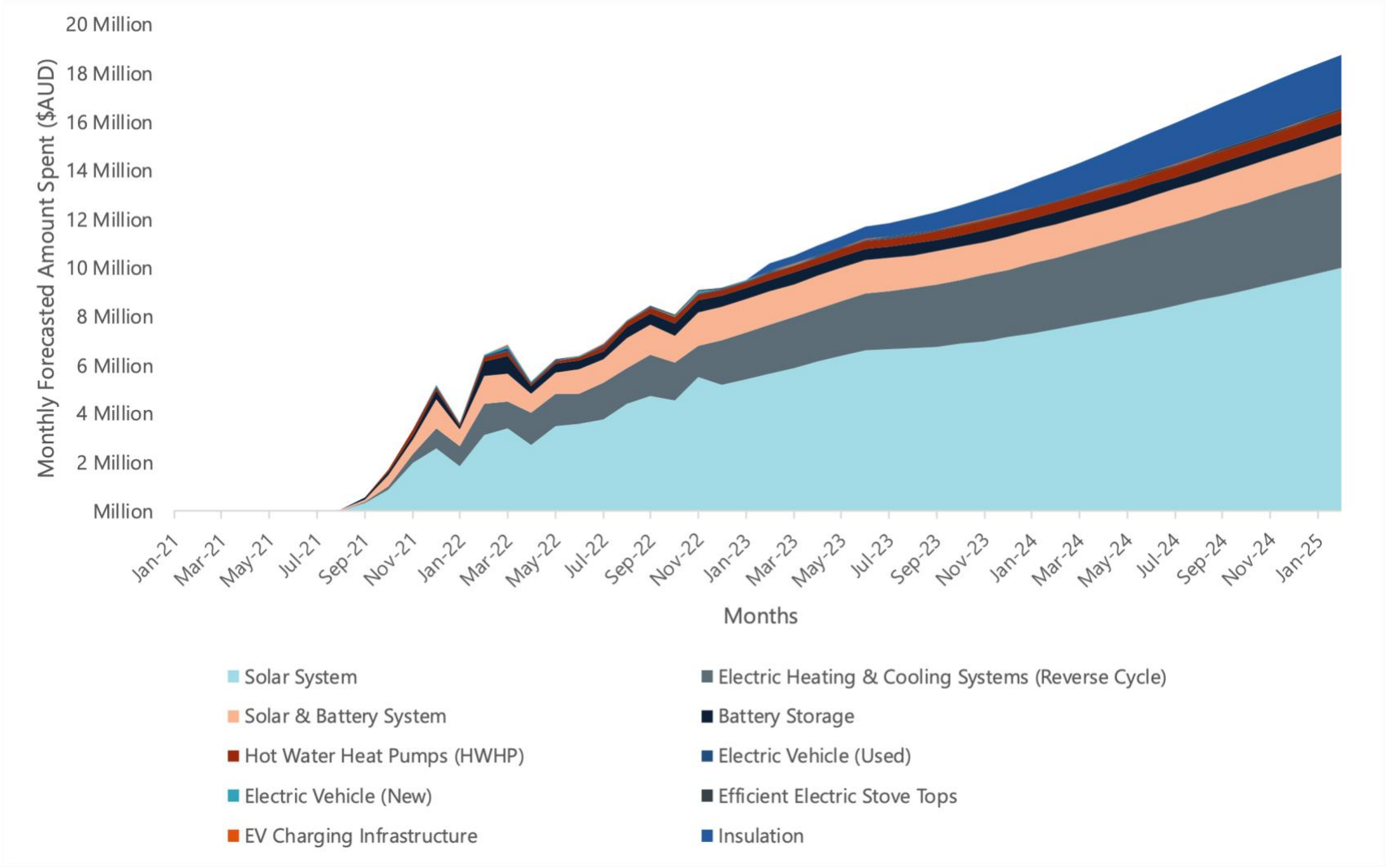

Figure 10: Projected Scheme monthly expenditure under Option 3

Table 12 – 4Es policy options analysis of Option 3 (nominal interest rate on solar loans)

