seai SUSTAINABLE ENERGY AUTHORITY OF IRELAND

Encouraging heat pump adoption in heat pump ready oil-heated homes

Report 2 - Insights from a homeowner survey and willingness to pay experiment

SEAI Behavioural Economics Unit

Behavioural insights for policy: primary research

Rialtas na hÉireann
Government of Ireland

Encouraging heat pump adoption in heat pump ready oil-heated homes

Report 2 - Insights from a homeowner survey and willingness to pay experiment

March 2024

Prepared by:
Hannah Julienne, Programme Manager – Behavioural Economics

Sustainable Energy Authority of Ireland
SEAI is Ireland's national energy authority investing in, and delivering, appropriate, effective and sustainable solutions to help Ireland's transition to a clean energy future. We work with the public, businesses, communities and the Government to achieve this, through expertise, funding, educational programmes, policy advice, research and the development of new technologies.

SEAI is funded by the Government of Ireland through the Department of the Environment, Climate and Communications

Contents

Executive Summary

Background

To accelerate heat decarbonisation through heat pump adoption, SEAI's Behavioural Economics Unit are conducting research to better understand how to drive heat pump uptake in oil-heated homes that are considered 'heat-pump ready' in terms of their existing energy efficiency. As part of this, a survey of target homeowners was carried out in autumn 2022 to better understand the barriers and drivers of heat pump adoption in this specific type of home, and the additional level of grant support that might be needed to further boost adoption.

Homeowners in oil-heated heat pump ready homes were identified through SEAI's National Building Energy Rating (BER) register and invited by post to take part in an online survey. A final sample of 1,402 completed the full survey, including a choice experiment to estimate how much these homeowners would be willing to pay for a heat pump under different scenarios. A smaller group of 35 respondents were identified as having already switched to a heat pump, and completed an alternative shorter survey designed to gather their views on their switching experience.

Main Findings

The primary findings are summarised below. It should be noted that **these results relate specifically to oil-heated heat pump ready homes**, and although some results may generalise more widely, they would need to be verified with an appropriately representative sample.

- **Target homeowners are willing to pay for a heat pump, but only when their current heating system needs replacing.** When we asked respondents to imagine their boiler was coming to the end of its life and asked them to choose a replacement, people were willing to pay about €2,000 more for a heat pump than for an oil boiler. However, when they were instead told to consider their current boiler's status and asked how likely they would be to switch to a heat pump in the next 12 months, the average willingness to pay was negative. In other words, on average, people would not be very likely to switch to a heat pump while they have a functioning boiler, even if offered an additional oil boiler scrappage bonus that means the installation would come at no cost to them. **This finding is especially pertinent given the advanced age profile of boilers in the homes surveyed** – nearly half were older than 10 years, with one in five over 15 years.

- **Additional grant support would boost heat pump uptake but SEAI grant processes are themselves a barrier.** Although respondents had a positive willingness to pay for a heat pump to replace a broken oil boiler, there is still a gap to bridge: the average amount that people are willing to pay for a heat pump is lower than the actual expected cost of installation. The larger an additional grant or oil boiler scrappage bonus, the higher the expected uptake. An additional bonus of €1,500 to €2,500 could result in an extra one in ten homeowners choosing a heat pump over an oil boiler. However, SEAI's grant application process was perceived as a hassle by two in five homeowners who were aware of existing heat pump grants. A number of the small group of homeowners who had already switched to a heat pump chose to do so without using a grant for this reason.

- **There is good awareness of heat pumps among homeowners in target homes, but there remains room for improvement, and many remain unaware of grants.** A little under three quarters of our sample demonstrated a good understanding of what heat pumps are, with higher awareness found among men, older people and those on higher incomes. That said, a third of respondents had never considered installing a heat pump and almost half were not aware the Irish government offers a grant for heat pump installation through SEAI.

- **Some knowledge gaps and misconceptions may be hindering heat pump uptake.** Those who thought heat pumps have a shorter lifespan than oil boilers were less inclined to choose the heat pump in the choice experiment, but only one in five respondents correctly indicated that oil boilers in fact have the shorter lifespan. As well as this, almost half of respondents thought they would need to improve their home's insulation before installing a heat pump, despite having been selected precisely because this should not be the case.

- **Both environmental motivations and financial motivations matter for heat pump adoption among target households.** Most homeowners who had already switched to a heat pump said they had done so for environmental reasons, and respondents who reported high worry about climate change or thought heat pumps are better for the environment were more likely to choose the heat pump in our choice experiment. Financial motivations do still feature, however, and homeowners who thought that a heat pump would have lower heating bills than an oil boiler were also more likely to say they would choose a heat pump.

- **Thinking everyone will switch to a heat pump eventually matters for intentions to switch.** Just under half our sample agreed that most people with oil boilers will eventually switch to a heat pump. This sample were more likely to choose the heat pump in our choice experiment or say they would be very likely to switch in the next 12 months.

Conclusion

This research adds to the existing evidence base regarding heat pump uptake, with particular insights for oil-heated heat pump ready homes. Importantly, the results point to an apparent paradox whereby it is very difficult to get homeowners to consider switching to a heat pump unless their current heating system needs replacing, but barriers to heat pump adoption are particularly heightened when a replacement is urgently needed. Well thought-out policy interventions are urgently needed to address this, given the advanced age profile of boilers in these target homes. A number of recommendations for policy and further work are highlighted in the box below.

Recommendations

- Identify heat pump ready homes that are likely to have older oil boilers that will soon need replacing and target interventions towards these (e.g. awareness campaigns alerting homeowners to the suitability of their home, fast track grant applications, pre-emptively carrying out preparatory work such as replacing radiators).
- Introduce measures to increase the convenience of heat pumps as an option for distress purchases (e.g. offering a temporary boiler or electric heaters as an interim solution, allowing a heat pump to be installed prior to enabling works being completed, installing hybrid heat pump systems).
- Consider increasing grant supports to further bridge the gap between homeowners' willingness to pay for heat pumps and installation cost, particularly for lower income households.
- Simplify SEAI grant processes and revisit requirements that lead to additional costs.
- Run a widespread campaign to raise awareness of heat pumps, highlighting their benefits as a 'clean' heating system with a long lifespan. Consider targeting initiatives towards groups with lower awareness but higher environmental concern such as women.
- Implement measures to ensure the running costs of heat pumps remain competitive compared with fossil fuel alternatives.
- Create stronger signals regarding Ireland's future trajectory towards fossil fuel phaseout and widespread heat pump deployment.

1. Introduction

1.1. Background

A central component of Ireland's Climate Action Plan is the decarbonisation of the residential heating sector through heat pump deployment, with 400,000 heat pumps to be installed in existing dwellings by 2030. SEAI's National Heat Study[1] found that heat pump deployment is critical for rapid decarbonisation of Ireland's heating sector. Policy measures are already in place to encourage heat pump adoption – most notably a grant for heat pump installation that was increased to €6,500 in 2022. However, a lot more progress is needed, and a step change will be required in the annual number of heat pump installations in order to meet Ireland's carbon emissions reduction obligations and technology deployment targets.

In an effort to accelerate decarbonisation through heat pump adoption, SEAI's Behavioural Economics Unit are conducting research to better understand what interventions (including additional grants) might be effective to promote heat pump uptake in oil-heated homes that are considered 'heat pump ready'.[2] We focus on these homes for two main reasons:

- Switching oil-heated homes to heat pumps would be particularly beneficial in terms of emissions savings, given the carbon intensity of oil.
- Heat pump ready homes should require little additional work prior to heat pump installation, meaning costs and hassle should be lower for the homeowner, compared to homes that require improved building fabric before they are considered heat pumps compatible.

1.2. Previous relevant research

A previous literature review identified a number of behavioural barriers and motivators relevant to heat pump adoption more generally, and some potential ways of addressing these.[3] Some of the main barriers to uptake that were identified include low levels of awareness and knowledge about heat pumps, a tendency to replace heating systems with the same technology (particularly for urgent replacements) as well as the complexity of installation and lack of finance.

In an Irish context, a 2018 study involving a choice experiment found that upfront cost and bill savings were the most important determinants in people's choice of heating system, with installation hassle, environmental sustainability and comfort also playing a part.[4] The study also estimated that people would be willing to pay an average of about €27,755 for a hypothetical home heating system with 50% bill savings, high environmental sustainability, moderate installation hassle, and low increase in comfort, corresponding roughly to characteristics expected from a heat pump at the time. However, the study was limited by the fact that the type of heating system in question was not explicitly named. A 2013 study conducted in the UK found that the actual type of heating system was by far the most important factor in decisions, much more so than financial factors.[5]

A more recent study also conducted in the UK estimated willingness to pay for a heat pump at about £1,500, or £500 less than the gas boiler alternative presented in their choice experiment.[6] Installation and running costs were cited as important factors stopping people from considering a heat pump, while a desire to future-proof their home was a common motivator for adoption.

