Programme Area: Smart Systems and Heat

Project: Value Management

Title: Overcoming barriers to smarter heat solutions in UK homes

Abstract:

Annexe 1b: Analysis of existing policy. This report was initially produced in March 2015. The detailed information and analyses documented within may be out of date with current thinking.

Context:

This project studied how value can be delivered across a smart energy value chain - in the context of the UK. It built a clear understanding of how smart energy systems can deliver combined consumer value alongside commercial value for market participants - producers, suppliers, distributors. The analysis will help to make the commercial deployment of smart energy systems more likely. This £600,000 project was delivered by Frontier Economics, a leading economic consultancy.

Overcoming barriers to smarter heat solutions in UK homes

Annexe 1b: Analysis of existing policy

PREPARED FOR THE ETI

March 2015

1 Overview

This annexe sets out the analysis of existing heat and energy efficiency policies underlying our analysis of barriers and solutions. The annexe is structured as follows.

- We first summarise our findings.
- We then review existing heat and energy efficiency policies in the UK and internationally, analysing how far policies have overcome barriers to uptake, and their wider effectiveness (e.g. in terms of cost, or impact on industry confidence).

1.1 Summary of findings

The policies we have analysed cover a range of policy successes and failures, both in terms of driving take up of low-carbon heat and energy efficiency, and in doing this in an effective way. We group our findings according to high level themes, and findings associated with mandates, incentives, and enabling policies. Our main findings are as follows.

General points

- **No 'silver bullet.'** Our analysis has shown that there is no 'silver bullet' that effectively addresses all barriers at once. This is in line with DECC's own findings on energy efficiency.[1]
- **Absent mandating, overcoming or bypassing interest barriers is a prerequisite for policy success.** The Green Deal has had little success in this area to date.

Mandates

- **Supplier obligations have been successful in driving energy efficiency take up but they may not result in the most effective delivery.** CERT and CESP were successful in driving increased energy efficiency, due to mandating this take up with punitive fines against non-delivery. While so far having a more limited impact than these, ECO is also driving take up, focusing on hard to treat and low-income consumers. There are political

[1] DECC, 2014, Foundations in place, The Green Deal and ECO annual report, available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/388761/greendealandecoannualreport.pdf.

risks associated with putting the cost of obligations on consumer bills, as illustrated by recent changes to ECO following billing concerns. Other organisations (e.g. local authorities and housing associations) may be better placed to identify suitable households and deliver measures in their homes.

- **Mandating can be an effective last resort.** More broadly, mandates have been applied effectively in some cases, for example with the mandate of condensing gas boilers and the introduction of minimum efficiency requirements through EU Products policy. Mandates can be effective when:
  - consumers are not very interested in having a wider choice; or
  - consumers make choices that are not in their economic interest because options are complex and information is difficult to process; and
  - the options being mandated entail net benefits for UK Plc.

- **To minimise the cost of mandated standards, they should be set in as broad a way as possible.** For example, this may involve setting minimum energy efficiency standards, rather than specifying the exact technologies required to deliver those standards.

- **Setting broad mandates also helps avoid adverse outcomes.** Experience with CERT shows that badly targeted or designed mandates can result in poor outcomes: CERT focussed explicitly on cost effective measures, but initially suppliers were able to meet their obligations while providing measures in a way that may not encourage or enable their use by consumers, for example as in the case where efficient light bulbs were mass mailed to consumers and not used.

Incentives

- **If financial incentives are high enough, many other barriers can be overcome.** Experience with the GDHIF, which has seen rapid take up of limited funding, predominantly for solid wall insulation, has demonstrated this, though for a relatively small number of consumers.

- **Alignment with long-term decarbonisation goals has not always been achieved.** Feed in tariffs (FITs) for solar PV have achieved widespread take up, but for a technology that is unlikely to make a major contribution towards meeting long-term carbon targets. This can be seen from scenarios for the future energy generation mix under decarbonisation.

- **To be effective, financial incentives must be designed with awareness and interest barriers in mind.** A wide range of financial incentives have been introduced for take up of low carbon interventions, with mixed

success. Solar PV FITs have had high take up, while the domestic RHI and Green Deal Cashback had limited take up, despite the RHI in particular offering a return that compensates for the difference in upfront cost when investing in low-carbon compared to some conventional heating. Low take up could be the result of awareness barriers (e.g. with solar panels more visible than heat pumps).

- **Consumers' tendency to focus on near term costs and benefits and credit constraints could also be driving low take up of financial incentives that are not paid up front.** This tendency makes instruments providing a future stream of subsidy payments less attractive than paying financial incentives upfront in a lump-sum. Credit constraints also point towards grants being more effective than ongoing payments.

- **Upfront grants may be a more cost effective way of driving uptake than ongoing payments.** This is because the Government's discount rate is lower than that for consumers. Other things equal, this means that it should be possible to incentivise take up with a lower pay-out to consumers if the pay-out is given upfront.

- **Green Deal loans have not been a success.** Take up of Green Deal loans has been low, with interest rates high relative to alternatives for many consumers, as well as being perceived as high. We note however that Green Deal interest rates compare more favourably with pricing of unsecured personal loans for consumers with lower credit scores, who are more likely to be credit constrained.[2] Limited success suggests that finance barriers may better be addressed through business models, that policy solutions must be designed to closer meet consumer preferences (e.g. loans provided through existing lending channels that consumers trust, or provided on shorter terms).

Enablers

- **District heat development internationally has relied on a range of enabling policy measures.** This has included a strong role for local authorities in identifying potential for district heat, policy to coordinate agents (e.g. zoning, and mandating in some cases), and financial incentives (grants, loans). The relative importance of these different policy measures is not clear.

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2 See **Figure 3**.

- **Experience with district heat also highlights the importance of supply side and competition policy.** Recent experience of district heat highlights the importance of having suitable supply side policy, to incentivise low-carbon generation of heat. A recent focus on competition concerns in Germany and Sweden highlights the potential for adverse outcomes in the absence of regulation, given the natural monopoly nature of heating networks.

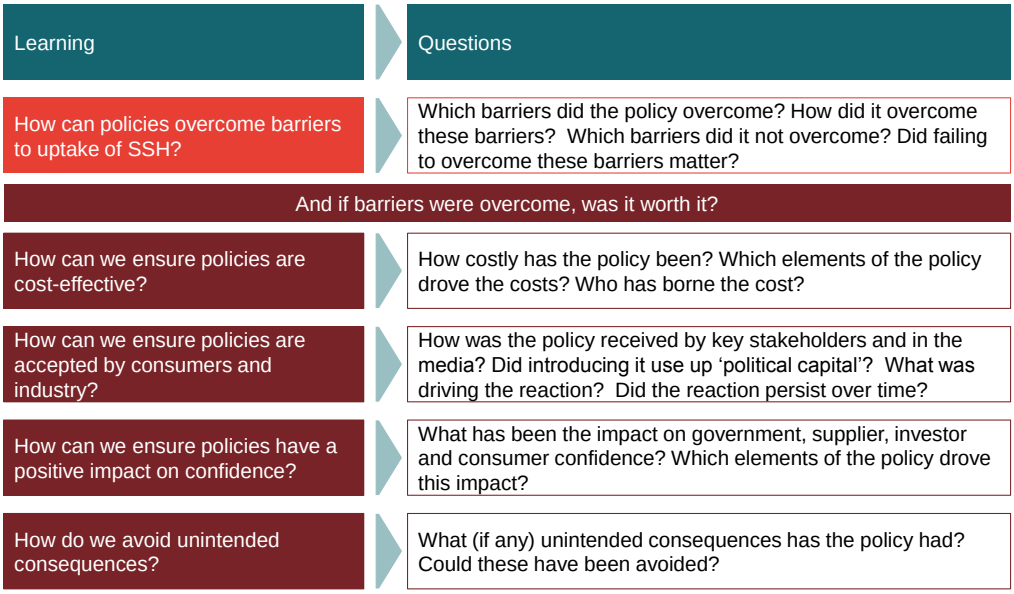
2 Analysis of existing heat and energy efficiency policies

We have analysed existing energy policies to further our understanding of barriers to uptake, and how they can be overcome effectively by policy and business models. For each policy, we assess:

- the impact of the policy on uptake of heat and energy efficiency interventions; and
- if the barriers were overcome, whether the policy was 'worth it,' for example in terms of cost effectiveness.

The questions we asked for each policy are shown in **Figure 1**.

Figure 1. Questions for analysing existing heat and energy efficiency policies in the domestic sector



Source: Frontier Economics

The policies we analysed spanned mandating, which introduce an obligation (e.g. on consumers that they only buy certain types of appliance) incentivising (which introduce rewards or penalties for different choices), and enabling policies (which typically sit alongside incentives and mandates, addressing issues such as skills barriers), both in the UK and internationally.[3] These are illustrated in **Table 1**

[3] This is adapted from the eight policy types considered in DECC, 2012, *Capturing the full electricity efficiency potential of the UK*

below. Note that some policies span across categories, for example with district heat policy focusing on enabling, but also including incentives and mandates.

Table 1. Existing energy policies analysed

Policy type	Significant impact on uptake	Less significant or unclear impact on uptake
Mandating	EU energy efficiency of products policy (standards and labelling) Energy Companies Obligation (ECO) and Carbon Emissions Reduction Target (CERT) Building Regulations Mandating of condensing boilers	Energy Performance Certificates (EPCs)
Incentivising	Solar PV Feed in Tariffs (FITs)	Domestic Renewable Heat Incentive (RHI) Good Quality CHP Green Deal Cashback and Home Improvement Fund
Enabling	District heat policy in Sweden and Denmark	Green Deal loans Microgeneration Certification Scheme Consumer protection – Swiss heat pump 'doctors'

Source: Frontier Economics

We have grouped some policies where there are significant overlaps (e.g. grouping Green Deal loans with Green Deal cashback and the Green Deal Home Improvement Fund). We analyse existing energy policies in the following order:

- the Green Deal;
- ECO and CERT;
- the domestic RHI;
- EU energy efficiency of products policy;

- Energy Performance Certificates;
- boiler mandating;
- Building Regulations;
- installer registration and consumer protection schemes;
- district heat policy; and
- solar PV FITs.

We now set out our findings for each policy we have assessed.

2.1 The Green Deal

Take up of Green Deal loans has been very low, with interest rates high relative to alternatives for many consumers, and confusion over how to compare long-term fixed Green Deal interest rates with pricing of other finance. Long contracts, tied to properties, can also create new risks for consumers. Upfront grants through the GDHIF have driven uptake, but may have been poorly targeted (e.g. not necessarily reaching consumers with greater barriers). In addition, there is no evidence on whether take up of measures funded by the GDHIF is additional to what would have been taken up anyway.

The Green Deal was introduced in January 2013. It consists of two parts, loans and subsidies.

- **Green Deal loans.** Loans are provided for investments in energy efficiency in the home. The loan is paid back through the energy bill attached to the property. If the consumer moves home, the loan stays with the property, so the new bill payer is liable for repayments. The loans are long term (typically 10-25 years) and offered at a fixed interest rate over the term. Green Deal loans are offered and priced irrespective of credit score, assuming the consumer meets some minimum lending requirements.