	Advantages	Disadvantages
Efficacy	• This option optimises across both bill and carbon benefits (rather than one or the other) as there will likely be an increased uptake in electrification activities resulting in increased carbon savings (given solar installations have no direct carbon savings benefit in the ACT) • Freeriding will likely be reduced as there is an additional cost to the loan	• Solar is currently delivering the majority of bill savings for the Scheme which would be reduced with a lower uptake rate for solar
Equity	• Vulnerable households would still be able to access solar rebates through HESP and $15,000 in zero interest loans through the SHS	
Efficiency	• Recouping the cost of borrowing (and any additional costs) for solar will mean more Scheme funding will be available for other products, stretching the Scheme funding further	• Whilst the rate of solar uptake would be reduced, there would still be a strong demand for solar. Subsequently, the highest level of additional funding (out of the three options) would be required to ensure the Scheme is operational until February 2025.
Ease of implementation	• Slowing the rate of solar will help mitigate quality and safety issues for solar installations as it will reduce the number of inspections required by Access Canberra and WorkSafe – allowing them to reduce the delay of inspection and identify defects and non-complying vendors earlier	• This option makes the program design more complex and harder to communicate to customers

The options outlined above will have little impact on the ACT's other programs

Modelled outcomes for each option are based on there being no changes for HESP customers. If changes under the options were applied to HESP consumers then they may endure a significant impact as detailed below.

In general, customers receiving HESP rebates are likely to be more price sensitive as they are typically lower-income households. Consequently, the options that increase the cost of upgrades under the Scheme, e.g. placing a cap on solar loans and applying a nominal interest rate to solar loans, are likely to have a disproportionately higher impact on HESP customers and reduce the accessibility of both HESP and the Scheme.

As discussed throughout this report, solar delivers significant lifetime bill savings. Option 1 would therefore likely have the greatest impact on the HESP program. This is because the high upfront cost of solar is likely a significant barrier for solar uptake in low-income households. Without solar, low-income households are exposed to rising or volatile energy prices and are therefore disproportionately impacted by a total removal of solar from the SHS.

Option 2 (placing a cap on solar loans) would likely have the smallest impact on HESP customers. This is because the average solar system installed using a HESP rebate costs approximately $7,929. When the HESP rebate is applied, this is reduced to $5,429. Given the modelled cap is $5,000 and an exemption is required if the customer is seeking a system larger than 6.6kW, only customers requiring costly electrical upgrades, those seeking an exemption to install a larger-than-average sized unit, or those seeking to install premium system components, would have a co-payment.

Option 3 (applying a nominal interest rate to solar loans) would have a larger impact on HESP customers than Option 2. The SHS would continue to bridge the upfront costs of installing solar, however, there would be a cost of borrowing which may be prohibitive to low-income households.

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APPENDICES

Appendix 1 - Modelling assumptions and sensitivities

Overview of our modelling approach

To support this project, we developed a model to calculate energy bill and greenhouse gas savings from the Scheme under three scenarios, using varying uptake rates and proportion of adoption of the different eligible products.

For each product eligible under the Scheme, we used estimates of reduced energy use (gas, electricity and/or petrol) based on the difference between pre-upgrade energy use for that activity (e.g. driving, heating, etc) and the post-upgrade energy use for a representative ACT home or vehicle. As detailed in Appendix 1, these estimates were based on the ACT Government's Energy Efficiency Incentive Scheme (EEIS) model. For each activity we then calculated the carbon savings based on the difference between the emissions intensity of the fuels (e.g. gas/petrol vs nominally zero emission electricity). We calculated the bill savings based on the before and after energy costs for each activity, considering the load profile of each activity and the different energy tariffs based on time of use/generation. Bill savings are calculated by using retail prices in the ACT and residential peak period electricity costs. Forecasts used the average solar system size (kW) installed under the Scheme (up until 13 December 2022) to predict the MWh that would be generated by solar installations under each option.

For uptake rates we forecast business-as-usual (BAU) uptake by product based on a linear projection from historical trends up to December 2022 for existing products, except for insulation. Insulation forecasts were calculated using the Bass diffusion model - a model that forecasts the diffusion of an innovation within a population [4]. For the Bass model, we assumed that 50% of properties in need of an upgrade will enter the scheme, and that it would take four years for upgrades to reach the full market.

Note, we typically use "s-curves" to model activity uptake, consistent with academic findings on patterns of innovation adoption [3]. These involve a slow adoption, then rapid acceleration and flattening again at market saturation. However, we adopted a more conservative approach for this project due to the very short timeframes of the forecasts involved and lack of readily available data to assess where each product was in its adoption cycle.

