



Reducing the cost of capital for household low-carbon investment decisions

FINAL REPORT

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Executive Summary

Frontier Economics has been commissioned by the CCC to research how the cost of capital for household low-carbon investment decisions can be reduced.

The cost and availability of finance is a barrier to the required rapid uptake of low-carbon technologies

Take up of low-carbon technologies such as heat pumps, electric vehicles (EVs) and household insulation will need to increase significantly for carbon budgets to be met.

Many of these interventions have high up-front costs which can be recouped over time through lower running costs. When appraised at the social discount rate (3.5%, real) these investments can provide a cost-effective way of reducing carbon emissions.

In theory, household finance options should allow customers to spread the costs and allow cost-effective investments to be made. However, in practice, there are factors which increase the cost of finance above socially-optimal levels or reduce households' access to finance. In addition, there are behavioural barriers to uptake of finance products. In this report, we focus on addressing market failures, and only encouraging more borrowing where this is in the interests of the consumer and does not misallocate risks.

Some financial products have low interest rates but availability is limited

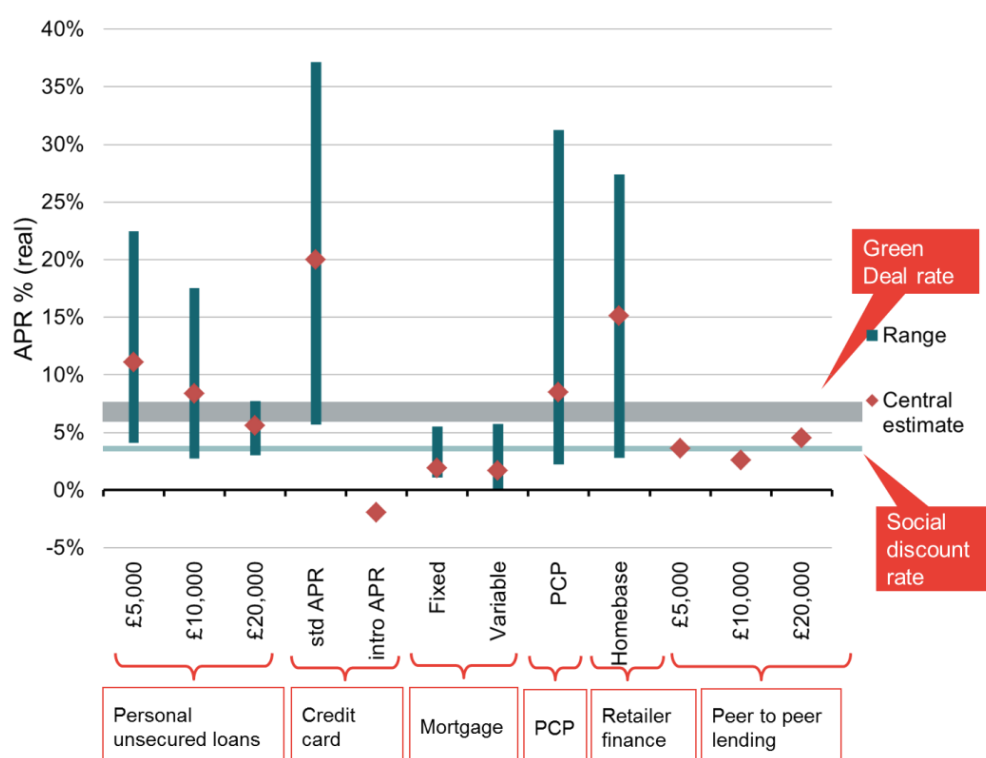
We reviewed the interest rates for a range of products that could be used for financing heat pumps, EVs and energy efficiency.

- **Finance provided by high street lenders** - unsecured personal loans, credit cards, and top-up mortgages.
- **Finance provided by retailers for specific products** - hire purchase, personal contract plans (PCPs), leasing, and retailer credit.
- **Alternative sources of finance** - peer to peer lending, local authority lending for home improvements, and salary sacrifice schemes offered by employers.

The ranges of interest rates currently available for these products are summarised in Figure 1. Some products have financing costs which are (at present) below the social discount rate (3.5%, real). However, availability of these products is limited to certain sets of consumers and/or for limited advances.

Top-up mortgages and (subsidised) local authority loans tend to have the lowest interest rates but availability is limited to homeowners with sufficient loan-to-value (LTV) and qualifying vulnerable households. Credit cards can have very low implied interest rates over short periods if customers switch to take advantage of introductory rates. However, the amount that can be borrowed under credit cards is limited and frequent switching negatively impacts on credit ratings.

Figure 1. Interest rates by type of lending (real)



Source: Frontier Economics.

Note: Rates for most of these products are likely to rise as the Bank of England base rate rises and as the effects of the Funding for Lending scheme unwinds. The Green Deal interest rate already factors this in because it offers a long-term fixed rate. We set out our projections of interest rates for unsecured loans, mortgages, and the Green Deal in Annexes 1 and 3.

Interest rates are largely driven by three factors: cost of funds, transaction costs and default costs

Three main factors determine the interest rate for a given product and consumer (see Figure 2).

- **Cost of funds.** This is the cost of raising funds for the provider of the finance products. This is influenced by the 'risk-free' cost of funds (e.g.

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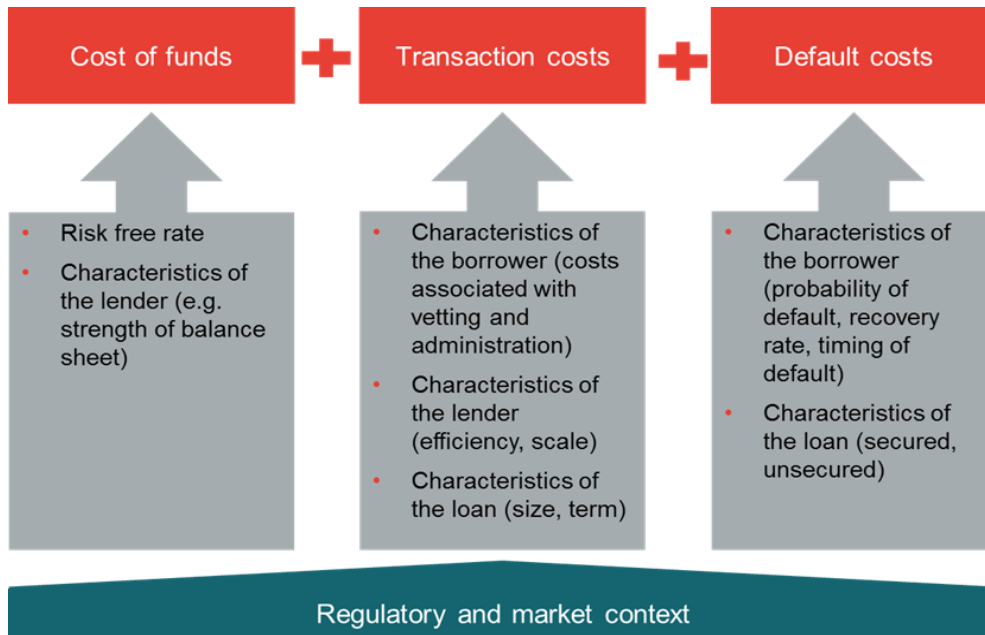
the Bank of England base rate) and characteristics of the provider (e.g. the strength of their balance sheet).

The marginal cost of funds for providers is currently around 2.0% (nominal) for most providers for short-term products. This has dropped significantly since the financial crisis as a result of expansionary monetary policy and the Bank of England's Funding for Lending scheme.

- **Transaction costs.** These are the direct costs associated with transacting with the consumer (e.g. vetting, administration and payment collection). Transaction costs represent a larger proportion of the interest rate for small and low interest rate loans.
- **Cost of defaults.** This is composed of the probability of loan default along with the amount recovered in the event of default. These are influenced by the characteristics of the borrower (e.g. income, outgoings) and the nature of the loan (e.g. secured, unsecured).

Policy interventions and the level of competition in the market can also influence the cost and availability of finance.

The relative importance of all the above factors varies depending on the product and the consumer.

Figure 2. Framework for assessing the drivers of the cost of finance

Source: Frontier Economics

Default risk is the most important driver of differences in the cost and availability of finance

There is a wide range of interest rates within and across products. For example, real interest rates for unsecured loans range from around 3% to above 20%. This is driven largely by the attributes of the consumer that influence the expected default costs (e.g. income, credit rating).

The level of security attached to the loan has a major impact on cost of financing and the availability of the product. For unsecured lending the expected losses associated with default are higher and therefore interest rates tend to be higher than for secured loans. Top-up mortgages provide rates around 200 to 300 bps lower than our central estimates for the equivalent unsecured loan. However, availability is limited to homeowners with significant loan-to-value (LTV) headroom.

Availability of finance for cars under PCPs is relatively high as the loan can be secured against the vehicle. This makes PCPs available to non-homeowners, although rates are higher than for mortgages.

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There are a range of barriers to lowering the cost of finance and increasing availability

We identified a number of barriers to lowering the cost and increasing the availability of finance for low-carbon investments (supply-side barriers).

- **Lack of scale.** Lack of scale for financing can limit the ability to efficiently access funding markets and can increase the importance of transaction costs in driving the interest rate. This is particularly relevant for new financing products such as the Green Deal.
- **Lack of knowledge of, and confidence in, the technology.** Lack of knowledge around technology performance risk and behaviour may increase the perception of default risk. Similarly, the extent to which technologies reduce energy costs may not be fully understood and therefore not reflected in the assessment of default risk.
- **Lack of information about borrowers.** Finance providers often have incomplete information about borrowers' credit risk which can limit lending. This may be more acute for alternative finance types (e.g. Green Deal) or for purchases of products where there is limited experience, such as EVs and heat pumps.
- **Lack of security.** EVs and heat pumps represent large purchases. Many consumers lack sufficient collateral against which loans can be secured for these. This increases the costs of default and reduces the availability of lending.
- **Policy and regulatory risk.** Risk around the longevity of government policies (e.g. Green Deal) can increase cost of funds and perceptions of default costs.

In addition, there are barriers which limit consumer uptake of finance at a given rate (demand-side barriers). These include myopia (where consumers have short time horizons when thinking about investments) and the principal-agent problem (where landlords have weakened incentives to invest when it is their tenants who benefit from reduced energy costs).

Our view is that these barriers are greater for heat pumps and other in-home investments than they are for EVs. With EVs, financing can be secured against the car and there is evidence that PCPs used for conventional vehicles are being adapted for EVs' specific characteristics. For example, some car dealers offer PCPs under standard 12, 24 and 36 month contracts while separately hiring the battery with a guarantee over its performance.

For heat pumps it is less clear that how loans could be secured given that they cannot be easily ‘repossessed’ by the lender. For owner-occupiers, the heat pump may not increase the value of the house, meaning that unless they have sufficient ‘headroom’ on their loan-to-value (LTV) the number of people for whom a top-up mortgage is an option is limited.

For tenants, the principal-agent problem applies where their landlords have weak incentives to install a heat pump if they do not receive the RHI payments and/or energy cost savings. Separately, demand-side barriers remain, for example due to uncertainties around the performance of heat pumps once installed.

The Green Deal increases availability of finance by allowing loans to be secured through energy bills

The Green Deal was introduced by the Government in January 2013 to help households and businesses finance energy efficiency investments in their property.

The Green Deal addresses the “lack of security” barrier by allowing loans to be secured against the energy bills associated with the property. In particular, it gives owners with insufficient LTV ‘headroom’ and non-owners a means to secure the loan.

Consumers repay their loan through their energy bills and if they move property the financial obligation stays with the new bill payer of the property. Default rates on energy bills are low and consequently default rates on Green Deal loans are expected to be similarly low. The component of the Green Deal interest rate represented by default is estimated to be less than 0.5%.

The nominal interest rates currently offered by the GDFC are in the range 8-10% (nominal) and 6-8% (real). This is higher than for some other products such as top-up mortgages and is largely a function of the high cost of funds. But it is a fundamentally different product for two reasons.

- **Green Deal rates are offered to all consumers irrespective of their credit score**, assuming they meet some minimum credit requirements. This means that Green Deal loans are available to 83% of the population, including 30% of the population that otherwise would not have access to standard consumer finance products.
- **Green Deal loans are offered at a fixed rate for 10 to 25 years** which makes them relatively distinct. Typical finance products only offer fixed rates for much shorter periods.

Despite the wide eligibility for Green Deal finance, only a total of 1,721 Green Deal plans had been installed by the end of January 2014. This is in part because of perceptions that the interest rate is high, but also reflects a lack of awareness,

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hassle costs involved in accessing the finance and restrictions on the amounts that can be borrowed under the Green Deal.

There is potential for Green Deal interest rates to fall substantially if the level of lending is scaled up

The largest component of the Green Deal interest rate is the cost of funds (~6.5%, nominal) for the Green Deal Finance Company (GDFC), currently the only provider of loans. This cost partly reflects the fact that the loans are offered at a long-term fixed rate. Therefore the cost of funds captures expected increases in Bank of England base rates as the economy normalises.

In addition, the cost of funds for the GDFC is currently inflated by the low level of uptake, the lack of a 'track record' for lending and perceived policy uncertainty around the Green Deal. These reduce GDFC's ability to access low-cost finance.

There are a number of measures that could help encourage the uptake of Green Deal loans, lower perceived policy risk and reduce the long-term interest rate.

- **Government guarantee of GDFC funding** (time or volume-limited). A government guarantee on the funding of the GDFC would reduce the cost of funds to the risk free rate (currently approximately 3.7% for 20 year loans in 2015). This would reduce the Green Deal interest rate by around 2 percentage points. This would increase uptake, helping the GDFC to establish a 'track record' such that private financiers are comfortable with lending to it. In effect Government would be taking the policy risk which it is best placed to manage.
- **Interest rate subsidy** (time or volume-limited). Alternatively, uptake could be boosted through an interest rate subsidy. This could be time or volume-limited so that the subsidy is only provided until the GDFC (or other loan providers) have developed a sufficient 'track record' for private financiers to be comfortable with Green Deal lending. However, this is a costly option and more likely to have problems getting State Aid clearance.
- **Amending the 'Golden Rule'**. One central aspect of the Green Deal is the Golden Rule which requires that expected financial savings must be equal to or greater than the loan repayments attached to the energy bills in the first year of the loan. At present the way this rule is applied puts restrictions on the amount that can be lent under the Green Deal.

The Golden Rule could be relaxed in a number of ways. For example, RHI payments could be counted towards the Golden Rule calculation, making heat pump investments much more likely to qualify. If consumers prefer shorter loan terms, these could also be allowed even if

this pushes regular loan repayments above the estimated financial savings in the early years of the loan.

Interventions in other areas of consumer finance could also help reduce costs and increase demand

There are also some more general interventions that could be used to stimulate lending for low-carbon technologies.

- **Understanding and transferring risks around future technology performance and value.** Business models for lending which transfer performance risks to manufacturers or installers are likely to be important for EVs and heat pumps. They may often have a better understanding of these risks (meaning they are more comfortable taking them) and, in some cases, are better-placed to manage them than consumers.

These lending models may evolve naturally (e.g. some PCPs for EVs already include battery guarantees) but there also may be a case for government interventions to stimulate these models. For example, subsidies can and have been made conditional on minimum performance guarantees being provided by installers/manufacturers.

For EVs, where there is uncertainty around vehicle depreciation rates, there may be a role for interventions that stimulate the second-hand market and raise confidence in the residual value of the car.

- **Tackling demand-side barriers.** There are a number of smaller interventions that could help increase demand for finance of low-carbon technologies. In particular, information campaigns could help consumers make better informed choices around which financial products are most appropriate for their situation and to overcome myopia over the benefits of investments in low-carbon technologies.

Secured finance offers the lowest cost of borrowing, while Green Deal reform could be important for households who cannot access this

Overall, we found that secured borrowing is the lowest cost option for funding LCTs and energy efficiency investments. For households that cannot access this, Green Deal reform could be an important route to increasing access to low-cost finance. We summarise our findings for heat pumps, energy efficiency and EVs below.

- **Heat pumps and energy efficiency.** Top up mortgages offer the lowest cost of capital for heat pump and energy efficiency investments. However, some consumers cannot access this type of finance, due

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either to not owning a property or not having sufficient headroom to borrow against their property. For these consumers, the Green Deal offers a route to low cost finance as the loan is attached to the energy bills of the property. Reforms to the Green Deal including a government guarantee of the GDFC's borrowing to reduce the cost of loans, and allowing RHI payments to contribute to the Golden Rule could reduce the cost and increase availability of finance for these investments.

- **Electric vehicles.** We found limited barriers to low-cost financing EVs, as the vehicle itself can be used as security on borrowing. This makes finance widely available.

PCPs for conventional cars are typically available at 5-12% real (and expected to rise to around 6.5-13.5% as Bank of England rates rise). This is higher generally than the rates for mortgages and (reformed) Green Deal finance due to the effect of depreciation on the cost of default.

While data on finance rates for whole-vehicle EVs via PCP (or EV batteries via leasing) is limited, high observed EV depreciation rates suggest finance rates could be higher than for conventional cars at present. This is likely to be partly related to misperception of the technology risks and the immaturity of the EV market which means, in the short term, there may be a case for intervention. Capital subsidies and required technology guarantees for EVs already help address these issues by increasing uptake and contributing to the development of the EV market. While the EV market matures, other time-limited interventions could also be considered (e.g. subsidising interest rates).

However, any premium should be expected disappear as both real technology risks and the misperception of technology risks decrease over time (including through business models where risks around the performance and future value of the battery are transferred to the manufacturer through leasing and guarantees). Therefore, we expect finance for EVs should be available at the same rates as conventional cars in future. It is also possible that EVs could be available at lower rates, if batteries were to depreciate at a lower rate than the vehicles themselves.

2 Introduction

For carbon budgets to be met cost-effectively, household take up of low-carbon interventions such as heat pumps, electric vehicles (EVs), and household insulation will need to increase significantly.

Many of these interventions have high up-front costs which can be (fully or partially) recouped over time through lower running costs. In theory, private finance options should allow customers to spread the costs of taking up these options. However, in practice, there are a number of factors which increase the cost of finance above socially-optimal levels or which reduce households' access to finance. Left unaddressed, this could become a major barrier to uptake of low-carbon technologies.¹

Frontier Economics has been commissioned by the CCC to research how the cost of capital for household low-carbon investment decisions can be reduced.

There are four main sections in this report.

- We begin the report by setting out a framework for analysing drivers of the cost of private finance.
- We then review the current market for private finance and explain what drives the cost and availability of different products.
- We then analyse the Green Deal, including drivers of Green Deal interest rates, and current uptake and availability. We project how the Green Deal interest rate may change in future under different scenarios.
- Finally, we assess approaches to reducing the cost and increasing the availability of finance for low-carbon investments, both through the Green Deal and more widely.

¹ For example a survey by the Great British Refurb campaign showed that 6% of people were 'very' or 'fairly' likely to take a Green Deal loan at a 7% interest rate. This proportion increased to 32% at a 2% interest rate.

3 Framework for analysing the cost of household finance

We define the costs of finance as the interest rate plus other charges that households incur when accessing a financing product. To understand the market for private finance and assess options for reducing the cost of finance, we need to understand the drivers of financing costs for different products.

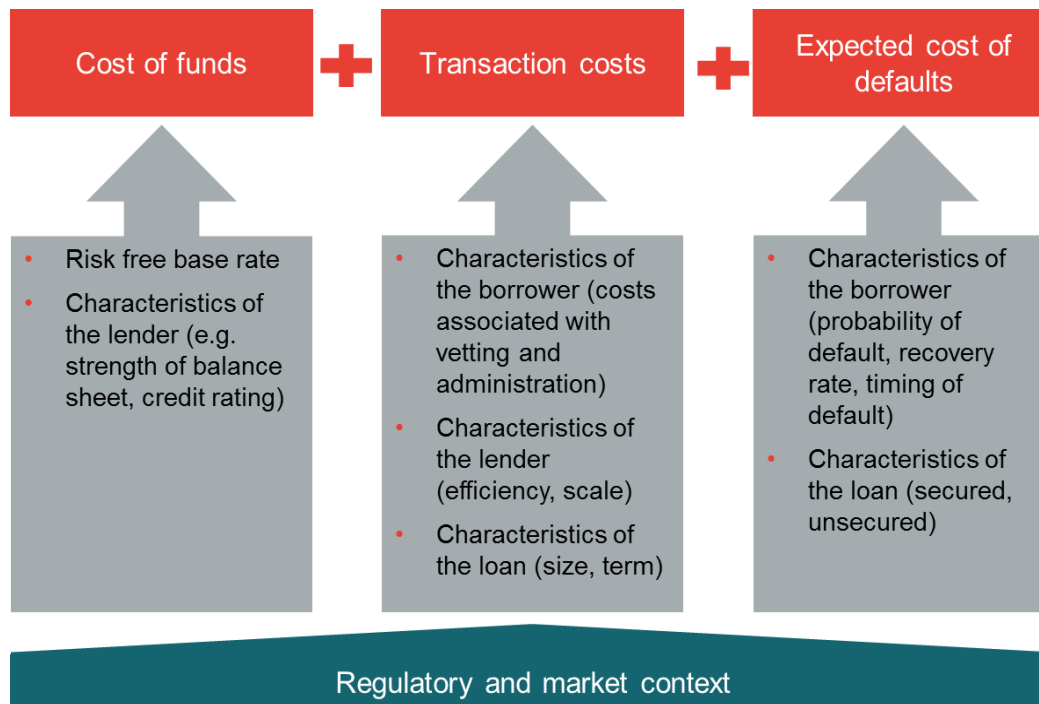
To do this we use a framework that breaks down the cost of private finance into three main components (see Figure 3 for overview).

- **Cost of funds.** This is the cost of raising funds for the provider of the finance products (e.g. bank, building society, local authority). This is influenced by the ‘risk-free’ cost of funds (e.g. the Bank of England base rate) and characteristics of the provider (e.g. the strength of their balance sheet, credit rating).
- **Transaction costs.** These are the direct costs associated with transacting with the consumer (e.g. vetting, administration and payment collection). These costs are influenced by characteristics of the provider (e.g. scale of operations), characteristics of the borrower and the nature of the loan (e.g. size, term).
- **Expected cost of defaults.** This is composed of the probability of loan default along with the amount recovered in the event of default. This cost is influenced by the characteristics of the borrower (e.g. income, wealth, outgoings) and the nature of the loan (e.g. secured, unsecured).

