

All the things I could do: financing green home upgrades

Testing options to help homeowners decarbonise

May 2023



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Executive summary

Our research shows that owner-occupiers want green finance to help fund green upgrades to their home. They want it to offset the high upfront cost of doing something they feel they should do, but don't have a compelling reason to any time soon.

We also know that green finance with government backing is seen as more attractive if it comes with advice, support and guarantees. Finance and support alone are unlikely to be enough to get more

homeowners to take action over the next few years. Government-backed providers like the Development Bank of Wales have a unique opportunity to introduce both of these crucial elements at the same time.

Owner-occupiers support government green finance

Finance for green home upgrades is not an established market in the UK. We believe that a new finance product needs to pass two key tests: whether homeowners actually want to use it and whether it makes them take action they otherwise wouldn't have.

In our work, we tested owner-occupiers' reactions to a number of prototype government-backed finance products and compared them to a control of either a generic commercial loan or no product at all. All government-backed options significantly outperformed the control group – with two exceptions, which we explore below. Our research therefore strongly supports the conclusion that government-backed finance has a role to play in the decarbonisation of homes.

Key features of the successful product would be:

- > A low rate of interest
- > Flexible repayment terms
- > A complementary package of support.

There was strong agreement (between 72% to 85%) that green finance was 'something the government should offer'. This indicates support in principle for this sort of policy, even amongst homeowners who do not see it as something for them.

Our work was undertaken in partnership with the Development Bank of Wales to help shape its planned retrofit finance offer. Our online randomised control trial involved just over 7,500 homeowners across Great Britain, with around 1,800 in Wales, 1,100 in Scotland and over half the sample (4,600) based in England. Interest in the products, as well as support for government intervention, was similarly high across all three nations.

Government can act and our work shows how it could do so successfully.

Owner-occupiers need support as well as money

We concluded that providing support is equally, if not more, important than the details of the finance product itself. Most aspects of this support are within the gift of government to either influence or provide. They include:

- > Home assessments and advice to increase homeowners' confidence that they are choosing the right upgrades
- > Recommendations for competent tradespeople
- > Consumer protections, guarantees, and redress if something goes wrong.

As well as testing different finance products, some homeowners were shown a description of the above support offer without any finance. This 'support only' trial arm had the highest positive response from

homeowners, with over half (55%) saying they would use the support in choosing green finance upgrades in the next three years.

However, we do not take this result at face value. Homeowners may have interpreted the question as asking them to assume they had a way to pay for the upgrades. When participants were faced with the full cost of their green home upgrade selections, take-up of the support offer dropped by 25%.

Our headline conclusion is that neither a green finance product, nor an ecosystem of advice and support is likely to be sufficient on its own. By introducing both, government is in a position to increase the pace of decarbonisation and de-risk the introduction of finance products from private providers.

Heat pump finance delivers the greatest carbon reductions

We looked closely at the role green finance could play in increasing heat pump installations. Whilst overall take up of the finance product was lower when trial participants had to use it to buy a heat pump, the CO2 reductions per pound loaned were clearly the highest for this group. Underlying take-up was still good, with around a third of homeowners saying they would use the product.

We have stopped short of recommending that the Development Bank of Wales should require homeowners to install a heat pump. Starting with a more popular core product will increase the chances of them launching a sustainable retrofit finance service, which can diversify its products over time. A heat pump loan product should then be a high priority in the medium term.

Overall willingness to pay may be too low for whole-house retrofits

Participants in our online trial were able to select from a list of upgrades, and had an average 'spend' of around £7,000. This figure would not be enough for a whole house retrofit of particularly low energy performance certificate (EPC) properties. However, with the UK Government Boiler Upgrade scheme grant of £5,000 factored in, it could be enough for a heat pump and some additional insulation.

Context and objectives

One area of focus for Nesta's sustainable future mission is the cost of heat pumps and other green home upgrades. As well as reducing our carbon emissions, most green upgrades already reduce energy bills by reducing demand, which lowers the running costs of heating systems. In the future, green upgrades like solar panels and batteries will likely enable homes to play a role in the wider energy system, and earn money by generating and storing their own energy.

However, the cost of these technologies is clearly a barrier today. Payback periods on most green upgrades can be long, and upfront costs can be high. Nesta has published detailed analyses of [the cost of heat pumps](#) and the ways they can be reduced. But affordability is not just about upfront cost.

Governments can play a role in affordability by offering grants, subsidies and incentives, but there is clearly a limit to how much can be grant funded. Access to low-cost, attractive finance packages will play an important role in decarbonising homes.

We believe that in the long term, most people will want to buy heat pumps and green upgrades on finance rather than paying upfront. We're also optimistic that, through a combination of market reforms and economies of scale, the running costs of heat pumps can and will fall relative to gas boilers, making finance more attractive.

However, we also know that the cost, benefit, and return on investment of a finance product will not be the only factor in its success, and don't believe that the introduction of financial products will be enough in itself to drive demand for green upgrades. When demand for both the underlying product and for finance itself are low, it is perhaps understandable that the dynamic and competitive market we would want to see for finance in this space isn't quite there.

The green transition will need a range of financial products from different providers, tailored to a range of different user needs and motivations. Importantly, it needs them soon.

Our partnership with Development Bank of Wales – a Welsh Government-backed body – has provided an opportunity to test what sort of products appear most popular, what else needs to be in place to help them succeed, and to explore the views of homeowners across the UK on the role of publicly-backed finance.

We have also revisited the learnings from previous public green finance offerings in the UK and elsewhere.

The context in Wales

Policy and funding around domestic decarbonisation in Wales has historically focused on social housing and households in fuel poverty. Programmes such as Nest, Arbed, and the Optimised Retrofit Programme (ORP) have largely offered green upgrades on a grant-funded basis for those who cannot afford to pay for them (though the ORP has a long-term objective to leverage in other sources of finance).

The Welsh Government is now working on policies to support decarbonisation in private homes. This includes considering what publicly-backed retrofit finance support could look like, working with delivery partners such as the Development Bank of Wales.

In 2021 the office of the Future Generations Commissioner for Wales published *Homes Fit For The Future: The Retrofit Challenge* which called for the Development Bank to play a key role in the coordination of funding for the private rented and owner-occupied sectors by trialling various finance offerings. We began working with the Development Bank in 2022 to explore the attitudes and needs of homeowners in funding green home improvements.

Importantly, the clear brief from the Development Bank was that the objective of this new financial product was decarbonisation, not tackling fuel poverty. For this reason, social housing was not a focus of this work – and in our user testing we focused on households that met a broad definition of being potentially able to pay for green upgrades.

We also chose to focus on owner-occupiers in the initial phase, as we believed their needs and motivations would be different to private landlords: we are not assuming that owner-occupiers are more or less likely to be interested in green finance than landlords. Where we refer to 'homeowners' in this report we mean owner-occupiers.

Previous UK Government green home finance schemes (e.g. the Green Homes Grant or the Green Deal) have had low take-up, and suffered from rushed implementation. We believe that early design and user-testing needs to be done before any future government-backed finance schemes are rolled out at scale.



1. What we did

Nesta took a multidisciplinary approach to providing the Development Bank of Wales with insights and options for a potential pilot for a green home finance product.

1. Polling

We polled 1,000 adults in Wales in March 2022 to begin to understand what would motivate people to take out home improvement finance and what people understand and believe about green home improvement measures.

Key findings: People unsurprisingly preferred a grant to a loan (58% vs. 2%) when given the range of options to choose from. But when asked about the idea of a Welsh Government loan, around a third of respondents were 'very' or 'fairly' interested.

Amongst those who had already invested in energy efficiency measures, the top reason given was to reduce energy bills (96%), and when thinking about taking out a loan the top consideration was also the impact on bills (50%).

55% of respondents would support 'a scheme to roll out heat pumps to every home in Wales' (though the scheme was not described in detail). However, some homeowners were sceptical about whether a heat pump would be right for their home, and were easily influenced by how information was presented.

2. Literature review

We undertook a short desk-based literature and data review of evaluations of other green home loans, gathering real-world examples of successes, lessons learned and reflections from across the globe. This review included a small number of stakeholder interviews with people with knowledge of the schemes' implementation.

Key findings: Government-backed green upgrade financing schemes in the UK have previously failed due to rushed implementation, sometimes to meet political timetables. This prevented early user-testing phases from being undertaken before launching at scale. Initial demand was often lower than hoped for and schemes were changed quickly (for example by introducing time-limited cash-back incentives to drive demand), before ultimately being cancelled, all of which harmed consumer and supply chain confidence.

By contrast, the German Development Bank's Kreditanstalt für Wiederaufbau (KfW) scheme has been a successful lending vehicle for over two decades. It benefitted from starting small and diversifying its offer over time.

