SUSTAINABLE ENERGY AUTHORITY OF IRELAND | ESRI ECONOMIC & SOCIAL RESEARCH INSTITUTE

Policy insights for encouraging energy efficiency in the home

A compilation of findings from a research fellowship co-funded by SEAI and ESRI

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Introduction

The Sustainable Energy Authority of Ireland (SEAI) and the Economic and Social Research Institute (ESRI) have a history of collaboration in energy research. The latest example is a jointly funded research Fellowship that combines SEAI's programme and policy knowledge with social and economic research expertise at the ESRI to gain a better understanding of consumer behaviour and decision making in the context of energy efficiency in the home.

The process of policy development can benefit from the use of quantitative evidence. SEAI provides this evidence based on data gathered from a range of sustainable energy schemes delivered on behalf of the Department of Communications, Climate Action and Environment (DCCAE). Analysis of this data provides a greater understanding of the causal mechanisms underpinning real-world outcomes, enabling more effective policy design. In 2017, SEAI established a dedicated Behavioural Economics Unit to increase the scope for experimentation, to inform policy design and to maximise the impact of existing policies.

This report compiles the findings of ten research papers written as part of the SEAI/ESRI Fellowship during 2016 and 2017. These research papers investigated many tenets related to energy efficiency in the residential sector. References to the full publications are included at the end of this report.

The findings from this report will inform the design and delivery of SEAI behavioural and grant schemes targeted at homeowners. They will also provide significant insight when examining options around alternative finance for residential retrofit and the potential for green mortgages. Some of the conclusions are already being tested by SEAI as it delivers its grant programmes. Others will require further consideration and analysis.

The Better Energy Homes scheme

Better Energy Homes (BEH) is a Government scheme, run by SEAI, which gives fixed cash grants for insulation and heating system upgrades. It is available to all owners of homes built and occupied before 2006. Grants are currently available for:

- Attic insulation
- Cavity wall insulation
- External wall insulation
- Internal wall insulation
- Heating system upgrade including heating controls
- Solar thermal panels or tubes

Between 2009 to the end of 2016, over €200 million of Government funding had been disbursed to over 190,000 homes to support reduced energy use. This leveraged a further €460 million of private householder expenditure on energy efficiency measures. Annual energy bills of households who engaged in the scheme have reduced by around €64 million per annum collectively. Residential sector emissions have reduced by over 236,000 tonnes CO_2 per annum as a result of upgrade work completed through BEH. In addition, scheme participants have warmer, more comfortable, healthier and more valuable homes.

Research questions

The focus of this research was to improve understanding of consumer behaviour and efficient grant scheme design in the context of policies and measures that can effectively encourage homeowners to increase the energy efficiency of their home. The four key research questions outlined below are addressed in more detail in the following sections.

1 Understanding the household

What affects the household decision-making process?

Gaining a greater understanding of household decision making and the needs of householders with regard to retrofitting informs policy makers in designing grant schemes, such as BEH. The section examines:

- Value for money to the household and what homeowners are willing to pay for technical energy savings under the scheme;
- How information can affect homeowners' interest in retrofitting and homeowners' preferences with regard to funding structures.

2 Scheme engagement

How can consumer behaviour inform the delivery of the Better Energy Homes scheme?

SEAI continually improves its programmes through evidence-based research and recognises that a greater understanding of household behaviour and decision making can drive more household upgrades in future. This section focuses on four features of the scheme:

- Factors affecting applications to the scheme;
- Abandonment of applications to the scheme;
- The depth of retrofit (number of measures) undertaken by households; and
- The impact of energy supplier involvement in BEH applications on abandonment and retrofit depth.

3 Efficiencies in funding

How can the structure of the BEH scheme become more efficient?

It is important to ensure that public money spent on the scheme is leading to the best value for money. This report asks a number of questions which examine the efficiencies in the funding mechanism, including:

- What has been the effect of the bonus payments for multiple measures?
- Which measures provide the best value for money from the Government's perspective in reducing energy consumption?
- How effective have grants been in inducing retrofits which would not otherwise have occurred?
- How might the scheme be altered or extended to attract landlords to invest?

4 Getting the incentives right

How do policies and measures interact?

Implementing new policies can lead to unintended positive and negative consequences. Externalities can be harnessed to improve the delivery of policies and measures. This aspect of the research examines spill-over effects from other grant aid schemes into the BEH scheme and how some potential unintended consequences of both energy efficiency standards and retrofitting policies are being addressed.

The following sections address each research question in more detail and highlight the key findings from the ten research papers delivered under the Fellowship. At the end of each section, a summary of the policy insights and actions for consideration is provided. These constitute the main findings with a practical policy application. Specific references are included at the end of each section and a full list of references to the papers on which this report is based is available in the Appendix.

1 Understanding the household

What affects the householder decision-making process?

Householder value for money

When it comes to a decision to invest in an energy efficiency upgrade, householders do not just value the economic cost savings flowing from reduced energy bills. Improved comfort, health and wellbeing, as well as poverty alleviation and disposable income benefits, have all been cited in the literature[1]. Value for money to the household is measured as the Net Present Value (NPV) to the household considering the costs of energy efficiency improvements, the value of the grant, and energy cost savings[2] in the SEAI/ERSI Fellowship research paper. It is noted that the net benefit calculation is likely to understate the true net benefit of the retrofit, as the value to the homeowner of improved comfort and warmth, health benefits, improved environmental conscience, etc. are not included in the equation. Similarly, hidden costs such as search costs and disruption, are not included.

On average, there is a monetary net benefit accrued by households based on the NPV metric. A large variation is found across the combination of retrofit measures undertaken. Attic insulation, cavity insulation and a heating controls upgrade provide the greatest net benefit, followed by a combined measure upgrade package including attic insulation, cavity insulation and a boiler with heating controls. Solid wall insulation is found to provide the lowest value for money to households in net benefit terms.

For these types of deeper (more expensive and comprehensive) measures, however, it is likely that the non-monetary gains such as improved comfort are high.