In addition there are other **market and regulatory factors** that influence these components and the overall cost of finance. These include:

- the level of competition between providers (and associated margins); and
- the policy and regulatory environment (e.g. including standards on and subsidies to support lending).

We use this framework throughout this report to explain interest rates (and other charges) and to assess the likely impact of interventions to reduce the cost of finance.

Figure 3. Framework for assessing the drivers of the cost of finance

Source: Frontier Economics

4 The current market for household finance

This section first investigates the products currently available in the market for funding household investments. It then draws comparisons across the range of products.

We have analysed three categories of private finance options available to consumers.

- **Finance provided by high street lenders.** The three types of finance we investigated were unsecured personal loans, credit cards, and mortgages (both top-up mortgages and re-mortgaging).
- **Finance provided by retailers.** This covers hire purchase, personal contract plans, leasing, and retailer credit. The main difference with finance provided by high street lenders is that these options are offered for purchase of a specific product (e.g. a car), and are often secured against the product.
- **Alternative sources of finance.** We also investigated non-mainstream finance options including peer to peer lending, local authority lending for home improvements, and salary sacrifice schemes offered by employers.

We investigated five types of finance in extra depth, to draw further insight on the drivers and outcomes for these finance sources. These were chosen both to capture the breadth of types of finance available to households, and to provide extra detail on the types of finance that appear most suited to household investments in low carbon technologies. The five types were:

- unsecured personal loans;
- credit cards;
- top-up mortgages;
- personal contract plans (PCPs); and
- local authority lending for home improvements.

We also include an assessment of the applicability of the different finance sources to low-carbon investments, such as electric vehicles (EVs) and heat pumps.

We first summarise the main findings of the analysis before setting out analysis of the products currently available in the market.

The current market for household finance

4.1 Summary of findings

Box 1 provides a summary of our main findings from the analysis of private finance products. Table 1 compares the drivers of the cost of finance across products along with the interest rates and availability for these. Figure 4 provides a comparison of interest rates by product. This should be read alongside the table on outcomes, which discusses uptake and availability of these products; as the interest rates found will not be available to all consumers.

Box 1. Main findings

General

- **The investment needed for the uptake of EVs and heat pumps to meet carbon targets is likely to have significant impact on the need for household finance.** We estimate the annual investment in vehicles will be £14-15bn in 2030 compared to £12bn at present, as a result of higher average upfront costs of EVs.²

We estimate that domestic heat pump adoption will require an increase in investment of £2-4bn in 2030 compared to approximately £2bn currently spent annually on conventional boiler replacement.³

While not all investments will require finance (e.g. some purchases may be self-financed), these estimates suggest that the overall requirement for finance could increase by roughly £5bn (excluding energy efficiency). To put this in context, the current market for private finance is worth around £160bn a year in the UK (excluding mortgages). This includes £13bn a year from credit cards.

- **Some products have financing costs which are (at present) below the social discount rate (3.5%, real) and Green Deal rates.** Top-up mortgages and (subsidised) local authority loans tend to have the lowest interest rates but availability is limited to households who are homeowners with sufficient loan-to-value (LTV) and qualifying vulnerable households. Credit cards can have very low implied interest rates if customers keep switching to take advantage of introductory rates. However, the amount that can be borrowed under credit cards is limited.
- **However, availability of top-up mortgages is limited to certain sets of consumers and/or for limited advances.** We estimate just under 60% of households are owner-occupied and have an outstanding mortgage with a LTV of 75% or lower (this includes those that own their property outright). With an average property price of £250,000,

² We base our estimate on the total vehicle finance provided for new cars in 2013 (FLA). We scale this finance requirement up to reflect the 60% penetration of EVs in new cars estimated by the CCC in 2030. We assume that EVs have a price increment relative to conventional cars of 30 – 50% (Element Energy for the CCC) though in practice this may fall by 2030.

³ This estimate is based on the CCC's 4th Carbon Budget estimate of 4 million domestic heat pumps installed by 2030. We then assume a price range of £7,000 to £14,000 for air-source heat pumps and £11,000 to £15,000 for ground-source heat pumps, with 60% of heat pump uptake being air-source. For conventional boilers, we assume around 1.6 million are installed each year at a cost of £1,500.

The current market for household finance

this suggests that, on average, owner-occupiers are likely to have the headroom to finance a £10,000 LCT investment using a top-up mortgage.

However, availability is highly varied across household types. For example, first time buyers would typically not be able to finance the same investment using a top-up mortgage.

Cost of funds

- **The cost of funds for providers is largely determined by exogenous factors (monetary policy, financial market conditions) and these are currently distorted below long-term average levels.** At present, expansionary monetary policy and the Bank of England's Funding for Lending scheme are depressing the cost of funds for providers. Bank of England base rates are currently only 0.5% (nominal) compared to rates of at least 4% (nominal) seen in the decade prior to the 2008 credit crunch. Funding for Lending may have reduced the cost of funds for some providers by an amount of the order of 100 bps.

The cost of funds in current interest rates for lending is largely driven by the *marginal* cost of funds⁴ for providers. This has dropped to approximately 2.0% (nominal) after the crisis. It is above the Bank of England base rate, reflecting providers' risks. We have estimated the *average* cost of funds to be slightly lower, in the range of 0.5-1.9% (nominal). Some variability in the cost of funds across providers is driven by the strength of their balance sheets.

Transaction costs

- **Transaction costs represent a larger proportion of the interest rate for small and low interest rate loans.** According to research by the Bank of England in 2010,⁵ for a 75% LTV tracker mortgage, transaction costs could account for around one to two percentage points of the interest rate (though this is based on a residual which may also include other elements such as the margin). For an unsecured personal loan of £10,000, transaction costs (again, based on a residual which could contain other elements) are of a similar magnitude, but represent a smaller proportion of the overall rate (due to higher rates).

⁴ The marginal cost of funds is the incremental cost of raising an additional unit of funding to fund additional assets or investments. The average cost of funds is calculated by computing the average rate paid by a bank to fund all assets or investments over a year.

⁵ <http://www.bankofengland.co.uk/publications/Documents/quarterlybulletin/qb100301.pdf>

The absolute level of transaction costs may be slightly higher for some unsecured products, particularly for smaller loans where costs represent a greater proportion of the loan.

Expected costs of default

- **There is a wide range of interest rates within and across products which is driven largely by the characteristics of the consumer.** For example, real interest rates for unsecured loans range from around 3% to above 20%. This is driven largely by the attributes of the consumer that influence the expected default costs (e.g. income, credit rating).
- **The level of security attached to the loan has a major impact on cost of financing and the availability of the product.** The credit risk component of the lending rate includes the cost of the expected loss associated with lending, as well as the cost of holding capital in case of losses that exceed the central estimate (i.e. the unexpected loss associated with the loan). The amount of capital that must be held is in part determined by regulation.

For unsecured lending the expected losses associated with default are higher and therefore interest rates tend to be higher than for secured loans. Top-up mortgages provide the lowest rate (outside of subsidised LA loans and limited borrowing under credit cards) with rates around 200 to 300 bps lower than our central estimates for the equivalent unsecured loan. However, availability is limited to homeowners with a significant LTV.

Availability of finance for cars under personal contract plans is relatively high as the loan can be secured against the vehicle, making PCPs available to non-homeowners, although rates are higher than for mortgages.

Table 1. Summary of interest rate drivers

Source of finance	Cost of funds	Transaction costs	Expected default costs
Unsecured personal loans		Vetting costs may differ between existing and new customers.	Unsecured Varies by consumer attributes, reflected in pricing
Credit cards	Cost of funds largely exogenous, though varies between providers depending on funding structure.	Evidence suggests that transaction costs for a credit card are lower than that for loans ⁶ .	Unsecured Varies by consumer attributes, reflected in pricing
Mortgages	Cost of funds similar across different finance types. The marginal cost of funds is currently around 2%.	Transaction costs may be substantial, though likely to be smaller for top-up mortgages	Secured against the property
Personal contract plans, leasing and hire purchase		There may be a cross-subsidy between the finance cost and purchase price of a product.	Secured against car
Retailer credit			Unsecured Varies by consumer attributes, reflected in pricing
Peer to peer lending	The cost of funds is determined by the opportunity cost to the peer-to-peer lender for lending their money. This is the saving rate that is offered by the	There may be lower transaction costs associated with peer to peer platforms arising from transaction cost savings from the online platform (this is discussed	Unsecured Varies by consumer attributes, reflected in pricing

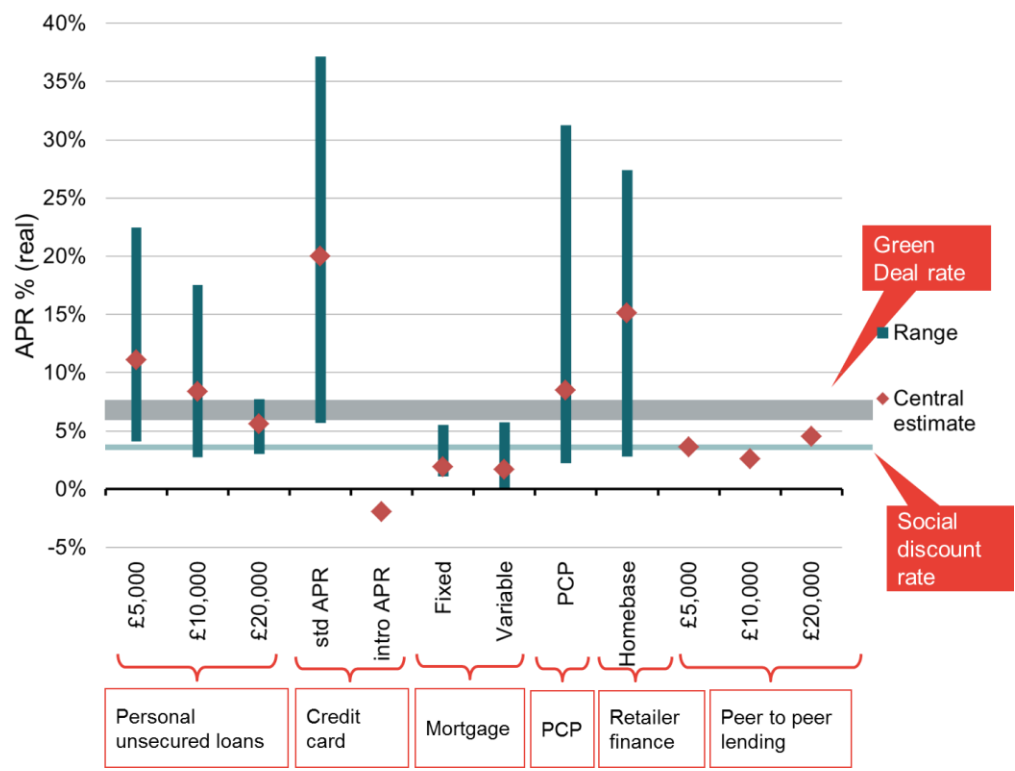
⁶ Brito et al, "Consumer Rationality and Credit Cards".

	bank. In Jan-2014 the saving rates for sight and time deposits is between 0.82-2.36%.	later).	
Local authority lending	Cost of capital for local authorities for a twenty year fund currently 4-5%.	We expect transaction costs to be high, given that the amount and type of loan available depends on in depth assessments of the individual circumstances of households.	Loans are typically secured against the property. Many loans are repayable on transfer of the property

Source: Frontier Economics

We summarise the interest rates in Figure 4 below. This should be read alongside Table 2 on uptake and availability of these products.

Figure 4. Interest rates by type of lending (real)



Source: Frontier Economics

Table 2. Summary of product interest rates, uptake and availability

Source of finance	Indicative real rates	Availability and limits
Unsecured personal loans	<ul style="list-style-type: none"> £5k: 11.1% £10k: 8.4% £20k: 5.6% 	<p>Widely available to customers without a poor credit score.</p> <p>Many providers do not provide loans for below one year.</p> <p>Loans not offered for more than 7 years or greater than £25k.</p>
Credit cards	<ul style="list-style-type: none"> Intr. APR⁷: -2.0% Intr. debt transfer fee: 13.3% Standard APR: 20.0% 	<p>Widely available to customers without a poor credit score.</p> <p>Some 'credit repair' products are available to customers with poor credit scores.</p> <p>Credit limits typically around £5k.</p> <p>Borrowing over the long term at low rates by balance transfers limited by credit rating impacts.</p>
Mortgages	<ul style="list-style-type: none"> Fixed: 1.9% Variable: 1.7% 	<p>Limited to property owners. 64% of UK dwellings are owner occupied.</p> <p>Consumers require a sufficient loan-to-value to borrow.</p>
Personal contract plans, leasing and hire purchase	<ul style="list-style-type: none"> 5-12% 	<p>Widely available for vehicle finance, as the vehicle can be used as security.</p> <p>For some customers, this can result in APRs lower than for unsecured loans.</p> <p>PCPs are used to finance 64% of new cars.</p>
Retailer credit	<ul style="list-style-type: none"> Similar to range for unsecured personal loans 	<p>Relatively small scale.</p> <p>Unsecured, resulting in relatively broad availability, dependent on credit status.</p>

⁷ APR stands for 'annual percentage rate.' This denotes the annual cost associated with the finance type over its term, including fees or charges.

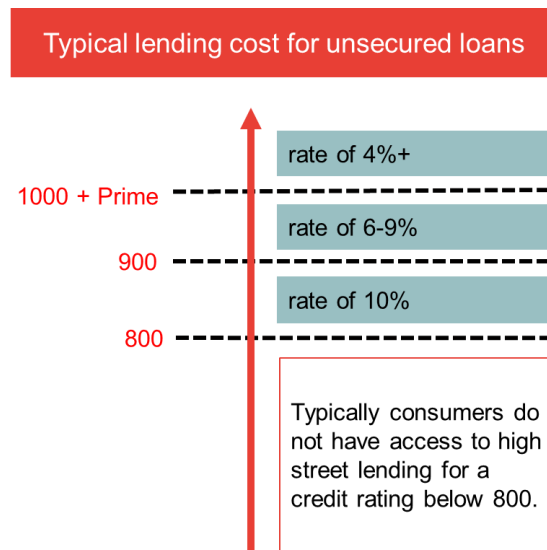
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Peer to peer lending	• £5k: 3.6%	Widely available to customers without a poor credit score.
	• £10k: 2.6%	
	• £20k: 4.5%	Small scale relative to high street finance options.
Local authority lending	Often offered interest free, with some grant provision.	Programmes at large scale may raise state aid issues.
		Small scale, reflecting limited availability.
		Loans are means tested.

Source: Frontier Economics

Across all finance products, consumer characteristics are an important driver of both pricing and availability. Credit scores are one of the main measures that lenders have available to them. We summarise the relationship between credit scores and interest rates in Figure 5 below. While this gives an indication of how interest rates vary by credit score, providers use different credit rating scales for different products. We discuss this further later in this section.

Figure 5. Indicative lending rates by credit score



Source: Frontier Economics

4.2 Product-by-product analysis

We investigated the products available for the type of borrowing we would expect for financing heat pumps and EVs⁸. To do this, we looked at four amounts of borrowing by consumers:

- ▣ £5,000;
- ▣ £10,000;
- ▣ £20,000; or
- ▣ £25,000.

For a given product, we focused on the amounts of borrowing most relevant to the product type, for example using the higher borrowing amounts for mortgages, and the lower amounts for credit card borrowing. We also specified other features, such as the borrowing term, based on what is most relevant for each type of product.

Interest rates are typically marketed in terms of nominal rates. To make comparisons of interest rates that are adjusted for future changes in price levels, we convert these into real interest rates.

To do this we use the long-term Consumer Price Index (CPI) rate of 2% and the Fisher equation⁹. We use CPI inflation because it is a standard, internationally-recognised measure of consumer price levels and the measure which is used for the Bank of England's inflation target. The long-term forecast and target value for CPI is 2%¹⁰.

In the absence of volume data on take up of loans at different interest rates, we use an average of the three highest and lowest representative rates available for each product to provide a central estimate. In practice, we might expect take up

⁸ A domestic air-source heat pump typically costs £7,000 to £14,000 (including installation) and ground source heat pumps cost £11,000 to £15,000. The range of costs for EVs is very wide but some of the most popular models are in the range £20,000 to £30,000 (including the costs of the battery which is sometimes leased separately reducing the upfront purchase price).

⁹ Real rate = (1+nominal rate)/(1+inflation rate) -1

¹⁰ The OBR publishes forecasts for CPI 5 years ahead. In their Economic and Fiscal Outlook (published 3rd December 2013) they report an average CPI inflation rate of 2.2% between 2013 and 2018. However, since these forecasts were published the CPI inflation rate has fallen below forecast to 1.9%. Therefore, a simple assumption of 2% is more appropriate than the available OBR forecast.

We note that for government spending the GDP deflator rate is typically used. The main difference between this and CPI is it includes non-consumer items (e.g investment goods, government services). We will consider using this measure of inflation when appraising intervention options in Task 3.

of the lower rates advertised to be higher. Therefore our central estimates are likely to be higher than that which a volume-weighted average would give.

We now analyse the types of finance provided by high street lenders. For each product, we set out our findings on the following drivers and outcomes:

- ▣ cost of funds;
- ▣ transaction costs;
- ▣ expected costs of default;
- ▣ rates; and
- ▣ uptake and availability.

4.2.1 Finance provided by high street lenders

We have looked into three different sources of finance typically provided by high street lenders:

- ▣ personal loans;
- ▣ credit cards; and
- ▣ mortgages (both top-up and re-mortgages).

High-street lenders are mainly retail banks and building societies. Their cost of funds is largely driven by exogenous factors (the risk-free rate and financial market conditions). There will be some variability in the cost of funds between lenders depending on their funding structure (e.g. the strength of their balance sheet).

Unsecured personal loans

We investigated unsecured personal loans in depth. We do not cover secured personal loans. This is because secured personal loans are typically secured against property, and similar to a second charge mortgage (i.e. an additional mortgage on a property that already has a separate mortgage). Consumers may choose this type of mortgage instead of a top-up mortgage or re-mortgage to avoid incurring fees on an existing mortgage, or to avoid paying a higher rate on the entire mortgage where the consumer's credit history has worsened since they took out their existing mortgage.

Table 3 outlines the main drivers of the cost of unsecured loan financing.

Table 3. Drivers of unsecured personal loan financing costs

Driver	Findings
Cost of funds	<ul style="list-style-type: none"> • Cost of funds is largely driven by exogenous factors (the risk-free rate and financial market conditions) • Cost of funds is a significant determinant of pricing of unsecured loans.¹¹ It is expected that there will be some variability between lenders depending on their funding structure (e.g. the strength of their balance sheet). • Based on banks' P&L accounts, we have estimated the average level of cost of funds for banks to fall in the range of 0.5-1.9%. The marginal cost of funds is currently around 2%. • Funds come from customer deposits and wholesale funds. Bank of England research suggests that the marginal funding cost is typically determined by the cost of long-term wholesale debt, as it is possible to raise a large amount of funds in a short period in this market.
Transaction costs	<ul style="list-style-type: none"> • The pricing of unsecured personal loans differs based on the size of the loan. This may be partially explained by lower transactions costs relative to the size of the loan. • Vetting costs may differ between existing and new customers.
Expected costs of default	<ul style="list-style-type: none"> • Loans are unsecured. Hence, we expect a bank's expected loss if the borrower defaults to be relatively large compared to secured lending. • The cost of expected loss of a loan is a significant determinant of the pricing for unsecured personal loans. It accounts for approximately 300 basis points for a typical £10,000 fixed-rate loan.¹² The capital charge to account for the <i>unexpected</i> loss of a loan was approximately 80 basis points in 2010.¹³ • The expected cost of default varies widely across consumers and loan types, meaning interest rates and charges also vary widely.

¹¹ <http://www.bankofengland.co.uk/publications/Documents/quarterlybulletin/qb100301.pdf>

¹² <http://www.bankofengland.co.uk/publications/Documents/quarterlybulletin/qb100301.pdf>

¹³ <http://www.bankofengland.co.uk/publications/Documents/quarterlybulletin/qb100301.pdf>

The average of the maximum and minimum representative APRs we found are shown in Table 4 below for five year loans, in both nominal and real terms. This indicates that the cost of borrowing decreases as the amount borrowed increases.

Table 4. Unsecured five year personal loans

Amount	Central estimate of representative APRs		Minimum and maximum real representative APRs	
	Nominal	Real	Min	Max
£5,000	13.4%	11.1%	4.1%	22.5%
£10,000	10.6%	8.4%	2.7%	17.5%
£20,000	7.7%	5.6%	3.0%	7.7%

Source: Moneyfacts, January 2014; Frontier Economics analysis

Note: In the absence of volume data on take up of loans at different interest rates, we use an average of the three highest and lowest representative rates available for each product to provide a central estimate. In practice, we might expect take up of the lower rates advertised to be higher.

We looked in depth at one loan term (five years), as the pricing reported is typically for a one to five or one to seven year term loan. Looking across the available terms, we found the following:

- one provider offered higher representative rates for longer term loans (e.g. for 4-5 years compared to 1-3 years), although the difference was small;
- many providers do not offer unsecured personal loans for a term longer than five years; and
- we did not find unsecured personal loans available at a term of over seven years and a loan size of over £25,000. Previously the £25,000 limit was due to the Consumer Credit Act (CCA) applying to loans up to £25,000, but this cap was removed in 2008.¹⁴

Note that the representative APRs listed by providers are unlikely to represent the true maximum and minimum prices consumers may face. A representative APR “must reflect at least 51% of business expected to result from the advertisement.”¹⁵ This has a number of implications:

¹⁴ See: <http://www.oft.gov.uk/about-the-oft/legal-powers/legal/cca/exempt/#.UyCVz7FFAy8>

¹⁵ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/31904/10-1072-consumer-credit-directive-quick-guide.pdf

- Not everyone obtains the representative rate. Some customers may be offered a different product, or may be declined the product at the representative rate; and
- Providers may be incentivised to report their lowest pricing on APRs, while large customer segments (49% or lower) could be offered higher rates. Alternatively, a provider could have a target group that they offer lower rates to relative to the APR.

Credit cards

Table 5 outlines the main drivers of the cost of credit card financing.