3. Prototype machine-learning tool

We developed an early version of a machine-learning tool for predicting the 'upgradability' of homes in a particular area. With further development, this tool could inform the choice of location for any green finance pilot using a combination of the concentration of upgradable homes and owners who can afford to pay for the upgrades.

4. Service mapping

Through stakeholder workshops, we mapped the customer journey to understand what different customers may need from a product, identify potential barriers, and look at the role of partners and other stakeholders, including the Welsh Government. This in turn then informed how the finance product might fit into the wider finance / retrofit systems.

Key findings: A government-backed lender is likely to be in a different position than a commercial finance provider with their own high street or online 'shop front'. Service-mapping revealed the need to consider how homeowners will first find out about the loan and be encouraged to take the next step? Finding a partner to fulfil this role will be a key step in developing a pilot of the product. This may be more achievable with a local, rather than Wales-wide, pilot.

The mapping also revealed that stakeholders assumed the homeowners would be able to get credible advice about upgrades from a home assessment. However, we know from our wider work that this advice is patchy, and consumers don't really feel they know where to go for it. Any future pilot will also need to explore this issue.

5. User insight interviews

To get beyond what we already knew about attitudes at a population level and to ensure any product could meet user needs, we undertook in-depth interviews with some owner-occupiers in Wales. We specifically recruited participants who we assumed would be broadly able to pay because of their incomes and socioeconomic category.

This allowed us to develop personas based on motivations, situations and specific needs related to the home and finance – and develop prototype products to meet those needs, which we tested in our online trial.

Key findings: Homeowners identified a number of barriers to getting green upgrades, covered in more detail later in the report. Whilst cost was a clear factor, homeowners strongly emphasised the need to have support to help them make the right choice of green upgrades for their home. They particularly feared making a 'bad choice' they would later regret.

6. Online randomised controlled trial

To maximise take-up of any offer, we needed to understand what kind of loans might be most attractive and what messages are most persuasive.

The Behavioural Insights Team (BIT) used Predictiv, its in-house policy testing lab, to run an online randomised control trial (RCT) with a sample of around 8,000 homeowners (around 2,000 in Wales) to test how different finance products and support offers affect take-up¹. A detailed overview of the methodology is below.

Key findings: The trial showed that there is a benefit to a government-backed finance option, with most potential variants outperforming the control.

Support and advice to help homeowners make the right choice of green measures for their home appeared to be a key feature of the high-performing versions of a green upgrades finance product.

Summary of Behavioural Insights Team online randomised control trial

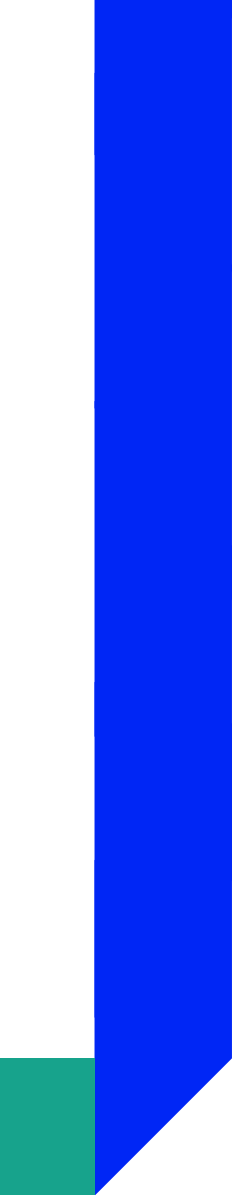
The findings of this report draw most heavily on the results of a Predictiv experiment undertaken by the Behavioural Insights Team (BIT) between August and September 2022.

BIT ran an online randomised control trial via its Predictiv platform, involving around 8,000 homeowners, 2,000 of whom were based in Wales.

The full findings of this experiment have been published alongside this report. Below we summarise the key conclusions, but the wider dataset lends itself to further analysis.

Figure 1 Participant flow through the trial





Homeowners saw information about different green upgrades, along with indicative figures on how much each would cost upfront and how much it might save them on their energy bills.

The homeowners were then randomised into one of nine treatment arms:

- > One control group saw a generic commercial loan offer, with text based on the personal loan page of a high street bank's website.
- > Six groups saw information about a finance product prototype, based on our user insight work.
- > One group saw a description of a wide package of support (an individual home assessment, an approved list of tradespeople, and a guarantee of works), but were not shown any information about a finance product.
- > A smaller group, of around 500, formed a 'pure control' group, and saw no information about any finance products or support at all.

Participants were then shown the information about home upgrades again, and asked to choose which they were likely to take up in the next three years, and, where relevant, whether they would use the finance product to pay for it. They were also offered the opportunity to give their email address to hear more about the product, as a soft test of real world commitment.

The non-control group products in the trial were presented as being offered by either the Welsh, UK, or Scottish Governments. We wanted to elicit any positive or negative views of government involvement in finance, but assumed that the Development Bank of Wales would not be as familiar to participants in Wales as the Welsh Government itself. We assumed any positive or negative attitudes they held towards publicly-backed lending which might influence their responses would be elicited by linking the offer to 'government' in this way.

The full text description of each of the finance products and examples of how it was presented, is available in the Maximising the uptake of green home upgrade financial products PDF, published alongside this report.

2. Green upgrades

Seeing green upgrades through the eyes of homeowners

We interviewed ten homeowners in Wales to generate insight for later stages of the project and inform the prototype products shown in our online RCT. These interviews also generated qualitative insights on homeowners' motivations and thought processes, which we believe are supported by the findings of the RCT.

We began with a core question: 'How do people approach upgrading their home?'

There is a useful comparison between what we might call 'lifestyle' upgrades – such as a new kitchen, bathroom or an extension – and green upgrades. Any home upgrade costs money, causes disruption, and creates a risk: *"what if the work is done badly? What if I regret making this change or wish I had made a different choice?"*.

People have an obvious incentive to improve their home and 'make it their own', and this is weighed against the disruption and risk. Our work suggests this balance is different for green home upgrades, which offer less of an immediate improvement to quality of life, and require a long term view on financial returns.

We therefore began by asking about any kind of upgrades interviewees had made to their home. We assumed we could learn about the thought process they would go through in weighing up costs and benefits and reducing the risk of making any big change. We then turned the conversation to green upgrades, and how to pay for them.

In our interviews, we were open-ended about what 'green home upgrades' meant, and were led by our interviewees' interpretations. Specific measures they mentioned without prompting included solar panels, new heating systems, fabric insulation, battery storage and more energy efficient appliances.

Why do people upgrade their homes?

We asked interviewees what upgrades, if any, they had made to their home, and then explored why they had done so. The top reason for making any kind of change were essentially 'liveability'. Interviewees wanted more space to do things, or to simply make their home a more enjoyable place to spend time in the ways that mattered to them.

Whilst this seems obvious, what is perhaps more important is what they didn't mention. Interviewees did not talk unprompted about improving the resale value of their home as a motivation for the upgrades they had already done. They also didn't talk about return on investment or payback periods on things they had bought.

How people approached upgrading their home

Setting motivations aside, we assumed that interviewees' approach to researching, implementing and paying for lifestyle upgrades would also provide some insight into how they would approach green upgrades.

Themes that emerged from these discussions included:

- > The importance of researching different options to find the one which was right for their home
- > For larger changes, a proper assessment and plan for the works done by someone qualified
- > A preference for work to be done by local tradespeople, and particularly those they had a personal connection to
- > Some poor experiences and regret caused by poor quality work done by local tradespeople they knew.

Again, these findings aren't particularly surprising – but they illustrate how interviewees both recognised and tried to mitigate the risk of lifestyle upgrades when they have committed to having them done.

Views on green upgrades

We then explored whether interviewees had considered green upgrades for their home. Some had considered investing in solar panels, heat pumps and various forms of improved insulation.

Interviewees would generally mention being greener as a motivation for considering green upgrades, expressing this in different ways such as reducing their carbon footprint, or contributing to a better future for their grandchildren. However, interviewees almost without exception would then quickly move on to a discussion of the return on investment (ROI) and payback periods achieved through energy bill savings. They want to be greener, but it's important the sums add up.

Intrinsic 'green' motivations, therefore, appear to be present for most homeowners we spoke to. But these motivations are weakly held, given lower priority, and not much time was spent talking about them.

However, in our online RCT, it is interesting to note that 'it will allow me to get green home upgrades' was the second most popular reason given by participants who said they would use a finance product to get green upgrades. This suggests that for at least some homeowners, green home upgrades are desirable but liquidity constraints are a key barrier. See Figure 2 below.

Figure 2

Why would you use the finance product? (n = 2,464)	
80%	The low interest rate
58%	It will allow me to get green home upgrades
50%	The repayment terms are flexible (42% said "There are no repayment terms" for the green equity release)
41%	The support will be useful
1%	Other (incl. "will save on my energy bills", "couldn't afford it otherwise")

Amongst those who said they would not install green upgrades at all (with or without finance), a range of reasons were given, but the top two clearly related to cost and energy bill savings; see Figure 3.