Less efficient homes with more energy savings potential are found to gain the greatest benefit. Net benefits go up by €27 for every unit (kWh/m2/year) increase on the Building Energy Rating (BER) for a house in its pre-retrofit state. Mid-terrace houses benefit the most from retrofitting, followed by detached houses, while apartments benefit the least.

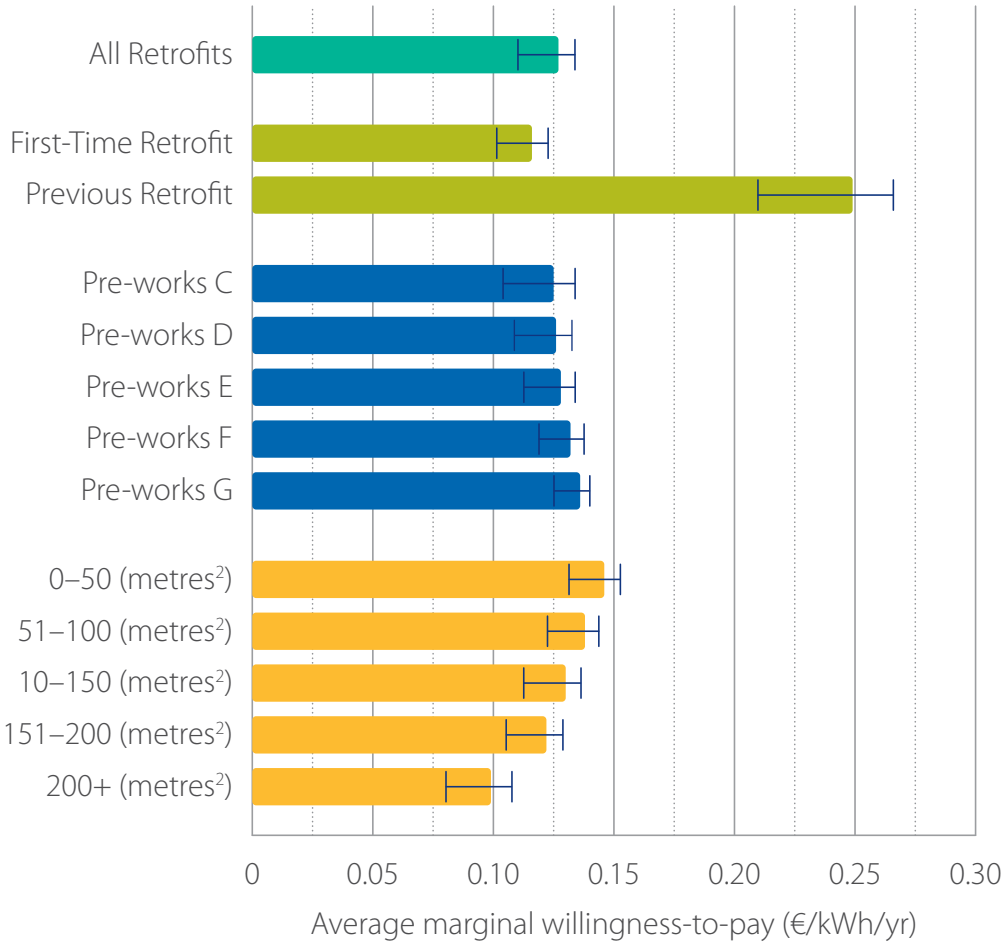
Figure 1 details the average amount, in euro, that households are willing to pay for each kWh/year reduction in Building Energy Rating. This is referred to as the average marginal willingness-to-pay (MWTP) and varies by certain characteristics. The average MWTP across the population of retrofits is found to be €0.127.

The largest variation in MWTP is found to exist between those who had previously undertaken a retrofit under the BEH scheme and those who had not. Those who had previously undertaken a BEH retrofit are found to be willing to pay over twice as much as those who had not. This reflects a greater understanding of the benefits of retrofits, relative to those retrofitting for the first time, who are more likely to be unaware of the full range of benefits.

1 See Capturing the Multiple Benefits of Energy Efficiency (International Energy Agency, 2014) for a summary. www.iea.org/publications/freepublications/publication/Captur_the_MultiplBenef_ofEnergyEficiency.pdf

2 Over a 20-year time horizon. A 7.5% discount rate was used.

Figure 1: Willingness-to-pay for retrofit works



Information for motivation

A lack of vital information or a lack of trust in information acts as a barrier to homeowners carrying out home energy efficiency upgrades. Therefore, identifying what specific information stimulates homeowner interest in retrofitting is important.

To identify whether homeowners have an interest in insulating, draught-proofing, replacing windows and/or doors, installing a high-efficiency boiler, heating controls or solar panels in their home, a survey of 2,430 households (nationally representative) was undertaken as part of a Fellowship research paper[3]. The benefits homeowners associate with each measure was also investigated.

Those interested in high-efficiency boilers and heating controls were found to have positive perceptions of the effects of retrofitting on energy costs and comfort. In addition, more favourable expectations of the comfort benefits is a significant predictor of being interested in insulating. Awareness of energy costs is a predictor of interest in both draught-proofing and solar panels. No positive statistical relationship was found for the perception of retrofitting on health outcomes, property value and condensation or mould growth, aspects that can potentially be impacted by improved household energy efficiency. Despite this perception, the ESRI have found that a better BER adds to the sales price of dwellings[4]. There is also significant literature linking warmer homes to improved health and wellbeing[5].

3 To ensure data quality, subsequent analysis was based on a sub-set of this sample to include only those who identified themselves as sole or joint decision makers with regard to energy related decisions in their home

4 Energy Economics, Vol. 40, November 2013, pp. 943-952, www.dx.doi.org/10.1016/j.eneco.2013.07.020

5 For a recent summary see Chapter 4 of Capturing the Multiple Benefits of Energy Efficiency (IEA, 2005) www.iea.org/publications/freepublications/publication/capturing-the-multiple-benefits-of-energy-efficiency.html

Policy insights and actions under consideration

1

Householders value monetary, and also non-monetary gains from energy efficiency retrofits, such as improved comfort and health.