---

[1] https://www.seai.ie/data-and-insights/national-heat-study/
[2] Homes that meet the minimum heat loss indicator (HLI) criterion for SEAI's heat pump grant eligibility and therefore do not require further insulation or airtightness works. Roughly 1 in 15 homes in SEAI'S National Building Energy Rating (BER) register fall into this category.
[3] SEAI (2020), Encouraging heat pump installations in Ireland: Strategies to maximise heat pump installation and the savings produced. https://www.seai.ie/publications/Heat-Pump-Adoption.-Maximising-Savings..pdf
[4] Meles, TH, Ryan L & Mukherjee SC (2022). Heterogeneity in preferences for renewable home heating systems among Irish households. *Applied Energy,* 307, 118219. https://doi.org/10.1016/j.apenergy.2021.118219
[5] Ipsos MORI & the Energy Saving Trust (2013). Homeowners' willingness to take up more efficient heating systems. https://assets.publishing.service.gov.uk/media/5a7b639ce5274a34770eb5d3/More_efficient_heating_report_2204.pdf
[6] Nesta & The Behavioural Insights Team (2022). Estimating the willingness to pay for a heat pump. https://media.nesta.org.uk/documents/Estimating_the_willingness_to_pay_for_a_heat_pump_v1.pdf

1.3. Aims of this research

It is likely that the barriers and motivators to heat pump adoption identified by previous research are also relevant to our target subset of homeowners. However, given that some barriers (e.g. need for additional insulation) should be less for these homes, it is less clear which remaining barriers are the most important to address and whether there are any other additional factors to consider.

For this reason, we conducted two pieces of research in 2022:

1. Structured interviews with SEAI-registered heat pump installers in spring 2022, the findings of which are the subject of a separate report,[7] and
2. A survey of a sample of target homeowners in autumn 2022, including a choice experiment to estimate willingness to pay for heat pumps, the results of which are summarised in this report.

[7] SEAI (2023), Encouraging heat pump adoption in heat pump ready oil-heated homes: Insights from interviews with heat pump installers.

2. Methodology

Target homeowners were invited to take part in this research via a letter, which directed them to an online survey. This section details how the target sample was selected as well as the structure of the survey and willingness to pay experiment, and the analysis approach.

2.1 Sample selection

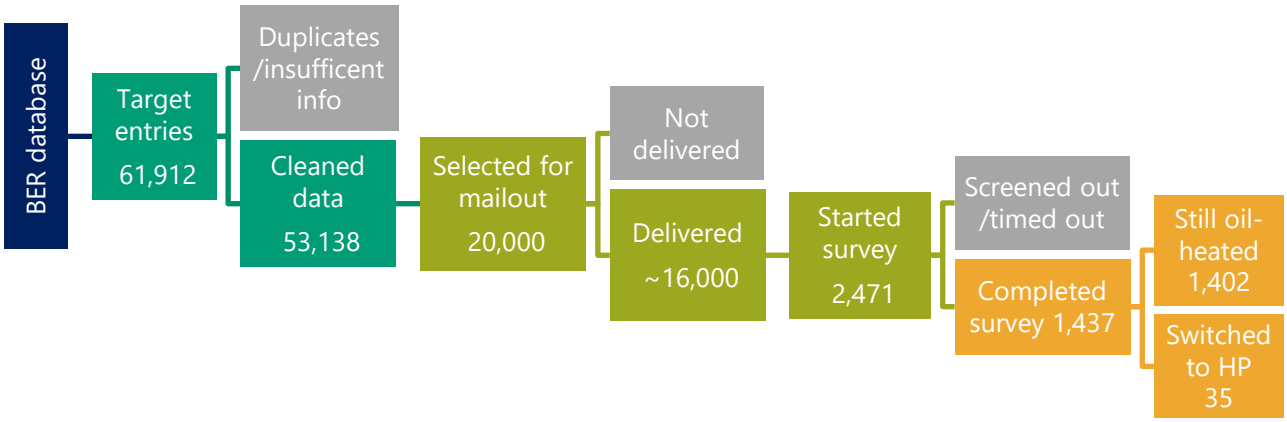
SEAI'S National Building Energy Rating (BER) register was used to identify homes that satisfy the following criteria:

- Non-apartment dwelling type[8], i.e. detached, semi-detached or terrace houses
- Oil used as main space heating fuel
- Heat Loss Indicator (HLI)[9] of less than 2 W/m²/K (i.e. considered 'heat pump ready')

This initial selection resulted in a sample of 61,912 target entries. Duplicate entries and entries for which there was insufficient address information were removed, resulting in 53,138 usable entries.

We used a stratified sampling approach to select a sample of 20,000 homes[10] that matched the larger sample in terms of proportions of (a) different dwelling types and (b) county.

Figure 1: Outline of process followed to obtain final participant sample for the survey.



2.2. Data collection

Letter invitations to participate in the survey were sent to the 20,000 selected homes in September 2022. Of these, approximately 4,000 were not delivered and returned to sender.[11]

The survey was programmed and hosted in Gorilla Experiment Builder – an online research tool specifically designed for running behavioural studies.[12] The letter invitations contained a link to a purpose-built SEAI webpage which redirected respondents to the survey. A sample letter is available in Appendix A. There was no mention made of heat pumps in the letter or survey link to minimise the chance of selection bias. To encourage participation, all respondents were entered into a draw for one of four €100 One4All vouchers. The survey was kept open for approximately 3 weeks.

[8] Apartments were excluded from this study as these dwellings face their own unique set of challenges in installing heat pumps.
[9] The Heat Loss Indicator (HLI) is a summary of the overall performance of the home with regard to fabric and ventilation.
[10] A previous SEAI survey issued using postal invitations had a response rate of approximately 8%, so we reasoned this sample size would be sufficient to receive over 1,500 survey responses.
[11] Reasons for failed delivery included insufficient address information and a requirement in some areas to include the homeowner's name in the address.
[12] Anwyl-Irvine, A. L., Massonnié, J., Flitton, A., Kirkham, N., & Evershed, J. K. (2020). Gorilla in our midst: An online behavioral experiment builder. *Behavior research methods*, 52(1), 388-407.

Of the estimated 16,000 households that received the letter invitation, 2,471 (about one in six) clicked on the link to commence the survey. Of these, 598 respondents were screened out due to not owning or living in the property, not being responsible for household decisions around bills and energy or indicating that the home was heated using a fuel other than oil or a heat pump. A further 439 did not complete the full survey.

The final sample consisted of 1,437 respondents. The majority of these (1,402) confirmed that their home still used oil as its main heating fuel and completed the full survey. A small number (35) indicated that their home already used a heat pump for space heating, and were directed to a shorter, alternative survey designed to capture their experience of switching heating system.

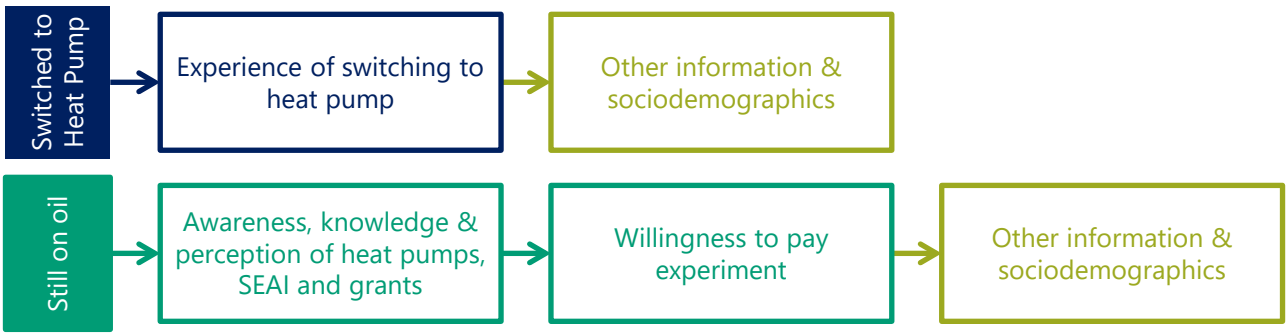
2.3. Survey structure

This section briefly outlines the structure of the online survey and the types of questions asked. Further detail on question wording is contained within the results section and the full questionnaire is available on request.

2.3.1. Screening

As mentioned above, participants were first screened to ensure they owned and lived in the home, were responsible for household decisions around heating and energy bills and that they used an oil boiler or heat pump as their main heating system. A schematic outlining the rest of the survey is shown in Figure 2.

Figure 2: Outline of survey structure



2.3.2. Experience of switching to a heat pump (heat pump homes only)

Participants were first asked when they installed their heat pump. If they said it was already installed in the home when they moved in, they were not asked any further questions. For the rest, they were asked open-ended questions about what made them decide to switch to a heat pump, their experience of the process, how much it cost and whether they availed of a grant from SEAI.

2.3.3. Awareness, knowledge and perception of heat pumps, SEAI and grants (oil homes only)

Participants were first asked whether they had heard of a heat pump or thought about installing one. Participants who had not heard of a heat pump did not answer further questions in this section and proceeded straight to the willingness to pay experiment.

Next, participants were asked to identify the definition of a heat pump from multiple options. This was followed by questions designed to probe their knowledge and perception of heat pumps (a) by directly comparing them to an oil boiler on a range of attributes and (b) by indicating their level of agreement with a number of statements about heat pumps. An attention check question was included amongst these.

Participants were then asked about their awareness of SEAI and their level of trust in SEAI advice about home energy decisions. Finally, they were asked if they were aware of a grant for heat pump installation and, if they had, how much hassle they thought it would be to apply for this grant.

2.3.4. Willingness to pay experiment (oil homes only)

The next section of the study involved an experiment to elicit participants' willingness to pay for a heat pump under different conditions. Before this however, participants were shown a short information sheet about heat pumps, which included basic information about installation, costs, grants, benefits and drawbacks, of the kind that would be easily available to someone if they decided to research the technology. The information sheet can be seen in Appendix B.