- **Green Deal subsidies.** There have been two successive subsidy policies associated with the Green Deal, both in England and Wales only[4]:
  - The **Green Deal Cashback Scheme** was available from January 2013 to June 2014. It was a financial incentive aimed to encourage domestic customers to get measures installed through the Green Deal. Customers did not have to take out Green Deal finance to be eligible. Funding packages were available for up to two thirds of the cost of measures

4 A separate cashback scheme operated in Scotland.

installed. If loft insulation or cavity wall insulation were recommended in the Green Deal assessment, then Cashback was only available if these measures were installed. Cashback levels were increased for some measures from December 2013, for example with Cashback for solid wall insulation increasing from £650 to £4,000.[5]

- This was replaced by the **Green Deal Home Improvement Fund** (GDHIF) in June 2014. The GDHIF allowed householders to choose one or both of two offers, with up to £7,600 available. The GDHIF opened in June 2014 and closed to new applicants in July 2014 as the total fund spent was £118 million, close to the £120 million budget.[6] The fund was reopened in December 2014 with £30m of funding, and further funding to be announced on a quarterly basis.[7] This is out of a total of £100m new Green Deal funding announced, with the remainder yet to be allocated. DECC has framed the GDHIF as aiming to bring more private finance into energy efficiency funding, and to offset the impact of changes to ECO's scope.[8]

Impact on uptake

Figure 2 shows uptake (measured in terms of number of energy efficiency measures installed) of the Green Deal, Green Deal Cashback, and the GDHIF since the start of 2013. Note that this aggregates a range of measures with differences in costs and carbon savings. It shows that uptake of energy efficiency measures associated with the Green Deal, Cashback, and GDHIF has been low. This is particularly the case compared to projected take up at the introduction of the policy.

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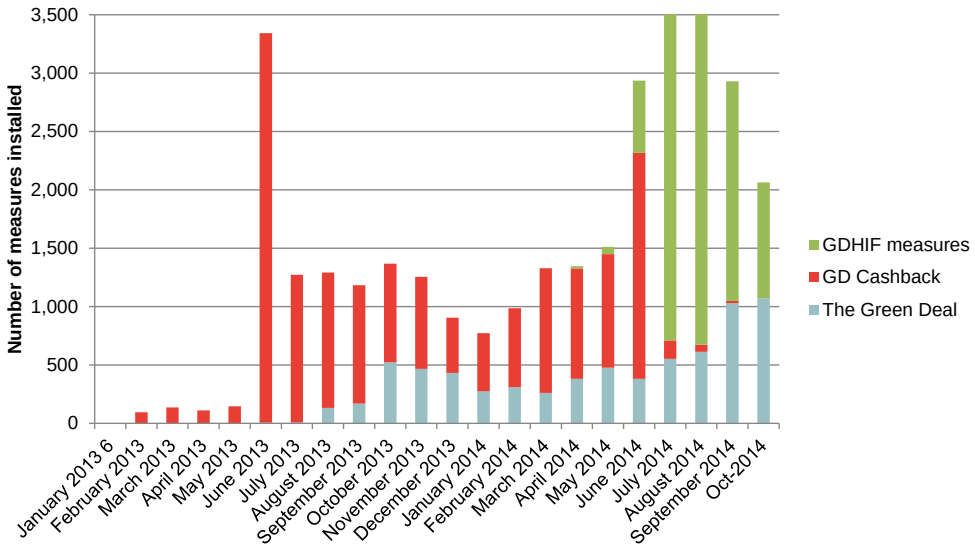
5 DECC, 2013, The Green Deal, Cashback for energy-saving home improvers, available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/294533/Cashback.pdf.

6 DECC, August 2014 Domestic Green Deal, Energy Company Obligation and Insulation Levels in Great Britain, Monthly Statistical Release

7 DECC, 2014, Press release, Green Deal home improvement fund details announced, available at: https://www.gov.uk/government/news/green-deal-home-improvement-fund-details-announced.

8 DECC, 2014, Foundations in place, The Green Deal and ECO annual report.

Figure 2. Uptake by number of installations through the Green Deal, Green Deal Cashback and GDHIF



Note: there may be some double counting where measures have been installed under more than one delivery mechanism.

Source: DECC (December 2014) Domestic Green Deal, Energy Company Obligation and Insulation Levels in Great Britain, Monthly Statistical Release

The figure also shows that uptake of Green Deal Cashback was significantly more than uptake of Green Deal loans. By July 2014 when the scheme closed, £9.8million had been taken in GD Cashback[9]. For the GDHIF, uptake in July by number of measures installed was 272. The total number of vouchers issued before the scheme closed was 20,437, indicating the greater scale of uptake of the GDHIF compared to the other parts of the Green Deal. This was significantly faster than expected, contributing to the closure of the fund.[10]

This suggests the following.

- Low take up implies that wider barriers to take up of energy efficiency, such as awareness and interest, have not been overcome through the policy. This could be both the result of the design of the policy and how it has been communicated (e.g. consumers finding the Green Deal complicated), and

9 DECC, September 2014, Quarterly Statistical Release of GD, ECO and insulation levels in Great Britain.

10 See for example: https://www.gov.uk/government/statistics/energy-savings-advice-service-esas-calls-and-green-deal-webpage-views

other factors (e.g. consumers' tendency to focus on the near term costs, but not the long term benefits of energy efficiency investments). The Green Deal could also have had the adverse impact of increasing some barriers to take up compared to not using the Green Deal, for example:

- increasing transaction barriers due to the requirement that consumers have a Green Deal assessment and installers must be registered; and
- reducing trust due to the Green Deal Finance Company (GDFC) being a new organisation that doesn't already have a relationship with consumers and existing brand or track record. Of households surveyed by DECC that had had a Green Deal assessment, direct marketing was cited by 48% and word of mouth by 35%[11]. Of those who have had a Green Deal installation from their assessment and were surveyed, over 80% were satisfied with the installation and this could work to slowly improve confidence[12].

- Low take up of loans in particular could also suggest that Green Deal loans are ineffective in addressing barriers to finance, or that finance is a less important barrier to uptake than was initially thought. In practice, a combination of these factors could be at play, for example with the Golden Rule limiting the availability of Green Deal funding, while at the same time many consumers are able to access low-cost finance through top-up mortgages.[13] It is not clear how important this is relative to the Green Deal's ineffectiveness in tackling awareness and interest barriers.

- Relatively higher take up associated with the subsidy parts of the Green Deal could suggest that upfront grants are more effective in driving uptake than reducing finance barriers. In addition, the GDHIF aimed to simplify the policy, and this may have increased uptake by addressing awareness, interest, and hassle barriers more effectively than for Green Deal loans. For example, the GDHIF could be accessed using a recent EPC instead of a Green Deal Assessment. Around half of consumers accessing the GDHIF used an EPC.

The following tables outline the most frequently taken up measures under each part of the Green Deal. Across the Green Deal, GD Cashback and the GDHIF wall insulation and condensing boilers were popular measures. However,

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11 These are the average figures from the three waves of surveys; DECC,2014, Green Deal Customer Journey survey, available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/365488/green_deal_customer_journey_wave_3_report.pdf

12 DECC,2014, Green Deal Customer Journey survey

13 Frontier Economics for the Committee on Climate Change, 2014, Reducing the cost of capital for household low-carbon investment decisions

between the policies, different measures were more popular. For example, photovoltaics[14] were the most frequently taken up measure using Green Deal loans, accounting for 29% of total installations associated with the policy. In contrast, the bulk of Cashback was used for condensing gas boilers (78%), with the GDHIF concentrated amongst solid wall insulation (61%), gas boilers (19%), and flue gas heat recovery devices (19%).

Table 2. Most frequent measures installed through Green Deal loans (to November 2014)

Rank	Measure	Number installed	Percentage of installations
1	Photovoltaics	2,279	29%
2	External wall insulation	1,254	16%
3	Condensing mains gas (not community) boiler	944	12%
4	Condensing gas boiler	852	11%
5	Loft insulation	759	10%

Source: DECC (December 2014) Domestic Green Deal, Energy Company Obligation and Insulation Levels in Great Britain, Monthly Statistical Release

Table 3 shows the five measures most frequently installed using GD Cashback.

14 Also known as solar PV

Table 3. Most frequent measures installed through Green Deal Cashback (to November 2014)

Rank	Measure	Number installed	Percentage of installations
1	Gas-fired condensing boiler[15]	12,308	78%
2	Solid wall insulation	2,108	13%
3	Loft insulation	762	5%
4	Cavity wall insulation	300	2%
5	Oil-fired condensing boiler	71	0.5%

Source: DECC (October 2014) Domestic Green Deal, Energy Company Obligation and Insulation Levels in Great Britain, Monthly Statistical Release

Measures taken up most frequently using the GDHIF are shown in **Table 4**.

15 This includes gas-fired combined condensing boilers

Table 4. Most frequent measures installed through the GDHIF (to November 2014)

Rank	Measure	Number installed	Percentage of installations
1	Solid wall insulation (internal or external)	6,856	61%
2	Gas boiler	2,199	19%
3	Flue gas heat recovery device	2,126	19%
4	Cavity wall insulation	47	0.0%
5	Double/triple glazing	28	0.0%

Source: DECC (December 2014) Domestic Green Deal, Energy Company Obligation and Insulation Levels in Great Britain, Monthly Statistical Release, England and Wales only

Green Deal borrowing appears to be concentrated in Scotland. 72% of Green Deal Plans up to the end of June 2014 were in Scotland, 26% were in England and 2% in Wales.[16] [17] It is not clear what is driving this. However, it is likely that differences in the cashback scheme available in Scotland relative to the scheme in England and Wales play a part. The cashback scheme in Scotland (Green Homes Cashback) includes additional technologies relative to those included in Green Deal cashback (e.g. LED lighting), while funding is not out of line with Green Deal Cashback and the GDHIF.[18] In addition, the funding in Scotland is also available for social housing providers. Green Homes Cashback funding has been fully allocated, so without further funding, would not be expected to drive further take up in Scotland.

Wider effectiveness and impact

For a given level of take up, we would expect the cost effectiveness of Green Deal subsidies to be lower than the cost effectiveness of Green Deal loans. This

16 Out of a total of 1,587 Green Deal Plans where measures were installed and billing had started.

17 DECC, September 2014, Domestic Green Deal, Energy Company Obligation and Insulation Levels in Great Britain, Quarterly report

18 See: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/294533/Cashback.pdf and http://news.scotland.gov.uk/News/Cutting-fuel-bills-cutting-emissions-c65.aspx.

is because Green Deal loans are provided without an interest rate subsidy, and assumes that the cost of subsidising measures outweighs the set up and ongoing costs associated with providing Green Deal finance.

Green Deal loans in 2013 were estimated to total £6.5 million,[19] spread over 1,738 loans. This implies an average loan size of around £3,700. Uptake in 2014 has remained low, at 5,967 loans to the end of June 2014. This compares to projected Green Deal lending of £303 million in 2013 and £392 million in 2014.[20] The majority of suppliers expected a higher level of activity under both the Green Deal and ECO than was realised[21].

In practice, given low uptake, the Green Deal is unlikely to be a cost effective way of driving uptake of energy efficiency measures. This is because the variable costs of the GDFC are high as it operates below scale, while the fixed costs of setting it up are unlikely to be fully recoverable from the small number of consumers taking up the loans.