- Actions to encourage home energy upgrades should include the promotion of the multiple benefits of home energy efficiency measures, beyond monetary savings.
- Further study is needed to understand where there are gaps in homeowner's knowledge of energy efficiency measures and exploring how to ensure that the right information is delivered to the right people.
- Exploring how best to convey the non-monetary benefits to different consumer cohorts should be tested. Focus should be given to understanding at what point in the decision-making process these messages are best delivered, and from which sources the message should be delivered.

2

Homes with a poor starting level of energy efficiency stand to gain most from an upgrade.

- Households that upgrade their homes through the BEH scheme and return for further support are willing to pay 2.5 times more for subsequent retrofits. Direct marketing to previous scheme participants should be considered to leverage this effect. SEAI needs to continue to support householders to undertake shallow retrofits, especially if it is proven that for some households this leads to deeper retrofits.

Findings are taken from:

- Collins, M. and Curtis, J. (2017) "Value for money in energy efficiency retrofits: Grant provider and grant recipients", Applied Economics, 49(51), 5245-5267.
- Collins, M. and Curtis, J. (2016) "Willingness-to-pay and free-riding in a national energy efficiency retrofit grant scheme: A revealed preference approach", ESRI Working Paper Series, WP551.
- Collins, M. and Curtis, J. (2017) "Identification of the information gap in residential energy efficiency: How information asymmetry can be mitigated to induce energy efficiency renovations", ESRI Working Paper Series, WP558.
- Collins, M., Dempsey, S. and Curtis, J. (2017) "Financial incentives for residential energy efficiency investments in Ireland: Should the status quo be maintained?" ESRI Working Paper Series, WP562.

2 Scheme engagement

How can consumer behaviour inform the delivery of the Better Energy Homes scheme?

Understanding how consumers engage with the Better Energy Homes scheme can reveal opportunities to drive the volume of applications and encourage greater depth (number of measures per home) of home energy efficiency improvements. Tailoring advertising methods, reducing the number of applications that do not complete retrofit works, and interactions with energy suppliers through the grant scheme are considered with a view to driving greater scheme uptake.

Scheme advertising

Various forms of advertising have been used throughout the course of the scheme to engage with households and encourage grant applications. These include outdoor advertising, local and national print and radio advertising and online. Online advertising included pay per click advertising and directly advertising the scheme through websites such as the Irish Times, Daft, MyHome and RTE.

The timing of applications and location of households applying to the scheme were analysed to estimate the effects of different forms of advertising on engagement by households. It should be noted that the data on advertising measures does not consider budget, different audience profiles, scale of advertising, timing of activity and other influencing factors, so it is not possible to evaluate the relative efficiency of different advertising media. In addition, there can be a lag time between encountering advertising and making a decision to apply to the scheme, which was not accounted for.

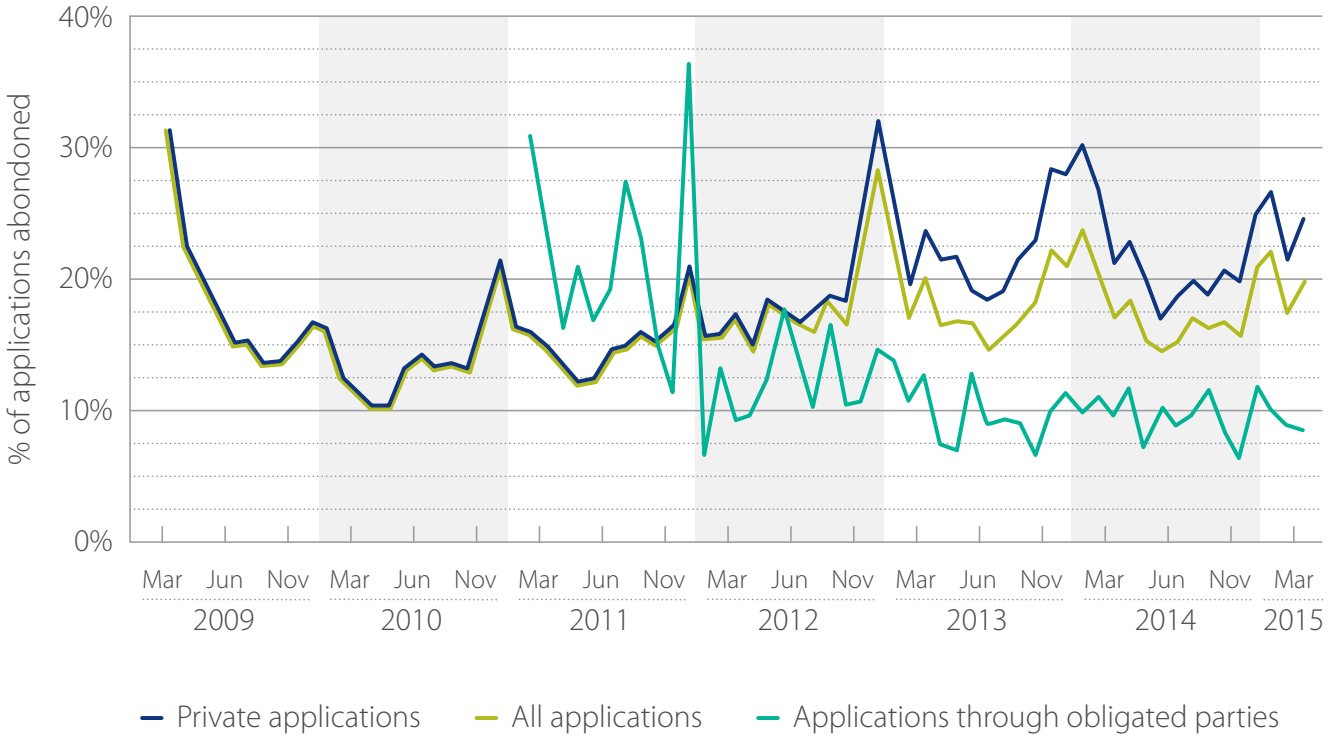
The presence of online advertising and national print advertising was linked to a statistically significant increase in applications. Data from 2015, a year in which the average monthly applications to BEH was 1,020, indicated that when online advertising was undertaken in a given month, on average an additional 80 applications to the scheme were observed in the next month, 35 of which were expected to result in completed retrofits. Similarly, when a national print advertising campaign was running, there was an average of an additional 38 applications, 17 of which were completed.