We then developed alternative forecasts for three modelled policy scenarios, using a multiplier on each product type to increase or reduce the uptake rate based on insights drawn from interviews. Our assumptions for each option are:

- Option 1: solar uptake was assumed to decrease to zero from 1 July 2023 as solar is removed completely from the Scheme.
- Option 2: Scheme uptake growth rate for solar activities was assumed to be 33% of the BAU (100%) scenario, which represents a moderate flattening of the current accelerating growth of solar uptake, in line with insights from interviews. Regardless of this growth rate, government expenditure per system installed is also capped at $5,000 and an average system costs more than $7,500. This will increase the amount of solar installed for every government dollar spent.
- Option 3: the growth rate was assumed to be 15% of the BAU (100%) scenario as during interviews, vendors were confident that an interest rate would slow the uptake of solar under the Scheme but were unable to state whether it would have a small, moderate or

large impact. We therefore tested the impacts of a 40%, 85% (central scenario) and 120% reduction to show the impacts at these different levels of uptake and selected the centre scenario as the base case.

For all options, we have assumed that the uptake of non-solar activities continues growing at a rate based on historical trends – independent of changes in demand for solar. It is possible that some activities may grow at a faster rate due to the reduction of solar uptake under the Scheme, however, interviews did not provide clear enough insights to model a significant acceleration in the uptake of non-solar activities.

Assumptions Tables

Tables 14 to 17 list out the assumptions used to develop our forecasting model. Table 13 includes financial assumptions and Table 14 lists the BAU trends for loan amounts. Table 15 accounts for the greenhouse gas assumptions used to calculate bill savings. Table 16 includes all other assumptions that we have used to calculate bill and carbon savings. Finally, Table 17 includes forecasting assumptions around the different scenarios that have been modelled.

Table 13 – Financial assumptions used in modelling

Interest rates	Unit	Amount	Assumption	Source
Government bond rate	%	3.8	Budget paper #1 Oct 2022	ACT Govt [3]
Cash rate	%	3.1	Current rate @14 Dec 2022	RBA
Lender’s rate	%	5	Current rate @14 Dec 2022	RBA

Table 14 – Forecast assumptions used in modelling – all derived from scheme data, best fit is a linear forecast

Category	BAU increase in expenditure per month
Solar systems	$242,200
Electric heating and cooling systems	$78,800
Solar and battery systems	$19,300
Battery systems	$5,400
Hot water systems	$10,500
Electric vehicle (new)	-$1,200
Electric vehicle (used)	-$2,600
Stove tops	$1,900
EV charging infrastructure	$300

Table 15 – Greenhouse gas assumptions used in modelling

Greenhouse gas assumptions (scope 1+2)	Unit	Amount	Assumption	Source
Gas	Kg/MJ	0.05	Australian National Greenhouse Gas Accounts Factors	DCCEEW
Wood	Kg/MJ	0.0012	Australian National Greenhouse	DCCEEW
Gasoline (transport fuel)	Kg/MJ	0.07	Australian National Greenhouse Gas Accounts Factors	DCCEEW
Electricity	Kg/MJ	0.00		ACT Government

Table 16 – Other assumptions

Other assumptions	Unit	Amount	Assumption	Source
Average house size	m2	150	House sales data ACT	Allhomes.com.au
Average fuel consumption for passenger vehicle	L/1000 km	11.1	Australian National Greenhouse	DCCEEW
Average km travelled per year, ACT passenger vehicles	km	11,800	Survey of Motor Vehicle Use, Australia	ABS
Fuel used (per year)	L	1,309.8	calculated from ABS data	ABS
Average passenger vehicle age, ACT	Years	9.4	Motor Vehicle Census, Australia	ABS
Energy content factor, cars and light commercial vehicles	GJ/kL	34.2	Australian National Greenhouse Gas Accounts Factors (Table 7)	DCCEEW
Energy in fuel used per vehicle per year	MJ	44,795.16	Calculated from above	

Typical EV electricity consumption	Wh/km	170	Average from EV database.	
Typical used electric car age	Years	6	Almost all are Nissan Leaf, mostly 40kWh which was replaced in 2019. Assume average age is 2017 vehicle (6 years old)	SHS data
Car Lifetime	Years	20	Assumed based on 200000+ km life.	
ACT residential electricity cost, peak	$/kWh	0.36795	ACT solar saver plan prices, October 2022. inc GST	ACTEWAGL
ACT residential electricity cost, shoulder	$/kWh	0.25465	ACT solar saver plan prices, October 2022. inc GST	ACTEWAGL
ACT residential electricity cost, offpeak	$/kWh	0.219021	ACT solar saver plan prices, October 2022. inc GST	ACTEWAGL
ACT residential electricity cost at July 2022, peak	$/kWh	0.36795	ACT Standard plan electricity prices	ACTEWAGL