Table 5. Drivers of credit card financing costs

Driver	Findings
Cost of funds	<ul style="list-style-type: none"> • Cost of funds is largely driven by exogenous factors (the risk-free rate and financial market conditions) • There will be some variability between lenders depending on their funding structure (e.g. the strength of their balance sheet). • Based on analysis of banks' P&L accounts, we have estimated cost of funding to fall in the range of 0.5 - 1.9%. The marginal cost of funds is currently around 2%. • Funds come from customer deposits and wholesale debt markets.
Transaction costs	<ul style="list-style-type: none"> • Credit card user behaviour (e.g. how quickly they repay, how often they switch) has a major influence on the effective interest rate they pay.
Expected costs of default	<ul style="list-style-type: none"> • Credit cards are unsecured. Hence, credit cards' pricing accounts for a large cost associated with the expected loss of default. The expected cost of default varies widely across customers and loan types, meaning interest rates also vary widely.

Table 6 below shows introductory and standard APRs, as well as debt transfer fees. Where providers offered introductory rates, the nominal APRs were all zero, implying a real interest rate of -2%. These introductory rates were typically offered for the first three to six months, though some providers offered them for a longer period.

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Table 6. Introductory and standard credit card rates

Rate type	Central estimate of representative APRs		Minimum and maximum real rates	
	Nominal	Real	Min	Max
Introductory APR	0.0%	-2.0%	-2.0%	-2.0%
Introductory - debt transfer fee	15.5%	13.3%	-1.2%	32.3%
Standard APR	22.4%	20.0%	5.7%	37.2%

Source: Moneyfacts, January 2014; Frontier Economics analysis

While the table shows an average real debt transfer fee¹⁶ of 13.3%, fees were in practice concentrated around low rates (around 0% real). The higher debt transfer rates we found (up to 32.3%) may reflect products aimed at consumers with a poor credit history.

The total costs of borrowing via a credit card may also be increased or reduced through benefits or fees associated with the product. Benefits and fees that we observed included:

- **benefits related to credit card use**, e.g. cashback, supermarket loyalty points;
- **standalone benefits not related to borrowing behaviour**, e.g. savings on travel and insurance, lost luggage insurance; and
- **annual fees**, of £10 to £140 (the higher fee being an outlier relative to the products we observed), though most credit cards do not have fees.

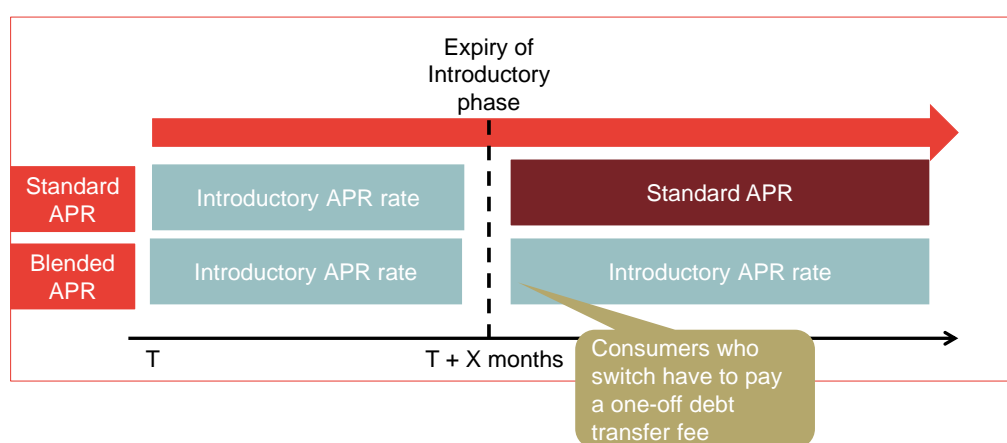
Credit card user behaviour (e.g. how often a consumer switches) has a major influence on the effective interest rate a consumer pays. Consumers can borrow to finance very cheaply (they would actually face a negative interest rate in real terms) on a credit card if they are able to repay in the near term and/or switch providers to take advantage of introductory APRs after each introductory rate

¹⁶ A debt transfer fee is an initial fee charged on the amount of existing debt transferred to the new credit card.

expires.¹⁷ This is illustrated in Figure 3 for two types of consumers, described below.

- In the standard APR case, the consumer pays the standard APR after the expiry of the introductory phase in its credit card.
- In the blended APR case, the consumer takes out the debt while using a zero introductory rate and then switches to a new provider on expiry of the offer. In this situation, the consumer will have to pay a one off debt transfer fee and then will benefit from an introductory APR.

Figure 6. Two types of consumer behaviour are observed in the short-run



Source: Frontier Economics

The short run cost to a consumer who switches will be very low, because the debt transfer fee is typically low. But, borrowers may not be able to repeatedly switch to low introductory rates over the long-term because:

- transferring a credit card balance from one card to another can affect one's credit rating (and hence also credit card limit); and
- the most competitive rates for balance transfer deals are usually only available to consumers with a good credit rating.

The short-term nature of credit card borrowing is reflected in current patterns of credit card use. An average of 63% of credit card borrowing incurs interest.¹⁸

¹⁷ As at March 2014, the longest introductory rate period available for debt transfer was 31 months, though the cheapest debt transfer fees were typically for introductory rate periods of around 15 months.

¹⁸ https://www.bba.org.uk/wp-content/uploads/2014/02/Credit_Card_Monthly_Release_Dec13.pdf

This implies that a substantial proportion of consumers use credit cards for borrowing within the interest free period (typically 50 – 56 days).

In addition, credit cards may not be suitable for financing heat pumps or EVs because they are typically designed for borrowing relatively small amounts over relatively short periods. At the end of 2012 (and calculated using active cards only) the average credit card borrowing limit was £5,100.¹⁹

Mortgages

We investigated two types of mortgage:

- top-up mortgages, where the homeowner extends the amount borrowed under their existing mortgage; and
- re-mortgages, where the homeowner takes out a completely new mortgage for a higher sum than the amount outstanding on the existing mortgage.

Our analysis focused on top-up mortgages in most detail. This is because interest rates are broadly similar for a re-mortgage compared to a top-up mortgage.

We analysed fixed and variable products available for the following baseline assumptions:

- a £20,000 advance to top-up an existing mortgage;
- loan to value (LTV) ratio of 75% after taking out the top-up; and
- a second time buyer.²⁰

To understand the drivers of the cost of borrowing, we also analysed two variations on the baseline assumption:

- a higher advance (of £25,000); and
- a lower LTV threshold requirement²¹ (of 60%).

We did not investigate LTV thresholds above 75%, as the availability of a further advance for higher LTVs may be limited.²² We did not analyse rates for

¹⁹ UK plastic cards, http://www.theukcardsassociation.org.uk/wm_documents/Plastic%20Cards%202013%20sale%20doc.pdf

²⁰ This assumption is in line with the starting LTV before the top-up mortgage, assuming the borrower's property is in line with the average dwelling price in the UK. See further discussion of borrower characteristics later in this section.

²¹ For each provider, we noted the mortgage rates with a LTV ratio of 60% and advance level of £20,000. In the case that providers did not offer *any* mortgage with a LTV ratio of 60%, we used the rate available at the next highest LTV, under the advance constraint. We are assuming that the rate that would apply to borrowers of a higher than 60% LTV value applies to borrowers of a 60% LTV.

borrowing £5,000 or £10,000, as borrowing via a mortgage typically incurs set up costs that could make it uncompetitive with unsecured loans when borrowing smaller amounts. Providers also set minimum advances, typically at either £20,000 or £25,000. This means that top-up and re-mortgages are most relevant to financing higher cost LCTs.

Table 7 outlines the main drivers of the cost of mortgage financing.

²² For example, Halifax states that borrowers can borrow up to 80% of the value of their home, taking into account their existing amount of borrowing secured on the property. See: http://www.halifax.co.uk/mortgages/furtheradvance_questions.asp.

Table 7. Drivers of mortgage financing costs

Drivers	Findings
Cost of funds	<ul style="list-style-type: none"> Cost of funds is largely driven by exogenous factors (the risk-free rate and financial market conditions) There will be some variability between lenders depending on their funding structure (e.g. the strength of their balance sheet). Funding cost is the main driver of lending rates. Based on analysis of seven banks' P&L accounts, we have estimated the average funding cost to be between 0.5 - 1.9%. Decomposing a typical rate for secured lending (i.e. 75% LTV mortgage) shows that the marginal funding cost is approximately 2%. Funds come from customers' deposits and wholesale debt markets.
Transaction costs	<ul style="list-style-type: none"> Transaction costs have a big impact on lending rates. According to research by the Bank of England, for a 75% LTV tracker mortgage, transaction costs could account for approximately half the lending rate.²³ We expect that the larger the size of the loan, the lesser the impact of transaction costs on the interest rates.
Expected costs of default	<ul style="list-style-type: none"> Mortgages are secured against the property reducing expected default costs. Hence, the expected loss of default has a small impact on mortgages rates. Accordingly, mortgages with a lower LTV have a lower rate. A lower LTV increases the collateral value to the provider and hence, reduces the expected default cost.

The rates we found are shown in Table 8. We used the same method as above to estimate a central rate, averaging the three highest and lowest rates available for each product.

As shown in Table 8, we found that rates for our baseline scenario were broadly similar for a five year fixed product relative to variable products. We would expect to see higher rates for fixed products, reflecting a risk premium for providers taking base rate risk, and the current expectation that variable rates will rise over the period of the product as the base rate rises. The currently small

²³ <http://www.bankofengland.co.uk/publications/Documents/quarterlybulletin/qb100301.pdf>

differential could be due to providers expecting only a small change in base rates over the term for fixed rate mortgages, or due to the higher variable rates (which are similar to the typical interest rates that are charged after a fixed rate term has ended) having lower take up, so that in practice the differential between fixed and variable rates in the market is smaller than suggested by the maximum and minimum interest rates we observe. Alternatively, margins may differ between fixed and variable products, driven for example by less ‘switchy’ customers choosing variable rates.

Table 8. Mortgage rates

Scenario	Central estimate of representative APRs		Minimum and maximum real rates	
	Nominal	Real	Min	Max
£20k; 75% LTV; Fixed	3.9%	1.9%	1.1%	3.4%
£20k; 75% LTV; Variable	3.7%	1.7%	0.0%	3.6%
£25k; 75% LTV; Fixed	4.5%	2.4%	0.8%	3.9%
£25k; 75% LTV Variable	3.8%	1.7%	-0.1%	3.9%
£20k; 60% LTV; Fixed	3.8%	1.7%	0.9%	3.4%
£20k; 60% LTV; Variable	3.4%	1.4%	-0.5%	3.2%

Source: Moneyfacts, January 2014; Frontier Economics analysis

Note: ‘F’ denotes fixed rate mortgages, while ‘V’ denotes variable rate mortgages.

Our analysis of alternative scenarios suggests the following on the drivers of mortgage interest rates.

- We found that rates for a higher advance (of £25,000) were higher.
- The overall spread of rates for higher advances was also greater.

In practice, the cost of borrowing using a top-up mortgage is likely to be slightly higher than indicated by the headline interest rates. This is because mortgages

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incur additional costs which affect the overall cost of borrowing. We observed fees that ranged from £0 to around £1,500.

We provide an indication of the fee-adjusted interest rates for a £20,000 advance, 75% LTV top-up mortgage in Table 9 below. This assumes that any fee is added onto the total advance, using the average fee found for the corresponding mortgage type. This increases the rates, but still leaves them below typical rates for unsecured personal loans.

Table 9. Fee adjusted rates

	Nominal	Real
20k; 75% LTV; Fixed	4.1%	1.9%
20k; 75% LTV; Variable	3.8%	1.7%

Source: Frontier Economics

The box below discusses longer term mortgage products.

Long term mortgage products

In the market as a whole, we found only two examples of providers offering fixed rate mortgages for a ten year term. This differs from the mortgage products available outside the UK.

In the United States, Denmark and France the dominant form of mortgage is 15-40 years fixed rate. In the UK fixed rates are not typically provided above 5 years. Part of the explanation for this is that outside the UK early repayment charges are less common meaning consumers have less concern about being 'locked-in' to an uncompetitive rate.

In the US the current average interest rate is 4.3% for a 30-year fixed rate mortgage and 3.4% for a 15-year fixed rate²⁴.

There have been attempts in the past to launch longer-term mortgage products in the UK, for example with Nationwide and Halifax launching 25 year fixed products in 2007, and Manchester Building Society offering a 25 year fixed product in 2012. However, demand for these products has been low, in part due to high early repayment fees, leading to their withdrawal.²⁵ We return to this in the next section in relation to the long-term fixed interest rates offered under the Green Deal.

Reasons for differences in take up of long-term mortgage product include:

- ▣ **Government-backing** of long-term finance products;
- ▣ **tax regimes**, for example the price of the mortgage may be less important for consumers if mortgage interest payments are tax deductible, which could in turn drive demand for long-term products;
- ▣ **borrowing culture**, where consumers prefer the certainty of a long-term fixed rate.

Currently 64% of UK dwellings are owner occupied.²⁶ Of these, around half are owned outright and half have a mortgage.²⁷ Borrowing through a top-up

²⁴ <http://www.bloomberg.com/news/2014-02-20/u-s-30-year-mortgage-rates-increase-for-a-second-week.html>

²⁵ Daily Telegraph, 2014, Why Britons can't have 40-year fixed rate mortgages, available at: <http://www.telegraph.co.uk/finance/personalfinance/borrowing/mortgages/10594494/Why-Britons-cant-have-40-year-fixed-rate-mortgages.html>

²⁶ DCLG, Table 101: Dwelling stock: by tenure, United Kingdom

²⁷ DCLG and ONS, 2013, English Housing Survey, Households 2011-12, Annual Report on England's households, 2011-12, available at:

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mortgage or re-mortgage to fund LCT investments is therefore not available to the whole UK population.

Finance can also be secured against the 36% of homes which are not owner-occupied (whether rented through a private landlord, housing association or local authority). However, principal-agent problems discourage private landlords from financing energy efficiency investments when they are not the occupier. This is discussed later, and could limit the use of secured finance such as top-up mortgages for landlords. Housing associations and local authorities are likely to have high access ECO funding, limiting their need to borrow to fund energy efficiency investments.

The median income of borrowers with a mortgage was £44,329 in 2012.²⁸ This is higher than median income in the UK, and supports that availability and use of this type of finance is concentrated amongst higher income households, which is illustrated by Table 10.

Table 10. Incomes of mortgage borrowers, 2012

Under £20,000	£20,000 to £24,999	£25,000 to £29,999	£30,000 to £39,999	£40,000 to £49,999	£50,000 and over
7%	7%	9%	19%	16%	42%

Source: ONS, 2014, Table 21 Housing market: distribution of borrowers' incomes, United Kingdom, from 1990

In 2013, the average outstanding mortgage value was £87,000, and 81% of consumers had a LTV of 75% or lower.²⁹ With an average property price of £250,000,³⁰ this suggests that on average, those with a mortgage are likely to have the headroom to finance a £10,000 LCT investment using a top-up mortgage. Across all tenure types we estimate just under 60% of households are owner-occupied and have an outstanding mortgage with a LTV of 75% or lower (including properties owned outright without a mortgage).

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/212496/EHS_HOUSEHOLDS_REPORT_2011-12.pdf.

²⁸ ONS, 2014, Table 21 Housing market: distribution of borrowers' incomes, United Kingdom, from 1990 1, 2, 4 (DCLG table 538)

²⁹ Bank of England, 2013, The financial position of British households: evidence from the 2013 NMG Consulting survey, available at: <http://www.bankofengland.co.uk/publications/Documents/quarterlybulletin/2013/qb130406.pdf>.

³⁰ ONS, December 2013 figure

However, availability is highly variable depending on the type of buyer. Table 11 below shows the average dwelling price, advance, and income for first time buyers relative to former owner occupiers.

We estimate that (at the time of buying) first time buyers would typically not be able to finance the same investment using a top-up mortgage, based on their average property values and LTV ratios and assuming a maximum 75% LTV after the top-up mortgage has been taken out. A much greater number of owners could use a top-up mortgage with a 90% LTV after the mortgage has been taken out. But this would be at higher interest rates and may not be allowed by the lender in many cases.

Former owner occupiers buying a property typically have a lower LTV, and we estimated that, at the average property value for these buyers, a top-up mortgage would be available at the time of buying, again assuming a 75% LTV ceiling after the top-up mortgage has been taken out.

Table 11. Average UK mortgage advances and borrower characteristics, 2012

Buyer type	Average dwelling price		Average advance		Average recorded income of borrowers	Average LTV
First time buyers	£	181,667	£	133,809	£ 44,766	74%
Former owner occupiers	£	283,246	£	170,226	£ 64,277	60%
All dwellings	£	246,032	£	156,911	£ 57,121	64%

Source: ONS, 2014, Table 28 Housing market: simple average house prices, mortgage advances and incomes of borrowers, by new/other dwellings, type of buyer and region, United Kingdom, from 1986

4.2.2 Finance provided by retailers

We have looked into four different sources of finance provided by retailers:

- **personal contract plans**, where a regular payment is made for the product and an option to buy the product at the end of the contract period is provided;
- **hire purchase**, where the product is purchased via a loan from the retailer;
- **leasing**, where the product is rented but there is no option to purchase at the end of the contract; and

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- **retailer credit**, which is similar to a personal loan, but for a specific product. It is distinct from the options discussed above as this type of credit is typically unsecured.

While leasing is not a form of personal finance, PCPs, hire purchase and retailer credit involve finance being provided to the consumer, and are therefore considered alongside other finance types in this report. Our focus is on credit available for new cars, home improvements and large consumer durable goods.

Data from the Finance and Leasing Association (FLA) shows that car finance is a substantial proportion of the consumer finance market, at 30% of total FLA consumer finance lending in 2012.³¹ FLA figures from 2013 show that 788,243 new cars were bought on finance through dealerships in the year to November 2013. The total value of advances for these cars was £11,842 million.³² This compares to 2,044,609 new cars registered.³³

Personal contract plans are currently the most widely used means of financing new cars, with 64% of new cars currently bought under a PCP.³⁴ Hire purchase and leasing are less frequently used in the UK for domestic purchase of cars. This is because personal contract plans (PCPs) are similar, but with the benefit of being able to decide towards the end of the contract whether to purchase the vehicle or return it at the end of the contract period.

Data from the FLA indicates that approximately 20% of customers using PCPs choose to purchase the car at the end of the contract period.³⁵ The remainder return the car, with the majority of those returning the car trading in for a new car on a PCP. Leasing is more frequently used by business customers who rent a fleet of cars. For this reason we focus on PCPs for car financing, also looking at hire purchase for comparison.

We focus on unsecured retailer credit for financing home improvements or large durable goods. This is because unsecured retailer credit is more likely to be offered and used for these types of purchase than for cars.

³¹ See: <http://www.fla.org.uk/research/news/Nov2012ConsumerFinanceStats>

³² See: <http://www.fla.org.uk/media/ModestgrowthnewcarfinanceNov>

³³ Figure for 2012 as this is the latest available. SMMT, 2013, the Society of Motor Manufacturers and Traders motor industry facts 2013 <http://www.smmt.co.uk/wp-content/uploads/sites/2/SMMT-2013-Motor-Industry-Facts-guide.pdf>.

³⁴ <http://www.economist.com/news/britain/21595046-increasingly-popular-way-finance-car-buying-has-helped-boost-sales-fast-lane/>

³⁵ Data from the FLA quoted in 'This is Money, 2012, Is Britain becoming a nation of car renters? More opt to 'rent' new motors on finance that they never actually own, available at: <http://www.thisismoney.co.uk/money/cars/article-2192080/Increasing-number-rent-motor-buy-it.html>.

Pricing data is less readily available for retailer finance than for finance provided by high street banks. We have therefore relied on price comparison sites and retailer sites for our estimates.

Personal contract plans

Table 12 outlines the main drivers of the cost of PCP financing.

Table 12. Drivers of personal contract plan financing costs

Driver	Findings
Cost of funds	<ul style="list-style-type: none"> Providers of PCPs are typically car retailers, rather than banks or building societies (although sometimes these are underwritten by banking groups). Cost of funds is largely driven by exogenous factors (the risk-free rate and financial market conditions). We expect the cost of funds to be in line with that for high street lenders (currently around 2% for new lending). There will be some variability between lenders depending on their funding structure (e.g. the strength of their balance sheet), and due to the impact of policies such as Funding for Lending. The source of funds is customer deposits and wholesale funds for high street banks providing finance (and may also include sources such as retained earnings for car retailers providing finance directly).
Transaction costs	<ul style="list-style-type: none"> There may be a cross-subsidy between the finance cost and purchase price of a product.
Expected costs of default	<ul style="list-style-type: none"> PCPs are secured against the vehicle meaning these financing options can be more widely available/lower cost than unsecured loans. The security (the vehicle and deposit payments) ensures low expected costs of default relative to unsecured lending. Expected costs of default are, however, higher than for mortgages; this is because the value of the secured asset depreciates over the term of the loan. Expected costs of default are an important driver of differences in rates, shown by wide variation in APRs depending on the borrower's credit score.

Current typical PCP APRs are between 7% and 14% in nominal terms,³⁶ i.e. 5% to 12% in real terms. We would expect PCP rates to rise as base rates rise, potentially to around 6.5%-13.5% in real terms by 2020 (see Annexe 1). Using price comparison site data, we found a wider variation in PCP pricing depending on a borrower's credit score. For example, we found nominal APRs averaging

³⁶ <http://www.which.co.uk/cars/choosing-a-car/buying-a-car/car-finance/dealer-car-finance-options/>

5.8% for customers with an excellent credit score, compared to 28.1% for customers with a poor credit score.³⁷ The range of prices available for customers at a given credit score was relatively limited, particularly at the highest and lowest credit scores.

Costs of funds and transaction costs for PCP lending are likely to be similar to those for other forms of lending such as mortgage products and credit cards. Costs of default are low relative to unsecured lending as PCPs are secured against the car, but higher than for mortgages, because the value of the secured asset depreciates over the term of the loan.

PCPs typically include an upfront deposit of around 10% of the retail price of the car. There are also constraints on the use of the vehicle when using this type of finance. Agreements specify the maximum mileage of the car each year, with additional payments if the limit is exceeded. Consumers must not modify the car, and must keep it in a good enough condition to enable trade in at the end of the contract.

When assessing these rates it is important to recognise that retailers often cross-subsidise between the finance cost and purchase price of a product. This is not something for which data is readily available.