Application abandonment

Around 15% of first-time applications to the BEH scheme are cancelled or allowed to expire and don't lead to an energy efficiency improvement. These applicants do not avail of the grant at a later date. Retrofit applications from homes carrying out three to four measures are more likely to be abandoned than shallower retrofits. Two-measure retrofits are less likely to be abandoned than one-measure retrofits. Two-measure retrofits undertaken through the scheme to date are predominantly attic and cavity wall insulation retrofits which are relatively inexpensive and simple to undertake compared to other retrofit combinations.

Winter applications are more likely to be abandoned than applications coming in at other times of the year. Summer applications are the least likely to be abandoned. There is also a greater likelihood of abandonment for homes built prior to 2000.

Figure 2: Application abandonment from private applications compared to applications made through obligated parties



The impact of obligated parties

The Energy Efficiency Obligation Scheme requires energy retailers and distributors to reduce the energy use of their customers. The energy retailers and distributors are referred to as obligated parties. Some obligated parties have generated energy savings by encouraging householders to utilise the BEH scheme to upgrade their homes[6]. Analysis of scheme data[7], found that obligated parties were responsible for over 18,500 applications (approximately 18% of total of applications)[8].

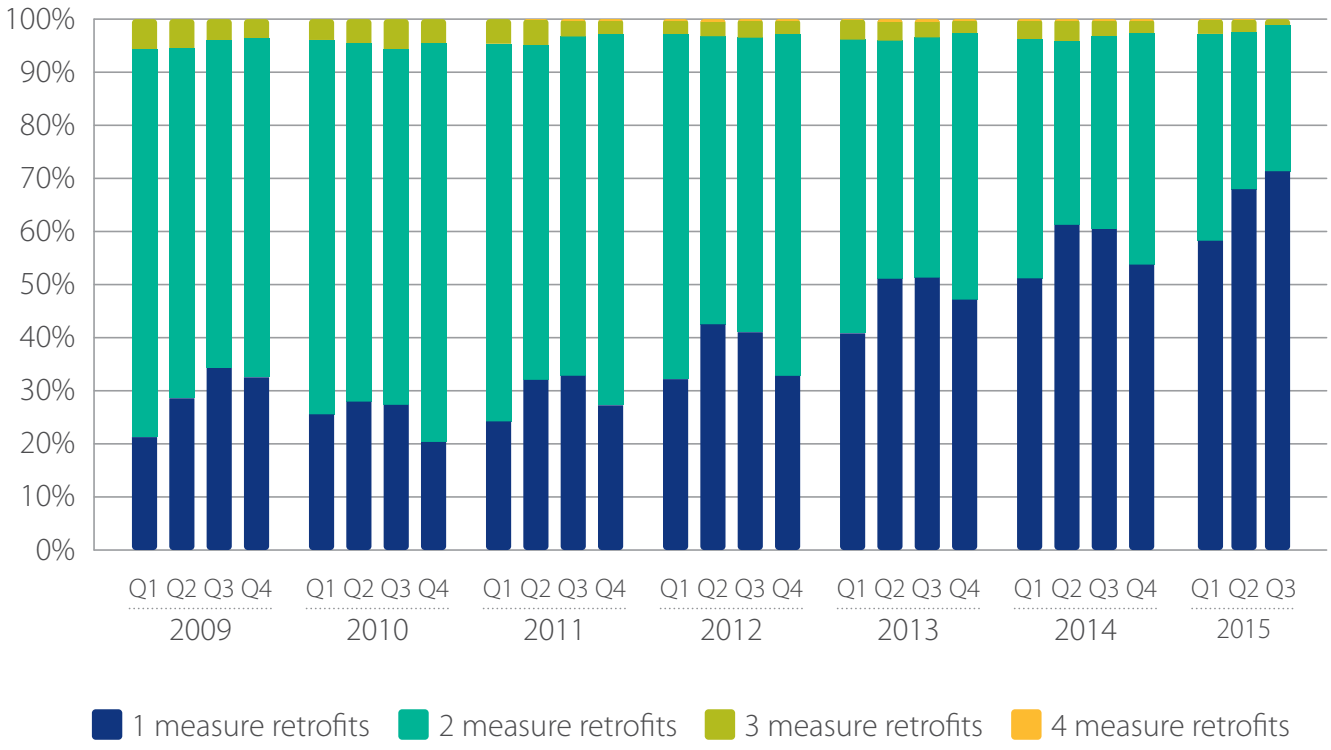
As shown in Figure 2, applications made with the support of an obligated party have lower levels of abandonment compared to private applications, although variation does exist between suppliers. It was found that, across all obligated parties, a learning phase of six months exists, during which the likelihood of abandonment declines to lower and more stable levels. This could result from additional support and information provided by obligated parties and/or homeowner confidence in undertaking the process where an energy supplier is involved. Understanding which obligated parties support a higher proportion of applications through to completion, and how they do that, could inform strategies to support application completion across the scheme.

6 Scheme rules are set out in this guidance document www.seai.ie/resources/publications/EEOS-Guidance-Document.pdf

7 All analysis relating to obligated parties is based on anonymised data. No obligated party or counterparty identifiers were available to the researchers. Given counterparties deliver many of the actions on behalf of obligated parties, results indicate the effectiveness of counterparty/obligated party relationships, rather than being wholly due to the obligated parties.

8 This analysis examined applications from March 2011 to October 2015.

Figure 3: Number of measures per home through Better Energy Homes Scheme 2009 – 2015



Driving deeper retrofit

Over the course of the BEH scheme, the number of single energy efficiency measure retrofits has consistently risen since the beginning of 2012, while the number of two, three and four measure retrofits have fallen. At the beginning of the scheme, the majority of retrofits were comprised of two measures, predominantly attic and cavity insulation. Deeper retrofits, where more measures are undertaken, are more likely outside the Greater Dublin Area.