Figure 3

Why wouldn't you install green upgrades? (n = 1,185)	
62%	Upgrades are too expensive
35%	Not enough difference to energy bills
24%	Too much hassle to install
21%	Not suitable for my home
17%	Environmental benefits are not worth the cost
9%	I don't want green home upgrades
6%	Unlikely to benefit the environment
1%	Other (incl. "moving house soon", "too old to benefit")

So energy bill savings appear to be a strong motivator for those who do not choose green upgrades, but a weak motivator for those who do.

This may have implications for the targeting of green finance products over the next few years, until there is significant movement in upfront and lifetime costs. Finance products may be more appealing to those who want to act, but want financial support to do so.



Recommendation: In the early years of any scheme, finance providers should target their product offer at people who are more likely to take action on a values basis.

Making the right choice

We see in Figure 3 that 21% of RCT participants who said no to any green upgrades gave the reason that they were 'not suitable for my home'. We cannot be sure what technology participants had in mind when giving this response, whether their view is based on research or an assumption, or indeed whether it is correct.

It is surely uncontroversial to say that the world of green home upgrades is filled with competing options, many of which are unfamiliar to most householders and require expertise to install effectively. Views are divided, even amongst experts, about the best solutions across housing archetypes and these debates are becoming increasingly public. So we must sympathise with homeowners who are trying to navigate this complexity and make a decision about their home.

Our interviewees articulated some of these anxieties, particularly around the right choice of green heating systems. Some were aware of the debate around electric vs. hydrogen, and whether one technology was likely to 'beat' the other. This presented them with the troubling possibility that they could choose a heat pump, and then later find that hydrogen boilers became the dominant technology. They also believed that the cost of all green technologies was likely to come down over time.

In the face of this, and given the relatively weak motivation to act, the pragmatic approach interviewees articulated was to 'wait and see'. To them, it made sense to allow other homeowners to take the risk of driving the market, paying a premium to be an early adopter, and/or making the wrong choice.

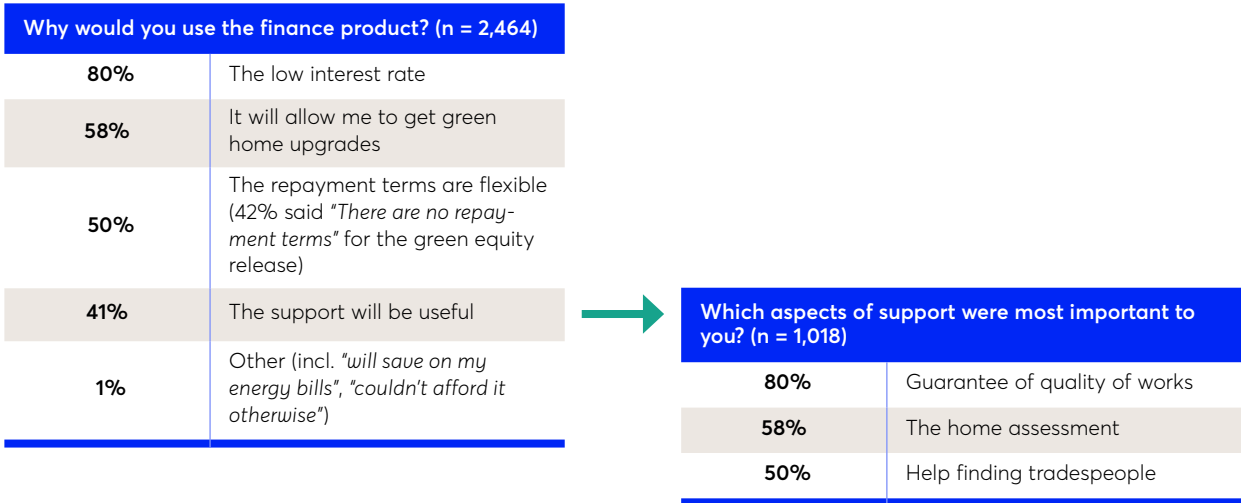
Encouragingly, another theme emerging from our interviews was of trust in the government. When discussing government backed finance products, interviewees assumed that the government would 'do its homework' – ensuring the measures on offer were suitable, and that work would be backed by some sort of guarantee.

All of the 'government-backed' finance products presented to participants in the RCT included some reference to a 'free personalised energy assessment'. As noted above, we believe this is a significant factor in why these products outperformed the control (a generic commercial loan) where support was not mentioned.

Figure 4 outlines the reasons participants gave for why the support would be useful, with 84% flagging the home assessment as important.



Figure 4



In summary, owner-occupiers:

- > Feel uncertain about what green upgrades will be right for their home
- > Believe some options that are right today could prove to be 'wrong' with hindsight
- > Are delaying making a decision because of this uncertainty
- > Trust the government to provide reliable advice.

The introduction of any government-backed finance product could therefore send a clear signal about which technologies are 'right', which in turn could make homeowners more confident to act sooner. Whilst we did not test this, it is also plausible that a strong signal from government about the 'right' technology could possibly influence tradespeople to have more confidence transitioning from gas installation to greener alternatives.



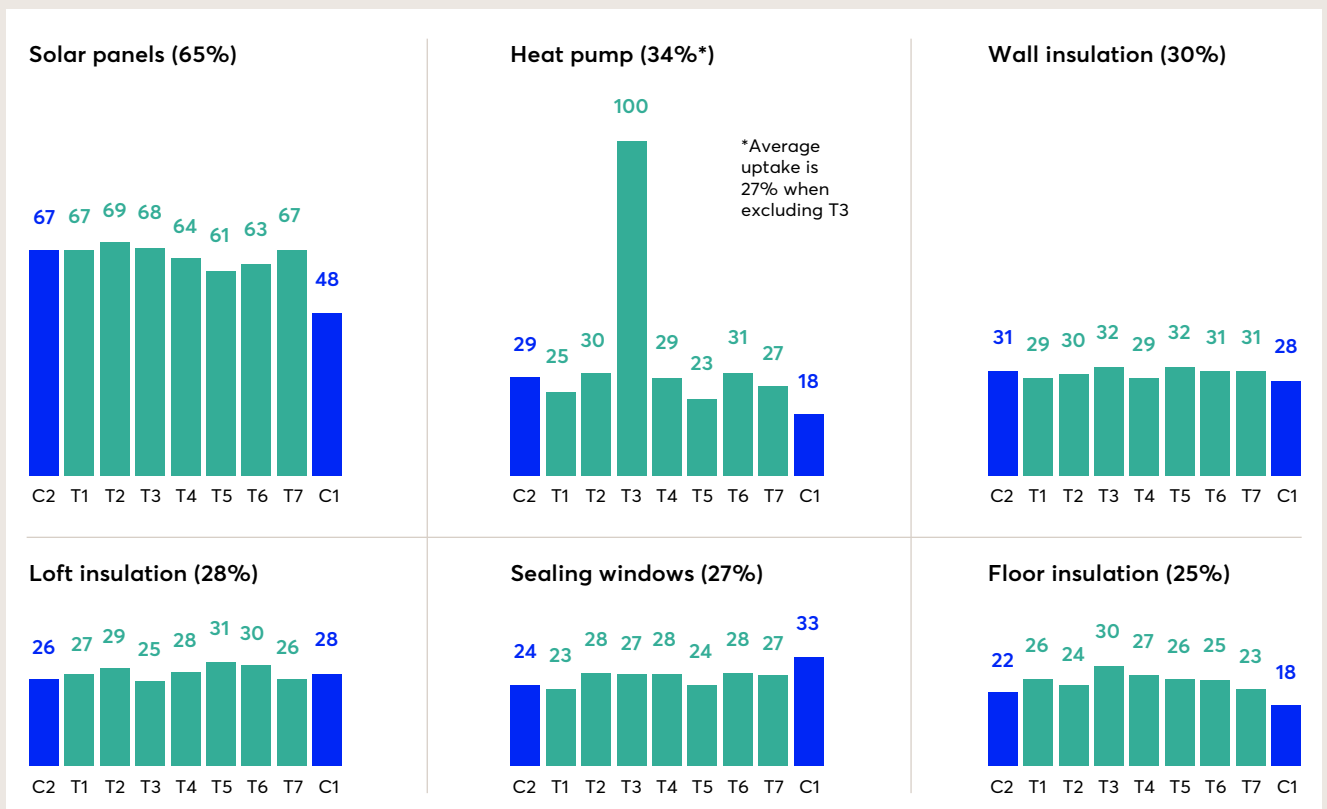
Recommendation: Welsh Government should use the introduction of a green finance product as an opportunity to provide a clear policy direction to homeowners about which technologies they can be confident in and ensure this is communicated through the support side of any market offer.

