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Evaluation of the reformed Renewable Heat Incentive
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Interim Applicant Fieldwork Working Paper

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CONTENTS

1	Headline findings	5
	Influence of the RHI on new heating system decisions	5
	Domestic heat pumps	5
	Non-domestic biomass	6
	Influence of RHI on system sizing	7
	Domestic heat pumps	7
	Non-domestic biomass	7
	Influence of the RHI reform announcements on applicants	8
	Domestic heat pumps	8
	Non-domestic biomass	8
	Influence of the RHI reform announcements on installers	9
	Domestic heat pumps	9
	Non-domestic biomass	10
2	Introduction	11
	Context	11
	About the evaluation	11
	Policy context	11
	Study aims and objectives	12
	The theoretical framework	12
	The demand theory	12
	The interim applicant theory	12
	About this report	13
3	Methodology	14
	Scope	14
	Applicants for domestic heat pumps	14
	Applicants for non-domestic medium-scale biomass	15
	Installers of medium-scale biomass technologies and domestic heat pumps	15
	Sampling	15
	Applicants for domestic heat pumps	15
	Applicants for non-domestic medium-scale biomass	18
	Installers of medium-scale biomass technologies and domestic heat pumps	21
	Recruitment	22
	Data collection	23
	Analysis	24
	Limitations	25

4 Influence of the RHI on renewable heating system decisions	26
The renewable heating system decision journey	26
Factors influencing decision to install new heating system	26
Domestic heat pump applicants.....	26
Non-domestic medium-scale biomass applicants.....	27
Factors influencing decision about which heating technology to install.....	28
Influence of RHI on decision to install a renewable heating technology.....	31
Domestic heat pump applicants.....	32
Non-domestic biomass applicants	37
Influence of RHI on installation size.....	42
Domestic heat pump applicants.....	42
Non-domestic biomass applicants	44
5 Influence of the RHI reform announcements on applicants.....	50
The candidate interim applicant theory.....	50
Applicants for domestic heat pumps.....	51
Interim applicant theory	51
March 2017 applicants.....	51
September 2017 applicants	55
Applicants for non-domestic medium-scale biomass.....	59
Interim applicant theory	59
6 Influence of the RHI reform announcements on installers.....	65
The candidate interim applicant theory.....	65
Domestic heat pump installers.....	65
Non-domestic biomass installers	71
7 Other findings	75
Installation costs	75
Installer views on the future of the market.....	76
Future impact of reforms.....	76
Longer term future of the market.....	78
Appendix A. Demand theory	80
Appendix C. Fieldwork recruitment materials	83
Appendix D. Fieldwork topic guides.....	84

Note: this paper was prepared for internal (BEIS) use only but is being published as the content is considered to be helpful in further understanding the main synthesis report, which is being published at the same time. It is a working paper and has not been produced to the same standards that CAG would normally work to for publishable content. Furthermore, the findings presented in this paper are not final research findings. The paper’s findings were used as part of a cross-evaluation synthesis process which, in turn, had implications for the findings presented in this paper. The synthesis report presents the final findings from this phase of the evaluation.

1 Headline findings

- 1.1 This working paper presents findings from qualitative research undertaken as part of the evaluation of the reformed Renewable Heat Incentive (RHI). It has been prepared by CAG Consultants on behalf of the Department for Business, Energy and Industrial Strategy (BEIS).
- 1.1 The purpose of this study was to explore how successive RHI reform announcements in 2016 and 2017, and the way they were implemented, have influenced RHI applications for domestic heat pump installations, and non-domestic medium-scale biomass installations. This research does not assess whether the reforms have achieved their aims, this will be covered by later years of the evaluation programme.
- 1.2 The findings presented in this working paper are qualitative in nature, they do not provide estimates of how common each type of applicant is within the RHI population.

Influence of the RHI on new heating system decisions

Domestic heat pumps

- 1.3 The interviews identified four main types of domestic heat pump customers. These four types, together with the main factors influencing each types’ decision to install a new heating system and their response and reasoning in relation to the RHI in this decision, are set out in Table 1,. These customer types demonstrate that **not all** domestic heat pump applicants are influenced by the RHI in their decision making about new heating systems.

Table 1 Influence of the RHI on new heating system decisions – domestic heat pump customer typology

Type	Primary factors influencing decision to install a heat pump	Reasoning
1 “RHI drove my decision”	<ul style="list-style-type: none"> • Financial considerations were a key driver, AND • The RHI subsidy formed a key part of an applicant’s financial considerations about whether to install a heat pump • Evidence suggested RHI could be a particularly important influencing factor for ‘on gas’ customers 	<p>I wouldn’t have gone ahead with a heat pump installation without the RHI subsidy</p> <p><i>Applicants would not have installed a heat pump without the RHI subsidy</i></p>