Consumers may choose PCPs over potentially cheaper top-up mortgages due to the following:

- lower hassle costs associated with using a PCP (e.g. as setting up a top-up mortgage may involve administration costs, while using a PCP is likely to have little incremental impact on hassle costs as the transaction to buy the car is still required);
- low awareness of the ability to use additional mortgage borrowing to finance a car; or
- a PCP includes the option to not buy the vehicle at the end of the contract, whereas using a top-up mortgage to finance the vehicle requires that it is purchased.

PCPs are likely to be well-suited to EVs. However, we found limited information on interest rates for EVs.³⁸

³⁷ Data from: <http://www.money.co.uk/loans/car-loans.htm>, rates collected on a single date. Four providers quoted different APRs depending on the credit score of the borrower.

³⁸ This is because not all car manufacturers advertise rates for specific vehicles, comparison sites often list rates in general terms (i.e. not for a specific model), some comparison sites list rates in terms of the cost per month for a specific vehicle without the information required to impute the interest rate, and many EVs are not included in PCP price comparison sites due to the small market for them.

At present, the Nissan Leaf represents almost three quarters of EVs sold in the UK's small market.³⁹ Nissan offers PCPs for its EVs that either lease the battery separately from the PCP for the EV, or include the battery in the PCP.⁴⁰ Leasing allows the capital cost of the battery to be spread over a longer time frame than through a PCP, and addresses the issue of consumer uncertainty over battery performance by transferring the risk of the battery failing to the finance provider.⁴¹

In the UK, Renault also leases the EV battery separately from the PCP for the EV itself, while other manufacturers offer PCPs for the entire EV. Interest rates on EV PCPs for the vehicle only (i.e. excluding the battery) are comparable to those for conventional vehicles (i.e. 5-12% real). However, it is not clear whether this holds across the market for EV finance, due to limited data. Good data are not currently available for the interest rates offered for a PCP on the entire EV (including battery), or for battery leasing arrangements. PCP rates for EVs could potentially be higher than for conventional cars, due to technology uncertainty.

It is reasonable to assume that the cost of funds and transaction costs for an EV PCP are comparable to those for a conventional vehicle PCP. In principle, the cost of default for a PCP on the entire EV, or for a lease on an EV battery should also be comparable. However, depreciation rates for EVs and EV batteries are currently faster than those for standard cars.⁴² Such accelerated depreciation would be expected to increase the cost of default over that of a conventional vehicle PCP, as the asset against which the finance is secured would have a lower value on recovery.

It is likely that the accelerated depreciation observed in the market today is due to the battery lifetimes that can be shorter than for conventional vehicles and the fact that the EV market is immature with consumers generally less comfortable

³⁹ 2,700 plug-in electric vehicles were registered in the year to May 2014, of which 1,897 were pure EVs. Source: SMMT

⁴⁰ As there currently are only a few hundred sales of EVs outside of Nissan there is limited information on alternative emerging financing models.

⁴¹ Element Energy for The Committee on Climate Change, 2013, Pathways to high penetration of electric vehicles, final report, available at: http://www.theccc.org.uk/wp-content/uploads/2013/12/CCC-EV-pathways_FINAL-REPORT_17-12-13-Final.pdf.

⁴² A study by CAP Automotive found EVs were worth 20.2% of their list price after three years (compared with around 45% for conventional vehicles). The National Automobile Dealers Association (NADA) found an average depreciation of 31.5% per year for EVs and of 12.4% for Internal Combustion Engine (ICE) in the US. More rapid depreciation of EVs relative to conventional vehicles may be due to: (i) battery life – a typical EV battery lasts 8 years and costs £8,000 to replace; (ii) the fact that these are new technologies and the used electric car market is immature; and (iii) the impact of grants for new EVs, which may inflate prices in the new EV market, while not affecting the prices of used EVs.

with the technology. As battery technology improves⁴³ and familiarity with the technology reduces any misperception of the risk of battery failure, it is expected that batteries would depreciate at a rate comparable to conventional vehicles. This would bring the cost of default – and therefore the cost of capital – for a PCP or lease on an EV or battery in line with that for a conventional car, i.e. 6.5%-13.5% in 2020.

It is also possible that, once the technical performance of EV batteries is comparable to lifetimes for standard vehicles and there is increased understanding of technology risks, EV batteries could depreciate more slowly than conventional vehicles. Conventional vehicles depreciate sharply as soon as consumers drive them ‘off-the-lot’. There are a number of reasons for this, for example adverse selection or retailer margins, some of which are expected to be similar across EVs and conventional cars. However, a reason for high depreciation which may differ across EVs and conventional cars is consumer preference for something which is ‘new’. It is possible that the battery element of EVs may be less affected by this premium for being ‘new’, so that the EV battery could depreciate at a lower rate than conventional vehicles, resulting in the overall EV (including battery) having lower depreciation than a conventional vehicle. This could lower the cost of default – and therefore the cost of capital – for a PCP or lease on an electric vehicle or battery below that for a conventional car, though this extent of this impact would depend on the relative importance of this compared to other factors determining depreciation. . .

Hire purchase

Where it is used, hire purchase includes an upfront deposit, and the contract is secured against the car. Monthly payments are typically larger than for a PCP, as payment for the purchase of the vehicle is spread across the agreement, rather than as a one off payment at the end of the contract. Estimates of APRs are between 7% and 13% in nominal figures⁴⁴ (i.e. 5-11% in real terms).

Unsecured retailer credit

We would expect drivers and rates to be similar to those for unsecured personal loans, discussed above. We found examples of retailer credit provided for purchases for up to five years. We provide some illustrative examples of rates and terms in Table 13 below. These indicate that rates are available with a similar range to those found for unsecured personal loans.

⁴³ By 2020, EV battery lifetimes are expected to be closer to the lifetimes of standard vehicles. See Element Energy for The Committee on Climate Change, 2012, Cost and performance of EV batteries, available at: http://www.element-energy.co.uk/wordpress/wp-content/uploads/2012/06/CCC-battery-cost_-Element-Energy-report_March2012_Finalbis.pdf.

⁴⁴ <http://www.which.co.uk/cars/choosing-a-car/buying-a-car/car-finance/dealer-car-finance-options/>

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Table 13. Example terms and pricing for retailer finance

Provider	Loan characteristics		Example APRs	
	Amount	Term (years)	Nominal	Real
Homebase	£1,000+	5	29.9%	27.4%
Homebase	£1,000+	3-5	4.9%	2.8%
Currys	£250-£2,000	2-3	19.9%	17.5%

Source: Moneyfacts, January 2014; Frontier Economics analysis

Retailer credit may be appropriate for some low-carbon technologies but the lack of security on the product may limit its availability for more expensive technologies such as EVs. Retailer credit products are available for heat pumps where they can be financed via loans from installers. For example, Hybrid Heating Systems offer loans over periods of up to 10 years for air-source heat pumps. The typical rate they quote is 9.9%.

4.2.3 Alternative sources of finance

Peer to peer lending

Peer to peer lending is a relatively new source of consumer finance. While the market for peer to peer lending is currently small, it has grown in recent years.

Table 14 outlines the main drivers of the cost of peer to peer financing.

Table 14. Peer-to-peer lending

Drivers and outcomes	Findings
Cost of funds	<ul style="list-style-type: none"> • The cost of funds is determined by the saving rate offered by banks. This rate ranges from 0.82-2.36⁴⁵ depending on whether peers hold a sight or a time deposit. • Funds are raised entirely from customers' deposits.
Transaction costs	<ul style="list-style-type: none"> • There are some suggestions that peer to peer lending transaction costs are lower than retail banks providing unsecured loans.⁴⁶ It seems that the lower rates offered by P2P lending platforms are achieved through the lower transaction costs attributed to the online platform, rather than some specific peer to peer lending attributes. Hence, we would expect online banking to be able to offer similar rates.⁴⁷
Expected costs of default	<ul style="list-style-type: none"> • Loans are unsecured. But, there is evidence that the increased peer pressure from peer-to-peer lending reduces the default rates.⁴⁸ It is unclear how large this effect would be as the lending platforms scale up. • To protect peer to peer lenders against default, peer to peer sites typically charge a fee for borrowers which is put into a fund that makes payments to lenders in the event of default. This fee is reflected in interest rates.

There is limited data available on pricing of peer to peer loans. To provide an indication of possible rates, we collected APRs listed by Zopa and RateSetter for different sizes of five year loan. The data, shown in Table 15, indicates that the lowest rates are offered for mid-sized loans. These rates include the cost of fees

⁴⁵ This is the range of the interest rates offered by the average UK bank on sight and time deposits on January 2014. The lower end of the range, is the interest rate paid on outstanding sight deposits, while the high end of the range represent the interest rate paid on outstanding time deposits. (source: Bank of England.)

⁴⁶ Paul Slattery, 2013, "Square Pegs in a Round Hole: SEC Regulation of Online Peer-to-Peer lending and the CFPB Alternative"

⁴⁷ Ashta et al, 2009, "Does Social Lending incorporate Social Technologies? The use of Web 2.0 Technologies in online P2P lending" https://dipot.ulb.ac.be/dspace/bitstream/2013/53996/1/RePEc_sol_wpaper_09-056.pdf

⁴⁸ Deutsche Bank Research, "Online P2P lending nibbles at banks' loan business", http://www.dbresearch.de/PROD/DBR_INTERNET_DE-PROD/PROD0000000000213372.PDF

(e.g. administration fees charged to set up the loan, fees to protect lenders against missed payments).

The rates are comparable to the lower range of prices for unsecured personal loans from conventional providers. This could reflect that take up unsecured personal loans is concentrated at the lower end of the spectrum of prices in the market, as discussed above. When compared just with the lowest unsecured loans available, peer to peer loans appear marginally cheaper. This may be because of lower transaction costs.⁴⁹

The usual caveat to APRs applies, with APRs unlikely to represent the true maximum and minimum prices consumers face.

Table 15. Five year to peer loans

Amount	Average of representative rates	
	Nominal	Real
£5,000	5.7%	3.6%
£10,000	4.7%	2.6%
£20,000	6.6%	4.5%

Source: Based on APRs offered by Zopa and RateSetter

Uptake of peer to peer loans is currently small but growing rapidly. In 2013 around £300m of consumer loans were made via peer to peer lending.⁵⁰ It has been estimated that, if the industry continued to grow at current rates, it would be worth £1 billion by 2016.⁵¹

The largest peer to peer lender is Zopa, which has lent around £500m since starting in 2005, and lent £190m last year. It has 50,000 active savers and 80,000 borrowers. RateSetter, another peer to peer provider, has lent £180m since starting in 2009, and is currently lending at a rate of over £100m per year.

⁴⁹ A paper by Paul Slattery at Yale Journal on Regulation argues peer to peer lending has lower transaction costs than any other traditional person to person lending because: (i) they reduce search costs by creating instantaneously searchable databases of borrowers and make it cheaper to evaluate counterparty risk (ii) they provide a standard contract making negotiations unnecessary (so the fees platforms charge to find, analyse, execute and enforce P2P loans are trivial) and (iii) the platforms dispense with the need for physical locations, and vast underwriting staffs. Slattery, P (2013) *Square Pegs in a Round Hole: SEC Regulation of Online Peer-to-Peer Lending and the CFPB Alternative*

⁵⁰ <http://www.p2pfinanceassociation.org.uk/>

⁵¹ Financial Times, Elaine Moore, July 15, 2013, Digital finance lending set to hit £1bn, available at: <http://www.ft.com/cms/s/0/28bf596c-cafb-11e2-bfdb-00144feabdc0.html#axzz30GgONcxs>.

Some peer to peer lender platforms introduce lending limits to reduce the credit risk for their lenders. For instance, at Zopa a lender faces a maximum lending limit of £20,000 and is time constrained between 2-5 years. RateSetter has no lending limit and the time frame one can lend for is between 2 months and 5 years. The size and terms of peer-to-peer loans suggests that peer to peer lending is potentially applicable for financing a wide range of low carbon technologies. However, peer-to-peer lending is currently small scale, meaning that this type of finance would be unable to meet borrowing needs relative to projected LCT and energy efficiency uptake required to meet carbon targets.

Local authority lending for home improvements

Under the Regulatory Reform Order (RRO), local authorities can offer grants and loans to households for home improvements. This must be targeted at vulnerable households⁵² living in private sector housing (i.e. housing not owned by the local authority). We are interested in funding provided by local authorities as it may represent the type of finance available to consumers typically unable to access conventional financial services products. Given that the Green Deal offers loans to households that might not be eligible for conventional loans, this provides a useful comparator. It should also be noted that some local authorities offer Green Deal finance alongside their home improvement financing described below.

To investigate the finance offered by local authorities for home improvements, we have drawn on consultations and Private Sector Housing Renewal Policies for different local authorities, both of which are a requirement for authorities offering assistance under the RRO. Our research is not a complete picture of local authority programmes; however we have provided examples to illustrate the range of approaches followed by local authorities.

The drivers of the cost of borrowing from local authorities are substantially different from the other finance sources currently available on the market. Table 16 below sets out our findings on the main drivers for local authority home improvement lending.

⁵² Vulnerable households are those where members living in the household are either i. in receipt of a means tested or long term disability benefit; or ii. Aged 70 years or over; or iii. A child aged less than 6 years.

Table 16. Local authority lending for home improvements

Drivers and outcomes	Examples
Cost of funds	<ul style="list-style-type: none"> • The cost of funds for local authorities may differ from the cost of funds for private sector providers of finance. • A recent paper estimated that the cost of capital for local authorities for a twenty year fund is currently 4-5%.⁵³ This is based on funds being raised from reserves and borrowing from central government through the Public Works Loan Board (PWLb).
Transaction costs	<ul style="list-style-type: none"> • A range of loan sizes are provided. We found examples of loans and grants provided up to £25,000.⁵⁴
Expected costs of default	<ul style="list-style-type: none"> • The examples of local authority funding that we found were typically secured against the property. • A number of loans were repayable on transfer of the property.⁵⁵

The interest rate for loans is typically zero implying a substantial subsidy (paid for from Local Authority revenues) is included to cover the difference between this and the local authorities costs of funds (around 4-5%), transaction costs and expected default costs.

Loans and grants are means tested, e.g. based on income and savings of households and funding must be for home improvements. These are typically to ensure that homes meet the Decent Homes Standard (e.g. where there are hazards such as excess heat and excess cold) and to reduce hazards.

Scaling up the scope of lending (e.g. beyond vulnerable households to purchasers of low-carbon technologies more generally) may result in state aid concerns, though loans to private consumers are not covered by state aid restrictions.

⁵³ UK Green Building Council, 2014, Green Deal Finance, Examining the Green Deal interest rate as a barrier to take up

⁵⁴ North Hertfordshire District Council offers discretionary renovation grants and loans (up to £25,000) as well as discretionary home repair assistance (up to £5,000). See: North Hertfordshire District Council Private Sector Housing Renewal Policy, Amended July 2011.

⁵⁵ For example the Stroud District Council Healthy Homes Loan or the Home Appreciation Loan offered by councils in Yorkshire and the Humber via 'Homes and Loans' (<https://www.homesandloans.org.uk/home-appreciation-loan.html>).

We did however find evidence on publicly provided finance available specifically for heat pumps in Scotland, where interest-free loans of up to £10,000 are available from the Scottish Government to cover up to 75% of the total cost of heat pump installation. These are allocated on a first-come first-served to owner-occupiers and self-builders who will use the property as their principle, private residence. The loans have a maximum loan repayment period of 12 years. The scheme is relatively small in scale. Between its launch in April 2011 and April 2014, 1,188 loans were made. This covers all loans made under the scheme, which also lends for biomass heating and micro-generation.⁵⁶

Salary sacrifice schemes

Salary sacrifice is available as a financing option for a wide range of employee benefits. The main benefit to employees is often through tax savings when payments can be made out of gross salary.

The expected default rate may also be low, as employees have limited scope to default on repayment. In some case loans can be interest free (e.g. season ticket loans) with financing cost effectively paid by the employer.

There are few examples of salary sacrifice being used to fund EVs. For example, low emission vehicles are offered to employees of Aston University and provided by Tusker, a company that runs a range of salary sacrifice car schemes for employers.⁵⁷

Separately to salary sacrifice schemes, many cars are provided via employer car schemes. The difference in costs for an employer compared to an individual buying a vehicle on finance is not clear, and depends on the business model of the finance provider. We would expect that the expected default costs for employer car schemes could be lower than the costs for individuals, due to lower default rates.

The availability of salary sacrifice or other employee car schemes may be limited. This is because cars are an employee benefit, and may not be provided by employers as they can be expensive relative to the overall remuneration for the employee's role, or because they are not relevant to the job.

To the extent that employee car schemes are more concentrated amongst those with higher incomes, and these people are likely to have higher credit scores, this means that the interest rates associated with such schemes should be compared to the PCP rates available for individuals with higher credit scores. In 2012, around 20,000 new cars were funded through salary sacrifice and 320,000 were

⁵⁶ The Scottish Government, 17/04/2014, £4 million boost for home energy efficiency, available at: <http://news.scotland.gov.uk/News/-4-million-boost-for-home-energy-efficiency-b9b.aspx>.

⁵⁷ See: <https://www.ss4c.com/> and <http://www1.aston.ac.uk/staff/hr/benefits/flexible-benefits-scheme/low-emission-car-lease-scheme/>

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financed through company car schemes. The total market for employee car schemes included approximately 390,000 cars, which compares to the market for fleet and business users which consisted of 360,000 cars, and the private market (non-business) market which consisted of 929,000 cars.⁵⁸

4.3 Explaining the drivers of private financing costs

The section explores the drivers of private financing costs more generally, looking across the product types.

4.3.1 Regulatory and market context

We found a wide range of potential providers for all the products we investigated. Given this, we would expect that the market is relatively competitive for all products. Moreover, there is substantial scope for competition between products. Consequently, differences in margins are unlikely to be a major driver of differences in interest rates.

4.3.2 Cost of funds

The cost of funds is largely a function of the risk-free rate and general financial market conditions. There is some variation across companies depending on the strength of their balance sheets.

There are two interventions that have distorted the financial markets and reduced the cost of funds for household finance in recent years.

- **Expansionary monetary policy.** Following the credit crunch, the Bank of England (and other central banks) adopted policies of expansionary monetary policy. Bank of England base rates are currently only 0.5% compared to rates of at least 4% seen in the decade prior to the 2008 credit crunch.
- **Funding for Lending.** In August 2012 the Bank of England launched the Funding for Lending scheme which offered banks and building societies access to cheap funds (by allowing them to swap some of their outstanding loans for 4-year Treasury bills).

⁵⁸ Element Energy for The Committee on Climate Change, 2013, Pathways to high penetration of electric vehicles, final report, available at: http://www.theccc.org.uk/wp-content/uploads/2013/12/CCC-EV-pathways_FINAL-REPORT_17-12-13-Final.pdf.

The rationale was to boost lending to households and business in the wake of the credit crunch. The total amount of outstanding drawing from this facility was over £20bn (as of September 2013).

From the end of January 2014 the Funding for Lending scheme is no longer available for household lending. However, given the large volume of outstanding loans the impact on the cost of funds for new lending remains significant and expected to take around four years to fully unwind.⁵⁹ The exact impact on the cost of funds is difficult to quantify but the Bank of England note that the rates on mortgage products typically fell by over 100 bps between June 2012 and October 2013.

The introduction of Basel III is phasing in minimum leverage ratios for banks, as well as capital and liquidity requirements. It is expected that this could act as a cost shock that restricts lending and increases interest rates.⁶⁰ However it is currently unclear what the magnitude of the impact will be.

4.3.3 Transaction costs

The influence of transaction costs on interest rates is more important for smaller loan sizes as the transaction costs can only be spread over a small principle. Also, although securitisation might be important to reduce the risk of default for large loans, it can increase the transaction costs to the lender. This is because of the high administrative costs over the whole process of collateralisation (i.e. selection, verification of property status, valuation, repossession).⁶¹

The channels through which loans are applied for and repaid can also influence transaction costs. For example, existing customers may have lower costs associated with vetting and processing. This is because if the bank already has access to information on the borrowers' income and payments, it can more easily assess the credit risk of the transaction and hence, speed up the lending application.⁶² Similarly online applications are cheaper to process than paper-based or in-store applications. It has been shown that for a typical customer transaction through a branch or phone-call that costs about £1, it would cost

⁵⁹ This is because the scheme allows banks to swap some of their assets for 4-year Treasury bills, which are used to back borrowing in wholesale markets. While these bills are outstanding they will still allow cheaper borrowing so the impact of Funding for Lending will take four years to fully unwind.

⁶⁰ See for example: P Angelini, L Clerc, V Cúrdia, L Gambacorta, A Gerali, A Locarno, R Motto, W Roeger, S Van den Heuvel and J Vlček, Bank for International Settlements, 2011, BIS Working Papers No 338, BASEL III: Long-term impact on economic performance and fluctuations, available at: <http://www.bis.org/publ/work338.pdf>.

⁶¹ http://www.ruralfinance.org/fileadmin/templates/rflc/documents/1158845651890_collateral_small_loans.pdf

⁶² p 142 https://etd.ohiolink.edu/rws_etd/document/get/osu1068473959/inline

£0.02 online. Also, overhead expenses for online banks are at least 1% of assets, compared with 2-3% for offline banks.⁶³

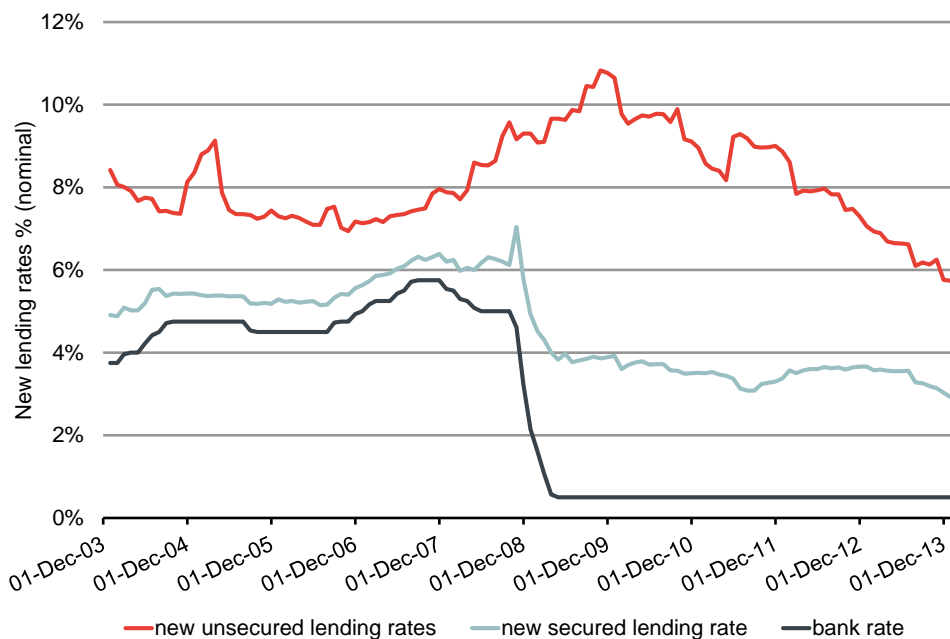
4.3.4 Expected cost of defaults

Whether or not the product is secured (and the level of security) has a large impact on the cost of finance. For example, the rates on top-up mortgages can be 200 to 400 bps lower than the equivalent unsecured loan. As illustrated in Figure 7, we observe a consistent spread between the rates offered by banks for secured and unsecured loans.