Popularity of specific upgrades

Participants in the online RCT were asked to choose which green upgrades they would buy using the finance product they had been shown (see Figure 5 below). There was little variation in the popularity of particular measures across the groups who saw different finance products. This suggests the detail of the product does not strongly influence the popularity of the measures.

One clear exception was the arm of the trial where the finance product was presented as a 'heat pump loan', where participants were required to buy one but had free choice of other measures.

Figure 5 The percentage popularity of different green home upgrade options (based on the 44% who would install green home upgrades)



Solar panels were clearly the most popular single option, with the four insulation options and heat pumps being similar in popularity across the sample. Our work did not explore why solar panels are more popular, but we speculate that reasons could include the direct financial return via

export tariffs and bill savings, the lower level of disruption from their installation, the fact they are a broadly 'established technology', and that they are a visible and obvious change to a home which clearly signals 'green'.



Recommendation: Make paying for solar panels an option for green finance products, and feature them prominently in any marketing materials.

Financing heat pumps

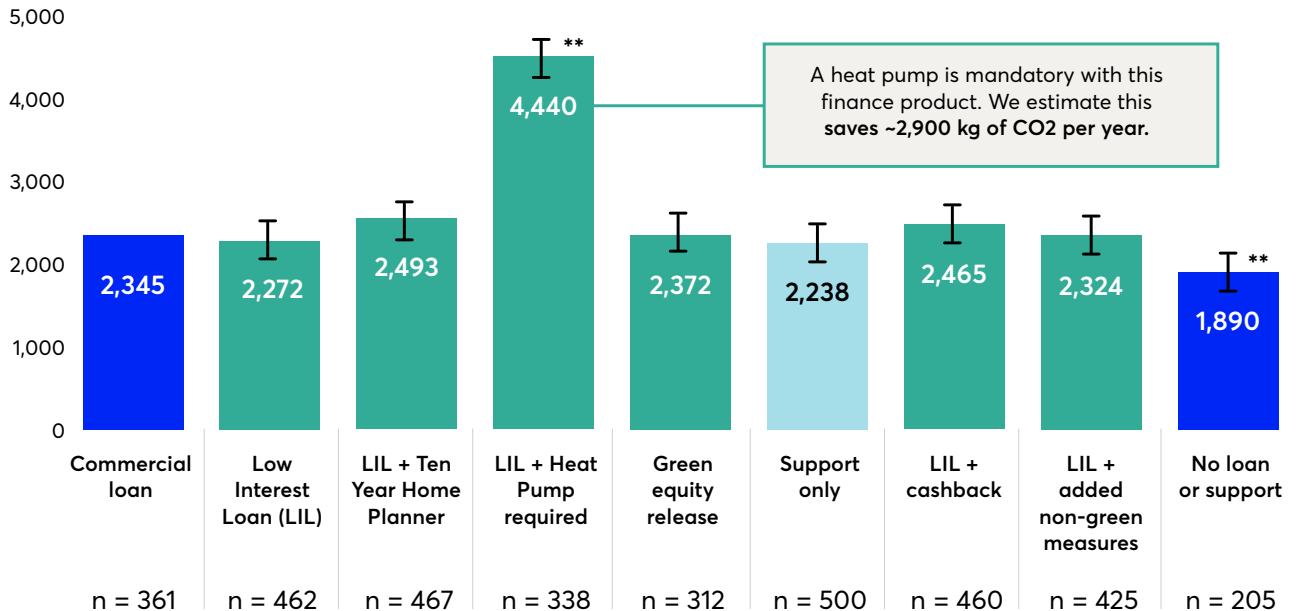
Nesta is particularly focused on lowering barriers to heat pump adoption, so we were keen to understand any interactions between take-up of the finance product and take-up of heat pumps. For this reason, we included a 'heat pump loan' arm of the online RCT, where participants had to have a heat pump installed.

Of all the potential upgrades, heat pumps have amongst the highest upfront costs. We use £10,500 as the median indicative cost of a heat pump installation (before the current UK Government Boiler Upgrade Scheme £5,000 grant is factored in). The only other measure likely to be comparable in cost would be extensive solid wall insulation, which only older properties with particularly low EPC ratings are likely to need.

Perhaps unsurprisingly, the 'heat pump loan' arm of the trial had lower take-up than other options. 35% of participants said they would take out the finance product in this arm of the trial, compared to 38% in the 'pure commercial loan' control group, and between 45 to 50% when they could choose any measures they wanted. However, notwithstanding its underperformance relative to other arms of the trial, a 35% rate suggests an encouraging level of underlying demand for heat pump finance.

We also compared the financial product options for their impact in terms of CO₂ emissions reduced. The heat pump loan arm of the trial clearly outperformed all other options by this measure. The chart below shows the CO₂ savings amongst participants who said they would take up the finance product, and gives an indication of potential savings per loan².

Figure 6 CO₂ savings from the selected green home upgrades

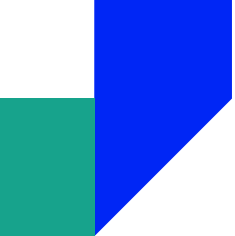


N = 3,530
Exploratory analysis. Linear regression including covariates.
Corrected for multiple comparisons.

** p < 0.01, * p < 0.05, + p < 0.1
Numbers in bars equals the control mean +/- treatment effects.
Data collected by BIT on 18 August – 12 September 2022.

For those who said they would install green home upgrades with the finance product, kilograms of CO₂ saved per year from the green home upgrades selected.

(Includes only those who would install green home upgrades with the finance product)



From this we conclude that a heat pump loan should not be the first green finance product the Development Bank should offer, given the aspiration is to develop a sustainable service offering a portfolio of products.

However, the ostensible priority of the Welsh Government and the Development Bank's finance offer is to decarbonise homes, and the impact of heat pumps on this goal is unambiguous. In addition, since the completion of our work for the Development Bank, the Welsh Government has published a consultation on a target for heat pump take-up in Wales of 5.5GW by 2035.

Assuming this target becomes a firm commitment, there is a clear strategic case for the Development Bank to develop a heat pump focused finance product as a medium term priority.

The RCT also tested a 'cashback' incentive (discussed in more detail below), which increased take-up of the finance product to around 50%. It also saw the highest level of heat pump take-up (31%) outside of the heat pump loan trial arm. Offering cash back for heat pump installation would be one potential way to offset the higher upfront cost, and help incentivise homeowners to choose the greatest decarbonisation impact.



Recommendation: If the policy goal is decarbonisation, green finance products should require homeowners to fund the purchase of a heat pump. This should be a medium-term priority for the Development Bank, or for any finance providers who are aiming to deliver the highest CO2 emission reductions per pound. In the near-term, lenders should consider including additional incentives, such as cashback, linked to heat pump installation.

3. Green finance

The core brief of our partnership with the Development Bank of Wales was to inform their decisions about a green finance pilot in Wales. All stakeholders recognised that thinking solely about the design of the finance product itself would be far from sufficient to guarantee success, and our trial has provided some insight on the effect support has on take up (as set out above).

The Development Bank's aspiration is to develop a finance vehicle which will make a contribution to decarbonising homes in Wales for some decades to come. Nesta's research leads us to conclude that there is no one product which will meet the needs of all users, so we have presented the Development Bank with evidence about which is likely to enjoy the highest take up. However a poorly designed end-to-end service can harm take-up of an otherwise 'good' finance product, and, ultimately, action on decarbonising homes. The proposed pilot therefore presents an opportunity to test and refine the service and customer journey. If the aspiration long term is to serve a wider range of borrowers, this is likely to mean a portfolio of different products in the medium to long term.

Nesta's work offers insight on the likely most popular product to develop a new service around. When this pilot product launches, further engagement with users will be vital to reducing friction and drop outs from the application process. A wider portfolio of tailored products can then be introduced over time, once the core service is working well.

Other important considerations will be how the product meets the needs of the installer base in Wales. The Development Bank will need to ensure that being paid to install retrofit measures under its finance scheme is a positive experience.

Finally, point of sale will be crucial. This points to the need for a partner who can engage homeowners in that crucial initial conversation about making their home greener.