The depth of retrofit varies depending on the obligated party associated with an application. The variation in retrofit intensity across obligated parties may reflect different strategies for meeting their energy reduction targets. For every energy saving measure implemented by an obligated party, a credit is awarded toward their target. Some obligated parties may be focussing on providing retrofits that earn the most credits, whereas others may choose to focus on attic and cavity retrofits as these provide less disruption and are easier to implement. Understanding why and how some obligated parties drive deeper retrofits (more measures per house) could lead to insights to further influence householder decision making.

Policy insights and actions under consideration

1 There is a correlation between the presence of national print and online advertising and grant applications.

- Local media outlets have a role to play in disseminating locally relevant information which is important in encouraging residential retrofits.

2 Deeper retrofits have a higher risk of abandonment.

- SEAI is in the process of assigning a 'risk of abandonment factor' to incoming applications based on data routinely provided at the application stage. Enhanced levels of support, e.g. extra phone calls or emailed information, should be provided to 'high risk' applicants.
- Further insights should be gained through email surveys or focus groups. This would enable a deeper understanding of the reasons scheme participants abandon applications and enable design and testing of actions that could reduce abandonment rates.

3 The mix of measures a household installs has changed over time.

- A Deep Retrofit Pilot Scheme launched by SEAI in 2017 aims to identify the main barriers to widespread deep retrofit and showcase retrofit solutions for different dwelling types.
- SEAI is investigating innovative finance pilots to discover the most favoured mechanisms for households to fund deep retrofit. An example of a funding option that is being tested, is examining the willingness of householders to take a grant plus a low-interest loan to cover remaining costs or to receive funding through their employer.
- Providing information to homeowners from a trusted advisor is key. SEAI is developing an enhanced BER Advisory Report to provide pertinent and timely information to householders. Additional work to ensure contractors and BER assessors provide support to homeowners considering retrofit should be explored..

Findings are taken from:

- Collins, M. and Curtis, J. "Advertising and multiplier effects in residential energy efficiency retrofits using a new product growth model". ESRI Working Paper Series, WP569.
- Collins, M. and Curtis, J. (2016) "An examination of energy efficiency retrofit depth in Ireland", Energy and Buildings, 127: 170-182.
- Collins, M. and Curtis, J. (2017) "An examination of the abandonment of applications for energy efficiency retrofit grants in Ireland", Energy Policy, 100, 260-270.

See also: *Behavioural Insights on Energy Efficiency in the Residential Sector (SEAI, 2017)*. Available at www.seai.ie/resources/publications/Behavioural-insights-on-energy-efficiency-in-the-residential-sector.pdf (Accessed January 2018)

3 Efficiencies in funding

How can the structure of the BEH scheme become more efficient?

Examining efficiencies in the funding mechanism ensures public money spent on the scheme is leading to the best value for money. The grant aid scheme has changed over its lifetime, including changes to the technologies supported, the size of grants for each measure and the introduction of bonus payments for deeper retrofits.

Grant scheme structure

Currently, under the BEH scheme, homeowners receive a cash grant after the works are completed. The grant amount varies between €300 and €4500 depending on the measure undertaken. A study was carried out examining financing structures for the grant scheme. It was found that the status quo of a cash grant following the completion of works was the most preferred financing option, followed by an upfront discount on the cost of works. The option of reduced property tax based on an improved energy efficiency rating is less preferred by those living in less valuable properties. Similarly, a tax credit or repayment through an employer system is found to be generally less preferred, in particular among older age categories.

While the majority of research in the energy efficiency literature is undertaken with a focus on homeowners, rental tenants comprise a significant subset of the residential sector. 37% of tenants were found to be willing to pay more rent for improved energy efficiency. These tenants are found to be willing to pay an average of €46 per month for an improvement in energy efficiency of one Building Energy Rating (BER) letter grade. Upon receiving information regarding the cost savings available from an improvement in a property's BER, the proportion of tenants willing to pay for improved energy efficiency rose to 55%, with this group willing to pay an average of €37 per month for a one grade improvement. This implies that education of rental tenants might lead to an increase in demand for energy efficiency and provide a stimulus for energy efficiency improvements in the rental sector.

Bonus payments

Householders that carry out three or four measures under the BEH scheme are entitled to a bonus grant. Bonus payments were introduced in March 2015. No measurable increase is evident in the number of applications for three or four measure retrofits since that time. Bonus payments were awarded to some householders that returned to the scheme for grants a second time, however it is not possible to conclude if these second applications were due to the bonus payment or not.