While the Bank of England base rate has fallen considerably in light of the financial crisis, we see that the rates offered by lenders for secured loans adjust quicker to this change compared to the rates for unsecured loans. A reason for this is that risk appetite in the market fell after the financial crisis, and market participants required increased compensation for any additional risk they would take up.⁶⁴ This effect was larger for unsecured loans, given the higher expected loss of default associated with these types of loans. Hence, we would expect the interest rate for unsecured loans to decrease at a slower rate than the rate for secured loans, as has been observed in practice.

⁶³ Claessens et al, 2002, "Electronic Finance: reshaping the financial landscape around the world" <http://content.ebscohost.com/pdf10/pdf/2002/1MW/01Aug02/7340391.pdf?T=P&P=AN&K=0627273&S=L&D=eoh&EbscoContent=dGJyMMv17ESep644y9fwOLCmr0yeprZSsq24SbaWxWXS&ContentCustomer=dGJyMOzprlCyqbFJuePfgeyx44Dt6fIA>

⁶⁴ <http://www.bankofengland.co.uk/publications/Documents/fsr/2013/fsr34sec2.pdf>

Figure 7. New lending rates and bank rate

Source: Frontier Economics, Bank of England data

Note: Data for new secured lending rate comes from BOE series of 75%LTV tracker mortgage monthly average data. The data for new unsecured lending rates refers to BOE's series of £10,000 personal loan average rate.

However, there are limits to the availability of secured borrowing, in particular for mortgages as consumers must be a home-owner and have a sufficient loan-to-value on their property. For instance, Figure 5 above shows that consumers with a credit rating typically below 800 have a limited access to banks' finance or it is prohibitively expensive. In this case, consumers would have to rely on an alternative institution, for example local authority lending for home improvements.

4.4 Comparing observed interest rates to the social discount rate

The social discount rate is typically defined in one of two ways.

- **Opportunity cost of capital.** This is the estimated return (taking into account all social costs and benefits) of the 'next best' use of government or private funds. Proposed investments must exceed this rate to justify foregoing the 'next best' option.

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- **Social time preference.** This is the value society attaches to present, as opposed to future, consumption. This can include an additional adjustment to reflect that per capita consumption is expected to grow over time and therefore extra consumption in the future will have a lower marginal utility.

The HMT Green Book uses the latter definition with a rate of 3.5% real (for time horizons up to 30 years) and applies this rate in the appraisal of projects and policies. If a project achieves a return higher than 3.5% (taking all social costs and benefits into account) then it is deemed welfare-enhancing from a social perspective.

From a consumer-perspective if the following conditions hold:

- they are able to finance investments at the social discount rate (adjusting for real resource costs such as transaction costs);
- they always invest when returns exceed this rate; and
- other social costs and benefits such as carbon emissions are factored into market prices.

Then they will always invest when this is welfare-enhancing from a social perspective and the level of investment will be socially optimal.

Put another way, if the cost of household finance is higher than the social discount rate (adjusted for real resource costs such as transaction costs) then the level of investment in low-carbon technologies will be less than the socially-optimal level.

In practice, the above conditions do not hold. In particular, there are behavioural reasons why consumers will not invest even when expected returns exceed their cost of finance. Nevertheless, achieving household financing costs which, adjusting for real resource costs, are in line with the social discount rate is a valid policy aim and can support investment in low-carbon technologies which is closer to optimal levels.

As Figure 1 shows, the real interest rates for many products are below the social discount rate, in particular, mortgages and credit cards (if users are “switchy”). However, availability of these products can be restricted (for example, the need to be a homeowner and have a sufficient LTV for top-up mortgages). Moreover, the rates on these products are near to historic lows as a result of current central bank policy. In future these rates can be expected to rise.

5 The Green Deal finance option

This section explores the Green Deal finance option. We first set out the main drivers of Green Deal interest rates along with the current availability and uptake of loans. We then develop scenarios on their likely future evolution compared to other finance products.

5.1 Green Deal finance

The Green Deal was introduced by the Government in January 2013 to help households and businesses finance energy efficiency investments in their property. The Green Deal is a “Pay as you Save” financing mechanism where consumers repay their loan through their energy bills. If they leave, the financial obligation stays with the new bill payer of the property.

For investments to be eligible for Green Deal loans they must meet the Golden Rule. This requires that expected financial savings must be equal to or greater than the loan repayments attached to the energy bills.

Currently the only organisation that offers Green Deal finance is the Green Deal Finance Company (GDFC). This is likely to be because other finance providers, such as retail banks, are not comfortable with providing Green Deal finance at present due to the policy risks associated with Green Deal lending and the lack of volume in lending. In addition, Basel III regulations mean that banks offering long-term loans must hold greater amounts of equity against lending, reducing incentives to provide long-term lending.⁶⁵

The GDFC provides finance to Green Deal Providers, who in turn deal with making installations for customers. The GDFC is a not-for-profit company that offers fixed rate finance for 45 energy efficiency improvements carried out by accredited Green Deal providers. Its business structure consists of 60 members ranging from the public and private sectors, and each of them has a symbolic £1 stake in the business.

5.2 Current Green Deal rates

The nominal interest rates currently offered by the GDFC are in the range 8-10%, as shown in Table 17. Green Deal rates are offered to all consumers irrespective of their credit score, assuming they meet some minimum credit requirements. This means that Green Deal loans are available to 83% of the population, including 30% of the population that otherwise would not have

⁶⁵ UK Green Building Council, 2014, Green Deal Finance, Examining the Green Deal interest rate as a barrier to take up

access to normal consumer finance (either with no access to finance, or with access only at prohibitively high interest rates).

Green Deal loans are offered at a fixed rate for 10 to 25 years which makes them relatively distinct from other finance products which typically only offer fixed rates for much shorter periods.

Despite the wide eligibility for Green Deal finance, only 1,721 Green Deal plans had been installed by the end of January 2014, a small fraction of projected uptake. We discuss this further in section 5.4 on Green Deal uptake and availability.

Table 17. Representative APR plans offered by GDFC

Amount	Max term (years)	APR		Monthly equivalent	Total amount to pay
		Nominal	Real		
£1,500	10	10.3%	8.1%	£20	£2,374
	15	9.8%	7.6%	£16	£2,794
	20	9.6%	7.5%	£14	£3,287
	25	9.4%	7.3%	£13	£3,835
£2,500	10	9.1%	7.0%	£31	£3,762
	15	8.8%	6.7%	£25	£4,438
	20	8.6%	6.5%	£22	£5,187
	25	8.5%	6.4%	£20	£5,935
£5,000	10	8.2%	6.1%	£60	£7,231
	15	8.0%	5.9%	£47	£8,438
	20	7.9%	5.8%	£41	£9,789
	25	7.9%	5.8%	£37	£11,231

Source: Green Deal Finance Company (<http://www.tgdfc.org/providers/our-finance/>)

The Green Deal finance option

The box below breaks down the interest rates offered by the GDFC.

Nominal interest rates charged by the Green Deal Finance Company include:

- ▣ a flat interest rate of 6.96%;
- ▣ a set up charge of £63; and
- ▣ an annual administration charge of £18.25.

Accordingly, consumers' APR is typically between 7.9 and 10.3% depending on the length and size of the payment plan. Interest rates are fixed for the whole duration of the loan. However, Green Deal providers have the option to increase the loan repayment by 2% each year. To date, this has not been applied.

The rates offered by the GDFC are higher than those currently available for top-up mortgages. This is illustrated in Table 18 below. For a £5,000 ten year loan the real APR charged by the GDFC is 6.1%. This is higher than the cost of borrowing via a top-up mortgage, though the mortgage rate shown is for an advance of £20,000, with many providers not lending below this amount. The Green Deal APR is lower than our central estimate of the real APR for a £5,000 unsecured personal loan. However, we found rates available for unsecured loans of this size were concentrated at lower interest rates, with the lowest representative APR 4.1% in real terms.

Table 18. Real APR comparison

	Green Deal, £5k, 10yr loan	Top-up mortgages, £20k, fixed, 75% LTV	Unsecured loans, £5k, 5 yr
APR	6.1%	1.9%	11.1%

Source: Frontier Economics

5.3 Drivers of Green Deal rates

This section explores the factors that drive Green Deal interest rates and sets out the specific characteristics that drive Green Deal rates apart from rates for other types of loans.

We explain Green Deal rates using the framework we introduced earlier to analyse other household finance products.

We summarise our findings on each driver in Table 19 below, before discussing each driver in more depth.

The Green Deal finance option

Table 19. Drivers of Green Deal interest rates

Driver	Findings
Cost of funds	<ul style="list-style-type: none"> • Current weighted average cost of funds 6.5%. • Cost of funds high due to low scale of GDFC lending to date, and high degree of political risk associated with the Green Deal (e.g. uncertainty over future uptake). • Green Deal loans are long-term and fixed rate, increasing the cost of funds due to the risk premium associated with this. • The GDFC does not have access to deposits, which provide low cost funds for banks and building societies.
Transaction costs	<ul style="list-style-type: none"> • The magnitude of transaction costs for a given Green Deal loan is currently uncertain. This is partly because Green Deal rates were set with an assumption of higher take up, which would mean some fixed elements of transaction costs could be spread across a greater pool of borrowers.
Expected costs of default	<ul style="list-style-type: none"> • There is currently a premium of around 0.25% to reflect the expected cost of defaults. • The loan is attached to the property (rather than the individual that takes out the loan) and paid back through the customer's energy bill, which may result in lower default rates and costs of default.

5.3.1 Cost of funds

The GDFC's cost of funds can be explained by looking at its capital structure. The current indicative breakdown of its cost of funds is as shown in Table 20. The junior debt layer includes private sector capital and DECC funding. The senior debt layer is currently provided by the Green Investment Bank (GIB). Total funding of £244m has currently been allocated to the GDFC.

Table 20. GDFC nominal cost of funding

	Share of funding	Cost of funds
Junior debt layer	30%	10%
Senior debt layer	70%	5%
Weighted average cost of funds		6.5%

Source: Frontier Economics and GDFC

There are three reasons why the GDFC's cost of funds are higher than for other finance products.

- **The Green Deal offers loans on fixed rates over the long-term.** This means the risk-free rate for funding is higher than for shorter term products. We estimate that the 20-year gilt forward rate in 2015 will be 3.68% which reflects expected future increases in Bank of England base rates.⁶⁶ This is higher than the risk free rate for high street lenders, which is currently 0.5% (the Bank of England base rate). This suggests that the long-term fixed rate offered by the GDFC is part of what is driving higher cost of funds for the GDFC relative to other finance providers.
- **Uncertainty over the future of the Green Deal.** Political uncertainty around the future of the Green Deal and the current scale of lending restrict the ability of the GDFC to access finance. We expect that lower political uncertainty and higher uptake of the Green Deal will reduce the cost of finance over time. This is because:
 - it would enable the GDFC to borrow in larger discrete amounts (to cover larger volumes of loans) and improve its access to wholesale debt and securitisation markets, with a lower associated cost; and
 - it would enable the GDFC to raise a higher proportion of finance through senior debt relative to junior debt/equity. This will reduce the cost of funds as on average it is more expensive to finance equity than debt, irrespective of the gearing level, because equity holders are residual claimants on assets

⁶⁶ We estimate implied future 20-year gilt rate used the Bank of England's Bank of England's nominal spot curve for gilts.

- **The GDFC's lack of track record.** An important driver of the GDFC's higher cost of borrowing is its lack of track record as a lender, meaning that it is unable to obtain the credit rating that would enable it to access lower cost funds.

5.3.2 Transaction costs

For both wider finance products and the Green Deal, transaction costs affect APRs, but there is no clear understanding of the exact magnitude of this relationship. For the Green Deal, this is partly because Green Deal rates (both the fixed interest rate and fees) were set with an assumption of higher take up, which would mean some fixed elements of transaction costs could be spread across a greater pool of borrowers. This means that, at current take up, the transaction costs element of the Green Deal APR may be below the true transaction costs.

Given that an in home assessment is required before a Green Deal loan can be agreed, as well as the fact that the GDFC does not have existing customers for whom transaction costs would be lower, we expect transaction costs to be relatively high for the GDFC compared to conventional finance providers. We have assumed transaction costs currently represent around 100 bps, based on our engagement with the GDFC.

5.3.3 Cost of default and financial contingency

As Green Deal bills are paid back through the customer's energy bill, default rates are expected to be low. We understand that there is a premium of roughly 25 bps that currently reflects the default risk and a further 25 bps to reflect general financial contingencies.

5.4 Uptake and availability of Green Deal loans

The Green Deal impact assessment projected £303m of Green Deal loans would be provided in 2013 in the central case with low and high scenarios of £269m and £369m.⁶⁷ In its first year, uptake of the Green Deal has been significantly lower than anticipated. From its launch in January 2013 to December 2013, the GDFC processed £6.5m in loans.⁶⁸ During this period, a total of 1,603 Green Deal measures were installed in 626 individual homes. This is around 2% of the

⁶⁷ DECC, 2012, Final Stage Impact Assessment for the Green Deal and Energy Company Obligation, available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/42984/5533-final-stage-impact-assessment-for-the-green-deal-a.pdf.

⁶⁸ UK Green Building Council

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central uptake projection. At the end of March 2014, 2,000 households had Green Deal Plans, while 188,234 households had had a Green Deal assessment.⁶⁹

There are a number of reasons suggested for the low uptake.

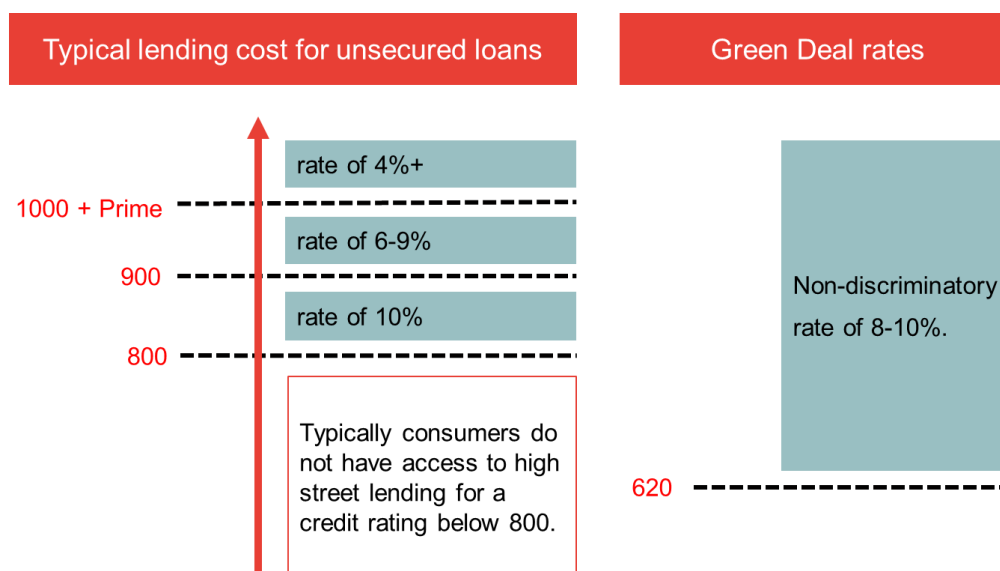
- **Perceptions of the interest rate.** Some consumers may perceive that the Green Deal interest rate is relatively high. For example borrowers may compare the Green Deal rate to rates for mortgages, which are typically shorter term or for rates available for those with high credit ratings. In addition, household may have a lack of appetite for long-term fixed rate loans as these are less common in the UK.
- **Hassle costs.** The number of Green Deal assessments to date has been lower than expected. This could suggest that the overall hassle costs associated with the Green Deal (e.g. the in-home visit required before measures can be installed and financed) make it unattractive to customers relative to alternatives.
- **Behavioural barriers around Green Deal measures.** Many consumers are not engaged with energy efficiency or heat pumps and are not aware of the potential benefits.
- **Behavioural barriers around the security of the loan.** Some households may have concerns around the impact on property values of the loan being attached to it.
- **Limits to investment as a result of the Golden Rule.** Many investments do not fully meet the Golden Rule meaning finance is also needed from another source (we discuss this further below).
- **Crowding out by ECO.** The current availability of free energy efficiency measures (under ECO) reduces the number of households who require Green Deal finance energy efficiency measures.

Availability of Green Deal loans is broad. The GDFC offers loans to 30% of consumers that otherwise would not have access to lending due to their poor credit rating, either due to no providers being willing to lend to them, or because interest rates would be prohibitively high. This is shown in Figure 8. The reason for the comparatively high availability is that Green Deal loans are repaid through

⁶⁹ DECC, 2014, Domestic Green Deal and Energy Company Obligation in Great Britain, Monthly report, available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/305432/Monthly_Statistical_Release_Green_Deal_and_Energy_Company_Obligation_in_Great_Britain_24_April_2014.pdf

energy bills, which have a lower rate of default than other forms of unsecured lending.⁷⁰ Actual default rates for Green Deal loans are not yet apparent, given that the recent introduction of the policy and the long term of the loans.

Figure 8. Broad eligibility of Green Deal loans



Source: Frontier Economics, based on industry engagement.

Green Deal finance is currently available to landlords to make improvements to their properties. The electricity bill payer would be liable for the repayments. This would usually be the tenant (who also receives the benefits from the funded improvements), except when the property is vacant, where liability reverts to the landlord. Currently both the landlord and tenant must give their permission for a Green Deal to be set up. New tenants must be made aware of the Green Deal when moving into the property, and must acknowledge the required repayments.

Uptake of the Green Deal in the private rented sector is likely to increase, as from 2016 landlords will not be able to refuse reasonable requests from tenants for Green Deal measures to be installed. From 2018, landlords will be required to either ensure their property meets a minimum of an EPC rating (likely to be “E”), or to have installed the maximum package of Green Deal measures.

To date, roughly a quarter of the uptake of the Green Deal has been by customers with a credit score below 800 (i.e. limited access to alternative high-street finance), while a further quarter of uptake has been by customers with prime credit scores (i.e. those able to access high-street finance at the most

⁷⁰ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/47978/1010-green-deal-summary-proposals.pdf

competitive rates). The remaining uptake has been from customers with credit scores between these numbers. Prime credit score customers choosing the Green Deal over alternatives such as a top-up mortgage may do this for a number of reasons. For example, with average Green Deal loan values of around £3,500, this may mean that the APR implied once set-up fees have been taken into account do not make a top-up mortgage competitive. The proportion of Green Deal loans amongst customers with credit scores below 800 may be expected to increase as changes are introduced to increase uptake in the private rented sector from 2016, to the extent that those in the rented sector have lower credit scores.

While the availability of Green Deal loans is high, in practice the amount of Green Deal funding may not be sufficient for some homes to finance energy efficiency improvements. This is because Green Deal loans must satisfy the Golden Rule. For many households, the Green Deal loan satisfying the Golden Rule will not cover the whole cost of the measures being installed. As a result, households must raise the remaining cost of the measures from alternative sources. In practice, this may reduce the effective availability of Green Deal finance as for households with low credit scores, finance for the remaining cost may not be available, or may be costly, resulting in low uptake.

A more important factor limiting Green Deal uptake by those that have had assessments is the availability of subsidies that remove the need for Green Deal finance. Research on the consumers that have had Green Deal assessments to date shows that 90% had received their assessment for free and 70% of those that had some measures installed had these funded either fully or in part by a third party (e.g. through a local authority or ECO).⁷¹ Almost half of those that had a Green Deal assessment did not receive a copy of their advice report.⁷²

We discuss barriers to Green Deal (and other finance) availability further in section 6.2.

5.5 Projections of Green Deal interest rates

Based on our analysis of the main drivers of Green Deal interest rates, we now project Green Deal interest rates for different scenarios. This section sets out these assumptions and the resulting projections, alongside projected interest rates for other finance sources to allow comparison over time.

⁷¹ DECC, 2014, Green Deal assessments research, Research report from Waves 1, 2 and 3, and the Wave 1 follow up survey, available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/271608/Waves_1_2_and_3_plus_wave_1_follow_up_-_full_report_P23_-_24_-_FINAL.pdf.

⁷² DECC, 2014, Green Deal assessments research, Research report from Waves 1, 2 and 3, and the Wave 1 follow up survey

5.5.1 Scenarios

To model future Green Deal interest rates, we varied the input assumptions for the main drivers. The drivers and the scenarios for each are outlined in Table 21 below.

Table 21. Green Deal interest rate drivers

Interest rate driver	Explanation of impact	Assumptions
Risk free rate	Based on the Bank of England's projections, we expect increasing base rates over time, which will increase the cost of funds for all finance types.	<ul style="list-style-type: none"> • We use forward gilt rates to measure the risk-free rate. • For 20 year loans we use the 20 year gilt rate. For 10 year loans we use the 10 year gilt rate
Cost of default and financial contingency	Currently costs of default are expected to be low, in line with the low and predictable default rates for energy bills. These could be reduced further by a guarantee for consumer borrowing (though this could introduce a moral hazard problem), or increased if outturn default rates are higher.	<ul style="list-style-type: none"> • Low (if Government guarantees consumer borrowing from the GDFC) • Medium (based on GDFC's current unexpected default costs) • High (if default rates are higher than anticipated)
Uptake	Higher uptake of the Green Deal would increase the scale of GDFC lending, enabling it to access funds at lower cost, and to spread transaction costs over a wider customer base.	<ul style="list-style-type: none"> • Low (based on current uptake) • Medium • High (based on gradually reaching DECC's central uptake projection)
Government guarantee of GDFC borrowing	We expect that a guarantee of GDFC borrowing would reduce the GDFC's cost of borrowing to the 20 year gilt rate. A guarantee could be time limited or linked to a threshold for uptake.	<ul style="list-style-type: none"> • No guarantee (current) • Guarantee
Subsidisation of interest rate	The Green Deal interest rate is not currently subsidised. A subsidy could enable loans to be provided at a lower interest rate, or interest free, for all households or particular target groups. A subsidy could temporary or linked to uptake.	<ul style="list-style-type: none"> • No subsidy • Subsidy to guarantee 5% interest rate • Subsidy to provide interest free Green Deal loans

Source: Frontier Economics

We project drivers of interest rates in five year periods from 2015 to 2035. We analysed three scenarios, outlined below.