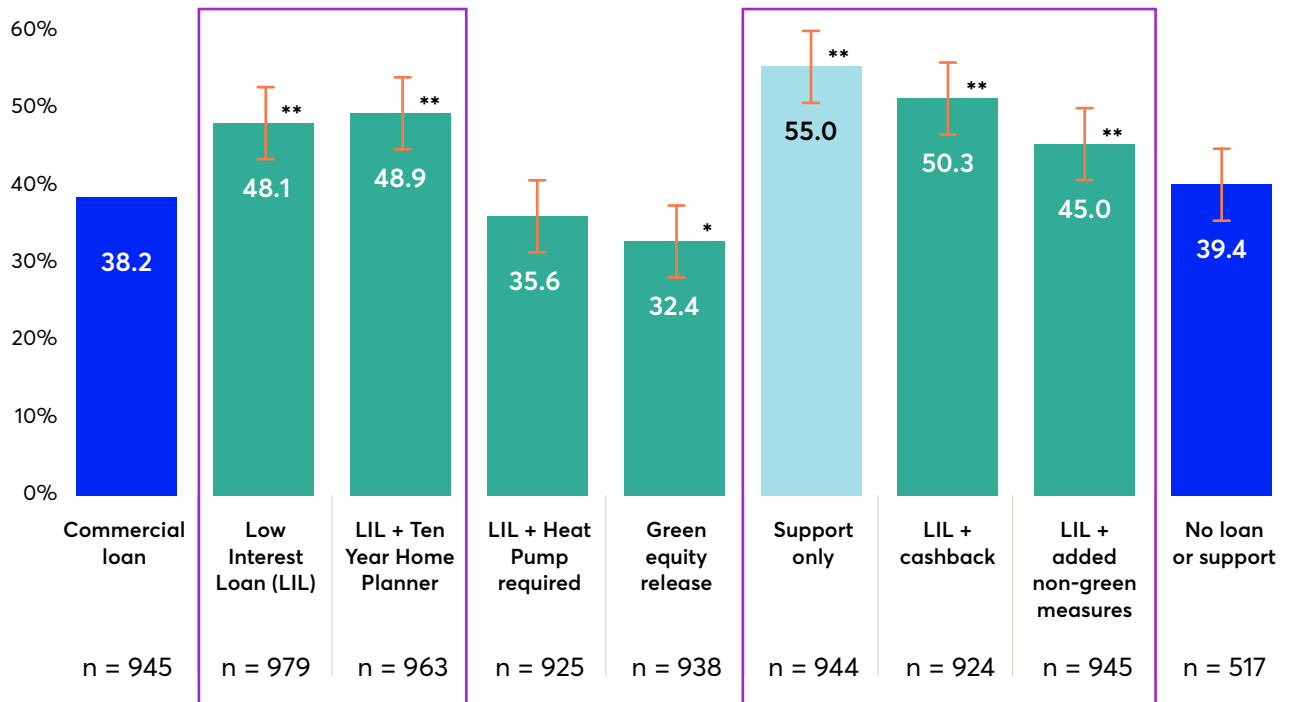
With all the above caveats, and our findings on how people view green upgrades in general, we can finally turn to our conclusions on the finance product itself.

Comparing take-up and impact of potential green finance products

The two primary areas of analysis for BIT's online RCT were:

- > Which product had the highest take-up (see Figure 7)
- > Which product delivered the highest CO2 savings (see Figure 8).

Figure 7 Percentage who would install green home upgrades using the finance product/support offer in the next 3 years

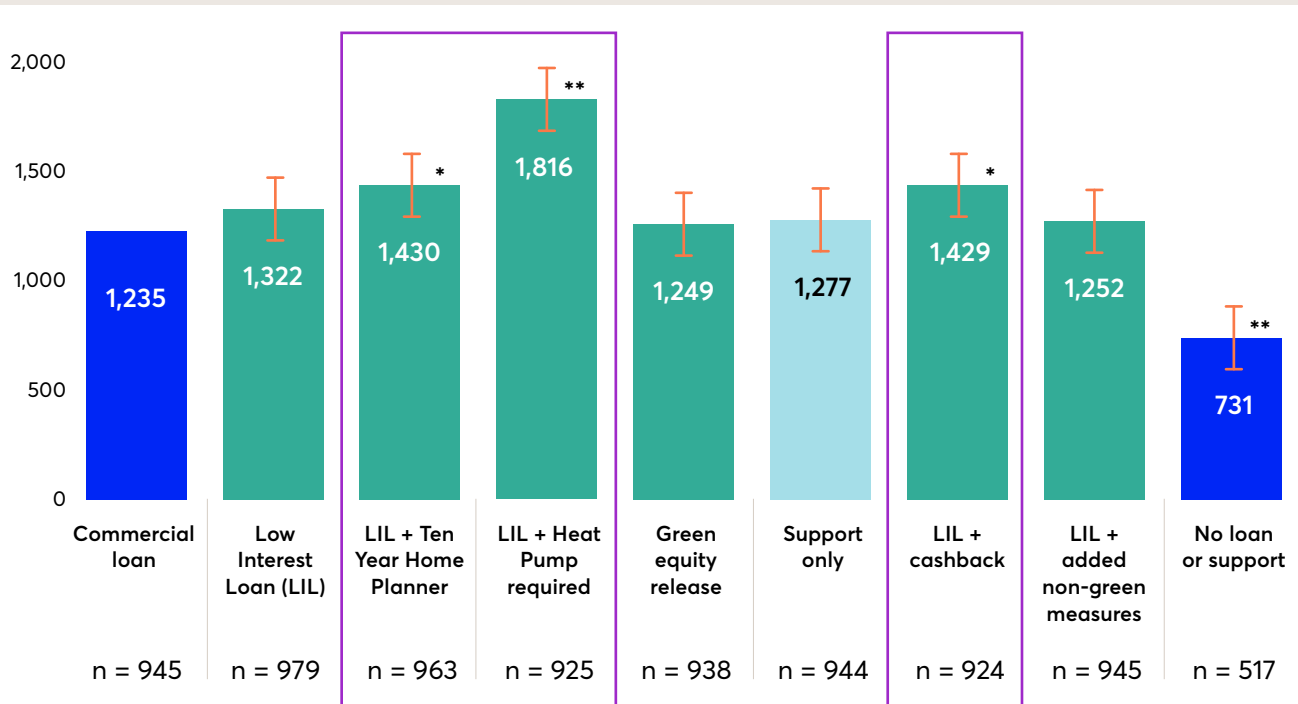


Primary analysis. Logistic regression including covariates.
 N = 8,080. Corrected for multiple comparisons.
 ** p < 0.01, * p < 0.05, + p < 0.1.

Numbers in bars equals the control mean +/- treatment effects.

Data collected by BIT on 18 August – 12 September 2022.

Figure 8 Kilograms of CO2 saved per year from the green home upgrades installed



Secondary analysis. Linear regression including covariates.

N = 8,080. Corrected for multiple comparisons.

** p < 0.01, * p < 0.05, + p < 0.1.

Numbers in bars equals the control mean +/- treatment effects.

Data collected by BIT on 18 August – 12 September 2022.

Below we will look more closely at the comparison between the specific products. However, it is worth noting the obvious difference between the user testing-informed products and the control groups.

Leaving 'support only' aside for now, the four finance products in the boxes in Figure 7, average just under 10% higher rate of take-up than the generic commercial loan product.

This points to an unambiguous positive effect of a finance product which:

- > Has a low rate of interest
- > Offers flexible repayment terms
- > Is packaged with support (as defined earlier)
- > Is backed by government.

Fundamentally, if the first question is whether a government-backed body should offer green finance, our research clearly supports this. Especially given that many of the wider success dependencies discussed in this report are also within the gift of governments to influence.

The treatment arm with the highest rate of take-up is 'support only', with 55% of participants saying they would get green home upgrades and draw on the support. However, we do not take this result at face value. Homeowners may have interpreted the question as asking them to assume financial means wasn't part of the decision.

When participants were faced with the full cost of their green home upgrade selections, take-up of the support offer dropped by 25 percentage points. Some participants used a free text box to mention that they would need help to pay for the upgrades.

This reinforces our headline conclusion that neither a green finance product, nor an ecosystem of advice and support is likely to be sufficient on its own in driving increased action on home decarbonisation. By investing in good quality advice and support around the Development Bank's finance offer, the Welsh Government

has the opportunity to make Wales a more attractive place for private finance providers. This ongoing advice and support should also be tested with homeowners to ensure it meets their needs.

We also asked RCT participants whether the product they had seen was 'something the government should be offering'. The sentiment was largely positive, ranging from 72% to 85% saying they agreed it was, including 82% agreement in the support only trial arm. This indicates support in principle for this sort of policy, even amongst homeowners who do not see it as something for them.



Recommendation: The Development Bank of Wales should offer a low (or ideally zero) interest loan to homeowners in Wales, and work with the Welsh Government to ensure advice, support, and guarantees are in place to give homeowners the confidence to take action.