Participants were then asked to respond to two scenarios:

- **Scenario 1:** Participants were asked to indicate whether they would choose a new oil boiler or a heat pump if their current boiler was at the end of its life.
- **Scenario 2:** Participants were asked to indicate their likelihood to switch to a heat pump in the next 12 months, given their current boiler's status (Not at all likely/Unlikely/Likely/Very likely).

Table 1: Summary information about heating systems shown to participants as part of the willingness to pay experiment. Information that varied between participants and scenarios is shown in orange.

Factors	Heat pump	Oil boiler
Installation cost	€13,000	€3,000
SEAI grant	SEAI heat pump grant: €6,500 Bonus for scrapping oil boiler: [X- drawn randomly from a uniform distribution from €0 - €6,500, rounded to the nearest €100. If the additional grant is €0, don't show any info at all.] **TOTAL: € [6,500 + X]**	N/A
Technical assessment	Required – approx. €650 (€200 rebate after installation)	Not required
Installation	Approx 4 days Moderate to high disruption	Less than a day. Little disruption.
Environmental impact	Low (uses renewable energy)	High (uses fossil fuels)
Running costs	A little lower than current costs	Same as current costs (but will rise with price of oil)
Lifespan	20 years	15 years

In each case, participants were shown summary information about the relevant heating system options as outlined in Table 1. For the second scenario participants were only shown information about the heat pump.

Information and costs were based on best available information at the time of design. All attributes were kept constant, except for the oil-boiler scrappage bonus, which varied randomly for different participants and scenarios between €0 (corresponding to the current status quo) and €6,500 (corresponding essentially to free installation of a heat pump). Varying this amount allows us to calculate the minimum additional grant amount that would be required to encourage more of these homeowners to switch to a heat pump and, consequently, the maximum price they would be willing to pay for a heat pump. Willingness to pay is calculated using a conditional logit model, an approach also taken by a previous study about heat pump uptake in the UK.[13] We provide further details of the methodology in Appendix E.1.

[13] Nesta & The Behavioural Insights Team (2022). Estimating the willingness to pay for a heat pump. https://media.nesta.org.uk/documents/Estimating_the_willingness_to_pay_for_a_heat_pump_v1.pdf

To minimise any price anchoring effects[14], participants were randomised to see Scenario 1 or Scenario 2 first. For Scenario 1, the order of the information about heat pumps vs. oil boilers was also randomised. To check participants were reading the information carefully, they were asked to identify the installation cost of the heat pump they were shown from multiple options after responding to the first scenario.

2.3.4. Other information and sociodemographic characteristics

Before finishing the survey, all participants were asked additional questions about themselves and their homes to add further nuance to the findings.

[14] Anchoring is a bias whereby people rely heavily on the first piece of information they are given, which then acts as a reference point or 'anchor' against which new information is evaluated. In this context, someone who first sees a scenario where the net installation cost of a heat pump is €11,000 euro might react more favourably to a second scenario where the net cost is €10,000, compared with someone who had first seen a scenario where the net cost was €9,000.

3. Results from homeowners in oil-heated homes

This section contains a summary of results relating to the 1,402 respondents who use oil to heat their homes, at whom the survey was primarily targeted.

3.1. Sample characteristics

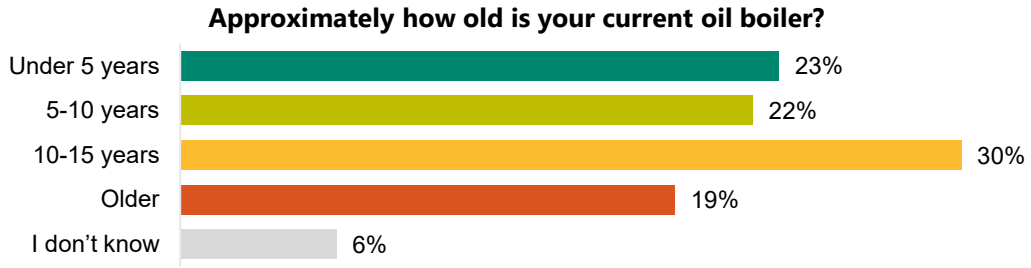
3.1.1. Individual characteristics

Sociodemographic characteristics of the sample can be found in Appendix C.1. A quarter of respondents reported experiencing some level of energy deprivation – as measured by having had to cut back on heating (for cost reasons) or having had difficulty paying heating bills over the previous 12 months.[15] Levels of worry about cost of living were high, with 80% of the sample responding above the midpoint of a 7-point scale (see Appendix C.2.). Worry about climate change and energy supply were slightly less pronounced but still high, with 72% and 74% responding above the midpoint, respectively.

3.1.2. Dwelling characteristics

Approximately half (49%) of the sample consisted of homeowners in detached homes, with a further 40% living in semi-detached or end-of-terrace homes. Over half (56%) lived in homes built between 2001 and 2010, with 28% living in older and 15% in newer homes. Two thirds of respondents said they planned to remain living in their home for longer than 15 years, with just 8% planning on staying less than 5 years. Over half (56%) of respondents reported having previously carried out a home energy upgrade, 79% of which had installed attic or wall insulation.

Figure 3: Age of oil boiler



Around half (49%) of respondents said their oil boiler was more than 10 years old, and a further 6% did not know how old their boiler was (Figure 3). Of these homes with older boilers, 69% were built between 2001 and 2010. Sociodemographic characteristics of the occupants of these homes with older boilers were broadly similar to those of the wider survey sample.

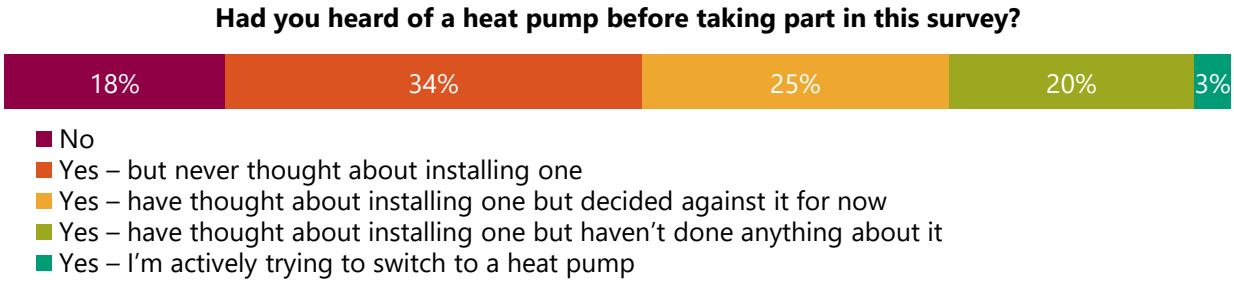
3.2. Awareness, knowledge and perception of heat pumps and SEAI

3.2.1. Heat pump awareness

Figure 4 shows respondents' stated awareness of heat pumps and whether they have thought about installing one. The majority (82%) of homeowners surveyed said they had heard of a heat pump, but over half either had not heard of a heat pump or never considered installing one.

[15] Note that this survey was conducted prior to large price increases experienced over the 2022/2023 winter period.

Figure 4: Stated awareness of heat pumps (n=1,402)

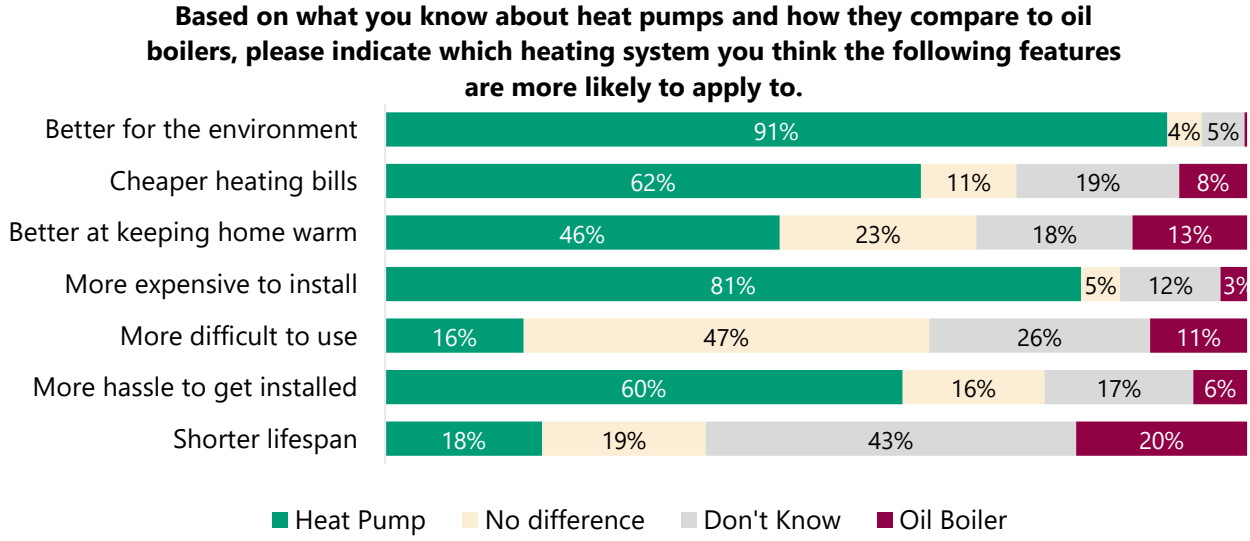


Of those who had heard of a heat pump, 87% were able to correctly identify its definition from four potential descriptions. We can therefore deduce that just under three quarters of homeowners in oil-heated heat pump ready homes have a reasonable awareness of what heat pumps are. Women had poorer awareness than men (60% vs. 82%), as did younger people (57% of under 35s vs. 73% of those aged 35 and older), those on lower incomes (61% of those with incomes under €40,000 vs. 82% of those with incomes over €80,000) or from lower social grades (64% of C2DEFs vs. 75% of ABC1s), but there were no geographic differences seen (see Appendix D).