<p>2 “RHI was just a bonus”</p>	<ul style="list-style-type: none"> • Applicants wanted ‘the most efficient, cost-effective heating system for their property type’ • Evidence suggests this type is more likely for self-builds and major refurb projects 	<p>I was interested in installing a heat pump anyway, for other reasons, and the RHI did not affect any aspect of my decision - the RHI subsidy was just a bonus</p> <p><i>Applicants would most likely have installed a heat pump even without the RHI subsidy</i></p>
<p>3 “RHI contributed to my decision”</p>	<ul style="list-style-type: none"> • Financial considerations were a key driver AND the RHI subsidy formed a key part of an applicant’s financial considerations about whether to install a heat pump • PLUS at least one other key driver e.g. environmental motivations 	<p>I invested in a heat pump for a mixture of reasons, including the availability of RHI subsidy.</p> <p><i>Applicants may or may not have installed heat pump without the RHI subsidy</i></p>
<p>4 “RHI influenced my technology or timing choices”</p>	<p><i>Timing or technology influenced by one or more of:</i></p> <ul style="list-style-type: none"> • Uncertainty about future of RHI • Approach and advice by sales company/installer (for whom RHI was part of sales pitch) • Experience of FiTs makes applicant more receptive to/enthusiastic about RHI subsidy 	<p>I would have invested in a renewable heating system anyway (possibly not a heat pump) but my choice of technology/timing were influenced by RHI rules or subsidy</p> <p><i>Applicants may or may not have installed heat pump without the RHI subsidy</i></p>

Non-domestic biomass

1.4 The interviews with non-domestic heat pump customers also identified four main customer types in terms of how they were influenced by the RHI (see Table 2). In contrast to domestic customers we found that **all** types of non-domestic biomass applicants included in this research reported that their decision was influenced by the RHI.

Table 2 Influence of the RHI on new heating system decisions – non-domestic biomass customer typology

Type	Primary factors influencing decision to install a biomass boiler	Reasoning
<p>1a “RHI drove my decision” (commercial operation)</p>	<ul style="list-style-type: none"> • Applicant was a commercial operation • RHI was fundamental to the business case for the installation (<i>scale of returns attractive</i>) • Applicants typically required a new heating system but this was not a primary driver 	<p>I wouldn’t have gone ahead with a biomass installation without the RHI subsidy</p>
<p>1b “RHI drove my decision” (non-commercial operation)</p>	<p><i>(The research generated limited evidence in relation to this CMO so the key contexts are less clear.)</i></p> <ul style="list-style-type: none"> • Applicant was not a commercial operation (e.g. a local authority) • RHI was fundamental to the business case for the installation (<i>business case marginal</i>) 	<p>I wouldn’t have gone ahead with a biomass installation without the RHI subsidy</p>

	<ul style="list-style-type: none"> • Applicants typically required a new heating system but this was not a primary driver • Wider strategic drivers (e.g. carbon) were additional motivations for the installation 	
3 “RHI contributed to my decision”	<ul style="list-style-type: none"> • RHI made biomass more financially attractive • Applicant had a need for new heating system 	I invested in a biomass boiler for a mixture of reasons , including the availability of RHI subsidy.
4 “RHI influenced my technology or timing choices”	<p><i>(The research generated limited evidence in relation to this CMO so the key contexts are less clear.)</i></p> <ul style="list-style-type: none"> • RHI was fundamental to the business case for the installation • The installation was related to a specific business opportunity (e.g. fuel drying or other non-RHI related activity) 	I would have invested in a renewable heating system anyway (possibly not a biomass boiler) but my choice of technology/timing were influenced by RHI rules or subsidy

Influence of RHI on system sizing

Domestic heat pumps

- 1.5 For domestic heat pumps, the interviews did not provide any evidence to suggest that domestic heat-pump applicants’ decisions over system sizing was influenced by the RHI. In all cases the sizing of the system was largely dictated by third parties, with limited input from applicants.

Non-domestic biomass

- 1.6 For non-domestic biomass, the nature of the RHI banding (up to September 2017) in particular, allowed applicants to install a larger boiler than currently needed, e.g. installing a 200kW+ boiler when less than 200kW would have met current needs. A key contextual factor here seemed to have been businesses or organisations allowing for future growth or expansion plans. The removal of banding is likely to impact on such cases but the extent to which it does so will provide an indication of the significance of the other non-RHI factors in influencing such decisions.
- 1.7 In other cases the income from RHI allowed applicants to run their biomass heating system for longer or at higher temperatures than would have been the case with a conventional heating system. A key context here was a business benefit (unrelated to the RHI) from having more heat beyond the core demand. It may be useful for future phases of the evaluation to explore the extent to which the reforms impact on such decisions.
- 1.8 It is clear from the findings that the pre-reform RHI was a factor in driving the installation of multiple boilers, although applicants also referred to other benefits such as greater resilience indication of the relative significance of these other benefits.
- 1.9 There were cases where the level of RHI benefits was not a factor in informing sizing decisions, i.e. boilers were sized in line with the heat requirements of the installation. The findings from the quantitative analysis may provide a useful indication of the scale of this sector of applicants.
- 1.10 There were also cases in which the applicant had no knowledge of their heat demand and had simply followed the advice of a third party in relation to size. Third party advice was an

important context across all of the CMOs. This reiterates the important role of the supply chain in determining the implementation of the RHI.