The media reaction to the Green Deal has been that it is a failure, as uptake has been significantly less than the government had predicted.[22] Criticism has been that the interest rate is too high. Part of this may also be driven by misperceptions around Green Deal interest rates, which are fixed for the term of the loan. With Bank of England base rates at a historic low and projected to rise over time, this could make comparisons with short-term interest rates misleading. Analysis has shown Green Deal loans to be competitive with other unsecured loans.[23] For many consumers however, other finance options such as a top-up mortgage offer the lowest borrowing costs.[24] We summarise in **Figure 3**, which shows availability and typical interest rates of unsecured loans by credit score, in comparison with the availability and long-term fixed rate offered under the Green Deal. It suggests that, for consumers with lower credit scores (who are more likely to be credit constrained and not have access to low cost mortgage

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19 UKGBC, 2014, Task Group Report on Green Deal Finance, available at [http://www.ukgbc.org/resources/publication/uk-gbc-task-group-report-green-deal-finance]

20 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]

21 DECC, 2014, Research into the Green Deal and ECO programme supply chain, available at: [https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/364666/GD_Supply_chain_research.pdf]

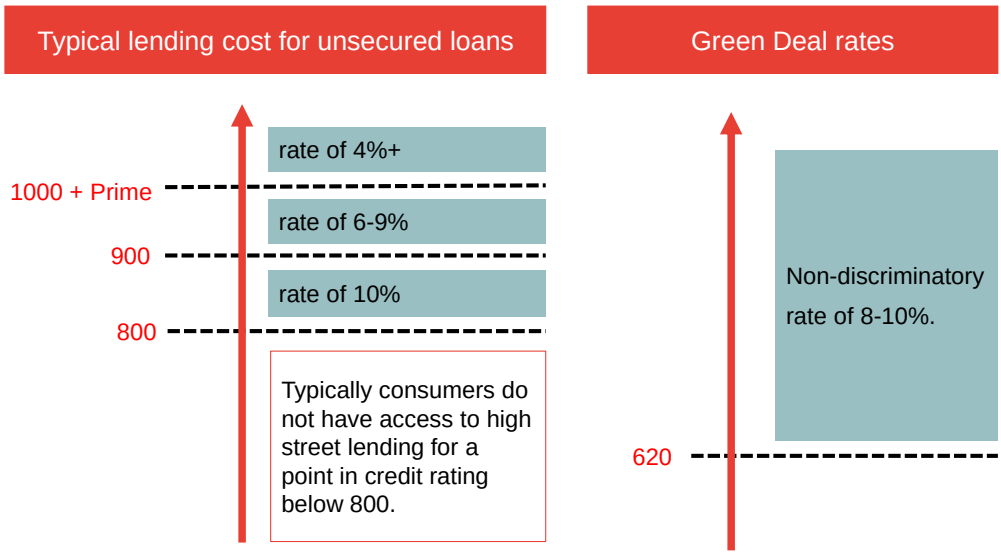
22 See for example: http://www.telegraph.co.uk/earth/energy/11095359/Green-Deal-energy-efficiency-scheme-a-disappointing-failure.html

23 UKGBC, 2014, Task Group Report on Green Deal Finance

24 Frontier Economics for the Committee on Climate Change, 2014, Reducing the cost of capital for household low-carbon investment decisions

finance), Green Deal interest rates compare favourably with unsecured personal loan interest rates.

Figure 3. Eligibility and pricing of unsecured and Green Deal loans by credit score



Source: Frontier Economics for the Committee on Climate Change, 2014, Reducing the cost of capital for household low-carbon investment decisions, based on industry engagement

Criticisms have also included that by being attached to the home, Green Deal loans may affect potential to sell properties in future.[25] There is not yet any evidence to suggest that this will be borne out, but the perception may remain a barrier.

The Green Deal has also faced regulatory challenges around its advertising. The Advertising Standards Authority upheld a complaint that the GDFC's material claimed its loans were typically the cheapest available, and a separate complaint against DECC relating to advertising guaranteed savings, while in practice savings are not guaranteed.[26]

There is uncertainty over the future of the Green Deal, especially given its low uptake. For example, there have been concerns over the solvency of the GDFC,[27]

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25 See for example: http://www.telegraph.co.uk/property/greenproperty/10903366/Eco-living-why-is-the-Green-Deal-failing.html

26 Advertising Standards Authority, 2014, ASA Adjudication on The Green Deal Finance Company Ltd, available at: http://www.asa.org.uk/Rulings/Adjudications/2014/5/The-Green-Deal-Finance-Company-Ltd/SHP_ADJ_247637.aspx#.VHRsbLFFCUk; and Advertising Standards Authority, 2014, ASA Adjudication on Department of Energy and Climate Change, available at: http://www.asa.org.uk/Rulings/Adjudications/2014/10/Department-of-Energy-and-Climate-Change/SHP_ADJ_258066.aspx#.VHRsxLFFCUk.

27 See for example: http://www.theguardian.com/business/2014/oct/05/green-deal-finance-firm-funding-gap-warning

though insolvency has since been claimed to be unlikely to occur as weekly Green Deal demand surpassed £2 million.[28] This uncertainty is likely to negatively impact on industry and consumer confidence, both in the policy and in the energy efficiency market. A survey of Green Deal and ECO advisors, assessors and installers between January and April 2014 found that expectations were fairly evenly split between whether work from the Green Deal would grow or decrease[29].

The lack of success of the Green Deal to date suggests that further piloting or trialling could have been beneficial, to inform assumptions around the most important barriers made in uptake modelling, and to enable development of the loan product being offered to better meet consumer needs before full roll out.

In Box 1 below, we provide information on green mortgages and loans outside the UK, and how they compare with the Green Deal.

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28 See for example: http://www.businessgreen.com/bg/analysis/2378231/green-deal-finance-company-says-liquidation-highly-unlikely-as-demand-accelerates

29 DECC, 2014, Research into the Green Deal and ECO programme supply chain, Quantitative and qualitative research with certified Green Deal advisors, assessors and installers, available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/364666/GD_Supply_chain_research.pdf.

Box 1: Green mortgages and loans

A number of countries offer loans specifically for energy efficiency investments. These often take the form of 'green mortgages,' where mortgage lending takes into account future energy savings from investing in energy efficiency, and enables homeowners to either borrow more or borrow more cheaply as a result of these savings. Some are subsidised, while others, like the Green Deal, are not. For comparison, Green Deal interest rates are currently around 6-8% in real terms, fixed for 10 to 25 years.

Examples of green mortgages available internationally include the following.

- **Green mortgages in the USA are rolled into the primary mortgage, and uptake has been low.** Green mortgages for new and existing homes were introduced in 1992. The standard Energy Efficiency Mortgage allows homeowners to borrow up to 15% of the value of their income. The product differs for new and existing homes. For new homes, homeowners are able to capitalise energy savings from the building being energy efficient, enabling them to borrow more against their income. For existing homes, homeowners are able to borrow for energy efficiency investments, financed by associated energy savings. The green mortgage is rolled into the primary mortgage and so it does not have different interest rates than regular mortgages. These mortgages are available through normal mortgage lending routes and are underwritten in the same way as regular mortgages. Uptake of green mortgages in the USA has been low and is likely to be due to low demand for energy efficiency measures in the first place, as a result of uncertainty over benefits, energy bills not reflecting actual costs, and behavioural barriers.[30]

- **Subsidised loans are available for energy efficiency investments in Australia, and have been used for limited retrofitting.** The loans are available interest free for up to four years. The programme has resulted in limited energy efficiency retrofitting, and more energy and water system renovation, but there is limited evidence available to assess its overall effectiveness and what is driving this.[31] It is also possible to add a loan for energy efficiency improvements into an existing home loan, separate from the subsidised loan scheme.

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30 Palmer, K., Walls, M. and Gerarden, T., 2012, Borrowing to save energy: an assessment of energy-efficiency financing programs, available at: http://www.rff.org/RFF/Documents/RFF-Rpt-Palmeretal%20EEFinancing.pdf.

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

- **In Germany, subsidised loans are offered for energy efficiency investments, and this can be combined with finance from a private provider.** The KfW offers subsidised loans at below market interest rates for energy efficiency investments. The funding is not means tested, and a higher subsidy is available where the investment will meet a higher energy efficiency standard. This finance can be combined with finance offered by private providers as well as subsidies. Take up appears to be higher than in other countries, and may be the result of more generous funding.[32] It may also be the result of ease of combining subsidised finance with other finance and subsidies, or the long duration over which the scheme has been in operation (which could overcome awareness barriers).

- **Interest free loans are offered in France alongside tax relief for household energy efficiency investments.** Take up has been relatively low, resulting in recent changes to the scheme simplifying it and making the financial incentives more attractive (with a government guarantee fund and income tax relief of up to 30% of the cost of energy efficiency investments), the outcome of which is not yet apparent.[33]

Source: Frontier Economics for the Committee on Climate Change, 2014, Reducing the cost of capital for household low-carbon investment decisions; US Department of Housing and Urban Development, available at http://portal.hud.gov/hudportal/HUD?src=/program_offices/housing/sfh/eem/eemhog96/; MortgageLoan.com https://www.mortgageloan.com/environment ; Energy Matters http://www.energymatters.com.au/rebates-incentives/low-interest-solar-loans/; Henger, R. and Voigtländer, M., Institut der deutschen Wirtschaft Köln, 2013, Green investments and green mortgages in Germany

2.2 Energy Company Obligation and Carbon Emissions Reduction Target

CERT drove increased energy efficiency, and ECO is expected to do the same over its lifetime, despite recent changes to reduce its ambition. Experience with CERT shows that badly targeted mandates can result in poor outcomes: CERT focussed explicitly on cost effective measures which often ignored behavioural aspects, resulting in adverse outcomes such as mass mailing efficient light bulbs which weren't used. Recent changes have also demonstrated how, as an

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

33 Committee on Climate Change, 2014, Meeting Carbon Budgets – 2014 Progress Report to Parliament

expensive policy paid for through energy bills, supplier obligations are subject to political risk.

The Energy Company Obligation (ECO) was introduced at the start of 2013 (although energy companies have been able to count against their targets measures delivered since 1 October 2012) and runs to 31 March 2015. It broadly takes over from two previous schemes: Carbon Emissions Reduction Target (CERT) and Community Energy Saving Programme (CESP). ECO focuses on providing energy efficiency measures to low income and vulnerable consumers and those living in 'hard-to-treat' properties. Similarly to the Green Deal, ECO funding can be used only after a Green Deal assessment.[34]

There are three main ECO obligations:

- The Carbon Saving Target: Carbon Emissions Reduction Obligation (CERO);
- Carbon Saving Communities (CSCO); and
- Affordable Warmth (HHCRO).

Following concerns around billing impacts and efficiency, the government announced changes to ECO in October, including extending it from March 2015 to March 2017.[35] The changes were introduced to reduce the costs of consumers' electricity bills and make ECO more efficient.[36] There will be a reduction in the CERO target, as well as new primary measures under CERO (such as less expensive measures becoming eligible). Eligibility criteria for the Carbon Saving Community Obligation (CSCO) will also be extended.