3.2.2. Heat pump knowledge and perceptions

Respondents' knowledge and perceptions of heat pumps were measured (a) by asking them to compare heat pumps to oil boilers on several key features (Figure 5) and (b) by asking them to respond to a series of statements about heat pumps (Figure 6).[16]

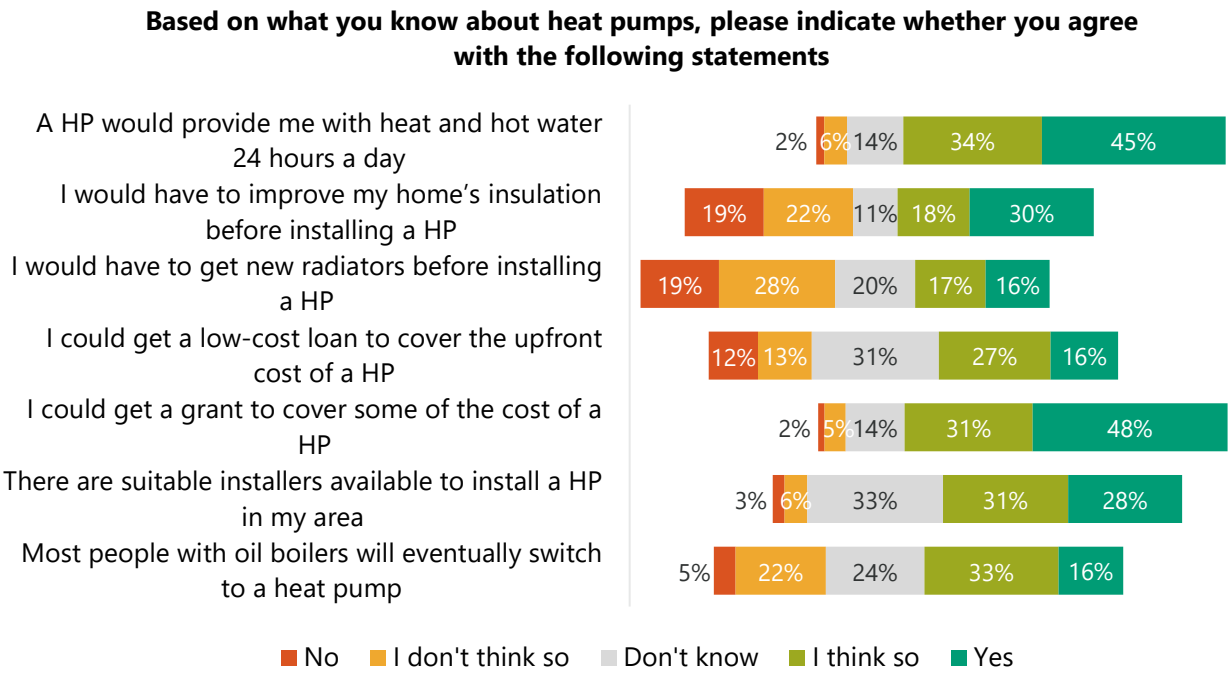
Figure 5: Knowledge and perceptions of heating systems (n=1,038)



Respondents were well aware that heat pumps are better for the environment but more expensive to install than oil boilers (Figure 5). A majority also thought that heat pumps would have cheaper bills and be more hassle to install, although there was a higher level of uncertainty here, with approximately one third responding that there was no difference or that they didn't know. The biggest knowledge gap concerned the comparative lifespan of the two heating systems – only 20% of participants identified oil boilers as having a shorter lifespan, and 43% did not know.

[16] Note that these questions were not asked of participants who stated they had not heard of a heat pump. Responses from participants who failed an attention check were also excluded.

Figure 6: Knowledge and perceptions of heat pumps (n=1,038)

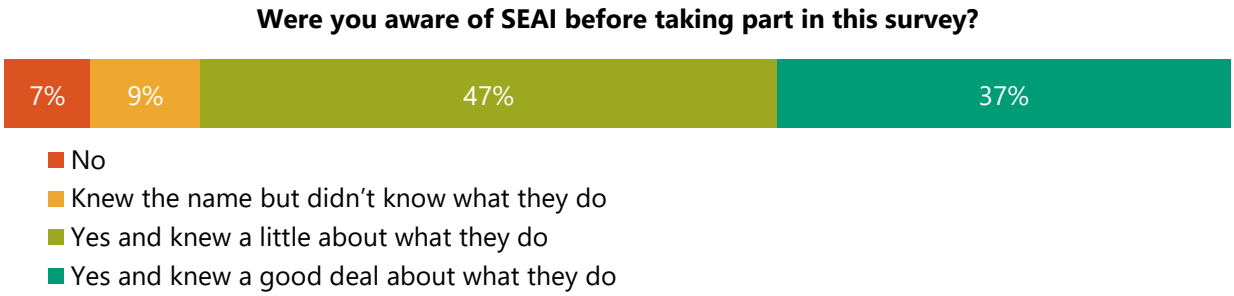


Responses to statements about heat pumps were mixed and highlight some potential knowledge gaps (Figure 6). The majority of respondents were aware they could get a grant to cover some of the cost of a heat pump, but 21% did not think they could or didn't know. Almost half thought they would have to improve their home's insulation before installing a heat pump, which is unlikely to be the case in homes with a low heat loss indicator, as per those surveyed. On the other hand, only a third thought they would have to get new radiators, which could be an underestimate.

3.2.3. Awareness, trust and perception of SEAI and heat pump grants

This section summarises responses to questions about SEAI and its activities.[17]

Figure 7: Awareness of SEAI (n=1,038)

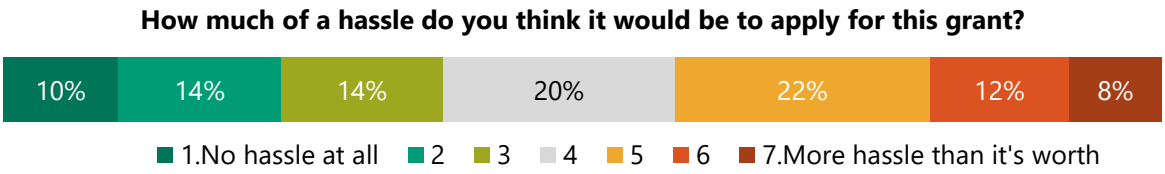


The vast majority (84%) of surveyed homeowners' who had heard of a heat pump had also heard of SEAI and knew at least a little about the function of the Agency (Figure 7). Of these, 84% stated that they trusted SEAI to provide sound, impartial advice on home energy decisions (responding above the midpoint of a 7-point scale).

[17] Note that these questions were not asked of participants who stated they had not heard of a heat pump and responses from participants who failed an attention check are also excluded.

Just under two thirds of homeowners surveyed stated they were aware that the Irish government offers a grant for heat pump installation through SEAI, with 23% responding that they weren't aware and 12% saying they weren't sure. Of those that were aware of the grants, a significant number thought that applying for the grant would be a hassle, with 42% responding above the midpoint of a 7-point scale (Figure 8).

Figure 8: Perceived hassle of applying for a heat pump grant from SEAI (n=678)



Of those participants who had heard of heat pumps in the first place, men were more likely to be aware of the grant, as were people in the 50 – 64 age group and people living in urban areas (see Appendix D).

3.3. Willingness to pay for a heat pump

This section outlines the main results of the willingness to pay experiment and factors related to heat pump choice across both scenarios. Data from participants who failed the attention check question between the two scenarios were excluded from analysis, resulting in a final sample of 983 participants.

3.3.1. Scenario 1 – Boiler end-of-life choice

Regression results for Scenario 1, for which respondents were asked to indicate whether they would replace their boiler with an oil boiler or heat pump when it reaches the end of its life, are presented in Appendix E.2.

The estimated average willingness to pay for a heat pump was €5,000 (rounded to nearest €100), or €2,000 more than an oil boiler in the scenario shown. This is the average amount: some people are willing to pay more, while others are willing to pay less. The standard error of this estimate is €1,000, with a 95% confidence interval of €3,000 to €6,900, indicating a large amount of variability in the estimate. Participants who saw this scenario first were more likely to pick the heat pump compared with those who saw this scenario second, demonstrating that factors extraneous to the decision itself can influence it.

Respondents on the highest incomes were more likely to choose the heat pump than those on the lowest incomes, as were those who said their existing boiler was 5 – 10 years old (compared to those with a newer boiler). There was no effect of any other sociodemographic factors measured. Respondents who said they were highly worried about climate change were considerably more likely to choose a heat pump, while those who were highly worried about cost of living were less likely to, even when controlling for income.

Table 2: Predicted choice of a heat pump over a replacement oil boiler with increasing oil boiler scrappage bonus (assuming heat pump installation cost of €13,000 and boiler installation cost of €3,000) at end of boiler life.