Influence of the RHI reform announcements on applicants

Domestic heat pumps

- 1.11 For domestic heat pump applications, there were spikes in applications in both March 2017 and September 2017. Interviews with individuals who submitted applications at these points
 1. “Proposal of heat demand limits sped up my application (installation not viable post-reform)”. Installer evidence suggested there were March 2017 applicants, who would have been over the proposed heat demand limits, who rushed through their installations and applications in order to beat the anticipated introduction of the reforms in April 2017.
 2. “Introduction of heat demand limits sped up my application (perceived reduced benefits post-reforms)”. These were applicants whose installations would have been over the heat demand limits and therefore submitted their applications ahead of the 20 September reforms. Installers reported rushing through installations in September to beat this deadline.
 3. “General RHI uncertainty sped up application”. There was also evidence that uncertainty about the future of the RHI in general motivated some March and September applicants. Among some March applicants there was also an uncertainty related to the potential for depressions to the heat pump tariffs.
- 1.12 In both application spikes we found applicants on whom the RHI reform announcements had no influence. These were applicants who either thought they would be unaffected by any potential reforms, or whose installation timescales were dictated by refurbishment or other building schedules.
- 1.13 Installers were identified as being influential in raising awareness of the upcoming reforms among domestic applicants and in some cases the applicants were aware that there was a time-frame in which they needed to install, but when asked they were not always clear if this was a change in the scheme, or a limited time offer from the installer.

Non-domestic biomass

- 1.14 For non-domestic biomass applicants, the research found that both reform announcements and wider RHI factors (including anticipated depressions) had an influence on application timings.
- 1.15 In some cases, where the applicant had an ability to influence the timing of their installation, an awareness of the proposed reforms and/or tariff depressions led to installations taking place sooner than would have been the case. This could have been because, post-reform, the installation would have been either unviable or less attractive financially. The quantitative reforms.
- 1.16 Some applicants were less able to make short-term responses to planned or potential changes, e.g. because their installation was part of a wider construction or refurbishment programme. The synthesis work and research in future phases of the evaluation could usefully explore the scale of this type of installation so that the likely impacts of past and future reforms and depressions can be better understood.

- 1.17 Some installations were unaffected by the reforms and depressions because of a lack of awareness of them on the part of the applicant.
- 1.18 In other cases, the nature of the reforms meant that the financial benefit to applicants was not significantly affected and did not therefore affect the timing of the installation. This appeared to be the case for those with more consistent, less seasonal, levels of heat demand. Such installations may become more prominent post-reforms.

Influence of the RHI reform announcements on installers

Domestic heat pumps

- 1.19 In terms of the influence of the RHI reform announcements on domestic heat pump installers, the interviews identified three main installer types:
- **'Business as usual' installers.** These were installers who were aware of the proposed reforms but did not make any changes to their business approach or see any changes in installation numbers between December 2016 and September 2017 as a result of them. All of these installers reasoned that the reforms would not have any significant impact on their business. This was either because (a) they believed that the heat pumps they installed were generally below the proposed heat demand limits, or (b) they felt that for their customer base, the RHI was not a key driver (for example because they were self-builders) and therefore any changes to the RHI would not impact on customer demand.
 - **Installers who undertook fewer heat pump installations¹.** This was an installer whose primary business was the installation of domestic heat pumps to high heat demand customers. As a result of the reform announcements, they stopped marketing domestic heat pumps and informed customers in their existing pipeline that installations and applications would need to be completed by the end of March 2017. This installer invested in a drilling rig to focus their business instead on the shared ground loop market, however, the delays to this aspect of the reforms less to many of these installations being put on hold.
 - **Installers who increased their business overall, even though heat pump installations remained static².** This describes an installer-manufacturer whose installation business increased overall between December 2016 and September 2017, with an increase in orders, but whose heat pump installations remained static. The reform announcements had 'very little impact' on their domestic heat pump installation business as this was only a very small part of their overall business (although note that they had a major impact on its manufacturing business³). This installer-manufacturer also saw shared ground loops as an opportunity as a result of the reforms. In contrast to the previous group, above, this installer targeted social housing providers. The evidence here suggests that social housing providers were less risk-averse than commercial developers, this led to social housing installations proceeding.

¹ These findings are based on just one interview, so may not be representative of the experiences of other installers who undertook fewer heat pump installations.

² These findings are based on just one interview, so may not be representative of the experiences of other installers who undertook fewer heat pump installations.

³ They reported 'record sales' between December 2016 and September 2017 for larger single phase heat pumps. Sales then disappeared once the September reforms came into force. This increase in sales in large heat pumps was countered by declining sales in smaller heat pumps during the same period.

Non-domestic biomass

- 1.20 Uncertainty about the future of the RHI had a significant impact on non-domestic biomass installers during the interim period. However, the nature and scale of the impact varied significantly depending on context.
- 1.21 In some cases, installers' experience was that whilst the overall numbers of installations may have declined, the number of medium-scale installations undertaken increased.
- 1.22 In other cases, the numbers of installations declined but the installer increased their focus on other related activities, e.g. servicing, repairs or parts supply.
- 1.23 In other cases still, installers reported a decline in medium-size installations even though the data suggests an overall increase in such installations during the interim period. One potential key context in such cases was where the installer's customer base was focused on larger and more corporate customers. These were seen to be more risk-averse and, therefore, more likely to push back decisions during a period of uncertainty.
- 1.24 Some installers were found to be better-placed than others to respond to spikes in demand caused by the reforms and depressions, e.g. those using plant with longer lead-in times were less able to respond to the spikes in the interim period.
- 1.25 Future phases of the evaluation could usefully explore the extent to which the quality of installations was affected during the interim period. Some installers suggested that it had created opportunities in the market for those able to promise faster installations or better returns through potentially inappropriate sizing.