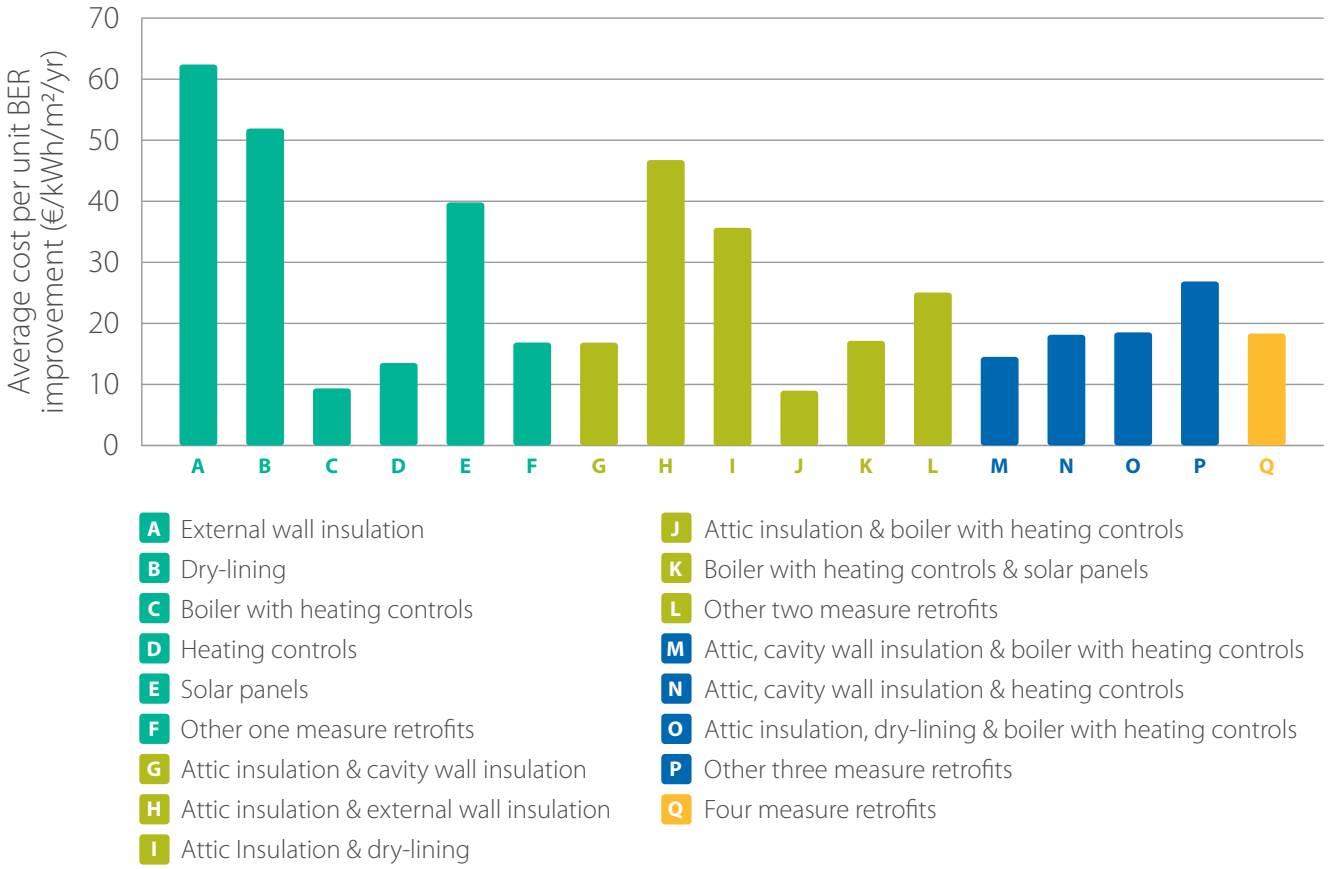
Studies in other European countries have found a higher uptake of deeper retrofits in schemes with progressive levels of grants linked to units of energy saved or emissions reduced.

Government costs per measure supported

The cost to induce decarbonisation of the residential sector varies substantially across retrofit options. Figure 4 details this variation, presenting the average cost per unit BER improvement (kWh/m^2/year) as measured on the Building Energy Rating (BER) scale, for the average dwelling. Our analysis finds significant variations in value for money depending on dwelling characteristics, such as size, age, initial condition, etc. and the upgrades that are completed.

Retrofits including solid wall insulation and solar collectors are the most expensive in terms of energy efficiency improvement from the Government perspective. The least costly retrofit combinations are found to be shallower retrofits, such as attic and cavity wall insulation retrofits and boiler with heating controls retrofits. Semi-detached and terraced homes are found to provide greater value for money from the grant provider perspective than detached houses, while apartments are found to be the most expensive.

Figure 4: Cost of different measures and measure combinations



Scheme deadweight and free riders

An unavoidable aspect of any grant scheme is that some scheme participants who were going to undertake an efficiency investment in the absence of the scheme ('free-riders') avail of the grant. The cost of grants to these free-riders is considered a 'deadweight' cost to Government.

Applications are defined under three categories; 'free-riders' are retrofits which would have occurred in the absence of a grant, and 'partial free-riders' are retrofits which would have occurred with a lower grant amount than was awarded but would not have occurred in the absence of the grant. Finally, 'dependents' are those who are found to be wholly reliant on the grant. Among all completed retrofits, analysis suggests that 8% could be classed as free-riders, with partial free-riders making up a further 7%.