Bonus amount	Proportion choosing HP
€0 - €500	55%
€500- €1,500	59%
€1,500 - €2,500	64%
€2,500 - €3,500	68%
€3,500 - €4,500	72%
€4,500 - €5,500	76%
€5,500 - €6,500	79%

To examine how additional grant support might impact uptake, we calculated participants' predicted probability of choosing a heat pump vs an oil boiler to assess how this likelihood relates to the level of the hypothetical oil boiler scrappage bonus offered, as summarised in Table 2. Encouragingly, even for a small bonus of €0 - €500 we already see over half the sample stating they would choose a heat pump over an oil boiler. As the bonus increases, this proportion also increases, reaching almost four in five for a scrappage bonus of €5,500 - €6,500, which would amount to covering close to the full installation cost.

3.3.2. Scenario 2 – Likelihood to switch in next 12 months

Regression results for Scenario 2, in which respondents were asked how likely they would be to switch to a heat pump in the next 12 months given their current boiler's status, are presented in Appendix E.3. In this case, models were run on whether a respondent said they would be 'very likely' to switch or not.

The average willingness to pay (to be very likely to switch) in this scenario was -€1,700 (rounded to nearest €100). Note that this figure is negative, indicating that on average people would not switch to a heat pump even if it were free, and would have to in fact be paid an average of €1,700 in order to be very likely to install one. The standard error of this estimate is €700, with a 95% confidence interval of -€3,000 to -€400.

As with Scenario 1, respondents in the highest income bracket were more likely to say they were 'very likely' to switch than those in the lowest income bracket, as were those with older boilers (over 5 years old) compared with those with new boilers. In this scenario, participants who were previously aware of heat pumps were more likely to say they would switch to a heat pump, as were those who said they were highly worried about energy security.

Table 3: Predicted proportions very likely to switch to a heat pump in next 12 months with increasing oil boiler scrappage bonus (assuming heat pump installation cost of €13,000).

Bonus amount	Very Likely to switch
€0 - €500	3%
€500- €1,500	4%
€1,500 - €2,500	6%
€2,500 - €3,500	9%
€3,500 - €4,500	13%
€4,500 - €5,500	20%
€5,500 - €6,500	27%

Unlike the boiler end of life scenario, in this case only 3% of respondents are predicted to be 'very likely' to switch to a heat pump given a bonus grant amount of €0 - €500, increasing to 27% for a scrappage bonus of €5,500 - €6,500, approaching free installation (Table 3).

3.3.3. Effects of heat pump knowledge and perceptions

Regression results examining the effect of knowledge and perceptions about heat pumps (i.e. responses to questions outlined in Section 3.3.2) on likelihood to choose or switch to a heat pump can be found in Appendix E.3. A summary of all the main factors that were found to have a significant relationship with heat pump uptake is shown in Table 4.

Across both choice scenarios, the perceptions regarding heat pumps most associated with uptake were thinking a heat pump is better for the environment than an oil boiler and thinking most people with oil boilers will switch to a heat pump eventually.

Table 4: Summary of factors found to be related to heat pump uptake in regression analyses.

	Choose HP (Scenario 1)	V Likely to switch (Scenario 2)
Individual characteristics		
Income of €80,000+	+	+
Prior heat pump awareness		+
High worry about cost of living	-	
High worry about climate change	+	
High worry about energy security		+
Heat pump knowledge & perceptions		
Heat pump better for environment	+	+
Heat pump cheaper bills	+	
Heat pump more expensive to install	-	
Heat pump shorter lifespan	-	
Suitable installers available		+
Everyone will switch eventually	+	+

+: Positive relationship; - : Negative relationship

For Scenario 1 only, thinking a heat pump would bring cheaper heating bills than an oil boiler was associated with choosing the heat pump, while those who thought a heat pump would be more expensive to install or would have a shorter lifespan were more likely to choose the oil boiler. Respondents who thought they could get a low-cost loan were also slightly more likely to choose the heat pump, although this was only statistically significant at the 10% level.

For Scenario 2 only, respondents who thought there were suitable installers available in their area were more inclined to say they would be very likely to switch to a heat pump.

Note that for both scenarios, thinking a heat pump was better at keeping the home warm than an oil boiler and would provide heat 24 hours a day was not associated with a higher propensity to choose or switch to a heat pump, when also accounting for the other factors mentioned above. Additionally, thinking a heat pump was more difficult to use, more hassle to install, or would require additional insulation or new radiators was not associated with a lower propensity to choose or switch to a heat pump.

4. Results from homeowners in heat pump homes

This section contains a summary of results relating to the 35 respondents who said they already use a heat pump as their primary heating system. Note that given the small number of respondents that fall into this group, results may not generalise to the same extent as those regarding oil-heated homes, and any findings should be verified with further research.

4.1. Sample characteristics

Sociodemographic characteristics of the sample are captured in Appendix C.1. Compared with homes who had not yet switched from oil, those living in homes with a heat pump were more likely to be living in Munster (less likely in Connacht/Ulster), living in rural areas, and on higher incomes. A lower proportion (11%) were at risk of energy poverty. Whereas homeowners in the broader sample were more worried about cost of living than climate change, the pattern was reversed here – 80% responded above the midpoint of a 7-point scale for climate change, compared with 74% for energy supply issues and cost of living (see Appendix C.2).

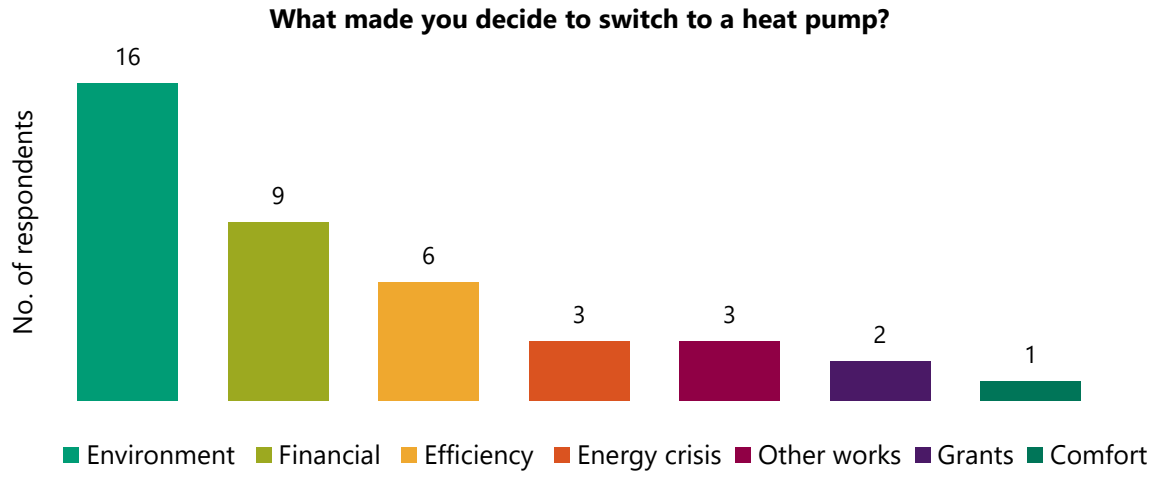
Of the 35 respondents in this group, 27 (77%) lived in detached homes. They tended to be bigger than those in the oil-heated sample – 60% reported their home having 8 or more rooms compared with 40%. The age profile of homes was broadly similar, other than a slightly higher proportion of new homes (29% said their home was built in 2011 or later).

A little under half (16) of the respondents with a heat pump said they had installed it that year. A further 11 had installed it between 2018 and 2021, with 5 saying they installed it earlier than that and 3 saying it was already in their home when they moved in. A further eight subsequently indicated their home was a new build. Further results outlined in this section pertain only to the remaining 24 respondents who had actually gone through the process of switching an oil boiler for a heat pump.

4.2. Stated motivations for switching

Homeowners were asked an open-ended question about their reasons for switching to a heat pump, the responses to which were coded independently by two researchers and are summarised in Figure 9.

Figure 9: Homeowners' stated motivations for switching to a heat pump.



The most commonly-mentioned motivations were environment-related – these were mentioned by two thirds of the sample, with multiple homeowners referring specifically to a desire for a 'cleaner' heating system. This was followed by financial motivations (including rising oil prices) and general mentions of 'efficiency'. Other less-commonly mentioned motivations included the energy crisis, doing other renovation works on the home, grants and comfort.

4.3. Switching experience

Respondents were then asked about their experience of switching to a heat pump, including whether they had to get any additional work done to the house.

On the whole homeowners were positive about their experience and found it straightforward – only 3 out of the 24 were explicitly negative in their response, citing expensive enabling works, complexity of the design process and the stress of getting used to a new type of heating system. A substantial portion of the sample (10 respondents) mentioned needing to undertake additional work as part of the installation process. This included changing radiators, improving insulation, upgrading windows and doors and replacing the hot water tank.

The amount respondents reported paying for installation ranged from €3,000 to €22,000, with a mean cost of €12,900. This further validates the choice of €13,000 for the heat pump installation cost in our willingness to pay experiment.

4.3.1. Use of SEAI grant

Of the 24 respondents who switched to a heat pump, 15 used an SEAI grant while 9 did not. Three of these cited the costs associated with additional works required by SEAI as the reason why they didn't use a grant, with two mentioning the expense of replacing radiators in particular. One homeowner mentioned that complying with grant conditions would have required them to install a larger heat pump than necessary. Another said that the installation company offered them a discount instead. One homeowner said they didn't apply as the process was 'complex, difficult and bureaucratic', another mentioned a timing issue and one respondent said their plumber was not registered with SEAI. Given the small sample size it is not possible to determine the prevalence of these individual issues, but the findings indicate there may be a substantial number of homeowners installing heat pumps outside of SEAI grant systems.