ACT residential electricity cost at July 2022, shoulder	$/kWh	0.25465	ACT Standard plan electricity prices	ACTEWAGL
ACT residential electricity cost at July 2022, offpeak	$/kWh	0.219021	ACT Standard plan electricity prices	ACTEWAGL
ACT residential gas use	$/MJ	0.02948	ACT solar saver plan gas prices, October 2022 (inc GST), used max tariff for marginal cost	ACTEWAGL
ACT Petrol Price	$/L	1.927	September quarter petrol prices, ACT	ACCC
Sydney petrol price	$/L	1.782	September quarter petrol prices, Sydney	ACCC
Solar output, ACT	kWH/kW	1,314	Solar Choice Data	Solar Choice
Peak period, ACT electricity use	Time periods	7am–9am and 5pm–8pm daily	ACT solar saver plan prices, October 2022	ACTEWAGL
Shoulder period, ACT electricity use	Time Periods	9am–5pm and 8pm–10pm daily	ACT solar saver plan prices, October 2022	ACTEWAGL
Offpeak period, ACT electricity use	Time Periods	All other time periods	ACT solar saver plan prices, October 2022	ACTEWAGL

Start peak 1, end offpeak	Time	7	Calculated from above
End peak 1, start shoulder 1	Time	9	Calculated from above
End shoulder 1, start peak 2	Time	17	Calculated from above
End peak 2, start shoulder 2	Time	20	Calculated from above
End shoulder 2, start offpeak	Time	22	Calculated from above
% solar energy generated during peak tariff period	% of yearly generation	12.7	Calculated from hourly solar generation via NREL PVWatts data
% solar energy generated during shoulder tariff period	% of yearly generation	86.2	Calculated from hourly solar generation via NREL PVWatts data
% solar energy generated during offpeak tariff period	% of yearly generation	1.06	Calculated from hourly solar generation via NREL PVWatts data
Battery charge periods per day (assume charge at offpeak tariff)	Hours Charging	9	Total off-peak hours calculated from above.

			Assumes battery will fully charge overnight	
Battery discharge periods (peak)	Hours discharging	5	Preferentially discharge at peak times	
Battery discharge periods (offpeak)	Hours discharging	4	Then discharge remainder at offpeak	
battery round trip efficiency	% Energy discharge	0.9	Assumed from solarchoice listing - best is 95, worst is 89, most are 90%	Solar Choice
External estimated price increase for electricity tariffs in the ACT, indexed to 2022-23 prices (See rows below):-				
2023-24		1.23	Post "Energy Price Relief Plan" price increase	PM.Gov
2024-25		0.984	Index using wholesale energy prices - AER forward contract price average for 2024-25 as % of 2023-24 contract prices	AER

2025-26	0.77982	Index using wholesale energy prices - AER forward contract price average for 2025-26 as % of 2023-24 contract prices	AER
2026-27	0.738		
Price increases for gas tariffs, indexed to 2022-23 prices (See rows below):-			
2023-24	1.18	Aus Gov treasury modelling	Ministers for the Dept of Industry, Science and Resources
2024-25	0.9711	Based on UK gas price trend (assume following international index)	Statista
2025-26	0.7255		
2026-27	0.6669		
2027-28	0.6816		

NPV Calculations	0.038	Use the government bond rate as starting point	
Number of houses that require insulation upgrade (rental only)	18450	ACIL Allen cost benefit for minimum standards, p40	HDP.au
Insulation cost, 2021 per square metre installed	$13.47	ACIL Allen cost benefit for minimum standards pC-7	
2022 inflation to October 2022	0.069	ABS	ABS
2022 insulation cost per square metre installed	$14.40	ACIL Allen cost benefit for minimum standards pC-7	

Table 17 – Scenarios Assumptions

	Growth rate variation from BAU	Average growth rate variation from BAU ($/month)
No Solar	Solar uptake decreases to zero	-$4,271,519

Cap Solar to $5K	Growth rate is amended from 100% (BAU) to 33%	-$19,463.82
Nominal Interest rate of 3.44%	Growth rate is amended from 100%(BAU) to 15%	-$25,296.4

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