Impact on uptake

Figure 4 shows the number of energy efficiency measures installed under ECO since its introduction. It shows that the numbers of measures installed under ECO has been declining since March 2014, with provisional figures showing there were 988,603 measures installed under ECO up to the end of October 2014. It is not clear why this is the case, but it could be the result of changes to the policy, continued uncertainty over whether future changes will be made, or

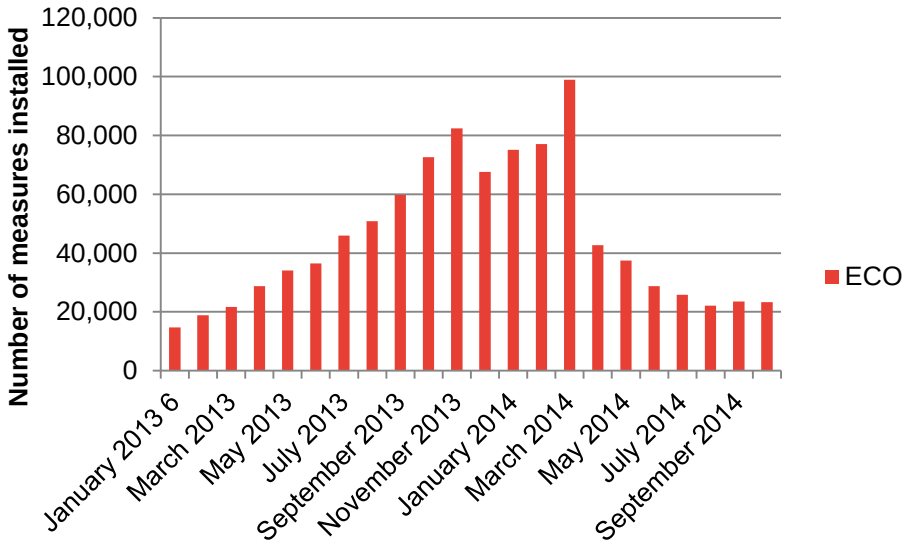
34 See for example: http://www.greendealinstallerhub.co.uk/data/ckeditor/PDFs/Green_Deal_Finance_and_ECO_Funding.pdf

35 OFGEM, 2014, Changes to ECO, available at [https://www.ofgem.gov.uk/publications-and-updates/changes-eco-ofgem-publications]

36 See for example: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/373650/ECO_IA_with_SoS_e-sigf_v2.pdf

increasing back-loading of measures by suppliers. The number of installations is significantly higher than the number under the Green Deal, GD Cashback or the GDHIF as previously outlined. To the end of July 2014, around 50 times as many measures were installed under ECO compared to the Green Deal.

Figure 4. Uptake of measures installed under ECO



Source: DECC (December 2014) Domestic Green Deal, Energy Company Obligation and Insulation Levels in Great Britain, Monthly Statistical Release

Measures installed under ECO have been delivered as follows:

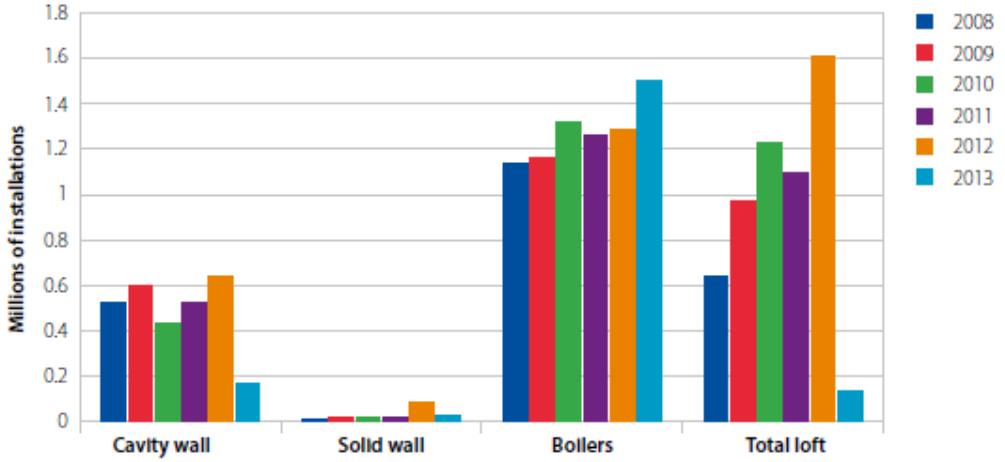
- 38% were delivered through the CERO;
- 39% through HHCRO; and
- 22% CSCO.[37]

Uptake of measures under ECO has been significantly lower than under CERT. This may be the result of lower ambition (in terms of the number of installations targeted), policy uncertainty reducing supplier activity, ECO's focus on targeting harder, more expensive measures compared to CERT, or back-loading in meeting the obligations (which was also observed under CERT). In 2013 loft insulations fell by 92% and cavity wall insulation fell 73% (although it should be noted that 79% of cavity wall insulation under ECO was for hard to treat

37 DECC, September 2014 Domestic Green Deal, Energy Company Obligation and Insulation Levels in Great Britain, Monthly Statistical Release

installations)[38]. Solid wall insulation increased under CERT in 2012 as companies drove to meet targets, but under ECO the levels fell back to less than 30,000 (similar to the 2011 level). The decrease in measures installed from 2013 is shown in **Figure 5**.

Figure 5. Measures installed under CERT 2008-2012 and ECO/Green Deal 2013



Source: Figure 3.6, Committee on Climate Change, 2014, Meeting Carbon Budgets – 2014 Progress Report to Parliament, and references therein

It should be noted that data from DECC on the installation of measures under ECO and the Green Deal, take up of boilers in 2013 was significantly less than **Figure 5** shows, at around 170,000[39].

Table 5 shows the five most installed energy efficiency measures under ECO. Similarly to the measures taken under the Green Deal, GD Cashback and the GDHIF, wall insulation and boiler replacement are amongst the most frequent measures. In addition, loft insulation accounts for over 20% of measures installed under ECO to date.

38 Committee on Climate Change, 2014, Meeting Carbon Budgets – 2014 Progress Report to Parliament, available at http://www.theccc.org.uk/wp-content/uploads/2014/07/CCC-Progress-Report-2014_web_2.pdf.

39 DECC, February 2014, Domestic Green Deal, Energy Company Obligation and Insulation Levels in Great Britain, Monthly Statistical Release, available at https://www.gov.uk/government/collections/green-deal-and-energy-company-obligation-eco-statistics

Table 5. Most frequent measures installed through ECO (to September 2014)

Rank	Measure	Number installed	Percentage of installations
1	Replacement qualifying boiler	269,689	27%
2	Hard To Treat Cavity wall insulation	267,346	27%
3	Loft insulation ceiling level top up	130,451	13%
4	Loft insulation ceiling level virgin	81,961	8%
5	Standard cavity wall insulation	79,231	8%

Source: DECC (October 2014) Domestic Green Deal, Energy Company Obligation and Insulation Levels in Great Britain, Monthly Statistical Release

Wider effectiveness and impact

Customers pay an average of £55 each p.a. on their energy bills to fund ECO.[40] The average cost of the scheme is £1.5 billion p.a. Aggregate expenditure on the administration of the ECO project was £111 million to the end of June 2014, as reported by suppliers[41]. The total cost of CERT from 2008-12 was estimated to be £5.77 billion[42]. CERT focussed more on loft and cavity wall insulation, whereas ECO will have more focus on solid wall insulation in comparison (though the redesign of ECO has shifted its focus further towards loft and cavity wall insulation)[43]. CERT focussed explicitly on cost effective measures which sometimes resulted in poor outcomes due to regulatory loopholes. For instance, under CERT thousands of energy efficient light bulbs were posted but they were not used.[44] Under ECO, there has also been some concern over failure rates associated with installations. Most recently, Ofgem estimated an installation

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40 DECC, September 2014, Domestic Green Deal, Energy Company Obligation and Insulation Levels in Great Britain, Quarterly report

41 DECC, September 2014, Domestic Green Deal, Energy Company Obligation and Insulation Levels in Great Britain, Quarterly report

42 In $£_{2014}$ from http://webarchive.nationalarchives.gov.uk/20121217150421/http:/www.decc.gov.uk/en/content/cms/funding/funding_ops/cert/cert.aspx

43 See for example: http://www.policyexchange.org.uk/images/publications/smarter%20greener%20cheaper.pdf

44 See for example: http://www.policyexchange.org.uk/images/publications/smarter%20greener%20cheaper.pdf

failure rate of 14.2% amongst the measures it monitored between April and June 2014, with the highest rates for loft and solid wall insulation.[45] The failure rate of 14.2% was the highest failure rate observed since Ofgem's quarterly monitoring of ECO began. Installation failures suggest that carbon savings and wider benefits of measures installed through ECO may not be achieved in practice.

Currently, the cost of ECO is borne by consumers through their energy bills (both gas and electricity), rather than through general taxation. This is a relatively unpopular aspect of the model,[46] contributing to the revision of ECO which lowered the targets for reducing carbon[47].

2.3 Domestic Renewable Heat Incentive (RHI)

The RHI illustrates that ongoing feed-in-tariff style payments are not an effective way of overcoming barriers to uptake of heat pumps. This could be because other barriers such as interest are more important and the financial signal is weakened by providing it through ongoing rather than upfront payments.

The domestic RHI is a similar financial incentive to the feed-in tariff. It applies to renewable heat sources, such as heat pumps and biomass boilers. It is necessary to have a Green Deal assessment done in order to claim the financial incentives. The scheme is paid for through general taxation, rather than through energy bills[48]. It is a long term subsidy scheme to promote the generation and use of renewable heat sources: it specifically focusses on households off the gas grid but not exclusively[49].

From 2015, social landlords will not need a Green Deal assessment to be eligible for the domestic RHI if they have had an EPC in the past two years[50].

Impact on uptake

Figure 6 shows take up of renewable heat under the RHI. It shows that domestic RHI installations have been increasing since the scheme began (April

45 Note that these numbers are subject to change. Ofgem, 2015, Energy Companies Obligation Technical Monitoring Report, available at: https://www.ofgem.gov.uk/ofgem-publications/92463/technicalmonitoringreportjan15.pdf,

46 See for example: http://www.carbonbrief.org/blog/2013/11/green-crap-is-hard-to-cut/

47 Ofgem, 2014, Changes to ECO, available at: https://www.ofgem.gov.uk/publications-and-updates/changes-eco-ofgem-publications.

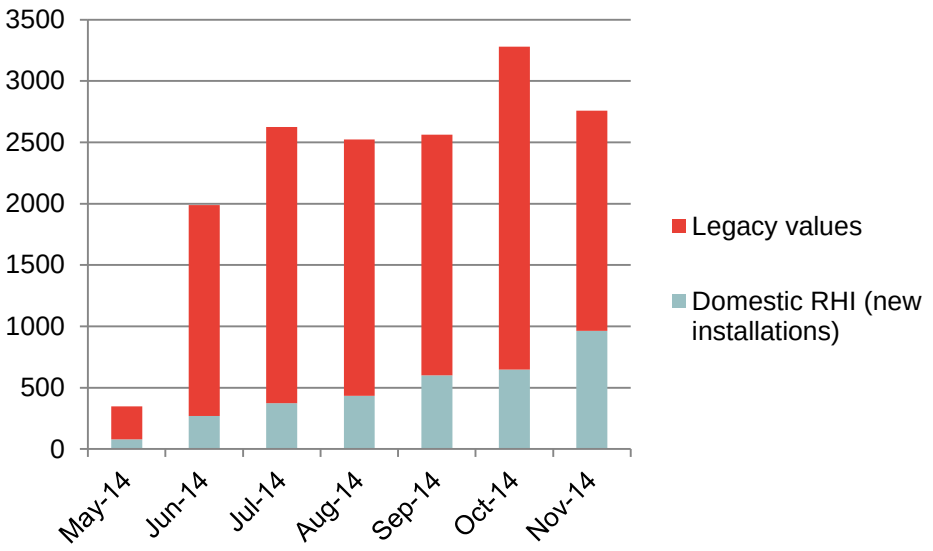
48 http://www.rhincentive.co.uk/RHI/

49 See for example: https://www.gov.uk/government/policies/increasing-the-use-of-low-carbon-technologies/supporting-pages/renewable-heat-incentive-rhi

50 Cornwall Energy

2014). To date, uptake of new measures under the RHI is significantly less than the number of measures already installed (legacy uptake). Legacy refers to all systems installed before the launch of the domestic RHI scheme on 9 April 2014, whether they claimed a RHPP voucher or not. For comparison, in its impact assessment of the RHI, DECC projected that 7,000 installations would occur under the RHI from 2013-14, 10,800 in 2014-15, and a cumulative total of 379,600 by 2020-21[51].