2 Introduction

- 2.1 This draft working paper presents findings from qualitative research undertaken for the evaluation of the reformed Renewable Heat Incentive (RHI). It has been prepared by CAG Consultants on behalf of the Department for Business, Energy and Industrial Strategy (BEIS). It is part of a suite of working papers presenting findings from research conducted in 2017/18. These working papers will inform the content of a report synthesising key evaluation findings to date.
- 2.2 This is a working paper, for internal purposes only, and not intended for publication.

Context

About the evaluation

- 2.3 CAG Consultants, working with Databuild, Regeneris, EREIRA and UCL, have been commissioned to undertake an evaluation of the reformed RHI on behalf of the Department for Business, Energy and Industrial Strategy (BEIS). The evaluation will provide a) an assessment of the impact of the scheme, and b) strategic learning to inform heat policy development. The evaluation is structured around theory-based evaluation methods which will develop, test and refine realist theories about the reformed RHI as the scheme proceeds.

Policy context

- 2.4 The Renewable Heat Incentive (RHI) scheme was launched to non-domestic applicants in 2011 and extended to domestic applicants in 2014. The scheme is intended to support the transition to low-carbon heating in the UK by providing financial incentives to install low carbon heat technologies. The scheme is open to commercial, industrial, public sector, not for profit and community generators of renewable heat as well as homeowners, private and social landlords.
- 2.5 The Government proposed a range of reforms to the RHI in 2016, but the implementation of these reforms has been subject to delays:
- March 2016: Government began initial consultations on proposed reforms
 - December 2016: Government announces package of reforms in its consultation response
 - Spring 2017: initial implementation of these reforms is delayed
 - September 2017: some reforms implemented (tariff changes, heat demand limits, etc.)
 - Spring 2018: reform regulations expected to be passed in Parliament
- 2.6 During the period between the announcement of the reforms in December 2016 to the applications.
- 2.7 This study was designed to understand how and why the elongated period of reform implementation influenced RHI applications, focusing in particular on the main application spikes during this time period.

Study aims and objectives

- 2.8 The overall aim of this study was to explore how successive RHI reform announcements in 2016 and 2017, and the way they were implemented, have influenced RHI applications for:
- domestic heat pump installations; and
 - non-domestic medium-scale biomass installations.
- 2.9 In particular, the research aimed to understand for whom and in what contexts was this influence most marked and why.
- 2.10 The qualitative research in this research paper does not attempt to assess whether the aims of the RHI reforms have been achieved.

The theoretical framework

- 2.11 This working paper presents, tests and refines the theoretical framework for the evaluation, which is framed in realist terms⁴. The theoretical framework hypothesises combinations of 'contexts', 'mechanisms' and 'outcomes' (CMOs) through which the RHI is expected to contribute to its objectives. While the theoretical framework is summarised in this paper, full details can be found in the Evaluation Plan for this evaluation.
- 2.12 The findings in this paper have been used to test two aspects of the theoretical framework in particular and highlight how it may be revised in the light of these findings. These are:
- The 'demand theory', and
 - The 'interim applicant theory'.

The demand theory

- 2.13 The demand theory seeks to explain the influence the RHI has on consumer decisions to install renewable heat technologies. It is in effect an 'additionality' theory, in that it sets out the circumstances in which consumers are influenced by the RHI in their decisions about whether to install a renewable heat technology.
- 2.14 The candidate demand theory is set out in full in Appendix A5.

The interim applicant theory

- 2.15 The interim applicant theory seeks to explain the influence the RHI reform announcements, and subsequent delays, had on RHI applications between December 2016 and September 2017. It focuses on the impact of the RHI reform announcements and delays on both applicants and

⁴ Realist evaluation is a type of theory-based evaluation. At the heart of realist evaluation is the question: "What works, for whom, in what respects, to what extent, in what contexts, and how?". As such, realist approaches seek to identify the underlying generative mechanisms that explain 'how' the outcomes were caused and the influence of context. See http://betterevaluation.org/approach/realist_evaluation for more.

⁵ A candidate theory is the initial theory developed as part of a realist evaluation. This theory is then tested and refined using the evaluation evidence.

2.16 The full interim applicant candidate theory is set out in full in Appendix B.

About this report

2.17 Chapter 2 summarises the methodological approach for this research.

2.18 Chapter 3 sets out the research findings in relation the influence of the RHI in general on renewable heating system decisions. It also sets out other factors that influence renewable heating decisions.

2.19 The findings in relation to the influence on domestic heat pump and non-domestic biomass applications of the RHI reform announcements and subsequent delays are presented in Chapter 4.

2.20 Chapter 5 outlines the findings regarding the impact of the RHI reform announcements and subsequent delays on domestic heat pump and non-domestic biomass installers.

2.21 Finally, Chapter 6 presents other findings from the research:

2.22 Findings in relation to the reliability of installation costs reported in applications, and

2.23 Installers' views on the future of the renewable heat market.

2.24 Appendix A presents the candidate demand theory. Appendix B presents the interim applicant theory and is attached in a separate document. The fieldwork recruitment materials and the fieldwork separately are also attached separately, in Appendices C and D respectively.

About qualitative research findings

Note that this is a qualitative research report and therefore is a presentation of the different views and experiences of those interviewed. It does not aim to quantify the number of participants who held particular views or had particular experiences. This is because “the qualitative research is not to measure prevalence, but to map range and diversity, and to explore and explain the links between different phenomena.”⁶

⁶ Ritchie, J., Lewis, J., McNaughton Nicholls, C. and Ormston, R., (2014), *Qualitative Research Practice (2nd edition)*. London: SAGE.