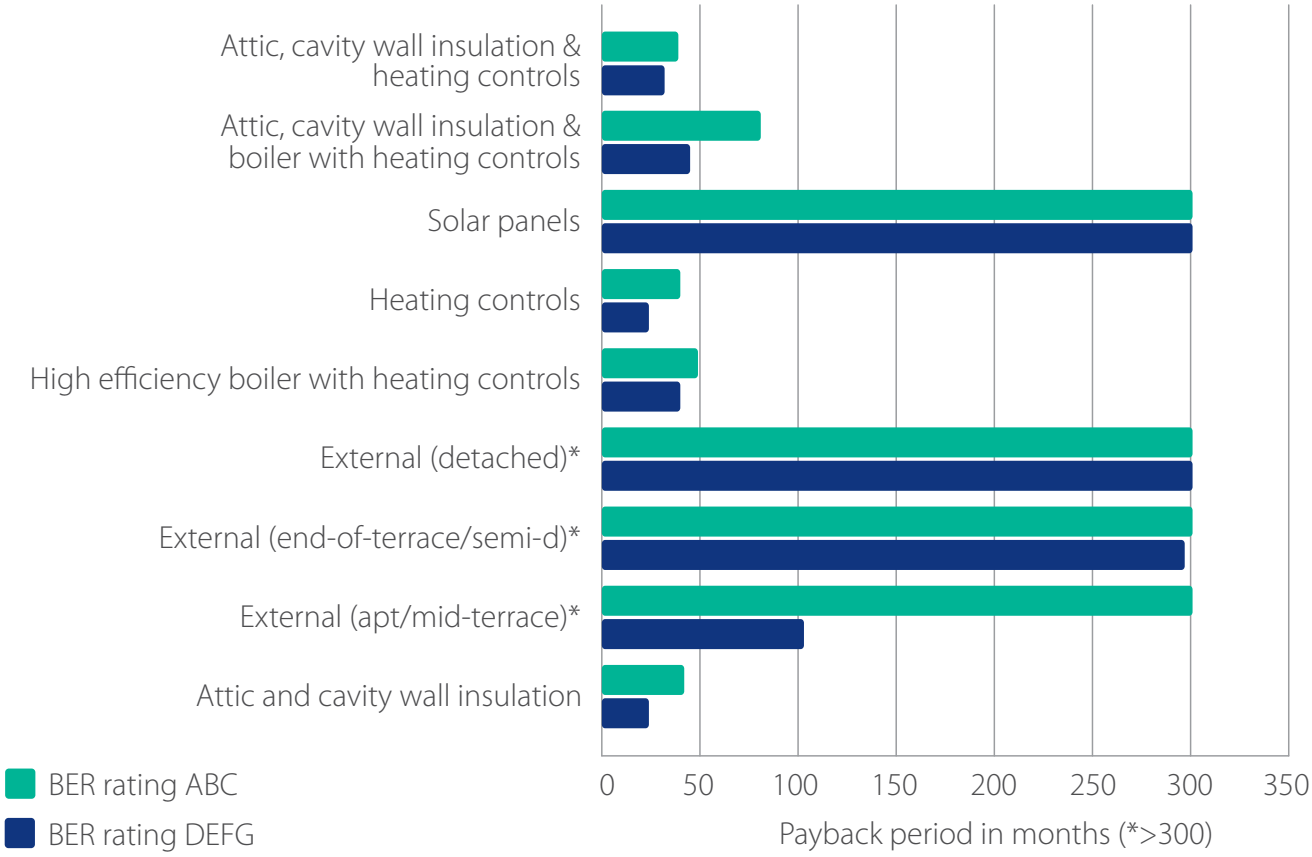
These outcomes compare favourably with international schemes with similar studies finding free-riding levels of greater than 40% in some cases. Outcomes vary across retrofit choices. Solar collector retrofits are found to have a very low (near zero) proportion of free riders, while it is estimated that heating control retrofits have a higher level at around 33%. This analysis only accounts for monetary costs and does not consider other benefits such as increased comfort and the health benefits of living in a warmer home, or hidden costs such as disruption during works.

A landlord perspective

While homeowners place significant value on the many co-benefits of energy efficiency retrofitting, the rental sector presents a less homogeneous cohort to incentivise. As landlords do not stand to benefit from non-monetary outcomes of retrofitting, return on investment is a key driver of the retrofit decision. In order to understand the business case from a landlord perspective, payback periods for landlord investments in certain retrofit measures have been calculated.

As shown in Figure 5, payback periods of less than four years have been calculated for investments in homes with Building Energy Ratings of D or below for combinations of measures comprised of attic and cavity wall insulation, boilers with heating controls and heating controls only. Substantially longer payback periods were found for solid wall insulation and solar thermal retrofits and, as such, these measures might require substantial grants to induce improvements in the energy efficiency of the rental sector.

Figure 5: Payback periods for different measure combinations



Policy insights and actions under consideration

1

Whilst grants are the preferred incentive for many householders, a mix of offerings is needed.

- SEAI is currently investigating opportunities to fund retrofits in alternative ways through pilot schemes, for example, employer based schemes. It is understood that these won't work for certain cohorts such as the elderly, nor will they suit all employers. It is clear that a mix of offerings is likely to have most impact.

2

Bonus payments to encourage more measures per dwelling are not currently driving an increased level of multiple measure retrofits.

Actions under consideration to increase the depth of retrofit include:

- Testing alternative levels of bonus payments to see if there is an optimal level
- Testing an alternative funding structure that supports a level of carbon savings or BER uplift instead of providing grants for individual measures. This approach could encourage innovative delivery of efficiency upgrades.

3

The least costly retrofit combinations are found to be shallower retrofits.

- Value for money in terms of Government spend per unit of energy savings varies across the measures supported. While grant levels are set at approximately 30% of total measure costs, there is merit in testing higher rates of funding for harder to implement measures. This could support market development for the technologies necessary for long-term transformation of the housing stock.

4

Free-ridership in the BEH scheme is on average low compared to similar schemes across Europe.

- Structuring grant amounts so higher levels of grant are awarded for deeper retrofit measures, and only when in combination with, or after, shallow measures are implemented, could be tested for its effect on free-ridership and with a view to driving deeper retrofit.

5

Return on investment is a key driver of retrofits in the rental sector since the multiple benefits, such as comfort and wellbeing, do not accrue to the landlord.

- To induce activity in the rental sector, landlords should be made aware of the value tenants place on more energy efficient dwellings.

Findings are taken from:

- Collins, M. and Curtis, J. (2017) "Value for money in energy efficiency retrofits: Grant provider and grant recipients", Applied Economics, 49(51), 5245-5267.
- Collins, M. and Curtis, J. (2016) "Willingness-to-pay and free-riding in a national energy efficiency retrofit grant scheme: A revealed preference approach", ESRI Working Paper Series, WP551.
- Collins, M. and Curtis, J. "Can tenants afford to care? Investigating the willingness-to-pay for improved energy efficiency of rental tenants in a stressed rental market and returns to investment for landlords", ESRI Working Paper Series, WP565.

4 Getting the incentives right

How do policies and measures interact?

The BEH scheme exists within a policy framework which includes a range of policies and measures aimed at a sustainable energy future.

Research, as part of this Fellowship, has identified interactive effects of complementary policies which can lead to various externalities. For example, positive externalities in the form of spill-over effects between polices, where one policy action leads to enhanced outcomes in another. The research also summarised some unintended consequences of retrofitting that should be considered when improving the efficiency of a home. Incentives driven by the Building Energy Rating (BER) system are also explored.

Enhanced impacts from policy packages

The BEH scheme supports individual households to upgrade for improved energy efficiency. A separate grant scheme, Better Energy Communities (BEC), calls for submissions from community groups to undertake upgrades to groups of homes, businesses and public buildings. By the end of 2016, over 300 community projects had been delivered across Ireland[9].