5. Discussion

In this section we briefly discuss some of the main themes emerging from this research and use the findings to provide policy recommendations for encouraging heat pump adoption in oil-heated heat pump ready homes in Ireland. Reference is also made throughout to findings from interviews with heat pump installers, the results of which are detailed in a separate report.

5.1. Target homeowners willing to pay for a heat pump only when heating system needs replacing

In our choice experiment, the average willingness to pay for a heat pump was approximately €5,000 (€2,000 more than an oil boiler in the scenario shown), when respondents were asked which heating system they would choose if their oil boiler broke down and needed replacing.

Given the estimated range of responses was relatively wide, this figure should be considered with a degree of caution – some people may be willing to pay significantly less while others may be willing to pay substantially more. Moreover, seemingly irrelevant contextual factors such as the ordering of scenarios had an effect on choices. The result nonetheless clearly points towards a positive willingness to pay. For comparison, a similar study run with a representative sample of UK homeowners in December 2021 found an average willingness to pay of just £1,500 (or £500 less than an oil boiler in their set up).

However, when participants were instead asked to consider their current boiler's status and indicate their likelihood to switch to a heat pump in the next 12 months, the average willingness to pay was negative (-€1,700). This means that most homeowners in our target sample would not be very likely to switch to a heat pump while they still have a functioning oil boiler, even if installation came at no cost to them. This is despite framing a hypothetical additional grant amount as an 'oil boiler scrappage bonus', although a different result may have been found if this bonus were time-limited in some way.

This finding is consistent with other recent research that showed homeowners delay energy efficiency investments until they need to replace broken building components.[18,19] **Efforts to boost heat pump uptake in oil-heated homes should be targeted towards homeowners who need to replace their heating system or are likely to need to soon**. Nearly half our survey respondents had boilers older than 10 years, with one in five over 15 years. A further 6% said they did not know how old their boiler is. Given that the lifespan of an oil boiler is about 15 years, a large number of oil-heated heat pump ready homes will likely need to replace their boiler in the next few years. **It is crucial that these homes are targeted before they get 'locked in' to fossil fuel use for another number of years.** Interventions could include targeted educational campaigns to alert homeowners to the suitability of their home for a heat pump, fast track grant applications or pre-emptively carrying out preparatory work such as replacing radiators.

5.2. Additional grants may boost uptake but processes can be a barrier

Although respondents had a positive willingness to pay for a heat pump if their heating system were to need replacing, there is still a shortfall of approximately €1,500 between this number and the actual expected cost of installation net of grants. Our results clearly indicate that **an additional grant or oil boiler scrappage bonus would boost uptake amongst homeowners replacing their heating system**, with an extra one in ten homeowners choosing the heat pump with a bonus of €1,500- €2,500 (compared to a small bonus of €0-€500). Where the bonus covers close to the entire installation cost, uptake is boosted to 4 in every 5 homeowners.

Despite uptake being much lower in the second scenario (as measured by the proportion saying they would be 'very likely' to switch), the bonus still proved beneficial, although **a larger bonus is required to achieve the same uplift where the heating system does not need replacement**. This time, a bonus of €3,500 to €4,500 is required to see an extra one in ten homeowners saying they would be very likely to switch, corresponding to covering over three quarters of the installation cost.

---

[18] Wekhof, T & Houde, S (2023). Using narratives to infer preferences in understanding the energy efficiency gap. *Nature Energy*, 8, 965 – 977. https://doi.org/10.1038/s41560-023-01303-x

[19] Ipsos MORI & the Energy Saving Trust (2013). Homeowners' willingness to take up more efficient heating systems. https://assets.publishing.service.gov.uk/media/5a7b639ce5274a34770eb5d3/More_efficient_heating_report_2204.pdf

These results pointing to the beneficial effect of grants echo the views of heat pump installers interviewed in a separate study. However, the installers also cautioned that complex SEAI grant processes can themselves pose a barrier to adoption. Indeed, 9 of the 24 survey respondents who had already switched to a heat pump had not availed of SEAI grants, with several citing the cost of additional enabling works required by SEAI as the reason. Among the main survey cohort who still used oil, more thought it would be a hassle to apply for a heat pump grant through SEAI than not. It is likely much of the perceived hassle stems from grant eligibility criteria that sometimes require additional works to prepare the home for heat pump installation. However, evidence from behavioural science also shows that people regularly face seemingly minor details of tasks or processes (e.g. form-filling) that have a disproportionate influence on whether they follow through with these (referred to as 'frictions', 'administrative burdens' or 'sludge').[20,21]

Further, some installers had pointed out that barriers associated with grant applications were particularly heightened for 'distress purchases' where a homeowner's boiler has broken down. Although heat pump ready homes do not typically require the same level of preparatory work for heat pump installation, they do often need some work such as replacing radiators. Given the difficulty getting people to switch to a heat pump *unless* they need to replace their heating system, **there is a pressing need to simplify grant processes and requirements, especially in situations where a heating system urgently needs to be replaced.**[22] A 'sludge audit' approach may provide further insights as to specific steps in the process that are disproportionately off-putting to homeowners and installers that should be prioritised for simplification.[23] There is also a **need to provide convenient and attractive alternatives to purchasing a new oil boiler in the case of distress purchases,** for instance offering a temporary boiler or electric heaters free of charge while awaiting heat pump installation, allowing a heat pump to be installed prior to all enabling retrofitting works being completed or installing hybrid heat pump systems.

5.3. Good awareness of heat pumps among target homeowners but room for improvement

Previous Irish research has reported low awareness of heat pumps among the general population compared with other renewable technologies.[24] Given this, awareness of heat pumps was relatively high in our sample – 71% of respondents had some awareness and were able to correctly identify the definition of a heat pump. This proportion is likely to be somewhat larger than the general population as over half of respondents had previously undertaken home energy upgrades of some sort and may therefore be more familiar with energy topics. Despite good awareness however, a third of respondents had never considered installing a heat pump. Awareness was also lower among certain groups such as women, younger people and those on lower incomes.

Considering the importance of finance to overcome the upfront cost of heat pump installation, awareness of grants was low. Of the 82% that said they had some awareness of heat pumps, one in five didn't know they could get a grant to cover some of the cost of a heat pump and a third weren't aware the Irish government offers a grant through SEAI – corresponding to almost half the overall sample. Again, awareness was poorer among women and younger people, as well as those living in rural areas.

There is still room for significant improvement in awareness about heat pumps and finance options for adoption. Prior awareness of heat pumps was associated with a higher stated likelihood to switch to a heat pump in the next 12 months in our study. **Awareness campaigns should arguably seek to target groups with lower awareness such as women,** especially considering women tend to have a higher level of concern about the environment and climate change than men.

---

[20] Martin, L, Delaney, L & Doyle, O (2023). Everyday Administrative Burdens and Inequality. *Public Administration Review*, 1–14. https://doi.org/10.1111/puar.13709

[21] Sunstein, CR (2021). *Sludge: What Stops us from Getting Things Done and What to Do about it*. Cambridge, MA: MIT Press.

[22] Note that SEAI research is ongoing to review air-tightness requirements for grant eligibility.

[23] Sunstein, CR (2020). Sludge Audits. *Behavioural Public Policy*, 6, 1–20. https://doi.org/10.1017/bpp.2019.32

[24] Mukherjee, S, Meles, T & Ryan, L (2020). Renewable Energy Technology Uptake: Public Preferences and Policy Design in Early Adoption. https://www.econstor.eu/bitstream/10419/228184/1/1689799129.pdf

5.5. Some knowledge gaps and misconceptions about heat pumps may be hindering uptake

Survey respondents displayed reasonable knowledge about some of the benefits and drawbacks of heat pumps, but some knowledge gaps were identified. Most notably, only one in five participants correctly indicated that an oil boiler has a shorter lifespan than a heat pump, with 43% responding that they didn't know. Given that we also found thinking a heat pump had a shorter lifespan was associated with a lower likelihood of choosing the heat pump in the choice experiment, **highlighting the longer lifespan of heat pumps may be beneficial in driving uptake**, provided this is indeed the case.[25]

In our separate qualitative study, heat pump installers mentioned that misconceptions among homeowners about the suitability of their home for a heat pump may prevent some from looking into the technology in the first place and cause others to abandon the process when they face unanticipated additional costs. Our survey results support this possibility. Almost half of respondents thought they would need to improve their home's insulation before installing a heat pump, despite having been selected precisely because their home's BER record suggests this would not be required. **Targeting homeowners based on their eligibility may help overcome the barrier posed by this knowledge gap.**[26] On the other hand, only a third thought they would need to get new radiators before installing a heat pump. We do not know what proportion of homeowners this would be true of, but it is possible that some homeowners are not aware that this step would be needed and will not have factored it into their decision making.

It is worth noting that perception of hassle was not associated with a lower propensity to choose or switch to a heat pump in our choice experiment when accounting for other perceptions of heat pumps that we recorded. A majority of participants recognised that a heat pump would be more hassle to install than an oil boiler and hassle is often cited as a prominent barrier to adoption,[27] but our results suggest that it is not a significant factor in forming intentions around installation in a hypothetical scenario.

5.6. Both environmental and financial motivations matter for heat pump adoption

In our previous study with installers, heating costs and rising oil prices were the most cited motivation for homeowners to install a heat pump. In this study, however, most homeowners who had already switched to a heat pump said they had done so for environmental reasons (almost double the number that cited financial motivations), with respondents citing, in particular, a desire to switch to a 'clean' heating source.