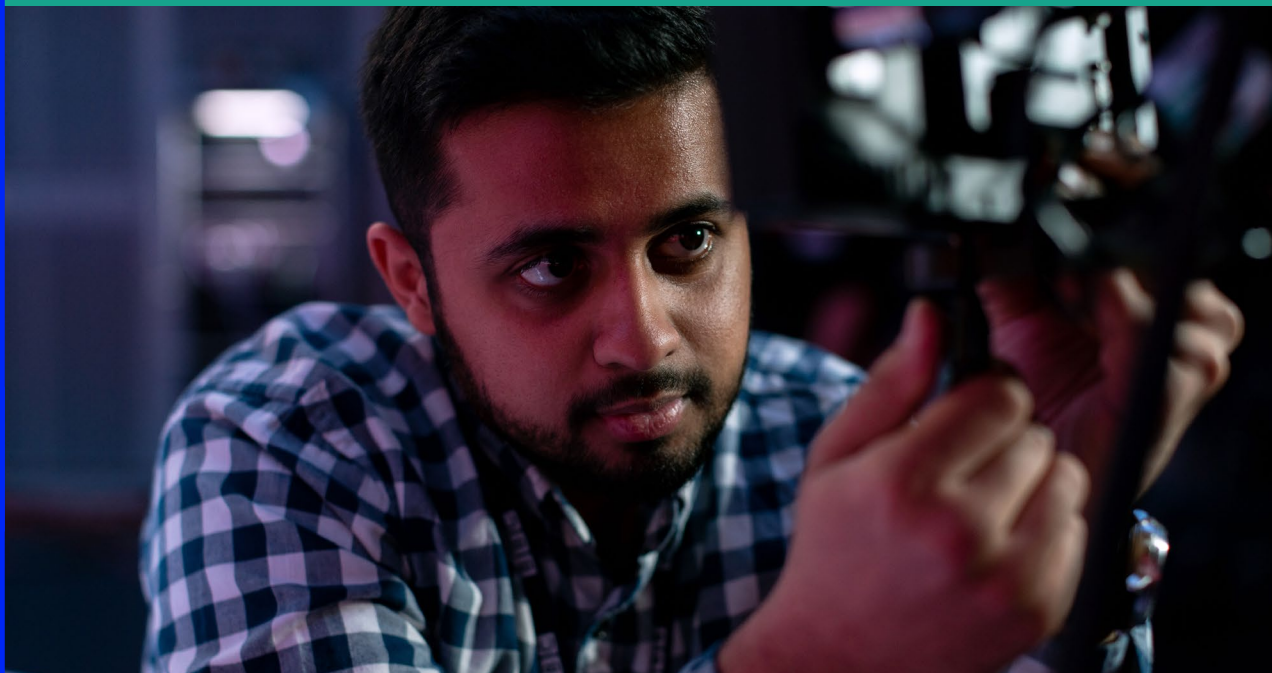


Figure 9

Why would you use the finance product? (n = 2,464)	
80%	The low interest rate
58%	It will allow me to get green home upgrades
50%	The repayment terms are flexible (42% said "There are no repayment terms" for the green equity release)
41%	The support will be useful
1%	Other (incl. "will save on my energy bills", "couldn't afford it otherwise")

Figure 9 summarises the reasons participants would upgrade their home using the finance product. Unsurprisingly, the low interest rate is the most important factor. This bears out the conclusions of

our literature review that high interest rates contributed to the failure of previous finance schemes – for example up to 9% interest on Green Deal loans.

Building passports

A 'green home assessment' was a common feature of all the Nesta-designed product prototypes. This was identified as a need by almost all interviewees in our user testing, and there was a clear consensus amongst stakeholders that this would be a non-negotiable part of the overall service. However, we were curious to generate some insight as to the form this assessment should take.

The concept of 'building passports' or 'green home log books' has significant support amongst stakeholders in the home decarbonisation debate. To summarise, the concept is that a home would be assessed, and all the steps needed to ultimately get that home to net zero carbon would be identified.

Homeowners would be provided with this information in some sort of plan, which would also be held on a central register, and updated each time they had works undertaken. This log book would then be available to any subsequent owners of their home, who would then know the next steps needed on the pathway to net zero.

We have not done detailed work to test whether building passports would be successful. However there was a strong view amongst some stakeholders that the existence of such a passport should be an essential precondition of any publicly backed lending. We wanted to test whether a building passport had an effect on take-up.

Revisiting Figure 7, we see a small positive difference between the low interest loan plus support treatment arm (48.1%) and the same product with the addition of a long term plan or building passport (48.9%). We refer to this in our experiment as the 'ten year planner'.

Excerpt from 'Ten Year Planner' product description

Get a long term plan for your home

We all know we need to make our homes greener, but knowing the right steps to take can be difficult. Our qualified energy assessors will visit your home and **create a step by step plan to get your home to net zero** – the right tech at the right time. You can be confident that the upgrades will reduce your energy use and lower emissions. You'll also get the peace of mind that you can borrow at a zero-interest rate to fund each step when you're ready.

Make changes when you're ready

We know that people often want to make changes to their home gradually so **we guarantee that the finance will be there for you to make the green upgrades** in your 10-year plan whenever you want to do them, from the first year to the last. If you choose to sell your home, your plan will be passed on to the buyer so they can see the value you've already added.

Apply once and get finance whenever you need it

When you get your home's 10-year plan you'll be able to **apply for guaranteed finance for all the upgrades laid out in it** and access this amount when you actually need it. You will only ever pay for the upgrades you do and there's no obligation to borrow the full amount.

Based on our research, it is not clear that the building passport has a strong effect on take-up. Where the 'ten year planner' appears to have a more convincing impact is on heat pump take-up, which it 'increases' from 25% to 30% compared to the low interest loan alone. It also results in around 100 kg/year more in CO2 reductions on average (see Figure 8).

We would speculate there are two possible reasons for this. Firstly the idea of an incremental and longer term plan could plausibly have an impact on the 'making the right choice' barrier identified in user testing.

Secondly, by focusing participants' attention on a longer time period, the planner may have encouraged them to be somewhat more ambitious in their green goals. Further research into the direct effects of a building passport on motivations would be valuable.

However, we do not conclude that the above effects are significant enough to make a full building passport a precondition of accessing public borrowing. Particularly because the passport is still under development and may not be available in its final form for a number of years.



Recommendation: The Development Bank should consider aligning its finance offer with building passports as and when they are available to homeowners, but this should be rooted in further testing of how well they meet user needs. The Development Bank should not delay the implementation of its finance product until building passports are available, and should not make such an assessment a condition of borrowing.

'Cashback'

The Kreditanstalt für Wiederaufbau (KfW) investment vehicle, originally created by the German Development Bank, was cited by the Development Bank of Wales as one inspiration behind its ambition to offer green finance. The KfW was established around 20 years ago, and has evolved from a relatively small portfolio of measures and finance offers to lending many millions of euros across hundreds of thousands of German homes, before turning its attention internationally.

In our literature review of retrofit schemes worldwide, KfW is considered amongst the most successful examples. One element of its product offer which is seen as contributing to its success is the offer of a cashback incentive which is paid out if and when the home reaches a specified level of

reduction in energy demand, or heat loss. We wanted to explore whether homeowners in Wales would be motivated by a similar incentive within the Development Bank's finance offer.

Looking again at Figure 7, we can see an increase in take-up of just over 2% for participants who saw the cashback option compared to the standard low interest loan. Participants in this trial arm were told the lender would 'reduce the amount you owe by 20% when you hit your home's energy target', and that this would mean they could either reduce their monthly repayments or pay the loan off early. We felt this was a necessary but acceptable simplification of the exact incentive which KfW offers, and fitted the requirements of the Predictiv platform around readability and attention.

Excerpt from 'loan plus cashback' product description

Pay 20% less for green upgrades when you hit your home's energy target When you apply for this loan your house will be given an energy target which you will achieve by installing upgrades like insulation or replacing your boiler. When the energy efficiency improvements are confirmed, we'll **reduce the amount you owe by 20%**. This means you can choose to **lower your monthly payments or pay the loan off early**.

The cashback incentive is really aimed at increasing the level of ambition on the part of the borrower – the more they achieve with a higher up front investment, the more attractive the overall package. This is borne out by our own findings where the deemed

CO2 savings achieved by the cashback loan were 100 kg per year higher than the standard low-interest loan (see Figure 8), suggesting participants may have been more ambitious in their choice of measures.



Recommendation: Consider offering a cashback incentive to borrowers to encourage a higher level of upfront investment in upgrades, and potentially higher CO2 reductions.

As noted elsewhere in this report, we also believe that the Development Bank should try to use its finance offer to drive increased heat pump take-up as a way to maximise CO2 reductions per pound loaned. Noting the negative effect on take-up of mandatory heat pump installation, we believe cashback tied to heat pump installation could be a way to incentivise take-up if getting one is optional.

Non-green borrowing incentives

We were curious as to whether allowing homeowners to borrow extra money for

lifestyle upgrades at the very low and competitive rate of interest would have any effect on take-up.

Excerpt from 'Additional non-green measures' product description

Borrow extra for your dream home improvement

If you take out our Green Home Loan, we offer the option to borrow up to 20% extra on top of your loan. **You can use this to pay for other home upgrades, like a new kitchen or bathroom,** and combine the works to minimise disruption.