3 Methodology

Scope

- 3.1 The evaluation plan sets out key policy questions relating to the expected reforms and how they are intended and expected to work. These have been defined in conjunction with BEIS. For each policy question, we have identified 'clusters' of contexts that would enable testing of that policy question. Defining these clusters formed part of the initial scoping work, taking current policy issues.
- 3.2 Given the delay in the implementation of the reforms, an initial key question for BEIS was: How has the elongated period of reform implementation influenced applications to the RHI scheme? It was proposed that testing of that question be achieved through focusing on sectors showing changes in application rates that appear attributable to announcement/anticipation effects.
- 3.3 A workshop was held with BEIS staff in September 2017 to further clarify the policy questions for this phase of the evaluation and to inform the design of the fieldwork. This confirmed that the focus of research with interim applicants should be on:
 1. Non-domestic medium-scale biomass applicants since April 2016.
 2. Domestic heat pump applicants since April 2016, for ground source heat pumps and air source heat pumps.
 3. Installers for these two applicant groups.
- 3.4 It was noted that there are other groups that may have been significantly affected by the reform process (e.g. biomethane/biogas, large projects eligible for tariff guarantees) but it was agreed that these were best researched during 2018/19, when more applications have come through and when the reforms have been more fully implemented.

Applicants for domestic heat pumps

- 3.5 BEIS officials expected there could be a rush for domestic heat pump applications prior to the introduction of heat demand limits (HDLs) but at the time of the workshop, there was limited evidence of this, except for a relatively modest spike for ground source heat pumps (GSHPs) in March 2017 (see Figure 5). This was considered logical because GSHP applications tend to be made by larger homes that would be more affected by HDLs.
- 3.6 BEIS would have expected to see a gradual upturn in all heat pump applications because of proposed tariff increases. A large spike was not expected because applicants applying after the December 2016 announcement are guaranteed to benefit from the tariff increase when it (ASHP), had remained steady with little sign of an upturn except in March 2017.
- 3.7 The policy position was asymmetrical because the benefits of reforms would arrive early for applicants (e.g. via the guarantee of higher tariff levels for all post-announcement applicants, when reforms came through) but disbenefits were delayed (e.g. no early implementation of HDL limits or biomass changes). As a result, it may have been that heat pump reforms had been implemented in a way that avoided significant peaks and troughs in demand; this may have been beneficial to the supply chain. BEIS were keen to explore this further, whilst noting that policy learning on this point should not be over-emphasised since the implementation of

RHI reforms was drawn out by both the Brexit referendum (which extended the period between March 2016 consultation and December reform announcement) and the 2017 general election (which delayed the implementation of reforms in 2017).

Applicants for non-domestic medium-scale biomass

- 3.8 There was a spike in applications for this group in March 2017, and then again in June 2017 (see Figure 4). BEIS noted strong indirect evidence which suggested that the March spike was caused by people rushing to avoid the expected cuts in tariffs (which many expected to apply

official suspected that there was another application surge in June 2017 to miss any further tariff cuts on 1st July 2017. Whilst this behavior was rational, the scale of the spikes was striking and BEIS was keen to understand the behaviour and reasoning of those applicants who were responding in this way.

Installers of medium-scale biomass technologies and domestic heat pumps

- 3.9 BEIS were also keen to explore the role of installers in responding to the reform announcements, including seeking to understand the extent to which the spikes in biomass applications were driven by installer activity (e.g. time-limited marketing or offering off-the-peg biomass solutions). In relation to domestic heat pumps, a particular interest was the impact on installers of guaranteeing the tariff increases to those who applied after December 2016.