Figure 6. Uptake of domestic RHI new installations[52] and legacy values



Source: DECC (September 2014) Renewable Heat Incentive, Quarterly Statistical Release

The following tables show a change in the most frequently taken up renewable heat installations since the introduction of the RHI. Currently the most popular measure is installing a biomass system.

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51 DECC, 2012, Impact Assessment, Renewable Heat Incentive – domestic, available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/66156/RHI_domestic_scheme_-_impact_assessment.pdf.

52 New installations refers to applications for systems installed after the launch of the domestic RHI scheme on 9 April 2014

Table 6. Most frequent RHI installations (to November 2014)

Rank	Measure	Number installed	Percentage of installations
1	Biomass system	1,960	44%
2	Air source heat pump	1,435	32%
3	Solar thermal	736	17%
4	Ground source heat pump	292	7%

Source: DECC (October 2014) Renewable Heat Incentive, Monthly Deployment Data

Legacy installations (i.e. systems now claiming the RHI but installed before the RHI was introduced) show that air source heat pumps were the most frequent type of installation now claiming the RHI but installed earlier. This is likely to be due to different incentives under the RHPP, which was available before the RHI was introduced. Replacing oil systems was the most common replacement across the technologies.[53] Overall, DECC research suggests that the main triggers for installation of air source heat pumps under the RHI are: needed to replace heating system (43%), upgrading/refurbishing a home (24%), Could get grant or funding (27%), and building a new home (17%).[54] Recent research found that RHI participants who installed ground source heat pumps and solar thermal were much less likely than average to install their technology because they needed to replace their heating system:[55]

- participants with ground source heat pumps were more likely to cite building a home as a motivation (40%) for installing a system compared with the average for all technologies (16%); while

53 We note that implementing solar thermal systems is different from other low-carbon heating technologies included in the RHI. This is because solar thermal heating is not installed as the sole heat source for dwellings, but is instead used alongside another source. For example, a home on the gas grid can install a solar thermal system and continue to use gas, while benefiting from using less gas, with associated carbon and bill savings.

54 DECC (2014), *Evaluation of the Domestic Renewable Heat Incentive: Interim Report from Waves 1–4 of the domestic RHI census of accredited applicants*

55 DECC, 2014, Evaluation of the Domestic Renewable Heat Incentive: Interim Report from Waves 1–4 of the domestic RHI census of accredited applicants, available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/375710/Publication_-_full_report.pdf.

- those with biomass systems were more likely to cite the availability of a grant or funding (36% compared to 27%).

Almost all RHI measures were installed by owner occupiers (92%); the 5% of measures taken up by social landlords were almost all to install heat pumps[56].

Changes were announced in December 2014 to come into place in spring 2015, to address specific barriers to take up. These included:[57]

- removing the requirement that registered social landlords (RSLs) applying for the RHI have a Green Deal Assessment as this has been a barrier, and instead allowing RSLs to use an EPC that is less than two years old;
- allowing some additional low-carbon heat sources ('cooker stoves' and high temperature heat pumps meeting the scheme requirements) to be eligible for the domestic RHI;
- referring to updated Microgeneration Certification Scheme (MCS) installer standards in the RHI regulation; and
- clarifying that dwellings made up of multiple buildings (e.g. a dwelling plus outbuilding) can be eligible for the domestic RHI, although heat going to ancillary buildings will not be eligible for the financial support.

Wider effectiveness and impact

More than half of RHI installations were for houses off of the gas grid. The financial gain off the gas grid is greater as it tends to be more expensive heating systems that are replaced[58].

The policy has had a generally positive response from the industry and consumers despite the slow uptake[59]. However, as the policy is new and many of the technologies are relatively untested, consumer confidence remains somewhat low[60].

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56 DECC, October 2014, Renewable Heat Incentive quarterly statistical release

57 DECC, 2014, Domestic Renewable Heat Incentive: Change to Eligibility, available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/372145/Domestic_RHI_-_Changes_to_Eligibility_-_November_2014.pdf.

58 DECC, October 2014, Renewable Heat Incentive quarterly statistical release

59 See for example: http://sustainableenergyassociation.com/press-release/progress-report-domestic-rhi/

60 Consumer Focus, 2012, Response to DECC consultation on the Renewable Heat Incentive, available at: [http://www.consumerfocus.org.uk/files/2009/06/Consumer-Focus-response-to-DECC-consultation-on-the-Renewable-Heat-Incentive.pdf]

Consumer Focus has raised concerns that RHI is not affecting those living in fuel poverty due to the high upfront costs associated with the scheme[61].

2.4 EU energy efficiency of products policy

EU energy Minimum Efficiency Requirements have driven increases in the energy efficiency of products. However, mandates like these remove consumer choice and may require policymakers to 'pick winners.' The impact of labelling is less clear, with a recent trial by DECC and John Lewis finding a small, inconsistent, impact of lifetime energy cost labelling on appliance choice.

There are two strands to the EU's policy around the energy efficiency of products, focusing on energy labelling, and minimum efficiency requirements.

- **Energy Labelling** legislation requires consistent energy efficiency ratings and labels are used on electrical appliances such as air conditioners and dishwashers at the point of sale.[62] This is to make comparison of energy use of products easier for consumers.

- **Minimum Efficiency Requirements** set rules for improving the environmental performance of energy related products.[63] Standards are set for individual appliances, which effectively ban the sale of products that do not meet the requirements. The aim of the requirements is to reduce the environmental impact of products, including their lifetime energy consumption.

Voluntary agreements are allowed where they are likely to achieve the policy objectives more cost-effectively or more quickly.[64] We consider labelling and minimum efficiency requirements in turn.

Impact of labelling on uptake

Labelling increases the information available to consumers at the time of buying a product, as well as potentially appealing to behaviour drivers such as a desire to save money or reduce environmental impact. This would be expected to increase the efficiency of products purchased.

61 Consumer Focus, 2012, Response to DECC consultation on the Renewable Heat Incentive,

62 Introduced through the Directive 2010/30/EU in 2010.

63 Introduced through Directive 2009/125/EC.

64 This has so far been used for complex set top boxes, and imaging equipment.

Looking at labelling requirements, evaluation recent evaluation by Ecofys found that categories above 'A' (A+, A++, A+++, introduced due to continued improvements in energy efficiency) were less effective in driving uptake of more efficient appliances than the original A-G categories. This is because consumers found a closed scale, as opposed to a scale which could be extended to include new higher ratings, easier to understand.[65] This suggests that rebasing the energy efficiency ratings could help make labels more effective as efficiency of appliances continues to increase.

In addition, effectiveness is likely to vary by product type, with different barriers to increased energy efficiency for different products. Research by DECC found that energy efficiency was a key driver in purchase decisions for white goods with long lifetimes and replacement only on breaking down (e.g. fridges), but not for products such as consumer electronics with shorter lifetimes and more fast-moving technology (e.g. TVs). Research also suggests that despite labelling, awareness of energy efficiency in the context of products is low amongst UK consumers compared to elsewhere in the EU, with only 24% of UK consumers reporting that they always consider energy efficiency when making a purchase decision.[66]

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65 Ecofys, 2014, Evaluation of the Energy Labelling Directive and specific aspects of the Ecodesign Directive, Final technical report.

66 DECC, 2014, Evaluation of the DECC/John Lewis energy labelling trial, available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/350282/John_Lewis_trial_report_010914FINAL.pdf

Box 2: Energy cost labelling

Recent trials conducted separately in the UK and Norway have tested the impact of providing information on the lifetime running costs of appliances on consumer decisions.[67] The trials tested providing this information in addition to existing labelling. Existing labelling includes example energy efficiency ratings (with EU regulations requiring energy costs be reported in kWh per year) and the upfront cost of the appliance. Sales staff were also trained in providing running costs information. Across the trials, appliances included fridge freezers, washing machines, washer dryers, and tumble dryers. The research found mixed impacts on energy use of appliances sold.

- In DECC's study, which took place in John Lewis stores:
  - washer dryers sold with the additional labels used on average 0.7% less energy compared to the control group; while
  - there was no significant difference in energy use between the treatment and control groups for washing machines and tumble dryers.

  The authors hypothesised that this was because washer dryers had the highest lifetime running costs, so the new information in the labels would be most relevant to these appliances.

- Similarly, a study combining labels with lifetime electricity costs and training staff in Norway found reduced energy use of 4.9% for tumble dryers when both labelling and training was used, with a smaller effect for just training. There was no significant difference in energy use for fridge-freezers.

Qualitative findings from the DECC trial included that consumers shopped around for white goods appliances based on brand, reliability, and running time, rather than running costs. Consumers found it difficult to understand running costs compared to running time. This contrasts with research that found that energy efficiency was one of the main factors driving purchase decisions for white goods such as fridges and laundry appliances.[68]

DECC's trial of labelling appliances with lifetime electricity costs estimated that providing similar labels for washer dryers in the UK for a year would result in a

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67 A further similar study is underway in Germany, being undertaken by Adelphi for the German Federal Environment Agency. See: http://behaveconference.com/wp-content/uploads/2014/08/A_Christian_Kind_Adelphi.pdf.

68 Mintel research quoted in DECC, 2014, Energy efficient products – helping us cut energy use

net present value of £1.7 million.[69] This indicates that the costs of providing this information could outweigh the benefits, although by a small amount, and with uncertainty around the estimate (e.g. as the trial results are unlikely to be representative of all washer dryer purchases).

Source: DECC, 2014, Evaluation of the DECC/John Lewis energy labelling trial, available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/350282/John_Lewis_trial_report_010914FINAL.pdf; Kallbekken et al. "Bridging the Energy Efficiency Gap: A Field Experiment on Lifetime Energy Costs and Household Appliances" Journal of Consumer Policy, 2013.

Impact of minimum standards on uptake

By mandating to remove the most energy inefficient products from the market, EU product policy effectively overcomes all the barriers to uptake of products above the minimum standard.

Wider effectiveness and impact

The recent evaluation of the EU's minimum energy efficiency of products and energy labelling policy found that measures taken were cost effective, with benefits flowing from reduced greenhouse gas emissions, and cost savings to both consumers and businesses. At the UK level, DECC estimate that annual net savings resulting from the policy will be more than £850 million per year by 2020.[70]

While the benefits have been estimated to outweigh the costs in aggregate, for some products reduced running costs have been offset by differences in purchase prices between more and less energy efficient appliances.[71] In addition, firms may have been disadvantaged by minimum efficiency standards in the following ways:[72]

- some stakeholders reported that profit margins were put under pressure due to higher production costs resulting from meeting the minimum energy efficiency standards; while

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69 DECC, 2014, Evaluation of the DECC/John Lewis energy labelling trial, available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/350282/John_Lewis_trial_report_010914FINAL.pdf

70 DECC, 2014, Energy efficient products – helping us cut energy use, available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/328083/Energy_efficient_products_-helping_us_to_cut_energy_use_-_publication_version_final.pdf.