Research modelled the timing and location of applications for homeowner grants in the hinterland of BEC projects was conducted. It found that energy retrofits undertaken through BEC lead to additional applications in BEH. Estimates suggest that for every four buildings retrofitted within the BEC scheme (both private and community buildings) one additional private retrofit is subsequently completed with grant support from the BEH scheme. SEAI is investigating how to leverage the kind of spill-over effects between programmes observed in this study.

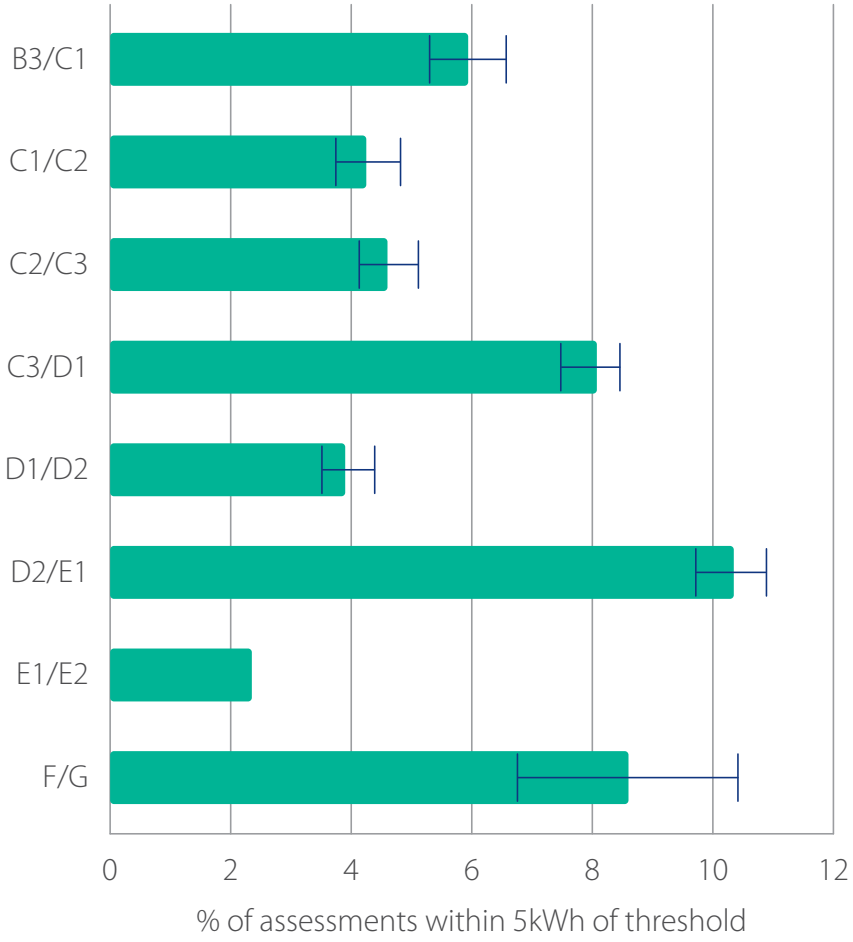
Unintended outcomes of retrofit

Improving the energy efficiency of a dwelling often means increasing the air-tightness and thermal efficiency of the building envelope to reduce heat loss. As international experience illustrates, if not proporely addressed, such actions can lead to reduced indoor air quality through accumulation of indoor pollutants, impacting on householder health. With appropriate ventilation systems, indoor air quality can be maintained as a building is made more air tight and energy efficient.

SEAI provides detailed guidance for contractors on the ventilation provisions required by the Code of Practice and Technical Specifications associated with the BEH scheme. It is recommended that all upgrades are installed in accordance with S.R. 54:2015 methodology for the energy efficient retrofit of existing dwellings.

9 Details and case studies are available at www.seai.ie/grants/community-grants/

Figure 6: Proportion of BERs within a 5kWh range on the 'favourable' side of BER thresholds



BER scale – Incentives for savings or misrepresentation?

New homes and homes advertised for sale or rent must have a valid BER. Having a standardised instrument to measure energy efficiency in residential dwellings provides an incentive for increasing energy efficiency and obtaining a higher BER rating. Since June 2010, the BEH scheme has mandated a Building Energy Rating (BER) assessment upon completion of retrofit works.

An analysis of participants in the BEH scheme has found that the BER do not follow a smooth distribution. This phenomenon is observed in similar banded structures such as those used for income taxation, energy labeling in cars, and assigning test (grade) scores. There is a bunching of homes close to the various grade thresholds. Approximately 3.9% (4,450) homes from a sample of 113,000 are estimated to have better ratings than would be the case were Building Energy Ratings to follow a smooth distribution.

Understanding the cause of this bunching is important to determine if there is any misrepresentation of ratings, or if the bunching is caused by homeowners targeting improvements to improve their grade. SEAI's ongoing monitoring programme targets a higher proportion of ratings at the BER thresholds to investigate the cause. A penalty system is applied to assessors where it is found there has been any misrepresentation of a buildings characteristics in a BER. Opportunities to leverage this effect, for example by supporting BER assessors to encourage householders to undertake any measures that would improve their BER, are being considered in this context.

Policy insights and actions under consideration

1

Results indicate that SEAI's BEC scheme is driving increased activity in the BEH scheme, which targets individual homeowners.

- Advertising can increase awareness, and leverage other behavioral interventions.
- It was found that there are increased BEH applications in areas that are participating in BEC.
- Examining how additional advertising in local areas participating in BEC might impact homeowners availing of energy efficiency upgrades could deliver further savings.

2

Research has discovered bunching of BERs on the more efficient side of each rating band.

- SEAI is monitoring and auditing BERs within the observed bunches to determine if any systematic misrepresentation is occurring.
- Enhanced savings could be achieved by empowering BER assessors to promote take-up of easy to deliver measures that impact on BER, such as low-energy lighting, draught proofing, lagging hot water cylinders and more.

Findings are taken from:

- Collins, M. and Curtis, J. (2016) "Evidence, drivers and sources of distortions in the distribution of building energy ratings prior to and after energy efficient retrofitting", ESRI Working Paper Series, WP535.
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Appendix – Programme of research overview

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