Keep it simple with one application and a single monthly repayment – all at 0% interest. Combine doing your bit for the environment with that upgrade you've been waiting for.

Given the disruption of having work done, and generally low appetite for green upgrades, we were interested to explore if this might be a way to incentivise getting green measures done at the same time. It would also point to a potential point-of-sale relationship with providers of other home upgrades.

The 'non-green measures' trial arm had 45% take-up, compared to 48% for the low-interest loan and 38% for the control/commercial loan. This suggests the presence of an additional non-green incentive actually had a negative effect on take-up. Interestingly, only 54% of the participants who said they would install green measures using this option said they would also take advantage of the additional borrowing.

We therefore concluded that the trial showed no benefits to including this sort of incentive in the finance product. Given the political sensitivities which would arise from using public money in this way, our recommendation is not to allow government-backed loans to be spent on non-green upgrades.

Equity release

Our work is focused on homeowners, towards the more affluent and able to pay end of the income spectrum – assuming that they are more likely to be able to take on debt and make decisions based on relatively long return on investments periods. However, such individuals are often asset rich but cash poor, and averse to taking on an additional

monthly outgoing to repay new debt. This may be particularly true during a cost of living crisis – where, although the return on many green upgrades has improved, homeowners may be especially worried about taking on new debt.

For these reasons, we wanted to explore equity release products as an alternative to a traditional loan.

Excerpt from 'Equity Release' product description

How does it work?

Equity release means the Welsh Government buys a share in your home at the market rate, unlocking the cash to fund your green home upgrades with no upfront cost to you, and no **monthly repayments**.

When you sell your home, they then receive a share of the sale price, and you keep the rest. You can also choose to buy back equity over time, with no **additional interest charged**, and you can still leave the property to a relative or friend in your will.

Our user interviews had suggested some interest in equity release, particularly amongst older participants, and indicated that the main objection or concern to these products would be around wills and legacies. There was some concern around losing out on the value of the home, but participants also found it plausible that green upgrades would increase the sale price enough to offset the loss from owning a smaller stake in their home.

However, equity release was the only trial arm where the product underperformed the control on its own merits (not because of constraining their choice of upgrades in the 'heat pump loan' arm). Equity release was taken up by 32% of participants, compared to 38% for the generic commercial loan control and 48% for the low interest loan.

Participants offered some interesting free text feedback on their objections to equity release

The idea of the government owning part of your home is unfavourable

"It's extremely cheeky that the UK Government would be seeking to take a proportion of the value of a person's home. It should be giving this money out as free grants subsidised by taxes on the excessive profits of energy companies."

Worry about value of home increasing meaning they lose out more

"I personally do not want to give away part of my home, especially when the house goes up in value."

"As I understand it, when the property is sold (assuming that the equity has not been entirely bought back in the meantime) then, in the event of a rise in house prices between the Scheme being used and the property sold, the Government's share of the sale proceeds could well be greater than the actual cost to the Government???"

Homeowners do not want to give away what they own

"It's selling out your home that you have already paid for with no real advantage."

"It's a con. Equity Release is never going to be in favour of the homeowner."

There is an unfortunate track record of sharp practice and outright scamming of homeowners using equity release, particularly as a way of paying for social care. We speculate that amongst participants who had some prior knowledge of equity release, many are likely to have heard of this because of negative reporting around previous schemes. We therefore do not recommend that equity release should be prioritised as a product by the Development Bank.

However, notwithstanding its underperformance relative to other arms of the trial, a 32% rate of take-up is actually not a disappointing result considered in its

own right. With the appropriate consumer protections, we believe equity release as a product would be likely to meet the needs of a significant minority of homeowners.

4. Demographic findings

The Development Bank of Wales was keen to understand whether there were particular demographic groups who would be more or less interested in their green finance offering.

The primary area of analysis in our Predictiv experiment was take-up, defined as participants saying they would install green home upgrades in the next three years and use the finance product they had seen to do so. Percentages in the figures below are for take-up. As a secondary area of analysis we should take the below findings as indicative or exploratory.

The percentages are controlled for across the other covariates within the sample, so we should also be cautious in combining them into a single ideal customer.

Figure 10

Personal characteristics			
Gender	Male* (n = 3,747)	49%	Men: 7 percentage points higher than women
	Female (n = 3,804)	42%	
Age	25 to 34* (n = 1,391)	57%	Those aged 25 to 34: 17 percentage points higher than those aged 55 and over
	35 to 54 (n = 3,469)	47%	
	55 and over (n = 2,642)	40%	
Household income	£40,000 and over* (n = 3,808)	50%	Those with high income: 4 percentage points higher than low income
	Less than £40,000 (n = 3,755)	46%	

Differences in uptake between subgroups control for covariates. *reference category.

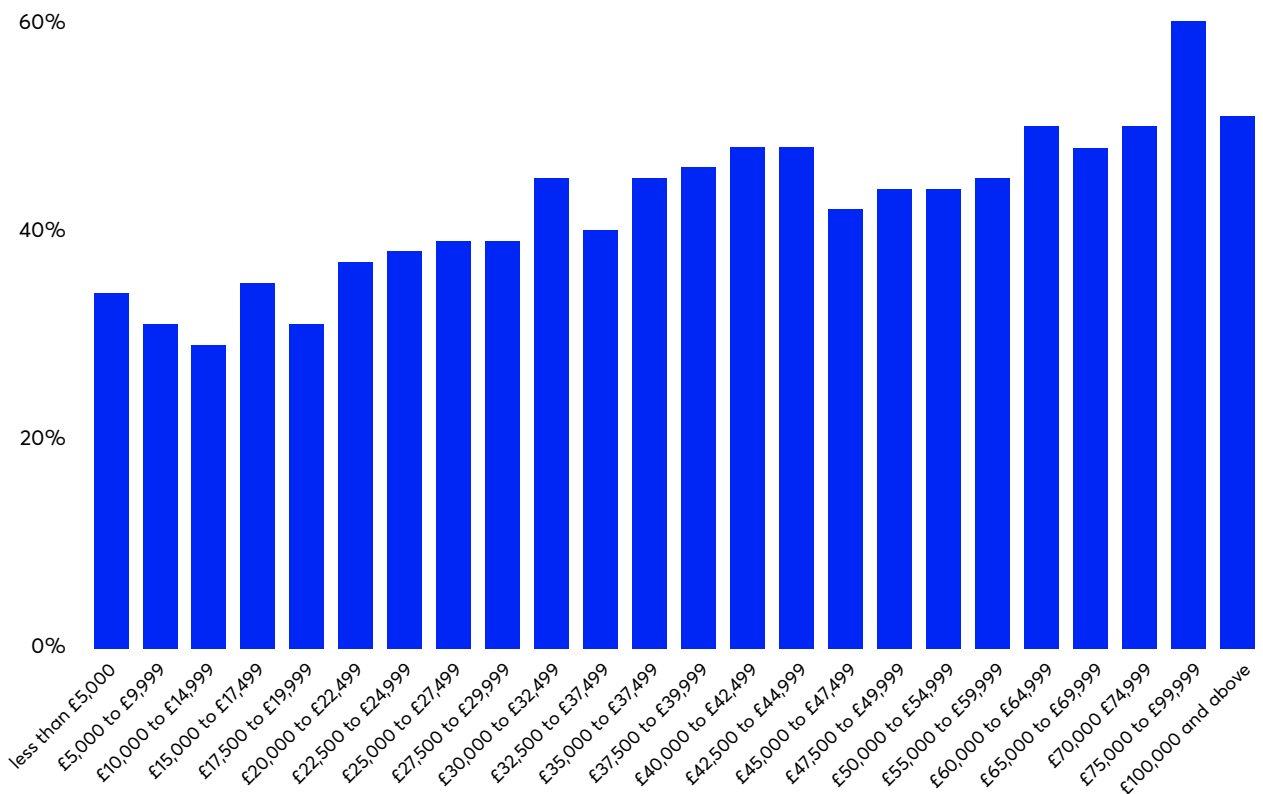
Data collected by BIT on 18 August – 12 September 2022.

Males appear somewhat more likely to take up a finance product than females, but it is not clear what conclusions we would draw from this for implementation.

There is a more significant difference across age groups, with 57% of younger homeowners interested. Possible reasons for this might include a different perspective on the payback period, or differences in attitudes towards 'being green' between generations. To the extent that green upgrades are seen as a way of saving money, younger people may find this is more of an incentive since their incomes tend to be lower.

Higher incomes, perhaps unsurprisingly, correlate with higher take-up, presumably because of higher ability to take on additional monthly outgoings. Figure 11 shows the income split in more detail, indicating a general increase in take-up as income increases. However, the difference between the highest and lowest income groups is not particularly pronounced, and we should be cautious of overinterpreting this particular data given the low numbers in each income band. Overall, we do not believe this data indicates a case for strongly targeting one income group over another.