71 DECC, 2014, Energy efficient products – helping us cut energy use

72 Ecofys, 2014, Evaluation of the Energy Labelling Directive and specific aspects of the Ecodesign Directive, Final technical report.

- small and medium enterprises (SMEs) typically have lower capacity to meet energy efficiency requirements, and could be less able to compete and exit the market as a result.

EU energy labelling and minimum efficiency standards appear to have been broadly accepted by both consumers and industry. However, there have been some adverse outcomes, which may also reduce the degree to which standards and labels are accepted.

- The recent adoption of higher energy efficiency requirements for vacuum cleaners gained a high degree of press interest.[73] This focused on the phase-in of new standards in September 2014 removing 'best buy' products from the market.

- It was argued in relation to these standards that they could actually result in an increase in energy use, though there is not yet evidence for or against this. Without improved products available, this could mean that consumers were required to use machines with less powerful motors, necessitating more prolonged use and therefore not saving energy. In addition, purchases of vacuum cleaners could have been brought forward to avoid the standards on lower power engines, again circumventing energy efficiency improvements as these machines would then not be replaced by ones meeting the standards for some time.

- Some standards were found to be outdated by the time they were introduced.[74] This was the result of product standards taking a long time to develop. The result could be reduced effectiveness and reduced confidence in the policy to deliver energy efficiency improvements.

- While the policy has been found to be coherent as a whole, there are some aspects where this does not apply, which could raise barriers by causing consumer confusion, and reducing the effectiveness of mandating. The evaluation found that aligning energy labelling for buildings and cars with the labelling in place for products could reduce complexity for consumers.[75]

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73 See for example: http://www.thisismoney.co.uk/money/news/article-2730642/Buy-powerful-vacuum-cleaner-BANNED-New-EU-rules-ban-best-models-September-warns-Which.html.

74 Ecofys, 2014, Evaluation of the Energy Labelling Directive and specific aspects of the Ecodesign Directive, Final technical report.

75 Ecofys, 2014, Evaluation of the Energy Labelling Directive and specific aspects of the Ecodesign Directive, Final technical report.

2.5 Energy Performance Certificates

EPCs enable consumers to compare energy efficiency of properties using a standardised scale. However, the evidence shows that there is limited trust and use of EPCs, suggesting they may not be effective as a demand side measure.

In the UK, an Energy Performance Certificate (EPC) is required whenever a property is sold, rented or built.[76] The certificate awards a property an energy efficiency rating valid for ten years, expressed as a colour coded letter from A-G, similar to energy efficiency labels on new products. One aim of the EPC is to make the link between energy efficiency and lower energy bills clear.[77] It allows potential buyers or renters to see how efficient the property is and estimates how expensive the property is to heat. The survey for obtaining an EPC can also be used to find out what the best energy efficiency improvements for the property would be.[78]

Impact on uptake

EPCs are mandatory for all dwellings when being sold, rented or built. While we would expect EPCs to address some barriers to uptake of energy efficiency measures, there is limited evidence on their impact. The evidence that is available suggests that the majority of consumers do not account for their EPC when buying a property.[79] However, there is evidence that properties with higher energy efficiency ratings have higher values, on average by 14 per cent in England.[80]

The EPC attempts to address four main barriers.

- **Lack of information for buyers and renters.** An EPC means that whoever is looking at buying or renting a property knows what the energy efficiency

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76 Gov.uk, Buying or selling your home, available at: https://www.gov.uk/buy-sell-your-home/energy-performance-certificates.

77 European Commission, 2013, Energy performance certificates in buildings and their impact on transaction prices and rents in selected EU countries, available at: [http://ec.europa.eu/energy/efficiency/buildings/doc/20130619-energy_performance_certificates_in_buildings.pdf]

78 Energy Saving Trust, Energy Performance Certificates, available at: http://www.energysavingtrust.org.uk/domestic/content/energy-performance-certificates.

79 Consumer Focus, Liz Lainé, 2011, Room for improvement The impact of EPCs on consumer decision-making, available at: http://www.consumerfocus.org.uk/files/2011/02/Room-for-improvement.pdf.

80 DECC, 2013, Energy saving measures boost house prices, available at: https://www.gov.uk/government/news/energy-saving-measures-boost-house-prices.

rating is, based on a comparable, accredited, scale. Individuals may not know how best to make their home more energy efficient without such advice. Practical advice on improvements was shown in the Improving Dwellings by Enhancing Actions on Labelling (for Energy Performance of Buildings Directive) survey to increase the impact of EPCs.[81] The practical advice is included under the heading 'Top actions you can take to save money and make your home more energy efficient,' and lists which measures will have the greatest effect, and how much average installation with cost.

- **Lack of interest.** By providing energy efficiency information at a time when consumers may be considering making home improvements anyway, the EPC may reduce barriers to uptake. However, research by Consumer Focus found that the EPC impacted on decisions to buy or rent a property for only 18% of consumers, while 17% of respondents reported that they had acted on the EPC's recommendations, and this was not statistically significantly different between those buying and renting.[82] DECC, along with the Government Behavioural Insights Team, redesigned the layout of the EPC in April 2012 to combat this.[83] The first page now gives greater prominence to what costs are and how costs can be reduced, which measures would be the most effective and whether they are available on the Green Deal. Whether or not this redesign has impacted on the effectiveness of EPCs is not yet clear.

- **Lack of trust.** There are standards for the production of EPCs and only accredited assessors can award EPCs. Survey evidence suggests that less than half of consumers actively trust EPCs: only 40% of individuals surveyed in 2011 said that they actively trust the EPC (25% distrust it and the rest neither trust nor distrust it).[84] However, some concerns have been raised that the surveys underlying an EPC are not accurate, reducing the effectiveness of the EPC as a guide for energy efficiency investments or property

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81 Energy research centre of the Netherlands, 2012, Key findings & policy recommendations to improve effectiveness of Energy Performance Certificates & the Energy Performance of Buildings Directive, available at : [http://www.ideal-epbd.eu/download/pap/Final_IDEAL_EPBD_result_oriented_report.pdf]

82 Consumer Focus, Liz Lainé, 2011, Room for improvement The impact of EPCs on consumer decision-making, available at: http://www.consumerfocus.org.uk/files/2011/02/Room-for-improvement.pdf.

83 See for example : https://opower.com/uploads/library/file/18/behaviour_change_and_energy_use__-_reduced_size.pdf

84 European Commission, 2013, Energy performance certificates in buildings and their impact on transaction prices and rents in selected EU countries

purchasing decisions.[85] For example, surveys may be based on the average characteristics of properties of a certain age, rather than tailored to individual properties. This could result in reduced impact of EPCs on energy efficiency uptake.

- **Awareness of the Green Deal.** EPCs could also make consumers more aware of the finance options available for them to fund energy efficiency improvements, specifically through the Green Deal. The EPC helps make the connection between the value of a property and its energy efficiency implicitly, through demonstrating how energy efficiency reduces heating costs.[86] However, the direct link to the increased potential value of the property is not explicitly made. EPCs were intended to encourage uptake of measures through the Green Deal,[87] though low Green Deal uptake suggests this is not a widespread outcome of EPCs. The EPC includes information on whether the measures it recommends are available on the Green Deal, as well as where to find more information on the Green Deal online.

Wider effectiveness and impact

The cost of an EPC is around £60-£120, though it can be lower.[88] This cost is borne directly by the owner of the property. There are no government estimates of how much the administration of the scheme has been.

While there has been some criticism of the accuracy of EPCs, there was not a widespread negative reaction to EPCs themselves on their introduction in 2007 in England and Wales. This may have been because the EPC was originally introduced as part of the Home Information Pack (HIP), a wider intervention which received a strong negative reaction and was later abolished.

2.6 Boiler mandating

Mandating condensing gas boilers has been effective in overcoming consumers' tendency to focus on near term costs and benefits. The mandate has saved consumers money due to the higher efficiency of condensing gas boilers.

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85 For example, see: http://www.telegraph.co.uk/property/propertyadvice/propertyclinic/7590776/Dont-waste-your-energy-on-eco-certificates.html

86 European Commission, 2013, Energy performance certificates in buildings and their impact on transaction prices and rents in selected EU countries

87 See for example: https://opower.com/uploads/library/file/18/behaviour_change_and_energy_use__-_reduced_size.pdf

88 http://www.which.co.uk/money/mortgages-and-property/guides/how-to-sell-a-house/epc-explained/

Previously, fewer consumers were taking condensing boilers up, despite it being in their own interest to do so.

Part L of the Building Regulations includes the mandating of condensing, or combined condensing, boilers, introduced in 2005.

Condensing boilers have higher upfront costs than regular gas boilers. The price for a typical condensing boiler is around £1,250 and for a typical non-condensing boiler it is £850.[89] This higher cost is recouped through lower running costs (saving around £95 a year).[90] Payback for the higher upfront costs occurs therefore within 5 years. Even though the higher cost is recouped through lower running costs, before mandating, take up of condensing gas boilers was low, suggesting that consumers were focussing on the near term costs, rather than the longer term benefits.

Impact on uptake

In 2013 99% of boiler sales in the UK were for condensing gas boilers, compared to a European average of 26%.[91] Mandating condensing boilers was accompanied by a £4.2 million training programme delivered through the new sector skills network, to develop the skills that the energy industry needed. The skills network is a high level working group that combines the government, including partnerships with local authorities, with industry experts. This caused over 70,000 installers gain their Energy Efficiency installer qualification through training delivered mostly by manufacturers.[92] The qualification gives advice and training on appropriate boiler sizing, how condensing boilers work in practice and how the changes to Part L will affect the work[93].

Uptake of condensing or combined condensing boilers has been fairly steady since 2008, averaging 1.29 million a year to 2013[94]. The total number of boilers taken up has exceeded the expectations of the CCC by 1.8m.

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89 See for example: http://www.servicemagic.co.uk/resources/cost-guides/boiler-replacement-costs-prices/

90 HM Government (2011) *The Carbon Plan: delivering our low carbon future*

91 Roger Webb, Director of the heating and hotwater industry council, 2014, UK outshines Europe, available at: [http://www.eua.org.uk/sites/default/files/pub_res_downloads/The-UK-outshines-Europe.pdf]

92 Roger Webb, Director of the heating and hotwater industry council, 2014, UK outshines Europe

93 See for example: http://www.tradeskills4u.co.uk/courses/energy-efficiency

94 The CCC, 2014, Progress Report

Wider effectiveness and impact

Condensing boilers have resulted in significant energy savings for UK energy consumers. The Carbon Plan estimated bill savings of around £95 per year in 2011 for many consumers as a result of condensing boiler mandating.[95] As well as recouping the cost through lower energy bills, the upfront cost of condensing boilers has been decreasing. This suggests that creating a larger market for more efficient boilers resulted in economies of scale, allowing the newer more efficient technology to compete on price. Overall savings for the UK were estimated to be at least £800 million in 2011.[96]

2.7 Building Regulations

Building Regulations ensure that new buildings and extensions meet high energy efficiency standards. The impact of the Zero Carbon Homes policy is uncertain as it will be introduced in 2016. However, exemptions will dilute its impact. The use of 'allowable solutions' off-site may make the mandate more efficient, but also limit the impact of the policy in driving take up of low-carbon heat.

In this section, we look at Building Regulations in relation to energy efficiency, and the Zero Carbon Homes policy.