It may be that the homeowners who have already switched represent an atypical 'early adopter' group, but the importance of environmental motivations is further supported by the fact that respondents who reported high worry about climate change were more likely to choose a heat pump over an oil boiler in Scenario 1 of our choice experiment compared to those who reported low levels of worry. Further, those who thought heat pumps are better for the environment were more likely to choose or switch to a heat pump in both scenarios than those who did not think they were better for the environment. Financial motivations do still feature, however, and homeowners who thought that a heat pump would have lower heating bills than an oil boiler were more likely to choose a heat pump in the boiler end-of-life scenario than those who did not think they would have lower bills (although not in the second scenario).

Given the above findings, **both the environmental benefits of heat pumps as a clean heating source and potential financial savings on energy bills should be emphasised to homeowners in oil-heated homes**. **Policy structures should also be put in place to ensure running costs of heat pumps remain competitive compared with fossil fuel alternatives.**

---

[25] Online sources at the time of survey design suggested heat pumps have a lifespan of approximately 20 years vs. 15 years for an oil boiler but lifespan is likely to vary widely depending on a number of factors.

[26] Note that this was the approach taken in a previous SEAI field trial that tested the effect of different behaviourally-informed letters informing homeowners in heat pump ready homes of their eligibility on subsequent uptake of grants. Although some letters led to an increase in enquiries regarding heat pump grants there was no effect on actual uptake, highlighting the need for interventions to address multiple behavioural barriers at once.

[27] SEAI (2020), Encouraging heat pump installations in Ireland: Strategies to maximise heat pump installation and the savings produced. https://www.seai.ie/publications/Heat-Pump-Adoption.-Maximising-Savings..pdf

5.7. Thinking everyone will switch matters

Aside from perceptions regarding lifespan, environmental benefit and running costs, the factor most strongly related to behaviour in our choice experiment was simply whether a respondent thought most people with oil boilers will eventually switch to a heat pump. The 49% of homeowners who agreed that this was the case were more likely to choose or switch to a heat pump across both scenarios, even when controlling for a range of other opinions and perceptions about heat pumps. This is in line with behavioural science research that shows people are more likely to adopt a behaviour they perceive as the norm, as well as a UK study indicating future phase-out of fossil fuels might boost near-term heat pump rollout through a desire among homeowners to 'future-proof' their home.[28] **There is a need for stronger signals regarding Ireland's trajectory towards fossil fuel phase out and widespread heat pump deployment, and the presentation of adoption as a social norm.**

5.8. Conclusion

This research adds to the existing evidence base regarding heat pump uptake, with particular insights for oil-heated heat pump ready homes, which are the target of current SEAI research. Of particular importance are findings that point towards an apparent paradox whereby it is very difficult to get homeowners to consider switching to a heat pump unless their current heating system needs replacing, but barriers to heat pump adoption are particularly heightened during 'distress purchases' when a replacement is urgently needed. Well thought-out policy interventions are urgently needed to address this, given the advanced age profile of boilers in these target homes.

[28] Nesta & The Behavioural Insights Team (2022). Estimating the willingness to pay for a heat pump. https://media.nesta.org.uk/documents/Estimating_the_willingness_to_pay_for_a_heat_pump_v1.pdf

Appendices

Appendix A – Invitation to take part in the study

SUSTAINABLE ENERGY AUTHORITY OF IRELAND | ÚDARÁS FUINNIMH INMHARTHANA NA HÉIREANN

9th September 2022

The Homeowner
[Address line 1]
[Address line 2]
[County]
[Eircode]

You have been selected to take part in a short online survey

Dear Homeowner:

Why are we writing to you?

The Sustainable Energy Authority of Ireland (SEAI) is conducting a survey to learn about how we can help people move towards more sustainable home energy use. Your address was one of those selected to give their views.*

We would really appreciate if you could take our short survey. It should take less than 10 minutes to complete, and you will be entered into a draw for one of **four €100 One4all vouchers** as a thank you for your time. All responses will be kept completely anonymous.

If you wish to take part, please complete the survey at the link below as soon as possible. The survey will close on 1st October 2022.

www.seai.ie/energysurvey

Sincerely,

Hannah Julienne

Dr Hannah Julienne
Senior Behavioural Scientist, SEAI

* Your address was selected from the National Building Energy Rating (BER) Database. For further information please visit the Data Privacy Notice at www.seai.ie/energysurvey/dpn.

3 Park Place, Hatch Street Upper, Dublin 2
3 Plás na Páirce, Sráid Halste Uachtarach, Baile Átha Cliath 2
t +353 1 808 2100
e info@seai.ie
w www.seai.ie

SEAI is funded by the Government of Ireland. Tá an SEAI maoinithe ag Rialtas na hÉireann.

Appendix B – Heat pump information

Please read the following information carefully:

What are heat pumps?

Heat pumps are an environmentally friendly alternative to oil boilers and other conventional home heating systems. The most common type of heat pump works by converting energy from the air outside of your home into useful heat inside the home, in the same way a fridge works by extracting heat from its inside.

What kinds of homes are suitable for a heat pump?

Heat pumps work best in homes that are relatively well insulated and good at keeping in heat. They work particularly well with underfloor heating or large radiators. Some homes will need additional work done to them before a heat pump can be installed.

How much does a heat pump cost?

Heat pumps are considerably more expensive than conventional boilers. Installation costs vary, but common models are likely to be in the range of €10,000 to €16,000. There may be additional costs associated with installing further insulation or replacing radiators.

What grants are available to me?

The Sustainable Energy Authority of Ireland (SEAI) offers a grant of €6,500 to help homeowners cover the cost of switching to a heat pump.

In order to qualify for this grant, you will first need to carry out a technical assessment to check if you need to do any additional work to your home to make it heat pump ready. This assessment usually costs around €650, but SEAI will give you a rebate of €200 if you go on to install the heat pump.

In the future, there could be an additional bonus grant brought in specifically for homes that are scrapping an oil boiler, as has been done in other countries.

What are the benefits of getting a heat pump?

Heat pumps are very energy efficient which means they can help you reduce your carbon footprint and save you money on your energy bills. They run off electricity, which can be generated from renewable resources, rather than using fossil fuels such as oil.

Unlike conventional boilers, heat pumps typically run continuously, meaning you can have reliable heating and hot water 24/7 for an affordable price.

What are the drawbacks of getting a heat pump?

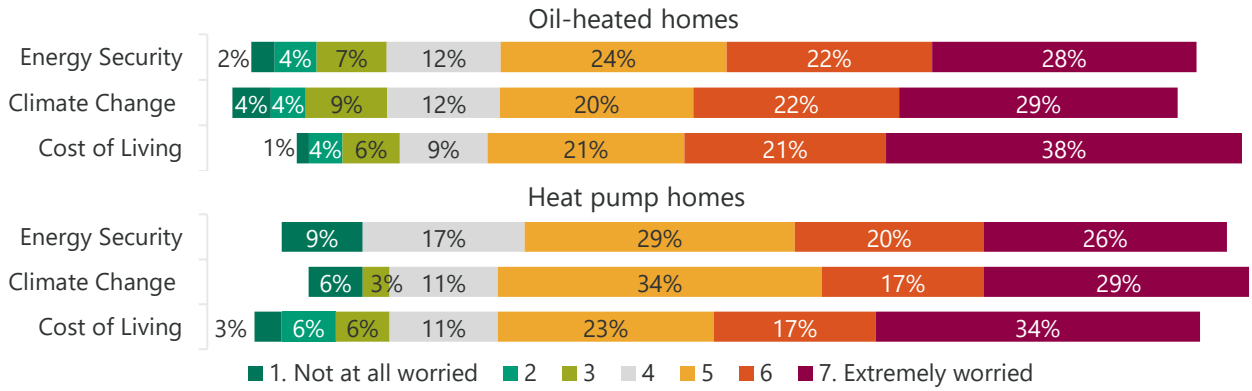
Aside from being more expensive, heat pumps are also more complex to install than conventional boilers. This means installation takes longer and is more disruptive, especially if radiators need to be replaced.

Appendix C – Sample characteristics

C.1. Sociodemographic characteristics

Characteristic		Still using oil		Switched to heat pump	
		n	%	n	%
Gender	Male	744	53%	20	57%
	Female	640	46%	15	43%
	Other/Not disclosed	18	1%	0	0%
Age	Under 35	135	10%	6	17%
	35 – 49	675	48%	14	40%
	50 – 64	373	27%	13	37%
	65+	219	16%	2	6%
Region	Leinster	435	31%	11	31%
	Munster	492	35%	18	51%
	Connacht/Ulster	475	34%	6	17%
Type of area	Urban	711	51%	9	26%
	Rural	691	49%	26	74%
Social grade	ABC1	985	70%	25	71%
	C2DEF	343	24%	9	26%
	Don't know	74	5%	1	3%
HH Income	Under €40k	351	25%	5	14%
	€40k – €80k	480	34%	8	23%
	€80k	412	29%	17	49%
	Not disclosed	159	11%	5	14%

C.2. Worry



Appendix D – Sociodemographic differences in awareness of heat pumps and grants

Table 5: Logistic regression models of (a) whether a participant said they were aware of heat pumps and able to identify them from a definition and (b) whether they were aware the Irish government offers a grant for heat pump installation through SEAI (given they were already aware of heat pumps).