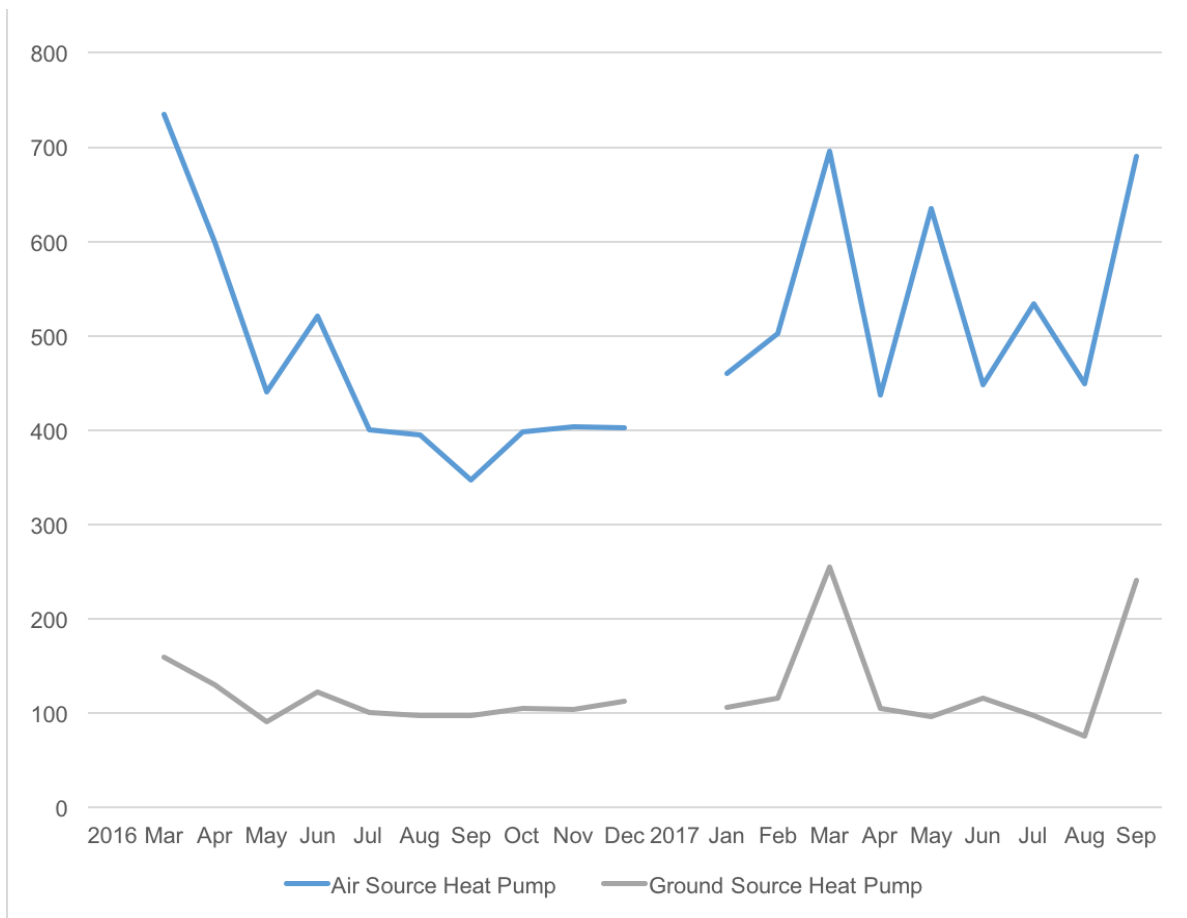
Sampling

- 3.10 The sampling approach was directly related to the mechanisms being tested through the research. Data in the RHI applicant database were utilised to inform the design of each element of the sample, as outlined below.

Applicants for domestic heat pumps

- 3.11 For ASHPs, a heat demand limit of 20,000kWh was announced in December 2016 and implemented in September 2017. For GSHP, the limit was set at 30,000kWh. The RHI application data shows spikes in the level of applications for both ASHPs and GSHPs in March 2017 and September 2017 (see Figure 1). The September 2017 spike is likely to have also been driven by the rise in tariff levels which was implemented that month, so the March 2017 spike is the one which is most likely to be associated with the reform announcements. To enable some understanding of the different drivers, the sample therefore included applications from both spikes.

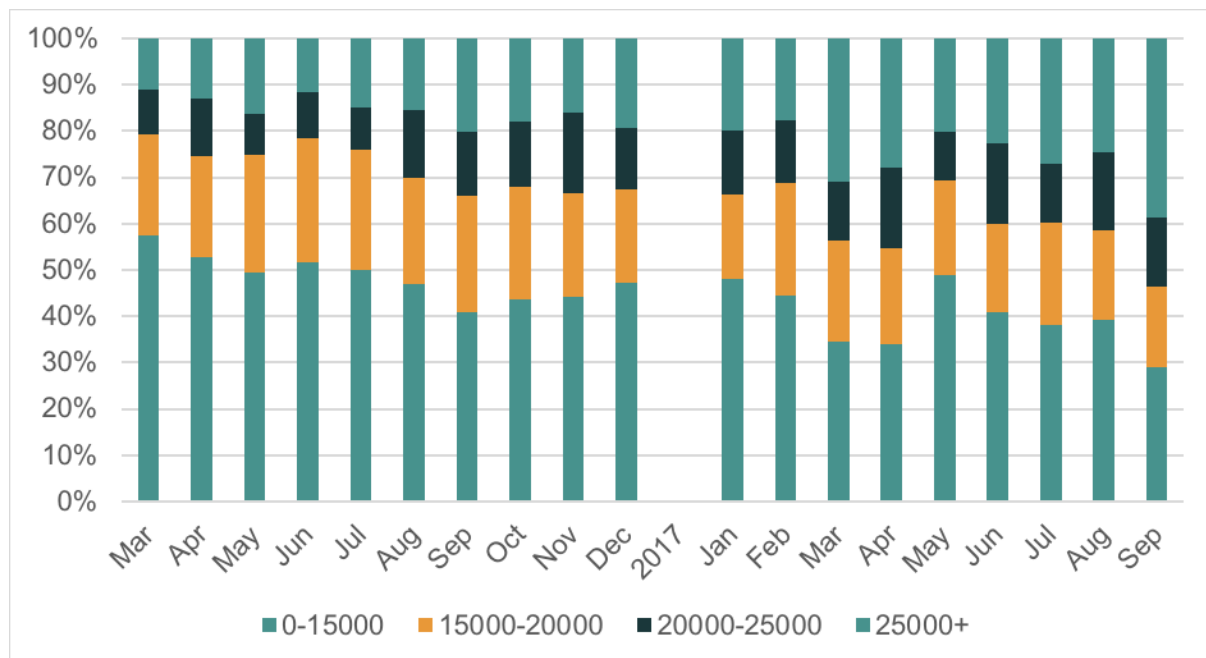
Figure 1: Number of domestic heat pump applications per month, Mar16-Sep17



3.12 In terms of ASHP applications, the data shows a higher proportion of applications which were significantly above the heat demand limit (25,000kwh+) from March 2016 onwards, and these applications were at their highest level (as a proportion of all ASHP applications) in September 2017 (see Figure 2).