Part L of the Building Regulations relates to energy efficiency standards for new builds and renovations; covering window replacements, boiler installations and insulation measures. Part L in England was strengthened in 2010 with a 25% efficiency increase in terms of carbon emissions compared to 2006, and again in 2013 with a 6% increase for new builds.[97] The Scottish government has announced a 21% improvement on 2010 efficiency standards from October 2015.[98]

Zero Carbon Homes is a building policy for all new build homes from 2016. Under this policy, new build homes will be required to have on-site carbon heat and power that is low or zero, and to meet the Fabric Energy Efficiency Standard. 'Allowable solutions' were introduced to allow developers to offset carbon emissions off-site rather than requiring all properties to be carbon neutral

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95 HM Government, 2011, The Carbon Plan: delivering our low carbon future

96 HM Government, 2011, The Carbon Plan: delivering our low carbon future

97 The CCC, 2014, Progress Report

98 Wales has followed England and Northern Ireland is currently creating plans for future improvements.

on site. The onsite carbon emissions combined with the off-site allowable solutions must meet the Zero Carbon target for new homes[99].

The target is designed to allow it to be met in the most cost effective way, rather than requiring that all solutions are on site. Small housing developments will be exempt from standards. While the definition of small developments has not yet been finalised, in its current consultation, the government puts forward a definition based on a site size of ten units or fewer.[100] This has the potential to allow many houses to be built to non-zero carbon standards, with 21% of houses built in 2013 on sites of ten units or fewer. [101]

Impact on uptake

In this section we focus on the impact of Building Regulations on the energy efficiency of homes, as the Low Carbon Homes policy has not yet been introduced.

Approximately 140,000 new homes are built each year, alongside 200,000 extensions and conversions[102]. There are currently around 28,017,000[103] dwellings in the UK: annual new builds and renovations are therefore around 1% of this total amount. This indicates that the aggregate impact of Building Regulations on the overall energy efficiency of the housing stock may be limited.

Wider effectiveness and impact

Changes to Part L and exemption of small developments from the Zero Carbon Homes were driven by concerns over the impact on housing supply. Exemptions will dilute the impact of the policy.

The allowable solutions mean that the property itself no longer has to be carbon zero onsite. While this could result in greater efficiency in achieving carbon savings, it may also result in slower take up of low-carbon heat than otherwise. The cheapest way for new builds to achieve compliance for the Zero Carbon

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99 See for example : http://www.zerocarbonhub.org/zero-carbon-policy/zero-carbon-policy

100 DCLG, 2014, Consultation, Next steps to zero carbon homes, small sites exemption, available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/375900/141117_Zero_carbon_small_sites_exemption_condoc_Final.pdf.

101 DCLG, 2014, Consultation, Next steps to zero carbon homes, small sites exemption.

102 See for examples: http://www.theguardian.com/politics/2014/may/20/uk-double-number-new-homes-300000-vince-cable and https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/376588/House_Building_Release_-_Sept_Qtr_2014.pdf

103 27,767,000 in 2012 plus 110,000 in 2013 and 140,000 in 2014, see for examples: https://www.gov.uk/government/statistical-data-sets/live-tables-on-dwelling-stock-including-vacants and https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/376588/House_Building_Release_-_Sept_Qtr_2014.pdf

Homes is through an efficient gas boiler, combined with energy efficient fabrics, allowable solutions and solar PV panels.[104] This suggests that heat pumps may be a last resort measure in overall decarbonisation of new buildings. The use of allowable solutions may result in energy costs being higher for consumers than if allowable solutions weren't used.

2.8 Installer registration and consumer protection schemes

There is limited evidence on the effectiveness of installer registration and consumer protection schemes. However, given the need to develop supply chains and reassure consumers on the benefits of low-carbon heat and energy efficiency investments, these may be an important low-regrets policy option.

In this section, we look at two registration and consumer protection schemes:

- the Microgeneration Certification Scheme (MCS); and
- Swiss heat pump 'doctors.'

104 Zero Carbon Hub, 2014, COST ANALYSIS: MEETING THE ZERO CARBON STANDARD, available at: http://www.zerocarbonhub.org/sites/default/files/resources/reports/Cost_Analysis-Meeting_the_Zero_Carbon_Standard.pdf.

Box 3: Microgeneration Certification Scheme (MCS)

Microgeneration Certification is a certification that demonstrates a high level of competence and quality for the installation of microgeneration electricity. This addresses safety issues by regulating installers in the industry, in a similar way to how the gas boiler installer industry is regulated.

The MCS was implemented both to provide consumer protection and to increase the electricity generated from renewable sources by removing barriers to take up (e.g. around a lack of expertise or trust in installers). The policy was implemented before the introduction of the domestic RHI scheme in April 2014. To be eligible for FITs or the RHI, generating technologies must be installed under the MCS.

From January 2009 to mid-August 2014, there have been 656,531 installations with the MCS with a peak of 220,688 in 2011. While the role of MCS in contributing to take up is not clear, as its impact is related to the use of FITs and the RHI, it is expected to address a number of barriers.

- When launching the MCS, DECC funded £500,000 in training for cross-skilling and apprenticeship support. This would be expected to reduce awareness barriers amongst the supply chain, as well as lack of technical skills.
- The certification complies with EU and international standards and would be expected to address barriers around lack of trust from the consumer.

Source: http://www.aspect.co.uk/renewable-energy/microgeneration-scheme/ http://www.microgenerationcertification.org/about-us/news-and-events/144-decc-rhi-training

We now look at heat pump 'doctors' in Switzerland.

Box 4: Swiss heat pump 'doctors'

The Swiss Association for the Promotion of Heat Pumps (FWS) was created in 1993 by the Swiss Federal Office of Energy. The association is a combination of local government authorities, key actors in the heat pump industry, energy suppliers and a professional marketing company. The FWS, and the testing and training centre it created, have been seen as key to the legitimacy and integrity of the heat pump industry in Switzerland[105].

The FWS has created a service to help customers who have problems with their installed heat pumps: the 'heat pump doctor'. It is a role similar to that of an ombudsman as the 'doctor' mediates conflict between installers and consumers, but it is not directly a government role.

The feedback mechanism of the 'doctors' allows the FWS to collect information on the most common customer problems so that they can be corrected for future heat pumps. Overall the scheme works to improve consumer trust and confidence in the heat pump industry, as well as providing expert information to consumers.

It is not clear what the impact of the service has been on uptake of heat pumps or satisfaction with them.

- If a customer has a bad installer then the heat pump 'doctor' can be informed, so that the installer is not recommended for further work. This acts as a form of consumer protection, and would be expected to increase satisfaction overall.
- The number of heat pumps installed in Switzerland has grown since the 'doctors' were introduced in 1993 but there is no evidence of direct causality between the two.
- As heat pump technology has been improving, this 'doctor' role has been used less.

Source: Kiss, B., Neij, L. & M. Jakob (2012). Heat Pumps: A Comparative Assessment of Innovation and Diffusion Policies in Sweden and Switzerland. Historical Case Studies of Energy Technology Innovation in: Chapter 24, The Global Energy Assessment. Grubler A., Aguayo, F., Gallagher, K.S., Hekkert, M., Jiang, K., Mytelka, L., Neij, L., Nemet, G. & C. Wilson. Cambridge University Press: Cambridge, UK; Martin Forsén (2005), Swedish Heat Pump Association 'Heat pumps: technology and environmental impact' http://ec.europa.eu/environment/ecolabel/about_ecolabel/reports/hp_tech_env_impact_aug2005.pdf; Frontier Economics (2013) report for the CCC 'Pathways to high penetration of heat pumps'

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105 Martin Forsén, 2005, Swedish Heat Pump Association 'Heat pumps: technology and environmental impact', available at: [http://ec.europa.eu/environment/ecolabel/about_ecolabel/reports/hp_tech_env_impact_aug2005.pdf]

2.9 District heat policy

Experience from Denmark, Germany and Sweden suggests that a wide range of policy measures are required to support district heat development, but their relative importance is not clear. Recent experience of district heat also highlights the importance of having suitable supply side policy (to incentivise low-carbon generation of heat) and competition policy (to protect consumers) in place.

Our focus is on district heat policy in Denmark, Germany and Sweden. We also look at CHP Quality Assurance in the UK. In areas suited to district heating, policy has addressed a broad range of barriers, often combining an element of mandating with interventions to improve the district heating offering available, address awareness, interest and perception barriers, and overcome financial barriers at a municipality level.

District heating policy in the countries we looked at currently focuses on decarbonisation (both of existing heating networks, and developing new low-carbon heating networks as an alternative to conventional higher-carbon heating). In addition, there has been a recent focus on addressing competition issues. In the past, policy to expand district heat in Scandinavian countries focused on building security of supply following the 1970s oil shocks.

District heat policy in Denmark, Sweden and Germany has consisted of the following.[106]

- **Financial incentives.** In Germany, the Combined Heat and Power Act promotes district heating, subsidising electricity produced through CHP, and subsidising new or expanding networks.[107] In Denmark, a feed in tariff is paid to decentralised CHP plants. Biomass is encouraged through an exemption from heat tax, and through a subsidy on top of the electricity price for biomass CHP.[108]

- **Planning process.** In Denmark, the Heat Supply Law (1979) set up a planning process around heat supply, whereby local authorities were required to identify the potential for district heating. This has been identified as the key policy in the early stages of creating district heat markets in Denmark.[109]

106 Danish Energy Agency, District Heating: Danish and Chinese experience

107 Federal Ministry for Environment, KWK Gesetz

108 Danish Energy Agency, District Heating: Danish and Chinese experience

109 Danish Energy Agency, District Heating: Danish and Chinese experience

- **Long-term contracts.** High upfront costs which are largely sunk mean that long-term contracts have been used to ensure profitability and reduce risk. In Germany, initial district heating contracts can be up to ten years, with subsequent extensions usually for five years.[110]

- **Provision of credit.** Financial incentives have been used alongside credit provision to incentivise investment in district heating. In Sweden, investment subsidies have been combined with loans on favourable terms.[111]

- **Mandating.** In Denmark, customers in specific geographies were required to connect to heating networks. There has been some use of mandating in Germany, although the majority of network areas did not mandate connection. In Germany in 2008:

    - 65% of network areas did not require customers to use the heating network;

    - 29% used partial purchase obligations (which are not clearly defined, but appear to be a time limited requirement that customers connect, to incentivise large investments in district heating); and

    - 6% required compulsory connection and usage.[112]

Governments may also provide quality assurance of installations, which can be incentivised by linking quality assurance to eligibility for financial incentives. We discuss CHP Quality Assurance in Box 5 below.

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110 Sector inquiry district heating (Federal Cartel Office, August 2012)

111 Karin Ericsson, 2009, RES-H Policy, Introduction and development of the Swedish district heating systems, Critical factors and lessons learned

112 Sector inquiry district heating (Federal Cartel Office, August 2012)

Box 5: CHP Quality Assurance

CHP Quality Assurance (CHPQA) is a government method of assessing CHP installations. It is a voluntary annual scheme that assesses energy efficiency and environmental performance. It is available for different levels of energy generation and different fuel sources.

There are financial benefits to achieving quality assurance. If a CHP installation receives certification, then it is eligible for financial benefits such as Enhanced Capital Allowances. The financial incentives of becoming certified (Enhanced Capital Allowances and Climate Change Levy exemption among others) work to remove financial barriers to introduction of CHP.