		Aware of heat pumps	Aware of SEAI grant
Gender	Male	0.97***	0.42**
Ref: Female		(0.13)	(0.14)
Age	35 – 49	0.59**	0.45+
Ref: 18 – 34		(0.21)	(0.24)
	50 – 64	0.85***	0.92***
		(0.23)	(0.26)
	65+	1.32***	0.50+
		(0.27)	(0.29)
Region	Leinster	-0.23	-0.07
Ref: Connacht/Ulster		(0.16)	(0.17)
	Munster	-0.04	0.06
		(0.15)	(0.16)
Type of area	Urban	-0.09	0.34*
Ref: Rural		(0.13)	(0.13)
Social grade	C2DEF	-0.32*	-0.22
Ref: ABC1		(0.16)	(0.18)
HH Income	€40,000 - €80,000	0.41*	0.11
Ref: Under €40,000		(0.18)	(0.20)
	€80,000+	0.94***	0.22
		(0.21)	(0.22)
Observations		1,402	1,038

Standard errors in parentheses. Some 'other' or 'don't know' categories omitted from table for conciseness.
*** p<0.001, ** p<0.01, * p<0.05, . p<0.1

Appendix E – Willingness to pay analysis

E.1. Estimation of willingness to pay

The experimental design and analysis was informed by the Behavioural Insights Team/Nesta's project examining switching from gas boilers to heat pumps in the UK.[29] We estimated a conditional logit model described by the following equation:

$$Choice_{ij} = \alpha * HP_j + \beta * Cost_{ij} + e_{ij}$$

- $Choice_{ij}$ is a binary variable equal to 1 if participant *i* chooses option *j* (heat pump or oil boiler), 0 otherwise
- HP_j is a binary variable equal to 1 if option *j* is a heat pump, 0 otherwise
- $Cost_{ij}$ is a continuous variable that represents the installation cost that the participant *i* is presented with for option *j*
  - €(13,500-(6500-*X*)) if *j* = heat pump, where *X* is the randomised additional oil boiler scrappage bonus
  - €3,000 if *j* = oil boiler
- e_{ij} is the error term

We also included control variables where appropriate for (a) whether the given scenario was seen first or second and (b) the order of the response options (heat pump vs. oil boiler). The willingness to pay for a heat pump is then calculated as - α / β.

[29] Nesta & The Behavioural Insights Team (2022). Estimating the willingness to pay for a heat pump. https://media.nesta.org.uk/documents/Estimating_the_willingness_to_pay_for_a_heat_pump_v1.pdf

E.2. Scenario 1 – Boiler end of life choice

Table 6: Conditional logistic regression models of choosing a heat pump over an oil boiler. Model 1: Baseline model from which willingness to pay is calculated. Model 2: Incorporating individual and dwelling characteristics. Model 3: Incorporating prior heat pump awareness and psychological factors.

		Model 1	Model 2	Model 3
Cost (€)		-0.000205***	-0.000213***	-0.000220***
		(3.78e-05)	(3.91e-05)	(4.00e-05)
HP constant		1.020***	0.954*	0.552
		(0.106)	(0.399)	(0.431)
Option order	HP first	0.0148	0.0168	0.00202
Ref: Oil first		(0.0706)	(0.0727)	(0.0741)
Scenario order	Second	-0.305*	-0.281.	-0.287.
Ref: First		(0.142)	(0.146)	(0.149)
Gender	Female		-0.229	-0.210
Ref: Male			(0.152)	(0.158)
Age	35 – 49		-0.387	-0.436
Ref: Under 35			(0.277)	(0.280)
	50 – 64		-0.214	-0.345
			(0.299)	(0.303)
	65+		-0.142	-0.370
			(0.335)	(0.343)
Region	Munster		0.101	0.121
Ref: Leinster			(0.183)	(0.187)
	Connacht/Ulster		0.0703	0.0710
			(0.182)	(0.186)
Type of area	Urban		-0.0720	-0.0458
Ref: Rural			(0.147)	(0.149)
Social grade	C2DEF		-0.348.	-0.251
Ref: ABC1			(0.190)	(0.195)
HH Income	€40,000 - €80,000		0.308	0.332
Ref: Under €40,000			(0.207)	(0.212)
	€80,000+		0.605*	0.527*
			(0.241)	(0.250)
Boiler age	5 – 10 years		0.481*	0.537*
Ref: Under 5 years			(0.221)	(0.226)
	10 – 15 years		0.266	0.315

			(0.201)	(0.205)
	Older		0.264	0.247
			(0.223)	(0.226)
HP awareness	Aware			0.280
Ref: Not aware				(0.172)
Worry – cost of living	High (6+)			-0.355*
Ref: Low (1-5)				(0.180)
Worry – climate change	High (6+)			0.714***
Ref: Low (1-5)				(0.155)
Worry – energy security	High (6+)			0.180
Ref: Low (1-5)				(0.175)
Observations		1,966	1,966	1,966

Standard errors in parentheses. Some 'other' or 'don't know' categories omitted from table for conciseness.
*** p<0.001, ** p<0.01, * p<0.05, . p<0.1

E.3. Scenario 2 – Likelihood to switch now given current boiler's status

Table 7: Conditional logistic regression models of being 'very likely' to switch to a heat pump. Model 1: Baseline model from which willingness to pay is calculated. Model 2: Incorporating individual and dwelling characteristics. Model 3: Incorporating prior heat pump awareness and psychological factors.

		Model 1	Model 2	Model 3
Cost (€)		-0.000427***	-0.000440***	-0.000448***
		(5.87e-05)	(6.03e-05)	(6.14e-05)
Switch constant		-0.730***	-1.681**	-2.455***
		(0.194)	(0.586)	(0.659)
Scenario order	Second	0.0644	0.0592	0.0748
Ref: First		(0.196)	(0.201)	(0.204)
Gender	Female		-0.186	-0.142
Ref: Male			(0.216)	(0.222)
Age	35 – 49		-0.450	-0.528
Ref: Under 35			(0.343)	(0.350)
	50 – 64		-0.511	-0.644.
			(0.378)	(0.388)
	65+		0.139	-0.0788
			(0.433)	(0.443)
Region	Munster		0.249	0.196
Ref: Leinster			(0.262)	(0.267)
	Connacht/Ulster		0.431.	0.387
			(0.259)	(0.263)
Type of area	Urban		0.201	0.217
Ref: Rural			(0.206)	(0.210)
Social grade	C2DEF		0.128	0.155
Ref: ABC1			(0.284)	(0.290)
HH Income	€40,000 - €80,000		0.303	0.338
Ref: Under €40,000			(0.331)	(0.336)
	€80,000+		0.819*	0.723.
			(0.363)	(0.371)
Boiler age	5 – 10 years		0.841*	0.804*
Ref: Under 5 years			(0.328)	(0.332)
	10 – 15 years		0.584.	0.552.
			(0.317)	(0.320)
	Older		0.789*	0.742*

			(0.343)	(0.347)
HP awareness	Aware			0.743**
Ref: Not aware				(0.288)
Worry – cost of living	High (6+)			-0.162
Ref: Low (1-5)				(0.248)
Worry – climate change	High (6+)			0.244
Ref: Low (1-5)				(0.214)
Worry – energy security	High (6+)			0.578*
Ref: Low (1-5)				(0.247)
Observations		1,966	1,966	1,966

Standard errors in parentheses. Some 'other' or 'don't know' categories omitted from table for conciseness.
*** p<0.001, ** p<0.01, * p<0.05, . p<0.1

E.4. Effect of heat pump knowledge and perceptions

Table 8: Conditional logistic regression models of (a) choosing a heat pump over an oil boiler (Scenario 1) and (b) being 'very likely' to switch to a heat pump (Scenario 2) as a function of participants' previous responses regarding their knowledge and perceptions of heat pumps.

		Choose HP	V likely to switch to HP
Cost (€)		-0.000209***	-0.000464***
		(4.98e-05)	(6.90e-05)
HP constant		-0.230	-2.591***
		(0.372)	(0.812)
Option order	HP first	0.153.	
Ref: Oil first		(0.0925)	
Scenario order	Second	-0.252	-0.0178
Ref: First		(0.185)	(0.225)
Comparisons with oil boiler			
HP better for environment		0.967**	1.695*
		(0.323)	(0.769)
HP cheaper bills		1.055***	0.111
		(0.196)	(0.255)
HP better keeping home warm		0.249	-0.0606
		(0.198)	(0.233)
HP more expensive to install		-0.667*	-0.390
		(0.306)	(0.342)
HP more difficult to use		-0.318	-0.285
		(0.239)	(0.346)
HP more hassle to install		-0.256	0.00307
		(0.216)	(0.254)
HP shorter lifespan		-0.663**	0.0266
		(0.226)	(0.308)
Agreement with statements			
Would provide heat 24h		0.113	0.182
		(0.233)	(0.328)
Need to improve insulation		-0.308	0.0860
		(0.191)	(0.238)
Need new radiators		0.264	0.106
		(0.207)	(0.252)

Could get low-cost loan	0.360.	-0.340
	(0.195)	(0.238)
Could get grant	0.185	-0.272
	(0.233)	(0.308)
Suitable installers available	0.172	0.573*
	(0.193)	(0.257)
Everyone will switch eventually	0.593**	0.838***
	(0.193)	(0.244)
Observations	1,516	1,516

Standard errors in parentheses.
*** p<0.001, ** p<0.01, * p<0.05, . p<0.1

SUSTAINABLE ENERGY AUTHORITY OF IRELAND

Rialtas na hÉireann
Government of Ireland

Sustainable Energy Authority of Ireland
Three Park Place
Hatch Street Upper
Dublin 2
Ireland
D02 FX65

e info@seai.ie
w www.seai.ie
t +353 1 808 2100