Figure 11 Percentage who would install green home upgrades using the finance product/support offer in the next 3 years, split by household income



N = 8,080; Each income group includes ~330 participants.
Exploratory analysis. Descriptives only.

Data collected by BIT on 18 August – 12 September 2022.

Property characteristics

Figure 12

Property characteristics			
EPC rating	Good (A, B, C)* (n = 2,535)	56%	Those with a good EPC rating: 10 percentage points higher than those with a poor rating
	Poor (D, E, F) (n = 1,226)	46%	
	I don't know (n = 3,802)	39%	
Year house was built	1990 to 2022* (n = 2,159)	56%	Those living in a house built post 1990: 17 percentages points higher than pre 1930
	1930 to 1990 (n = 3,642)	43%	
	Pre 1930 (n = 1,527)	39%	
House type	Semi-detached house* (n = 2,697)	56%	Those living in a semi-detached house: 14 percentage points higher than a detached house
	Terrace house (n = 1,923)	55%	
	Flat (n = 621)	49%	Freehold owners: uptake 18 percentage points higher than leasehold owners (56% vs 38%)
	Detached house (n = 2,068)	42%	

Differences in uptake between subgroups control for covariates. *reference category.

Data collected by BIT on 18 August – 12 September 2022.

Our findings on property characteristics appear both more definitive and to have more obvious implications for implementation. Both a higher EPC and a newer home correlate significantly with a higher take-up of the finance product³.

On the surface this might appear counterintuitive. Properties with lower EPCs, or which are older have – on paper – more potential to benefit from green upgrades, particularly where savings on bills is the goal. However, what a home objectively 'needs' and what the home's owner is willing to borrow for appear to be negatively correlated in our trial.

Why might this be?

- > Lower EPCs clearly come with a higher cost to improve. To the extent that participants understand this, we may simply be seeing a correlation between higher costs of measures and unwillingness to spend.
- > EPCs may be higher because the homeowner has already invested in green upgrades. Past behaviour here may be influencing future behaviour.
- > There is some correlation between higher EPCs and higher property values, and therefore also with higher incomes and ability to pay.
- > Newer homes will tend to have a higher EPC. For homes built in the last few years, the correlation we see may be because homeowners are still settling into a home and 'making it their own', and more willing to consider making any sort of change.

What upgrades did people choose?

Figure 13 shows the average amount 'borrowed' by participants in each trial arm, for an average of two upgrades chosen.

Figure 13

From the green home upgrades selected...	Commercial loan	Low Interest Loan (LIL)	LIL + Ten Year Home Planner	LIL + Heat Pump required	Green equity release	Support only	LIL + cashback	LIL + added non-green measures	No loan or support
	n = 945	n = 979	n = 963	n = 925	n = 938	n = 944	n = 924	n = 945	n = 517
CO2 savings per year (kg)	1,235 kg	1,329 kg	1,447 kg	1,836 kg	1,262 kg	1,273 kg	1,456 kg	1,277 kg	733 kg
Energy bill savings per year* (£)	£445	£482	£492	£380	£425	£468	£495	£450	£278
Total cost to homeowner* (£)	£6,384	£7,013	£7,538	£13,830	£6,514	£6,591	£7,611	£6,859	£4,082
Number of green home upgrades selected [†]	1.8	2.0	2.1	2.0	1.8	1.9	2.1	1.9	1.1

N = 8,080 (Full sample, including those who would not install green home upgrades)

Exploratory analysis. *Linear regression including covariates. †Quasi-binomial regression including covariates.

Blue (red) text identifies values statistically significantly ($p < 0.05$) higher (lower) than the commercial loan.

Numbers in table are mean averages within each group.

Data collected by BIT on 18 August – 12 September 2022.

Excluding the 'heat pump loan' arm, we see an average loan across the whole sample of around £7,000. The majority of the spend (£6,500) for most participants (65%) is on solar panels.

Solar panels do improve EPC ratings in some instances, but the more direct benefit to home owners is a financial return – deemed £600 per year in the trial. Solar panels are also a more visible upgrade compared to other measures, for any participants for whom signalling being green is a consideration.

So from these data points we can conclude that:

- > Lower EPCs do not correlate positively with higher take-up
- > Spending on energy efficiency or fabric measures doesn't appear to be the priority for homeowners in our sample.

This also gives some indication of an average overall spend owner-occupiers might be willing to tolerate. Depending on its starting point, £7,000 is not really enough for a comprehensive fabric retrofit that would get a home from the lowest to the highest EPC.

However, with the £5,000 Boiler Upgrade Scheme (BUS) grant factored in, it could be enough for a heat pump, and a small amount of additional insulation to reduce heat loss. Recent analysis by Sero suggests the 'cost optimal' balance from the system perspective is to reduce heat demand by about 10%⁴ via a light fabric retrofit such as cavity wall insulation.

In short, our trial suggests people are not willing to borrow sufficient money to pay for a whole house fabric retrofit, where all the insulation measures presented to participants gave a total deemed cost of around £20,000. A product which, combined with the £5,000 BUS grant, paid for a heat pump and some lower cost insulation measures would be much closer to the £7,500 willingness to pay figure indicated by our work.

Life moments

Figure 14

Life moments			
Time lived in home	Less than 5 years* (n = 2,680)	46%	Those who have lived in their home for less than 5 years: 7 percentage points higher than 5 years or more
	5 years or more (n = 4,883)	39%	
Intended future time in home	5 years or more* (n = 5,420)	44%	Those who intend to live in their home for 5 years or more: 3 percentage points higher than less than 5 years
	Less than 5 years (n = 2,143)	41%	

Differences in uptake between subgroups control for covariates. *reference category.

Data collected by BIT on 18 August – 12 September 2022.

We were also interested in what we could learn about when homeowners might be more interested in green home finance.

There are small but nonetheless significant differences in take-up in the two variables above. People who have recently moved into their home, and people who intend to be in their home for some time are both more likely to take out the product.

Our analysis does not capture combined effects of variables, but it would be reasonable to speculate that homeowners who have recently moved into a home they intend to stay in for some time are a potential target market. For any finance provider, this suggests that a relationship with estate agents, surveyors and others in the property sector would potentially be a fruitful route to market.



Recommendation: Although we caution that an online experiment is just a first step to understand targeting strategies, our initial evidence suggests that lenders may most fruitfully target: younger householders, those who have recently purchased a newer property, and those in higher-EPC homes.

Nation

Figure 15

Nation			
Country	Wales (n = 1,854)	46%	Those in Wales and Scotland: 6 percentage points higher than those in England
	Scotland (n = 1,106)	46%	
	England* (n = 4,603)	40%	

Differences in uptake between subgroups control for covariates. *reference category.

Data collected by BIT on 18 August – 12 September 2022.

Lastly, we see higher take-up of the finance offers in Wales and Scotland compared to England.

Whilst the Development Bank will not be extending its offer beyond the Welsh border, we hope this finding instils further confidence that there is healthy underlying demand for retrofit finance in Wales.



A note on grants and property-linked finance

There were two important areas which we chose not to look closely at in our work: grants and property-linked finance.

In our research, homeowners understandably preferred grants to loans, but it seems unlikely that full grant funding will be a realistic option for the Welsh Government (other than for households in fuel poverty). A mix of grant and loan may well be a possibility, and the 'cashback' arm of our trial can be taken as the best proxy for what take-up might be for such a product.

Property-linked finance (PLF) is where a debt is attached to the home itself, and passes from owner to owner when sold. This was tried within the UK Government's Green Deal, but the repayment process was managed through energy bills, rather than more directly through land or property registries. Organisations such as the Green Finance Institute have concluded that the availability of PLF which is not tied to energy bills would drive a step change in the domestic retrofit space.

However we understand that this is likely to require primary legislation (at either Westminster or Senedd level). It is therefore not currently a product which the Development Bank of Wales could introduce in the immediate future, so we did not include it in our work.

Endnotes

1. To note: In interpreting results, Predictiv's sample doesn't capture the digitally excluded, or those not inclined to complete online surveys. In addition, when people say they would do something in an online experiment, this doesn't mean they always will in real life. We therefore generally interpret stated intent as a likely upper bound of real behaviour.
2. The 'heat pump loan' also delivered higher CO2 savings (around 400kg per year more) than other products, even when factoring in people who said no to using the product. This would be the metric to consider when evaluating the overall cost/benefit of launching the service – the cost of targeting homeowners who declined the product – rather than per loan agreed.
3. We should note that each percentage finding in this section controls for the other finding as a covariate, so we should avoid inferring combination effects when considering these figures. However, 'older home' and 'lower EPC' will clearly have a causal link in some instances.
4. *Retrofit: is Fabric First Really the Best Strategy?* Sero. (December 2022) <https://sero.life/energy-advice-support/understanding-energy/retrofit-is-fabric-first-really-the-best-strategy/>



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