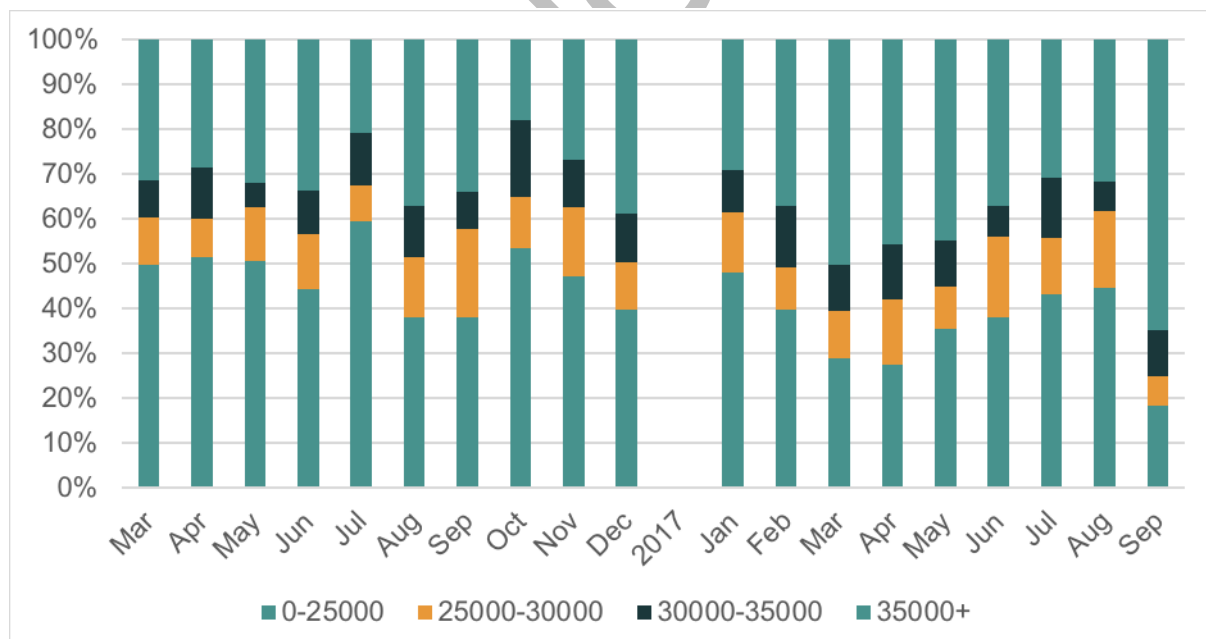
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Figure 2: ASHP applications by estimated annual generation (kWh), Mar 16 – Sep 17



3.13 In terms of GSHP applications, the proportion of 35,000kwh+ applications fluctuated considerably since the announcement of the heat demand limits in December 2016 but there was a very clear spike in these applications in September 2017 (see Figure 3).

Figure 3: GSHP applications by estimated annual generation (kWh), Mar 16 – Sep 17



3.14 Given these spikes in larger installations the sample focused on those applications which were above the heat demand limits, as these were the ones felt most likely to have been influenced by the introduction of the limits.