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- **Central case.** This is based on our central assumptions for the drivers analysed, with no Government subsidy or guarantee
- **Targets met.** This scenario is as above, but with Green Deal uptake targets approached in 2015-19, and then met by 2020.
- **Enhanced policy support.** This scenario is the same as the central case, but with a Government guarantee on borrowing by the GDFC.

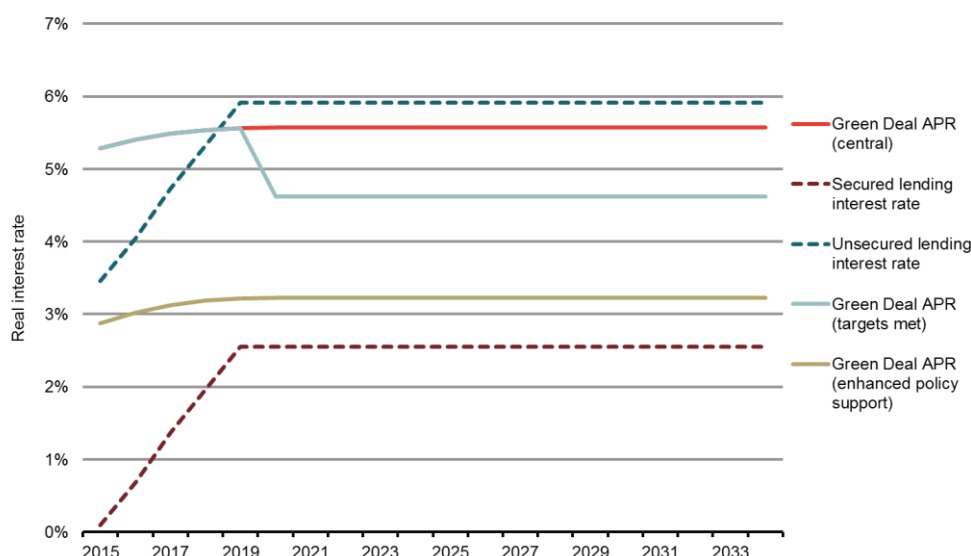
In Annexe 3 we set out the assumptions made for all these scenarios and the breakdowns of the interest rates over time.

5.5.2 Projections

The scenarios above bring together consistent sets of assumptions on the drivers of Green Deal interest rates out to 2035. Figure 9 below shows projected Green Deal real APRs for these scenarios alongside our central projected interest rates for ‘average’ secured and unsecured lending over the same period (see Annexe 1).⁷³ It should be noted that the terms of the products differ, as the Green Deal offers long-term, fixed rate lending, while the unsecured and secured lending rates plotted offer fixed rates for much shorter terms. In addition, the Green Deal is more widely available to those on lower credit rating relative to these other finance types.

The chart shows that in our central scenario, lending through the Green Deal is set to become cheaper relative to unsecured borrowing, while it will remain more expensive than secured borrowing through a top-up mortgage.

⁷³ The secured rate is for a tracker mortgage with a 75% LTV, while the unsecured rate is based on a £10,000 unsecured personal loan. The projections use Bank of England data and OBR forecasts. They do not assume a credit rating, as the Bank of England’s data is based on average quoted rates for a given product, rather than for a given consumer.

Figure 9. Projected Green Deal rates

Source: Frontier Economics

NB: We include the typical unsecured and secured lending rates (dotted lines) for comparison. However, it is important to recognise that Green Deal loans are a fundamentally different product in that loans are provided (i) at a fixed rate for the long-term and (ii) to consumers with a wider range of credit ratings.

Our scenario in which the Government guarantees borrowing by the GDFC shows that this could reduce the real APR offered by the GDFC by more than two percentage points. This is due to the GDFC being able to access funds at the 20 year gilt rate in the event of a guarantee.

Our projections also show that meeting uptake targets could result in lower Green Deal rates by around one percentage point relative to the central case. This is based on the assumption that higher uptake will increase the credit rating of the GDFC to BBB+ (from BBB) and reduce the required amount of risk-absorbing equity to 10% (from 20%). The GDFC's current borrowing cost is compatible with a BBB- credit rating. Our credit rating assumptions are based on the following:

- at higher uptake, the GDFC will be able to develop a financial track record and hence, its credit rating will increase; and
- large banks and utility companies' credit ratings are mostly concentrated around BBB and BBB+. We expect that a financial track record will allow GDFC to issue bonds with a higher credit rating in line with those for large banks and utility companies.

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Transaction cost would also be expected to fall as the fixed element of these costs can be spread across a greater number of borrowers.

We also investigated the impact of varying other drivers relative to our central scenario which forecasts a Green Deal interest of 5.6% real in 2020. This showed the following.

- **Reducing the term of Green Deal lending.** Reducing the term results in an APR of 5.6% real in 2020. This is through changing the cost of funds for the GDFC to the ten year gilt rate. A shorter term could also affect the interest rate via transaction costs, for example as upfront fixed transaction costs are spread over a shorter period. In the absence of better information on transaction costs, we have not modelled this effect.
- **High/Low default rates.** We also analysed a government guarantee for borrowers from the GDFC, which we expect would reduce the cost of default for the GDFC. A zero default rate would reduce the Green Deal APR to 5.1% (real).
- **Low Green Deal uptake.** We expect that uptake is endogenous with respect to the Green Deal APR. We abstract from this here by assuming that uptake refers to the taste of consumers for Green Deal investments, and that this is not affected by the level of the Green Deal APR. We found that low uptake would increase the APR to 6.6% (real) in 2020, by increasing the GDFC's cost of funds. This is because a higher uptake level will increase the debt to equity ratio as the GDFC will be perceived as less risky overall, reducing the proportion of equity required as a buffer against losses. Higher uptake will also reduce the cost of debt, because of an increased credit score for the GDFC as its risk decreases.
- **Interest rate subsidy.** We modelled a subsidy resulting in interest free loans (in real terms, a negative APR), and a subsidy resulting in 5% nominal APR (around 3% real).

6 Improving low-carbon finance options

In this section we set out the current financing available for low-carbon investments along with the barriers which are increasing financing costs or reducing availability. We then develop options to overcome these barriers, assessing and short-listing these. Finally, we conclude and suggest a timeline of actions.

6.1 The current market for financing low-carbon investments

Throughout this report we have noted where products are suited to financing EVs and heat pumps. We found the following.

- There are some generic products that can be used to finance all LCTs. However, these can be high cost or have limited availability if the consumer does not have security and/or a high credit rating.
- There are some products specifically designed for EV purchases, such as PCPs and hire purchase for EVs.
- The Green Deal is only available for energy efficiency and heat pump investments. However, as Renewable Heat Incentive payments aren't accounted for in the Golden Rule, this limits the Green Deal finance available.

There are important differences between heat pumps and EVs, which influence the current finance available and the barriers to providing finance. Before discussing the barriers to financing EVs and heat pumps, we outline the main differences in Table 22 below.

Table 22. Characteristics of EV and heat pump finance

Characteristic	Heat pumps	Electric vehicles
Lending scale	Direct financing of heat pumps is currently sub-scale. The characteristics of lending in the current market for financing home heating differ from those required for heat pumps (e.g. finance required is smaller for conventional heating, and the technology risk limited).	Direct EV financing is currently small. However, EV financing is similar to current market for financing conventional cars, so funders benefit from scale of overall car financing market.
Size	Typical cost of heat pump is around £7,000 to £14,000 (for air-source) and £11,000 to £15,000 (for ground-source) substantially higher than conventional boiler replacement costs.	The typical cost of an EV is around 30-50% higher than the cost of a conventional vehicle (though with a grant of up to £5,000 available). ⁷⁴ However, EV prices are within the range of prices observed for a number of car types.
Term	Determined by borrower preferences as well as constraints set by current finance options (e.g. the Golden Rule in the Green Deal).	Term likely to be determined borrower preferences (e.g. this may be affected by how often consumers buy new vehicles).
Security	Heat pump cannot be used as security. Home can be used as security to extent consumer has sufficient LTV 'headroom' or mortgage providers account for its value. GD allows energy bill to be used as security.	EV can be used as security. Home can be used as security.

⁷⁴ http://www.theccc.org.uk/wp-content/uploads/2013/12/CCC-EV-pathways_FINAL-REPORT_17-12-13-Final.pdf

Timing of finance decision	The average life span of a boiler is typically around 10-15 years. ⁷⁵ A decision to invest in a heat pump is likely to be made around the time of failure of existing boiler, on moving home, or when making other home improvements. Currently there are an estimated 1.5m boiler sales in the UK per annum. ⁷⁶	New cars are typically replaced every 3-4 years. ⁷⁷
Technology risk	There remains uncertainty around the performance of heat pumps, in particular the efficiency of the unit once installed.	The risk around EV performance over time (both the battery and the vehicle) is uncertain, resulting in substantially higher depreciation rates than for conventional vehicles.

Source: Frontier Economics

The wider finance markets (e.g. for unsecured personal loans, top-up mortgages) are large scale, and can be used to access finance for EVs and heat pumps for customers that meet providers' eligibility requirements. The markets for specific finance for EVs and heat pumps are both currently sub-scale. However, this masks significant differences between the two.

- **Finance required for an EV is similar to that required for a conventional vehicle.** While we found a small number of examples of finance specifically for EVs (e.g. provided from car manufacturers, or from salary sacrifice car providers), the finance required for an EV is similar to that required for a conventional vehicle. This means that PCP providers for conventional vehicles can adapt the finance they already provide to finance EVs.

⁷⁵ <http://www.corgiservices.com/2011/03/replacing-a-boiler-what-to-look-for/>

⁷⁶ DECC, 2012, Final Stage Impact Assessment for the Green Deal and Energy Company Obligation, available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/42984/5533-final-stage-impact-assessment-for-the-green-deal-a.pdf.

⁷⁷ <http://www.economist.com/news/britain/21595046-increasingly-popular-way-finance-car-buying-has-helped-boost-sales-fast-lane/>

- **The finance required for a heat pump is significantly different from that required for a conventional boiler.** This is due to the higher upfront cost of heat pumps. The options for securing a heat pump loan are more limited, as it cannot be secured against the heat pump. The Green Deal gets around this by securing against the energy bill. However, as we have discussed, take-up is currently extremely low.

In some countries, ‘green mortgages’ and loans are available to finance energy efficiency investments. We set out the available finance in the box below.

Green mortgages and loans

A green mortgage is a mortgage that takes into account future energy savings from energy efficiency investments, and allows homeowners to borrow more or borrow more cheaply due to these savings. Examples of green mortgages available internationally include the following.⁷⁸

- **Green mortgages are available in the USA for new and existing buildings.** The product for new energy efficient homes allows homeowners to borrow more by capitalising energy savings from the building being energy efficient. For existing homes, there is a product that finances improvements in energy efficiency through the energy savings. Uptake has been low since the introduction of these products in 1992.
- **In Australia, interest free loans are available to finance energy efficiency investments for existing homes.** The interest rate subsidy is available for up to four years and to a maximum loan value. To date, the programme has resulted in more energy and water system renovation, but more limited retrofitting.
- **In Germany, subsidies are available for energy efficiency investments, which can be combined with a mortgage from a private provider.** The KfW receives subsidies to offer loans at below market interest rates. Finance from the KfW for energy efficiency investments (e.g. insulation or heating upgrades) can be combined with finance offered by private providers. The improvements must be certified as meeting technical requirements. The size of the subsidy varies with the specific scheme and the energy efficiency standard that will be met following the improvements. A higher proportion of the loan can be subsidised where the efficiency standard being met is higher. The funding is not means tested.

⁷⁸ Henger, R. and Voigtländer, M., Institut der deutschen Wirtschaft Köln, 2013, Green investments and green mortgages in Germany

6.2 Barriers to private finance of low carbon investment

There are a number of supply-side barriers which increase the cost and/or reduce the availability of finance. In addition there are demand-side barriers which limit consumer uptake of finance. These are summarised in Table 23. We discuss these barriers further in section 6.3 when setting out the policy options that could address them.

Table 23. Barriers to private financing of low-carbon investments

Barrier type	Impact of barrier	Interest rate component
Supply side		
Lack of scale (affecting the Green Deal only)	<ul style="list-style-type: none"> Lack of scale can limit ability to efficiently access funding markets. The GDFC currently has a low supply of funds available to it given its small scale and high risk. This results in a high cost of funds, which affects interest rates for Green Deal borrowers. This is a market failure if the high cost of finance for the GDFC is mis-priced due to a misperception of the GDFC's actual risk. Low demand affects interest rates for the GDFC, as it means that it must borrow in small amounts that are subject to higher interest rates and transaction costs. This is then passed on to Green Deal customers in the interest rate they are charged for Green Deal loans. Lack of scale increases transaction costs where there are fixed costs (e.g. payment systems). 	Cost of funds, transaction costs

Barrier type	Impact of barrier	Interest rate component
Policy and regulation	<ul style="list-style-type: none"> • Risk around the longevity of government policies (e.g. Green Deal, RHI) can increase cost of funds and (perceptions of) default risk. • Regulation (e.g. consumer protection requirements shaping the Golden Rule including home visits and warranties) can increase the interest rate through higher transaction costs as well as reducing demand (e.g. due to hassle costs or high complexity). • The provisions of the CCA mean that some providers won't finance some products. For example, where claims made of the product cannot be validated (e.g. around energy savings), this may reduce the availability of finance as in some circumstances the provider will be jointly liable with the retailer in the event of misrepresentation.⁷⁹ This is a potential barrier to availability rather than the interest rate. 	Cost of funds, transaction costs, expected cost of defaults
Lack of information about borrowers	<ul style="list-style-type: none"> • Finance providers often have incomplete information about borrowers' credit risk which can limit lending. • This may be a greater problem for alternative finance types (e.g. Green Deal) where there may not be evidence on how borrower characteristics relate to their behaviour (e.g. where borrowing is secured against the energy bill). • This may also affect lending for products with small demand, e.g. lenders for EV purchases may have limited information on the characteristics of customers buying EVs, making it difficult to estimate their expected default costs. 	Expected cost of defaults

⁷⁹ See section 75 of the Consumer Credit Act. This applies to purchases on credit cards and retailer credit. See: <http://www.ofc.gov.uk/about-the-ofc/legal-powers/legal/cca/equal-liability#.UzqZ8bFwboo>.

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Barrier type	Impact of barrier	Interest rate component
Lack of security	<ul style="list-style-type: none"> Many consumers lack collateral against which loans LCTs can be secured. This increases the costs of default and reduces the availability of lending. This is less of an issue for EVs as the car itself can be used a security. The value of low-carbon investments in the home is not necessarily reflected in the value of the property (e.g. mortgage providers may not accurately assess the value). This may reduce availability of finance if borrowers do not have sufficient borrowing 'headroom' (e.g. a low LTV on a mortgage). There is evidence that higher EPC ratings are associated with higher house prices, controlling for characteristics such as age of the property. This suggests that this barrier could be small.⁸⁰ 	Expected cost of defaults
Demand side		

⁸⁰ Fuerst, F., McAllister, P., Nanda, A., and Wyatt, P. for DECC, 2013, Final project report, An investigation of the effect of EPC ratings on house prices, available at: [https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/207196/20130613 - Hedonic Pricing study - DECC template 2 .pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/207196/20130613_-_Hedonic_Pricing_study_-_DECC_template_2_.pdf).

Barrier type	Impact of barrier	Interest rate component
Myopia and other cognitive failures	<ul style="list-style-type: none"> • Consumers may have short time horizons and apply a high discount rate to the future, limiting demand for cost-saving investments and the long-term finance products that support them. • Consumers may not know or understand the potential savings associated with products, meaning these will not be incorporated into decisions. This may raise transaction costs for finance providers (e.g. Green Deal assessments must be carried out to estimate savings before loans can be made) or reduce demand. • Myopia can be particularly acute where costs and savings are presented in percentage rather than absolute terms, as consumers may find it more difficult to make comparisons using percentages. Given that PCPs are typically presented in £ terms, this could suggest that myopia is less of a barrier for EV finance than for heat pump and energy efficiency finance. 	<p>Affects demand</p> <p>May affect Green Deal cost of funds (through lack of scale) and transaction costs</p>
Principal-agent problem	<ul style="list-style-type: none"> • Landlords are often the decision-maker on in-home investments whereas renters face the energy costs. Therefore, landlords can have weakened incentives for investing in measures that reduce energy costs. • Renters may not take energy costs into account when evaluating rents, weakening incentives for landlords to invest in energy efficiency. 	<p>Affects demand</p> <p>May affect Green Deal cost of funds (through lack of scale) and transaction costs</p>

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Barrier type	Impact of barrier	Interest rate component
Lack of knowledge of, and confidence in, technology	<ul style="list-style-type: none"> Extent to which technologies reduce energy costs may not be fully understood and therefore reduce demand. Similarly, lack of information on technology performance risk (i.e. the likelihood it will fail or deteriorate in performance) and behaviour (e.g. EV charging habits) may result in finance providers assuming rapid depreciation rates. This may raise the total cost of financing the LCT (e.g. the monthly payments in a PCP), although it would not affect the interest rate. This may make customers less willing or able to take on the risk of the LCT. 	<p>Affects demand</p> <p>May raise total costs of financing, though not via the interest rate</p>

Source: Frontier Economics

Some of the barriers we have identified may be temporary (e.g. those relating to the current lack of technology maturity for heat pumps and EVs). Others such as principal-agent problems are likely to be longer-term barriers. This affects the timing and nature of the policy measures that could remove the barriers. We set out policy options, and their timing, in the next section.

There are also wider barriers to uptake of heat pumps and EVs. For example, there is a lack of consumer awareness of alternative heating systems and upfront costs of heat pumps are high relative to conventional alternatives. Similarly, upfront costs of EVs are currently in the higher end of the range of prices for conventional vehicles. While these are not a barrier to provision of finance for LCTs, they shape the market conditions (e.g. low demand) which determine some of the barriers we have identified. The design and marketing of finance products must take these demand side barriers into account.

6.3 Options to reduce the cost of funding low-carbon investments

This section first summarises the long list of possible policies to address the supply and demand side barriers to financing low-carbon investments. We then short-list five of the options that could be most effective, assessing them in more detail. Our focus is on addressing market failures, and only encouraging more borrowing where this is in the interests of the consumer and does not misallocate risks in the long-term.

6.3.1 Supply side policy options

There are a wide range of policy interventions and new business models that could be used to tackle the barriers identified in section 6.2. We summarise possible interventions below, in relation to the barriers each policy addresses. We focus predominantly on the supply side barriers that affect the cost and availability of finance. However, it is important to also consider the demand side, which we address separately.

Green Deal reform

A number of measures could be used to increase uptake of the Green Deal and widen availability. The Green Deal Home Improvement Fund (GDHIF) will be introduced in June 2014 and aims to simplify the Green Deal and make more funding available for energy efficiency improvements.⁸¹ The GDHIF will be

⁸¹ Outlined at:
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/308780/QG12_GDHIF-web.pdf.

available with a Green Deal loan, but does not require that households accessing GDHIF funding take up a Green Deal loan.

Further option could address the lack of scale of the Green Deal and reform it to reduce the cost of Green Deal loans and encourage uptake. A lack of scale for the GDFC could be addressed through:

- support for lending (e.g. interest rate subsidies or government guarantees) to lower interest rates and increase demand such that the level of finance can reach an efficient scale; or
- early funding of providers by specialist investors (e.g. Green Investment Bank) until financing reaches efficient scale. These specialist investors may have a better understanding of the risks giving them the comfort needed to fund at competitive rates.

This would address a market failure to the extent that lenders to the GDFC are currently mis-pricing the GDFC's risk.

For other financing products (e.g. top-up mortgages, PCPs) lack of scale is not a significant barrier as markets for these are already mature and large-scale.

Measures to address the cost barriers to the Green Deal include the following:

- a Government guarantee to transfer policy risk away from the GDFC and enable the GDFC to access cheap finance despite its lack of borrowing track record;
- support for lending (e.g. interest rate subsidies) to help the GDFC reach scale and build a 'track record' until the private sector has confidence in the policies which underpin investments (e.g. Green Deal, RHI);

Interventions to increase uptake of the Green Deal could include:

- changes to the definition of the Golden Rule, to increase the amounts that that can be lent and the range of measures that qualify;
- increasing access to Green Deal finance (this is in part already underway with additional requirements on landlords regarding the Green Deal from 2016); and
- allowing differentiated Green Deal interest rates depending on consumer characteristics, which could reduce rates for borrowers with higher credit scores.

Lack of information about borrowers

To address a lack of information about borrowers, a time limited subsidy for interest rates could be used. This could allow learning about how consumers behave when borrowing for LCTs, by encouraging higher uptake.

This could also be addressed by collecting and sharing improved information on default rates associated with long-term borrowing and, in the case of the Green Deal, the impact of transferring debt with a property on default. In turn, this could help give providers more confidence and certainty when pricing these risks, potentially reducing interest rates for consumers.

Lack of security

Two options to address lack of security include:

- regulating to ensure that the value of low-carbon investments is reflected in home valuations (e.g. surveys, or minimum EPC requirements at point of sale/rental). This may make it easier and cheaper to use top-up mortgages to borrow as the increase in the home value creates more LTV 'headroom' to borrow; or
- a Government guarantee of mortgage-based finance of low-carbon investments (known as 'Green mortgages').

6.3.2 Demand side policy options

Demand side policy options focus on removing barriers to uptake of finance and the LCTs themselves and better tailoring the available finance to household needs and preferences.

Myopia and other cognitive failures

There are a number of interventions that could reduce barriers to finance and LCT uptake caused by myopia and other cognitive failures. Given our focus on finance, we suggest interventions that could affect finance decisions rather than overall LCT uptake. An information campaign on interest rates and cost savings from LCT investments could highlight the differences between Green Deal and other finance types (for example lower relative borrowing costs of the Green Deal for consumers with lower credit scores) and recommend the most appropriate type of finance product for different types of consumer.