The government introduced CHP Quality Assurance to encourage the use of CHP, in order to reduce CO_2 emissions in a cost effective manner. CHP has a high efficiency rate (60-80% compared with traditional methods of electricity power stations at 25-50%).[113]

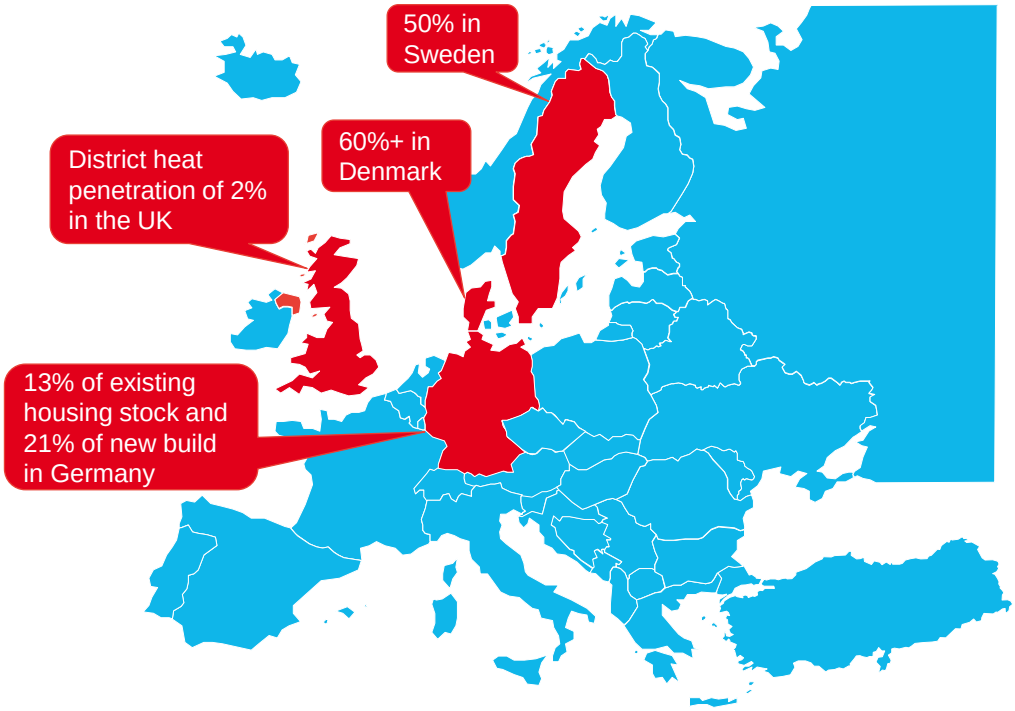
Impact on uptake

The main difference between district heating in these countries and the UK is the scale of district heating supply, which covers 2% of UK homes compared to over 60% of homes in Denmark,[114] as shown in **Figure 7**.

113 DECC, 2014, Combined heat and power quality assurance programme, available at [https://www.gov.uk/combined-heat-power-quality-assurance-programme]

114 DECC, 2013, The Future of Heating: Meeting the challenge

Figure 7. District heating penetration (percentage of homes supplied by heating networks)



Source: DECC, 2013, The Future of Heating: Meeting the challenge and Frontier estimates based on BDEW numbers, 2013

The different national contexts (e.g. in terms of density and level of heat demand, the incumbent technology, and the regulatory context under which district heat was introduced) must be borne in mind when assessing the relevance of the policies reviewed to future development of district heat networks in the UK.

Wider effectiveness and impact

Consumer acceptance of district heating in the countries we have investigated has been high, based on reliability and pricing of district heating.

However, there have also been recent competition concerns which suggest that the natural monopoly features of heating networks (suppliers are monopolies, and consumers have no economic option to switch heating sources in the long-term after choosing district heat) may have been resulting in adverse outcomes for some heat network customers. Competition investigations have included the following.

- An investigation by the German Federal Cartel Office started in 2009. It has instituted proceedings against seven district heating suppliers on suspicion of their charging abusively excessive prices. Investigations are focussing on

around 30 different supply areas throughout nearly all federal states. This is amid evidence of large price differentials, with some customers paying less than 4ct/kWh, while others pay more than 18ct/kWh.[115]

- Due to ongoing competition concerns, the Energy Market Inspectorate in Sweden has a continuous monitoring role for district heat. This follows arguments by the Swedish Competition Authority that district heating enterprises should be regulated, and government investigations of suppliers.[116]

2.10 Solar PV Feed-in Tariffs (FITs)

Experience with solar PV FITs demonstrates that they can be effective in driving uptake where awareness and interest barriers are overcome. This may be the result of the characteristics of solar PV relative to other renewable technologies. However, FITs for solar PV have achieved widespread take up, but for a technology that is unlikely to make a major contribution towards meeting long-term carbon targets. This can be seen from scenarios for the future energy generation mix under decarbonisation.

The feed-in tariffs (FITs) scheme was launched in 2010 and provides a fixed tariff to small-scale renewable electricity generators in GB with installations of up to 5MW. The aim of the policy is to drive investment in renewable electricity.

Our focus is on FITs with respect to solar PV. This is due to take up of solar PV (and associated FIT) being more rapid than expected in 2011 as costs fell rapidly. This meant that returns through the solar PV FIT were higher than anticipated, and rapid uptake resulted in spending being higher than budgeted for, and changes to the policy to bring costs down. By the end of September 2011 the actual uptake was more than double what the predicted uptake was[117]. DECC estimated that if the tariffs were not changed the policy could cost £400m p.a. more than expected[118].

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115 Federal Cartel Office

116 Karin Ericsson, 2009, RES-H Policy, Introduction and development of the Swedish district heating systems, Critical factors and lessons learned

117 DECC, 2011, Feed-in tariffs scheme: consultation on comprehensive review phase 1 – tariffs for solar PV, available at: [https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/42831/3364-fits-scheme-consultation-doc.pdf]

118 DECC, 2014, Government response to consultation on changes to financial support for solar PV, available at: [https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/360280/Government_response_RO-FIT_changes_to_Solar_PV_-_FINAL_2014-10-02.pdf]

Solar PV is the most frequently taken up generation technology under the FIT for small-scale renewables (which also includes wind and micro CHP). It is relatively straightforward to deploy, and as an established technology it carries low risk for individuals deploying it[119]. Domestic wind turbines are more difficult to deploy domestically as there are more requirements (wind flow and height of installation for example), and come with more potential hassles (such as noise)[120]. There may be behavioural reasons associated with the high uptake of solar PV: the panels are visible on the outside of the home. This visibility could drive take up, e.g. through a 'keeping up with the Joneses' effect.

Impact on uptake

The FIT policy was implemented to overcome the hurdle rate for investment by paying individuals for the electricity they generated through their domestic renewable technologies. The higher than expected uptake of solar PV shows that this policy was successful in overcoming barriers to uptake. The change to the policy reduced the tariffs for solar PV and gave new energy efficiency obligations[121].

The installed capacity of solar PV has been fluctuating monthly, with a noticeable spike in July 2012. This is likely because of the announcement of a planned decrease to the tariff at that time for new installations[122].

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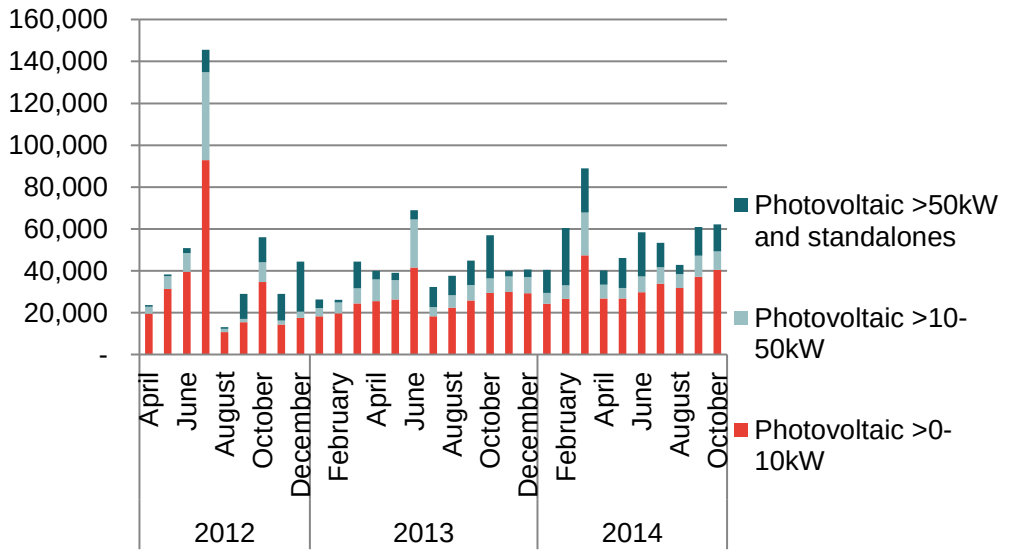
119 DECC, 2009, Impact assessment of Feed-in Tariffs for small-scale, low carbon, electricity generation, available at: [http://www.fitariffs.co.uk/library/regulation/090715ImpactAssessment.pdf]

120 See for example: http://solarelectricityhandbook.com/Solar-Articles/wind-turbines.html

121 DECC, 2011, Feed-in tariffs scheme: consultation on Comprehensive Review Phase 1 – tariffs for solar PV, available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/42831/3364-fits-scheme-consultation-doc.pdf

122 DECC, February 2012, Feed-in tariffs scheme consultation on comprehensive review phase 2A: solar PV cost control, available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/43079/4309-feedin-tariffs-scheme-phase-2a-consultation-paper.pdf

Figure 8. Solar PV uptake over time by installed capacity (KW)



Source: DECC and Ofgem (November 2014) Monthly MCS and ROOFIT degression statistics

Wider effectiveness and impact

The Impact Assessment for FITs estimated that the policy would have a negative net present value of £8.2billion over 20 years.[123] The policy was justified through anticipated non-monetised benefits, such as roll-out leading to reduced technology costs over time.

In practice, actual spending on FITS has been higher than anticipated, with FIT spending at the end of 2011 exceeding the initial allocation for the period to 2015.

The original policy was well received by consumers and the media, while the change in policy to reduce the tariffs was negatively received[124]. The cuts to tariffs were successfully legally challenged, but some solar PV installation companies

123 DECC, 2012, Feed-in-tariff scheme October 2007- October 2011, Lessons for the future, available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48487/6124-feedin-tariffs-lessons-for-the-future-report.pdf).

124 See for example: http://www.theguardian.com/environment/2012/mar/23/uk-government-solar-feed-in-tariff

went out of business after the changes[125]. This caused consumer and industry confidence to fall, as there was uncertainty over the future of the policy.

A review found that the information being monitored by DECC and Ofgem lagged actual uptake of solar PV.[126] This is likely to have contributed to the budget overrun, and therefore the need to modify the policy at last minute to reduce costs. The review also raised concerns over how value for money was addressed. Continued high take up of solar PV FITs (the drivers of which are discussed above) is moderated through 'degressions,' whereby tariffs are reduced if recent take up exceeds certain thresholds.

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125 See for example: http://www.solarpowerportal.co.uk/news/illegal_fit_changes_had_devastating_effect_on_solarlec_4532

126 Government Feed-in-tariff scheme October 2007- October 2011, 2012, Lessons for the future, available at [https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48487/6124-feedin-tariffs-lessons-for-the-future-report.pdf]

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