For the Green Deal shorter lending periods could be considered to better reflect borrower preferences for shorter term loans. This may require a relaxation of the Golden Rule as it would imply higher loan repayments, albeit over a shorter period.

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Principal-agent problem

Principal-agent problems are to some extent already being addressed, for example with a new requirement that landlords improve energy performance of homes before they can be rented out privately from 2018, via minimum EPC ratings or installing the maximum combination of Green Deal measures.

Lack of confidence in and information on the technology

The options to address lack of confidence and information on technology performance include the following:

- introducing stronger product standard requirements, to give finance providers and borrowers greater assurance over the financial benefit of the investment;
- installer or manufacturer guarantees of product performance risk. This can be encouraged by government policy. For example, subsidies can be made conditional on guarantees, as in the case of DECC's Plug-in Car Grant;⁸² and
- paying RHI payments to heat pump installers instead of consumers, to increase installers' incentives to manage heat pump performance, potentially reducing the technology risk and increasing demand.⁸³

These interventions could increase demand for LCTs and energy efficiency along with the associated finance needed for these.

6.3.3 Assessment of short-listed options

From this long-list, we selected a short-list of five policy options to assess further. These include options for reducing the cost and increasing the availability of both Green Deal and wider finance. These options were discussed with industry stakeholders and selected based on the following criteria:

- the impact on finance rates and availability of low-carbon technologies (supply-side impacts);
- the impact in reducing demand side barriers to uptake of finance for low-carbon technologies, and more widely to uptake of low-carbon technologies (demand-side impacts);
- the overall costs of the intervention, whether to government, consumers or industry;

⁸² This requires that vehicles must have a three year or 60,000 mile warranty, and a three year battery and electric drive train warranty, with an option to extend the battery warranty by two years.

⁸³ Currently Feed-in tariff payments can be transferred to a nominated third party.

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- ▣ distributional impacts (e.g. does the intervention improve outcomes for lower-income households?); and
- ▣ potential risks and unintended consequences of intervention.

This section sets out the options. We discuss each in relation to the short-listing criteria above. The options for heat pumps focus on improving the design of the Green Deal and measures that could significantly reduce the interest rate associated with it. The options for EVs are primarily around understanding and better assigning the technology risk. For both, we have suggested ways to tackle demand side barriers which currently limit overall uptake and demand for finance.

We summarise our assessment in Table 24 below.

Table 24. Summary of assessment of policy options

	Overall assessment	Impact on interest rates and availability	Effectiveness in addressing demand side barriers	Costs	Distributional impacts	Risks and unintended consequences
Guarantee of borrowing by GDFC, 2015-2020	Potentially low-cost means of reducing Green Deal interest rate, if GDFC risk currently mispriced	Real APR in 2020 reduced to 3.2% from 6.6%. After 2020, Green Deal APR lower as GDFC attains a higher credit rating and gearing having established lending track record	Interest rate related to uptake: a lower interest rate is likely to increase uptake	The government's contingent liability (i.e. the amount they must pay in the event of default by the GDFC) for lending in 2020 would be £150m. But expected direct costs to government could be less than £10,000 p.a.	May have distributional impacts as the GDFC supports borrowing by those that would not otherwise have access to high street lending	May be challengeable under State aid rules

	Overall assessment	Impact on interest rates and availability	Effectiveness in addressing demand side barriers	Costs	Distributional impacts	Risks and unintended consequences
Time-limited interest rate subsidies	Effective in reducing interest rate, but high direct costs to Government	Real APR of -2% (high subsidy) or 2.9% (low subsidy)	Interest rate related to uptake: a lower interest rate is likely to increase uptake	Cost to govt. NPV of £1.2bn to 2039 for interest free Green Deal loans, and £250m for low-interest loans	Varying distributional impacts to the extent that a subsidy is targeted (our modelling assumes no targeting)	May be challengeable under State aid rules. Impact of removal of subsidy unclear

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	Overall assessment	Impact on interest rates and availability	Effectiveness in addressing demand side barriers	Costs	Distributional impacts	Risks and unintended consequences
Improving the design of the Green Deal	Could significantly increase range of measures that can be fully-funded under Green Deal, but may also require other measures to increase attractiveness of Green Deal	A larger proportion and greater range of investments could be covered by Green Deal loans as a result of relaxed Golden Rule Including RHI payments in the Golden Rule could potentially result in 50,000 – 100,000 additional heat pumps being installed by 2020	Option to reduce the term of Green Deal loans on APR may make them more attractive to some consumers	Quantified NPV of additional heat pumps purchase is negative as the additional resource costs outweigh the carbon and air quality benefits. However, there are major benefits in developing the supply chain and reducing the demand-side barriers to heat pump uptake.	Increased GDFC lending better enables low-income (and lower credit-rating) households to access sufficient financing	Risk of RHI being removed, leaving households to pay off Green Deal loans for heat pumps without subsidy payments

	Overall assessment	Impact on interest rates and availability	Effectiveness in addressing demand side barriers	Costs	Distributional impacts	Risks and unintended consequences
Understanding and transferring technology risk	Policy measures could support greater understanding of technology risk (and transfer of risks to those who can best manage it).	Could reduce interest rates if improved understanding of risks allows greater certainty around depreciation rates	Reduces technology risk as a barrier to uptake of technologies and associated finance products	Direct costs to government are likely to be limited, while performance guarantee or buyback requirements would impose some costs on providers	Limited distributional impacts if uptake of LCT finance is expected to be spread across households with different incomes and credit ratings	Technology risk may already be correctly priced and allocated (i.e. there is no market failure)
Tackling demand side barriers	An information campaign could be a cost effective way of increasing awareness of the best financing options for energy efficiency and LCT investments	No direct impact on interest rates and availability. However, higher Green Deal uptake could reduce the cost of Green Deal borrowing given the GDFC is currently sub-scale	The evidence indicates that information campaigns can be effective in reducing demand side barriers	The cost of an information campaign could be around £10m p.a.	There could be distributional impacts, for example if a campaign was targeted at low-income households	Risk of perceptions of mis-selling

Source: Frontier Economics. The basis of these estimates is set out in the write-up below.

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We now assess each option in turn.

1. Time-limited guarantee of borrowing by Green Deal finance providers

The government could provide a time-limited guarantee of borrowing by the GDFC. Under a guarantee, the Government would commit to paying back the GDFC's borrowing in the event of its default. This would apply only to borrowing by the GDFC for 2015-20. This would address the lack of track record for specialist lenders. We consider the case where a guarantee is provided to the GDFC as this is likely to be where a guarantee would be most effective.⁸⁴

This is based on the view that current financing costs of the GDFC do not reflect its actual risk, as it does not have a track record to demonstrate its risk. A government guarantee would enable the GDFC to access funds at a lower cost, reducing the cost of borrowing for the GDFC finance provider to the risk-free rate (we use the 20 year gilt rate as proxy for this for 20 year loans offered by the GDFC).

Assuming the impact of the guarantee on the GDFC's cost of funds is completely passed through to consumers, our projections suggest this would result in the rates shown in Table 25 below. This compares the Green Deal APR, uptake, and costs to government of a guarantee lasting from 2015-20 with both the current situation and with a counterfactual with no guarantee. We find the following.

- **Green Deal APR.** The guarantee could have two effects, resulting in reduced APRs:
 - a guarantee would reduce the Green Deal APR, to 3.2% in 2020 in real terms, compared to 6.6% under the counterfactual in 2020;⁸⁵ and
 - post 2020, we assume that the guarantee results in higher gearing and a higher credit rating for the GDFC (see Annexe 3), as the guarantee is assumed to result in greater lending consequently

⁸⁴ Other providers that may face this issue could include specialist EV or heat pump financiers, though it is likely they may be linked to existing lending markets that are at scale, which may make a guarantee less relevant. We also do not consider this option for large scale, general lenders such as retail banks. These finance providers do not have high costs of funds resulting from a lack of lending track record and it would be difficult to ensure any guarantee was targeted on lending for LCTs specifically.

⁸⁵ Our estimates are consistent with the IPPR's analysis, which estimated that a guarantee could reduce Green Deal rates to 5-6%, i.e. 2.9-3.9% in real terms.
http://www.ippr.org/images/media/files/publication/2013/11/Help-to-heat_Nov2013_11562.pdf

allows the GDFC to establish a track record. This would result in a lower APR even after the guarantee expires.

- **Uptake.** We do not explicitly model the impact of a guarantee on uptake, as it is not clear how uptake is influenced by different interest rates (it is also a driver of interest rates). We assume that Green Deal uptake is £10m per annum in the counterfactual, in line with current lending of £6.5m per annum. However, we expect that a lower Green Deal APR would be consistent with our central Green Deal uptake scenario (over £150m of Green Deal lending annually). This assumption is in line with the evidence that uptake of Green Deal loans could be quite sensitive to the interest rate:
 - A survey by the Great British Refurb campaign showed that 6% of people were ‘very’ or ‘fairly’ likely to take a Green Deal loan at a 7% interest rate. This proportion increased to 32% at a 2% interest rate;⁸⁶ and
 - our projections indicate that a guarantee would bring the Green Deal APR in line with interest rates for more widely used finance types (mortgages and unsecured personal loans), which could increase uptake, particularly if framing effects mean that consumers consider the Green Deal APR in relation to other lending rates such as mortgage interest rates.
- **Cost to government.** We estimate that a guarantee could be less costly than a direct interest rate subsidy, assuming that the GDFC’s actual realised risk is lower than that currently priced into its cost of funds.⁸⁷ In other words, the guarantee would be largely covering a perceived rather than real risk. The contingent liability for lending in 2020 would be £150m, representing the total value of lending. However, The expected direct cost to government for this level of lending would be less than £10,000 per annum, based on an estimated default rate of around 0.01% and recovery rates of 40% for a BBB+ company⁸⁸,

⁸⁶ <http://www.greatbritishrefurb.co.uk/images/pdfs/gbr-greendealmarketresearch.pdf>

⁸⁷ The IPPR’s analysis assumes that the cost of a guarantee could be met through reassigning some of the funds currently used for ECO. We do not assume that a guarantee would be funded in this way.

⁸⁸ These estimated are based on Moody’s, 2011, Corporate Default and Recovery Rates, 1920-2010

Table 25. Impact of a guarantee for the GDFC's borrowing until 2020

Outcome	Current	2020 (with no guarantee)	2020 (with guarantee)
Projected Green Deal APR (real)	5.9 - 7.8%	6.6%	3.2%
Uptake (£m Green Deal lending)	£6.5m	Low (£10m p.a.)	Assumed to be consistent with central uptake (£150m p.a.)
Cost of guarantee to government for loans made in 2020	£0 (no guarantee)	£0 (no guarantee)	Contingent liability of £150m. Expected direct costs of less than £10,000 p.a.

Note: The current nominal APR is higher than our central projection, due to low uptake. Our central projection assumes uptake of £150m per annum, close to the target rate.

Given the benefits of a Green Deal guarantee and the potentially limited cost to government, we recommend a time-limited guarantee to support access to lower cost finance for energy efficiency.

The ability to provide a guarantee may be limited by state aid rules as there may be concerns that a guarantee gives an unfair advantage to the guaranteed lender (i.e. the GDFC).⁸⁹ State aid concerns may be surmountable if it can be established that there is a genuine market failure regarding the GDFC's current cost of funds, in that its funding cost does not reflect its actual risk given its lack of track record.

We would expect distributional impacts of a guarantee of the GDFC relative to the counterfactual only to the extent that the GDFC supports borrowing by those that would not otherwise have access to finance at the Green Deal APR. Given the Green Deal's wide availability, this suggests that there could be some distributional impact given that consumers with lower credit scores also tend to be those with lower incomes.

We did not assess a guarantee of the borrowing by the final consumer, as this may introduce significant moral hazard problems.⁹⁰

⁸⁹ UK Green Building Council, 2014

⁹⁰ Such a guarantee could be justified if the credit risk associated with lending was being misunderstood or mispriced by finance providers. It is not clear that this is the case for general finance products where providers have well-established credit metrics. For the Green Deal the credit risk may be less understood due to the novelty of the scheme. However, given the low expected

2. Time-limited Green Deal interest rate subsidies

An alternative to a guarantee is to introduce a time-limited subsidy to the interest rate for LCT finance. This would apply to secured lending only (given that the size of heat pump investments means that lending would typically be secured in order to access the cheapest interest rates), from 2015 to 2020. This could boost demand for LCTs and the associated finance by:

- reducing the APR; and
- ensuring that more energy efficiency investments meet the Golden Rule.

A subsidy could also enable the GDFC to reach scale, as well as allowing providers to better understand the risks associated with lending for EVs and heat pumps (reducing barriers such as those posed by the CCA).

We analysed two subsidy options, a high subsidy that enables interest free loans (as is currently the case for some local authority lending), and a subsidy that achieves an APR similar to a mortgage interest rate.⁹¹ Our estimates of the impact on the Green Deal APR, uptake, and the costs to government are shown in Table 26 below.

- **Green Deal APR.** With no subsidy, we project an APR of 6.6% in 2020 in real terms. This compares to a -2% real APR with a subsidy to provide GDFC loans at 0% APR nominal, and 2.9% real APR with a subsidy to achieve a nominal APR roughly equivalent to that achieved under a guarantee. As before, we assume that after 2020 the APR will be consistent with our central projection. This is due to increased gearing and a higher credit rating for the GDFC (both pushing down the cost of finance) as it will have been able to demonstrate a track record for lending.
- **Uptake.** We assume that interest free loans are consistent with high uptake (£300m GDFC lending per annum) and that the smaller subsidy is consistent with uptake of £150m per annum, compared to £10m per annum in the counterfactual. After the subsidy expires in 2020, we assume that uptake will be £150m per annum for both subsidy sizes and £10m per annum in the counterfactual. This is because we assume both subsidies are consistent with higher uptake than in the counterfactual even after the subsidy expires, due to a track record for the GDFC and greater social norms around using Green Deal finance.

default costs for energy bills the impact of any such guarantee would be limited and would have to be weighed against the moral hazard impact.

⁹¹ The APR achieved by this smaller subsidy is similar to that achieved by a guarantee.

- **Cost to government.** The cost of providing these subsidies is likely to be around:

- £130m in 2020, and £1.2bn in total to 2039 (both in present value terms) for interest free Green Deal loans; and
- £30m in 2020, and £250m in total to 2039 (present value terms) for the smaller subsidy.

We model 20 year Green Deal loans, and assume that the subsidy applies to all Green Deal loans taken out between 2015 and 2020.

Table 26. Impact of subsidy

Outcome	No subsidy	High subsidy	Smaller subsidy
Projected Green Deal APR (real) in 2020	6.6%	-2.0%	2.9%
Uptake in 2020 (£m Green Deal lending)	Low (£10m p.a.)	Assumed consistent with high uptake (£300m p.a.)	Assumed consistent with central uptake (£150m p.a.)
Costs to government of subsidised loans made in 2020, over their 20 year lifetime (PV)	£0	£213m	£45m
Costs of subsidy to government in 2020 (PV)	£0 (no subsidy)	£130m	£30m

A subsidy could have varying distributional impacts to the extent that it is targeted. For example, subsidised loans could be targeted just at low-income households as LAs currently target their lending for home improvements.

The smaller subsidy is preferable to the interest free option, as:

- a larger subsidy has a higher direct cost to government;
- a subsidy to provide interest free loans may be less likely to comply with state aid rules, as market finance providers would not be able to offer these;

- if the barrier to Green Deal take up at the current APR is due to framing effects relative to mortgage interest rates then a smaller subsidy which brings Green Deal loans into line with these may still have a major impact on uptake; and
- the larger subsidy is further from market-based finance, and it is not clear what the impacts on confidence in the GDFC would be of a move from interest free loans to market rates (given these are very different products), relative to a smaller jump from less subsidised loans to market rates, where consumer responses may be more similar.

However, we do not recommend a subsidy in favour of a guarantee, as the guarantee is likely to be less costly to government while achieving a similar outcome.

3. Improving the design of the Green Deal

This option looks at reducing policy and regulatory barriers to the Green Deal. The Golden Rule requires that:

- Expected bill savings must exceed the Green Deal repayment in the first year and over the duration of the loan; and
- the repayment term must not be greater than the expected lifetime of the measure.⁹²

Research by e3g estimated that even relatively modest Green Deal retrofit investments would require an interest rate of 2% or lower on a 25 year loan to meet the Golden Rule.⁹³ This suggests that relaxing the first part of the Golden Rule (on bill savings rather than the expected lifetime of the measure) could ensure more energy efficiency investments are financed by the Green Deal.

The Golden Rule could be relaxed while maintaining the ‘pay as you save’ principle.

- **Shorter loan terms could be allowed in response to consumer demand**, even if this pushes regular loan repayments above the estimated annual financial savings. Shorter term loans have an indeterminate impact on the Green Deal APR, as discussed in section 5.5.2. However, we expect that relaxing the Golden Rule to enable a

⁹² DECC, 2012, Final Stage Impact Assessment for the Green Deal and Energy Company Obligation, available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/42984/5533-final-stage-impact-assessment-for-the-green-deal-a.pdf.

⁹³ <http://www.e3g.org/library/financing-the-green-deal>

greater range of shorter term loans to comply with it would make the Green Deal more appealing to consumers. This is due to the following:

- ▣ research has shown that the long-term nature of Green Deal loans and the high total amount of interest paid as a result of the long terms is a barrier to take up,⁹⁴ with consumers preferring shorter term loans;
 - ▣ allowing shorter-term loans in the Green Deal increases the annual costs (not the overall costs) of the loans, but not the benefits (as energy savings would remain unchanged), meaning that some Green Deal investments would not meet the Golden Rule; and
 - ▣ because of this, a relaxation of the Golden Rule would be required to enable shorter-term Green Deal loans to be provided.
- **Renewable Heat Incentive (RHI) payments could be counted towards the Golden Rule calculation**, making heat pump investments much more likely to qualify. The tariffs on the RHI are set to offer typical consumers a 7.5% rate of return, designed to account for high capital costs, barrier costs, and the approximate Green Deal rate of return. This is close to the current interest rates for Green Deal loans. This implies that counting RHI incentives towards the Golden Rule would mean that heat pumps could be widely funded under the Green Deal.

We estimated the impact of the latter. Our estimates are indicative, making a number of major assumptions. We describe our methodology in more detail in Annexe.

Using an estimate of heat pump uptake from a recent report for the CCC,⁹⁵ we estimate that allowing RHI payments to count towards the Golden Rule would result in 50,000 – 100,000 additional heat pumps being installed by 2020.⁹⁶ This suggests that an extra £82m of Green Deal lending could be expected in 2020 if RHI payments could be counted towards the Golden Rule. This is around one-third of the Green Deal lending projected for 2020 in the Green Deal impact

⁹⁴ UK Green Buildings Council

⁹⁵ <http://www.theccc.org.uk/wp-content/uploads/2013/12/Frontier-Economics-Element-Energy-Pathways-to-high-penetration-of-heat-pumps.pdf>. Our estimate is less than half the estimated additional heat pumps bought if the same calculation is made using the RHI impact assessment projections. This is likely to be due to more conservative assumptions around barriers in the Frontier and Element base case estimates.

⁹⁶ Our counterfactual assumes that heat pump uptake would be lower than the base case projection by 36%, as this is the proportion of target consumers that would not be able to access finance (or would only be able to access high cost finance).

assessment. In turn, higher uptake may reduce the Green Deal APR by giving the GDFC a greater track record.

Given that the GDFC is able to lend to households that wouldn't otherwise be able to access finance at similar rates, reforming the Golden Rule would enable increased access to finance for energy efficiency and LCT investments. We therefore recommend this alongside measures to reduce the cost and increase awareness of Green Deal finance.

As before, changes to the Golden Rule could have distributional impacts relative to the counterfactual, to the extent that they better enable low-income (and possible lower credit-rating) households to access sufficient financing to enable investment in heat pumps.

A possible risk around reducing the term of Green Deal lending is that it could lock future residents into paying back finance for energy efficiency investments that deliver limited improvements. Similarly, including RHI payments in the Green Deal also risks disadvantaging consumers with Green Deal loans if RHI subsidies are removed retrospectively or if heat pump running costs prove higher than expected.

4. Understanding and transferring risk around technology performance and future value

Business models for lending which transfer technology performance risk (e.g. the likelihood of failure) to installers or manufacturers are likely to be important for EVs and heat pumps. Manufacturers and installers may often have a better understanding of these risks (meaning they are more comfortable taking them) and, in some cases, are better-placed to manage them than consumers or finance providers.

For EVs a key risk is around the depreciation rate for the technology. As set out in Section 4.2, EVs currently have high and uncertain depreciation rates compared to conventional cars.⁹⁷ This reflects a lack of experience with the technology, uncertainty over battery performance, an immature second-hand market and shorter lifetimes for batteries compared to conventional vehicles. Over time and as the penetration of EVs grows, experience with battery technology will increase, the second-hand car market will mature and battery lifetimes are expected to increase.

In the long term, this is expected to bring the depreciation rates of EV batteries and EVs in line with depreciation of conventional vehicles, and therefore result

⁹⁷ For example, a recent simple analysis in the US compared conventional and EV depreciation rates and found five year residual values of 15-28%, compared to 36-40% for similar conventional vehicles.

in PCP and battery lease interest rates being similar for EVs and conventional vehicles, at around 6.5%-13.5% in real terms by 2020 (see Annexe 1).

It is also possible that EV batteries may be less affected than vehicles by the premium for being 'new', so that the EV battery could depreciate at a lower rate than for conventional vehicles. This could lower the cost of default – and therefore the cost of capital – for a PCP or lease on an EV or EV battery below that for a conventional car. The extent of this impact would depend on the relative importance of this compared to other factors determining depreciation.

In the short to medium term, the currently high depreciation rates of EV batteries can be alleviated through risk transfers where manufacturers take more of the risk around technology performance and depreciation rates which they may be best placed to manage. We would expect the market to provide financing that best meets customer preferences (e.g. around not taking on the technology risk), and there is evidence that finance models are already being introduced that are tailored to EVs. For example, Nissan and Renault lease EV batteries separately from the PCP for the EV itself. These leases include guarantees on the performance of the battery.

In effect, this transfers the risk around the performance and future value of the battery from the consumer to the manufacturer. A finance provider with limited experience of EV technology providing an EV PCP could apply a high depreciation rate to the EV battery (e.g. due to not understanding the actual rate of depreciation, or the level of uncertainty around the rate of depreciation). In this case the manufacturer guarantee could result in a lower cost of finance to the consumer.⁹⁸ Manufacturers are likely to have the best understanding of the “true” value of the battery. Therefore, they are less likely to apply excessive depreciation than consumers or finance providers. Therefore, business models such as leasing where the manufacturers retain ownership of the battery are likely to be more effective while consumer experience with battery technology is limited. This financing model has been encouraged by government policy by DECC's Plug-in Car Grant where the subsidy is made conditional on guarantees being provided.

There are other actions that could further improve understanding of risks, encourage efficient risk transfers and correct for any misperception of risk .

- **Supporting EV uptake and finance.** As discussed, the cost of finance for EVs may be increased as a result of high EV depreciation rates, which in turn are related to misperception of the technology risks and the immaturity of the EV market. These issues should be resolved through the adoption of business models (leasing, guarantees) where

⁹⁸ Similarly, consumers are likely to require a higher premium to bear risk around the battery than manufacturers, as manufacturers have a better understanding of battery and technology risks than the consumer

technology risks are transferred to manufacturers and over time as the EV market matures.

However, in the short-term there may be a case for intervention. Capital subsidies and required technology guarantees for EVs already help address these issues by increasing uptake and contributing to the development of the EV market. While the EV market matures, other time-limited interventions could also be considered such as subsidies on EV interest rates or funding of EV finance providers by the Green Investment Bank. Both of these measures could lower the cost of EV finance, correcting any increase in the cost of finance for EVs related to misperception of risk, and help mature the EV market by increasing uptake.

- **Supporting the second hand EV market.** Finance providers may not have sufficient information on residual values of EVs due to the technology not being mature and as the second hand market is small. This can result in conservative (rapid) estimates of EV depreciation which are often imposed by bank funders of the PCP providers. This would increase the total cost for a customer using a PCP, which may reduce demand. This could be addressed by supporting the development of a used EV market to reduce uncertainty about depreciation rates. Possible ways of doing this include:
 - introducing incentives for dealers to market second hand EVs (this would have to balance the impact of information failures against the possibility of introducing mis-selling incentives);
 - requiring guaranteed buybacks of EVs bought on finance.⁹⁹ This would give car dealers stronger incentives to market second hand electric vehicles helping develop the market. In turn this could result in finance providers having more confidence in the residual values of EVs, due to a larger secondary market; or
 - alternative options could be explored, for example incentivising demand for second hand EVs through subsidies or government guarantees of residual EV values. However, for these schemes to be effective in building confidence in residual values it is important they do not distort the prices of vehicles.

⁹⁹ This would mean the manufacturer or finance provider must buy the vehicle at the end of the finance period at an agreed price, providing the EV meets a certain standard. Examples of guaranteed prices currently used in EV finance include the Tesla S EV in the USA, for which the finance offered includes a three year guaranteed resale value.

Each of these options would have to be assessed against the magnitude of any current information failure, and the extent to which it addresses the failure. It is likely that, absent information failures, depreciation rates for EVs will still be higher than for conventional vehicles, contributing to the higher relative cost of buying an EV on a PCP compared to a conventional vehicle. Moreover, with greater experience and take-up of electric vehicles, the second hand market and confidence in residual values should gradually improve over time without an intervention.

- **Allowing part of RHI payments to go to the installer with requirements on performance guarantees.** For heat pumps, RHI payments could be allowed to go directly to the installer, with payments conditional on them providing continued performance guarantees to the customer. In practice, this means installers may part or fully finance the heat pump in return for the claim on the subsidies. Therefore, uptake and finance of heat pumps is encouraged by:
 - reducing the financing burden for the consumer and transferring this to the installer who may be more comfortable with the risks; and
 - encouraging transfer of performance risks to the installer who may be best-placed to manage them. Providing a guarantee would give the installer strong incentives to install and size the heat pump correctly and to maintain it over time. In turn this would give consumers greater confidence in investing in the technology.

Given that current uncertainty about technology risks is a barrier that increases the cost of finance for EVs and heat pumps, we recommend these measures that support greater understanding of the risks, and that transfer the risk to the parties that best understand them.

The distributional impact of technology risk transfer may be limited; to the extent that uptake of this finance is expected to be spread across households with different incomes and credit ratings.

The main risk of such interventions is that they may be unnecessary to the extent the market is already correctly pricing and allocating technology risk (i.e. there is no market failure). However, we do not believe this is the case while the markets for these technologies remain immature.

5. Tackling demand side barriers

Identifying and addressing demand side barriers could increase uptake of finance for LCTs, as well as LCT uptake itself. An information campaign could be used to tackle:

Improving low-carbon finance options

- a lack of understanding of the best available finance products for LCT investments for a given consumer and situation; and
- myopia, which prevents consumers from taking into account the long-term benefits and costs of LCT investments compared to alternatives.

Current information campaigns or tools on energy efficiency and LCT investments include the following:

- advertising for Green Deal finance; and
- an online calculator available to show consumers their eligibility for different energy grants¹⁰⁰ and information on how to pay for Green Deal measures.¹⁰¹

However, neither enables a comparison across different financing products to fund energy efficiency or LCT investments.

In designing an information campaign, the following aspects are likely to be important.

- **Simplicity.** Behavioural research suggests that providing a large amount of information can reduce engagement, for example by creating a belief that any information received won't be useful. This suggests that a lack of understanding of the best available finance products should be addressed through simple, targeted information. However, this must be within the constraints of regulation, for example as specified by the CCA or the Advertising Standards Authority (ASA).¹⁰²
- **Timing.** The timing of an information campaign is likely to affect its impact. For investments in energy efficiency and LCTs, information on finance products and the long-term costs and benefits of different options may be most effective if delivered at the time of renovation (e.g. when moving home, making home improvements, or boiler failure), but before the point of sale. This is supported by recent research which has shown that receiving price information for add-on insurance earlier than the point of sale can improve the outcomes of consumer decisions.¹⁰³

¹⁰⁰ <https://www.gov.uk/energy-grants-calculator>

¹⁰¹ <https://www.gov.uk/green-deal-energy-saving-measures/how-to-pay-and-get-cashback>

¹⁰² In 2013, DECC changed adverts for the Green Deal after complaints to the ASA that they could mislead consumers over the costs of the Green Deal.

¹⁰³ FCA, 2014, Occasional Paper No. 3, How does selling insurance as an add-on affect consumer decisions? A practical application of behavioural experiments in financial regulation, available at: <http://www.fca.org.uk/static/documents/occasional-papers/occasional-paper-3.pdf>.

- **Messaging.** Who delivers the message can also affect how consumers respond to new information. For energy efficiency and LCTs, the Energy Saving Trust may be effective in delivering information, due to its impartial status. However, a trial by the FCA on the impact of varying different aspects of a letter to inform consumers they were eligible for redress found that including the FSA logo had no impact on the proportion of consumers that claimed their compensation.¹⁰⁴ Including the CEO's signature had a small negative impact. This illustrates the importance of choosing the right body to deliver and frame information.
- **Social norms.** Successful information campaigns often appeal to social norms. With low adoption to date, social norms around high energy efficiency and investing in LCTs have not yet been established in the UK. Targeting an information campaign at a particular area (e.g. linked to DECC's current community level Green Deal initiatives) could foster social norms, as behavioural research shows that people can be constrained or spurred to action by their neighbours' behaviour.¹⁰⁵

Trialling should be undertaken to understand how these factors affect behavioural responses in the context of energy efficiency and LCT finance. This would enable measures to be best designed before being rolled out.

Information campaigns can be relatively low-cost, with the cost of a broad-based campaign in the order of £10m per annum.¹⁰⁶ The evidence shows that they can be effective when well-targeted. With currently low awareness of the Green Deal, it is not clear whether a national marketing campaign or more targeted local campaigns would be more effective in increasing uptake. In the context of the low awareness and uptake of the Green Deal, we recommend an information campaign on finance for energy efficiency and LCT investments, in conjunction with measures to reduce the cost and increase availability of finance.

¹⁰⁴ Financial Conduct Authority, 2013, Encouraging consumers to claim redress: evidence from a field trial, available at: <http://www.fca.org.uk/static/documents/occasional-papers/occasional-paper-2.pdf>.

¹⁰⁵ IPPR, 2013, Help to heat, a solution to the affordability crisis in energy, available at: http://www.ippr.org/images/media/files/publication/2013/11/Help-to-heat_Nov2013_11562.pdf.

¹⁰⁶ For example, in a report for the CCC on heat pumps pathways, Frontier Economics estimated a marketing campaign to increase heat pump uptake has been estimated at £8m per annum, of which planning and design represents £1m p.a. and the remaining costs are from leaflets, TV and radio advertising, online advertising and exhibition costs. This was for a campaign aimed at reducing behavioural barriers to uptake. The scope of the campaign suggested here is similar, but focuses primarily on barriers to accessing finance, as well as barriers to uptake. <http://www.theccc.org.uk/wp-content/uploads/2013/12/Frontier-Economics-Element-Energy-Pathways-to-high-penetration-of-heat-pumps.pdf>

As before, an information campaign on the Green Deal could have distributional impacts, for example if it was targeted at low-income households. The distributional impacts may vary depending on the channel used.

A risk of a marketing campaign could be that it results in changed decisions that make consumers worse off (for example if consumers are mis-sold LCTs or finance products as a result of the campaign). This risk could be mitigated by choosing a delivery body for the campaign that has an incentive to ensure consumers access the best available finance option available to them, rather than promoting a particular finance type.

6.4 Conclusions and timeline

Having assessed the policy options, our recommended timeline of actions is as follows. Reducing the cost and increasing the availability of LCT finance would require a combination of different measures, with greater action required for heat pump finance, given the higher barriers. The interventions to reduce demand-side barriers would address both barriers to accessing finance, and barriers to taking up LCTs.

- **Guarantee of GDFC borrowing for Green Deal lending (2015-20).** A time-limited guarantee would allow the GDFC to establish a track record, resulting in lower cost of funds even after the guarantee is removed.
- **Information campaign to encourage LCT uptake and better choices regarding LCT finance (2015-25).** The information campaign would run until 2025 as after this technologies may be well-understood such that further awareness raising and ‘nudge’ interventions are not required.
- **Encourage technology risk transfer and understanding (2015 onwards).** For example, this could be achieved by requiring guarantees around buyback and performance as a condition of subsidy.
- **Amend Golden Rule to allow RHI payments to qualify and support shorter term borrowing (2015 onwards).** If reformed in 2015, this would allow heat pumps to be much more widely financed using the Green Deal.

We expect finance for EVs should be available at the same rates as conventional cars in future. It is also possible that EVs could be available at lower rates, if batteries were to depreciate at a lower rate than the vehicles themselves.

As the EV market matures, EVs finance rates should be monitored to verify this and to assess whether there is any case for short-term interventions to reduce the cost of EV finance while the market matures.

Annexe 1: Projecting interest rates for finance products

To enable comparison of Green Deal interest rates with interest rates for other types of finance over time, we also projected rates for unsecured personal loans and mortgages.

To do this, we adopted a simple approach which summed the following two components.

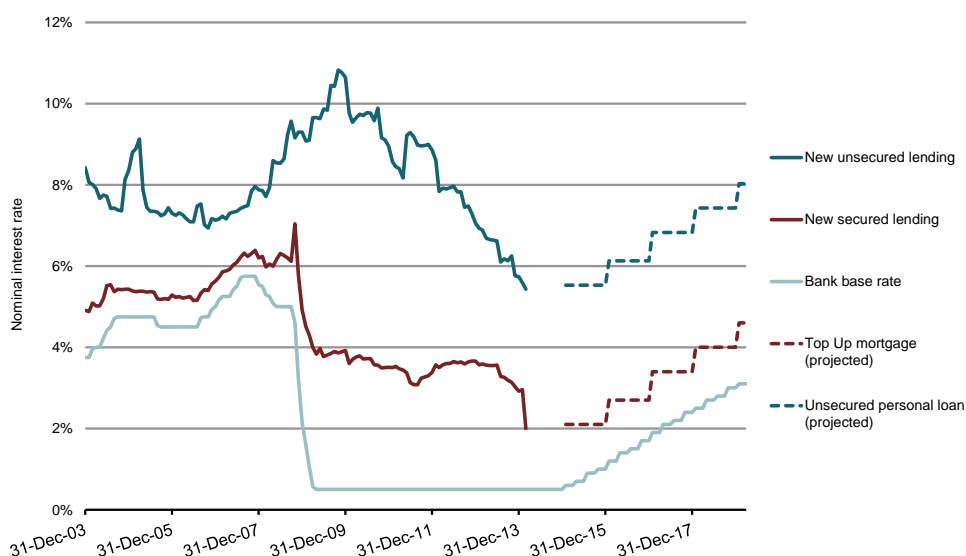
- The projected base rate.
- The spread between the base rate and the personal loan (or mortgage) interest rate, under different degrees of risk appetite.

We modelled risk appetite using past spreads between the base rate and personal loan (or mortgage) interest rate,¹⁰⁷ estimated as follows:

- high risk aversion: estimated using the average spread between the base rate and the observed interest rate in 2009-10 (during the financial crisis);
- current risk aversion: the spread between the base rate and observed interest rate in February 2014; and
- low risk aversion: the average spread between the base rate and observed interest rate in 2003-07.

The resulting interest rate projections are shown in Figure 10 below, which compares our projections (dashed lines) to the actual interest rates observed for the equivalent products since 2003. These are our central projections for these products, assuming a medium risk appetite.

¹⁰⁷ The personal loan was an unsecured £10,000 personal loan, average quoted rate, while the mortgage was a 75% LTV tracker, average quoted rate (Bank of England data).

Figure 10. Projected and past rates

Source: Frontier Economics, based on Bank of England and OBR data and forecasts

We would similarly expect PCP rates to rise as base rates rise, potentially to around 6.5%-13.5% in real terms by 2020 (from the current central range of 5-12%) based on current projected base rates. We would expect there to be continued wide variation between PCP rates depending on the consumer's credit score.

Annexe 2: Projecting the impact of including RHI payments in the Golden Rule

This annexe sets out how we estimated the number of additional heat pumps bought if the Green Deal is modified to allow Renewable Heat Incentive payments to be included in the Golden Rule.

We assume that the RHI is targeted at the 83% of the population that the GDFC lends to, because:

- to be eligible for the RHI, households must have had a Green Deal assessment and installed loft and cavity wall insulation if this is recommended; and
- the 17% of households that the GDFC does not lend to would not be able to access Green Deal finance for these measures, and are also may be targeted by ECO Affordable Warmth for heat pump installations.¹⁰⁸

Having focused on the group that could access Green Deal finance, we estimated the proportion of this group that would be unable to access finance for a RHI subsidised heat pump under the counterfactual. Given that the GDFC's lending includes lending to the 30% of consumers that would otherwise not be able to access finance or would have a high cost of finance, we estimate that 36% of consumers targeted by the RHI would not be able to access finance in the counterfactual.¹⁰⁹ This assumes that the profile of consumers targeted by the RHI is the same as the profile of consumers that the GDFC lends to. In practice, this assumption might not hold as the RHI targets off-gas grid households, which may have different characteristics and access to finance compared to the population as a whole.

Applying this to the Frontier Economics and Element Energy base case estimate of heat pump uptake,¹¹⁰ we estimate that this would result in 87,000 additional heat pumps being installed by 2020.¹¹¹ This assumes that making RHI payments

¹⁰⁸ Though in practice heat pumps are a relatively costly solution, so other measures are more likely to be installed for low-income and vulnerable households under ECO.

¹⁰⁹ This is the proportion of the population targeted by the GDFC (83%) that would not otherwise be able to access finance or would have a high cost of finance.

¹¹⁰ <http://www.theccc.org.uk/wp-content/uploads/2013/12/Frontier-Economics-Element-Energy-Pathways-to-high-penetration-of-heat-pumps.pdf>

¹¹¹ Our counterfactual assumes that heat pump uptake would be lower than the base case projection by 36%, as this is the proportion of target consumers that would not be able to access finance (or would only be able to access high cost finance).

eligible is sufficient for heat pumps to meet the Golden Rule, and that there aren't further barriers to consumers using the Green Deal to finance heat pumps.

Table 27 shows the estimated costs and benefits if RHI payments are included in the Green Deal. We estimated the costs and benefits at our central estimate of additional heat pump uptake from the policy. At our central estimate, the net present value of carbon savings as a result of allowing RHI payments in the Golden Rule could be £112m to 2042. This is small compared to the resource costs of the RHI for these additional heat pumps, of £338m over the same period.

Carbon benefits from heat pumps will increase over time as the electricity sector decarbonises, and as the social value of carbon saved increases. There would also be additional benefits from increased heat pump uptake, including the development of a supply chain for heat pumps, learning on installation and reducing demand-side barriers such as lack of awareness of heat pumps.

Table 27. Costs and benefits from additional heat pumps bought if RHI payments included in Green Deal

Costs and benefits, NPV in 2014 prices, £m	Per annum in 2020	Cumulative to 2020	RHI policy lifetime (to 2042)
Resource costs from additional HPs	-£17	-£53	-£292
Air quality costs/benefits from additional HPs	£1	£2	£10
Carbon benefits from additional HPs	£5	£14	£96
Total NPV from additional HPs	-£12	-£37	-£185

Source: Frontier Economics

Annexe 3: Green Deal projection scenarios

This annexe sets out the assumptions in our three Green Deal APR scenarios. We first break down the input assumptions, before setting out the resulting rates. Table 28 sets out the assumptions in our central case.

Table 28. Central case assumptions

Assumptions	2015-2020	2020-2025	2025-2030	2030-2035
Risk free rate	20-year gilt forward rates	20-year gilt forward rates	20-year gilt forward rates	20-year gilt forward rates
Uptake	£150m loans/ per year	£150m loans/ per year	£150m loans/ per year	£150m loans/ per year
Subsidization of interest rate by	No subsidy	No subsidy	No subsidy	No subsidy
Cost of Green Deal default	Current	Current	Current	Current
Government guarantee of GDFC borrowing	No	No	No	No

Source: Frontier Economics

Table 29 describes the assumptions in the targets met scenario.

Table 29. Targets met

Assumptions	2015-2020	2020-2025	2025-2030	2030-2035
Risk free rate	20-year gilt forward rates	20-year gilt forward rates	20-year gilt forward rates	20-year gilt forward rates
Uptake	£150m loans/ per year	£300m loans/ per year or more	£300m loans/ per year or more	£300m loans/ per year or more
Subsidization of interest rate by	No subsidy	No subsidy	No subsidy	No subsidy
Cost of Green Deal default	Current	Current	Current	Current
Government guarantee of GDFC borrowing	No	No	No	No

Source: Frontier Economics

Table 30 sets out the assumptions in the enhanced policy support scenario.

Table 30. Enhanced policy support

Assumptions	2015-2020	2020-2025	2025-2030	2030-2035
Risk free rate	20-year gilt forward rates	20-year gilt forward rates	20-year gilt forward rates	20-year gilt forward rates
Uptake	£150m loans/ per year	£150m loans/ per year	£150m loans/ per year	£150m loans/ per year
Subsidization of interest rate by	No subsidy	No subsidy	No subsidy	No subsidy
Cost of Green Deal default	Current	Current	Current	Current
Government guarantee of GDFC borrowing	Yes	Yes	Yes	Yes

Source: Frontier Economics

The resulting projected APRs and their breakdown are shown for each scenario in the tables below. The nominal APR is the sum of the cost of funds, transaction costs, and default costs.

Table 31. Green Deal APR breakdown, central scenario

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Cost of funds	6.1%	6.3%	6.3%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%
Risk-free rate	3.7%	3.8%	3.9%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
Debt spread	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%
Credit rating	BBB throughout															
Cost of debt	5.2%	5.3%	5.4%	5.5%	5.5%	5.5%	5.5%	5.5%	5.5%	5.5%	5.5%	5.5%	5.5%	5.5%	5.5%	5.5%
Share of debt	80% throughout															
Cost of equity	10% throughout															
Transaction costs	0.8% throughout															
Costs of default and contingency	0.5% throughout															
APR (nominal)	7.4%	7.5%	7.6%	7.6%	7.7%	7.7%	7.7%	7.7%	7.7%	7.7%	7.7%	7.7%	7.7%	7.7%	7.7%	7.7%
APR (real)	5.3%	5.4%	5.5%	5.5%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%

Source: Frontier Economics

Annexe 3: Green Deal projection scenarios

Table 32. Green Deal APR breakdown, targets met scenario

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Cost of funds	6.1%	6.3%	6.3%	6.4%	6.4%	5.7%	5.7%	5.7%	5.7%	5.7%	5.7%	5.7%	5.7%	5.7%	5.7%	5.7%
Risk-free rate	3.7%	3.8%	3.9%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
Debt spread	1.5%	1.5%	1.5%	1.5%	1.5%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%
Credit rating	BBB-					BBB+										
Cost of debt	5.2%	5.3%	5.4%	5.5%	5.5%	5.2%	5.2%	5.2%	5.2%	5.2%	5.2%	5.2%	5.2%	5.2%	5.2%	5.2%
Share of debt	80%					90%										
Cost of equity	10% throughout															
Transaction costs	0.8%					0.5%										
Costs of default and contingency	0.5% throughout															
APR (nominal)	5.3%	5.4%	5.5%	5.5%	5.6%	4.6%	4.6%	4.6%	4.6%	4.6%	4.6%	4.6%	4.6%	4.6%	4.6%	4.6%
APR (real)	7.4%	7.5%	7.6%	7.6%	7.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%

Source: Frontier Economics

Annexe 3: Green Deal projection scenarios

Table 33. Green Deal APR breakdown, targets met scenario

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Cost of funds	3.7%	3.8%	3.9%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
Cost of debt																
Share of debt	N/A: we assume guarantee means that the GDFC can borrow at the 20 year gilt forward rate															
Cost of equity																
Debt spread	0% throughout															
Transaction costs	0.8% throughout															
Costs of default and contingency	0.5% throughout															
Green Deal APR (nominal)	2.9%	3.0%	3.1%	3.2%	3.2%	3.2%	3.2%	3.2%	3.2%	3.2%	3.2%	3.2%	3.2%	3.2%	3.2%	3.2%
Green Deal APR (real)	4.9%	5.1%	5.2%	5.2%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%

Source: Frontier Economics

Annexe 3: Green Deal projection scenarios

Annexe 3: Green Deal projection scenarios

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