3.15 Table 3 provides an overview of the criteria applied in this part of the sample.

Table 3: Sampling criteria for domestic heat pump applicants

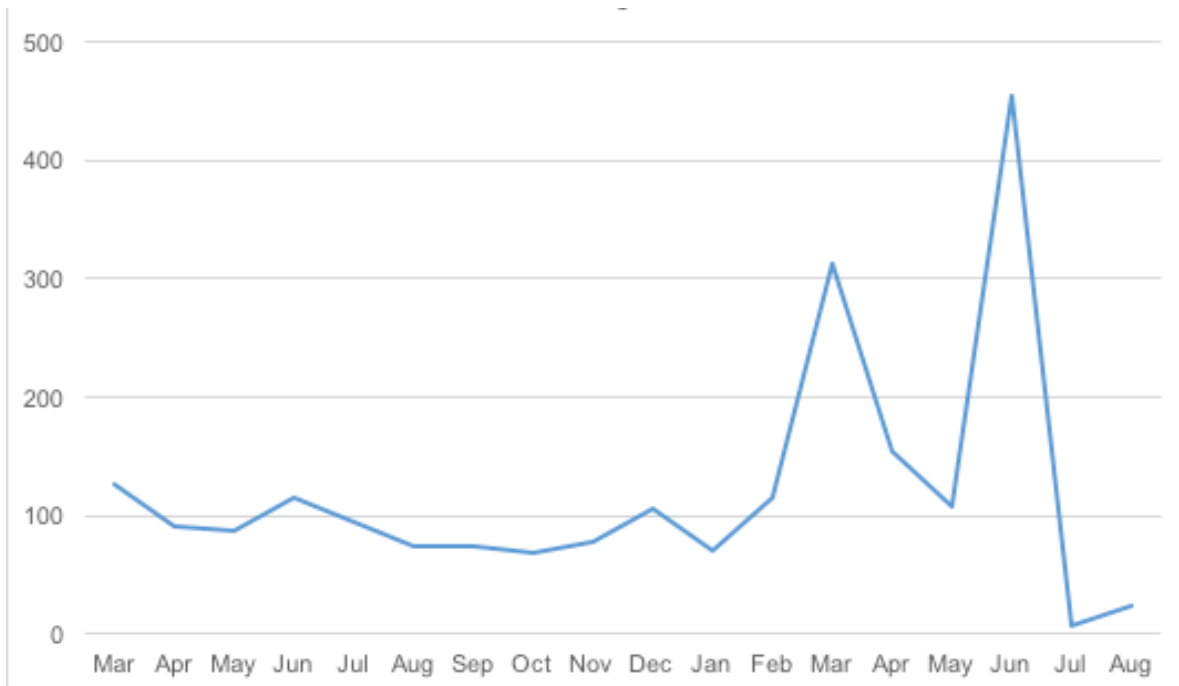
Sample size	10
Sample frame	RHI application data
Sampling criteria	<p>5 applicants who submitted their applications in March 2017 (based on tariff rate date), to explore whether the uncertainty regarding the reforms contributed to the spike in applications in that month.</p> <p>The above to be selected at random from within the following categories:</p> <ul style="list-style-type: none"> - 3 ASHP applicants for a system 25,000 kWh+ est. annual generation - 2 GSHP applicant for a system 35,000 kWh+ est. annual generation <p>This selection was intended to enable us to explore the impact of the proposed HDL reforms on applications significantly above the proposed HDLs.</p> <p>5 applicants who submitted their applications between 1st and 19th September 2017 (inclusive) (based on tariff rate date) and who are significantly above the heat demand limits (i.e. 3 ASHP above 25,000 kWh, 2 GSHP above 35,000 kWh). This group was selected in order to specifically explore the impact of the confirmed introduction of the heat demand limits on applicants for heat pumps significantly above the HDL.</p>
Filters	<p>Email and tel number present in the database</p> <p>Application status – approved</p> <p>Haven't opted out from further contact via the quant survey or only partially completed the quant survey</p>

- 3.16 It proved challenging to recruit domestic applicants, particularly from the smaller number of GSHP applicants, and this led to the achieved sample being slightly different to the criteria above. The March sample included 4 ASHP applicants and 1 GSHP applicant.

Applicants for non-domestic medium-scale biomass

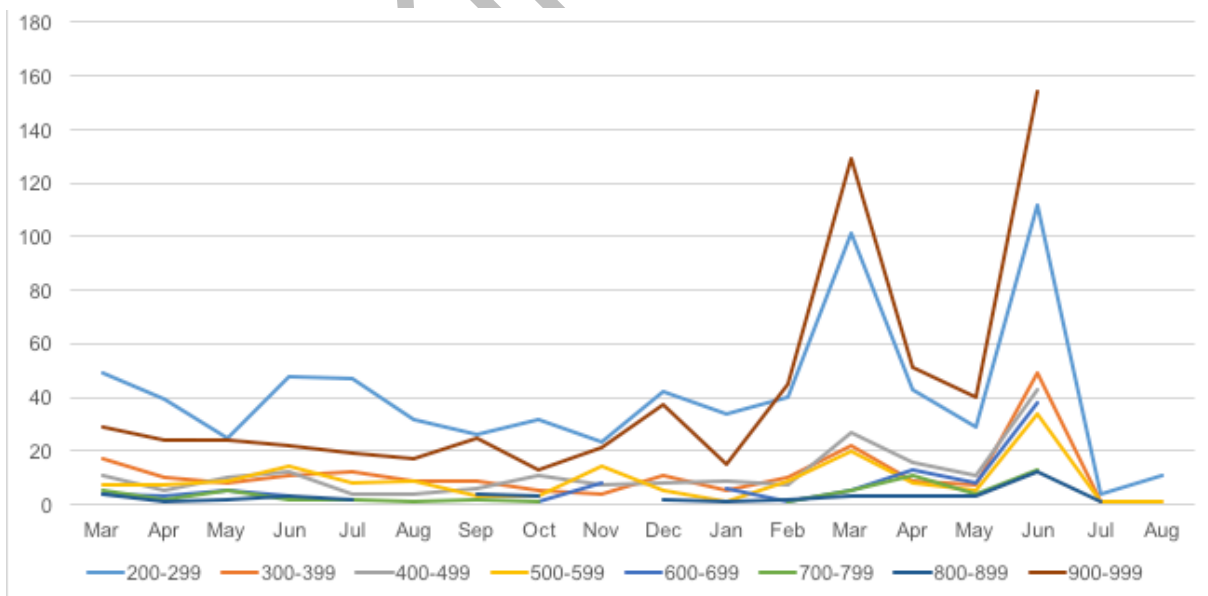
- 3.17 There were clear spikes in the number of applications during the interim period - in March and June 2017 (see Figure 4, below). These spikes involved all heat uses (space, water and process). The applicant sample therefore focused on applicants from within the two spikes and included applications across all three heat uses. Since there was no particular theory regarding whether the two spikes had materially different drivers, the sample was drawn at random from the two spikes as a whole.

Figure 4: Number of non-domestic medium-scale biomass applications per month, Mar16-Aug17



3.18 Analysis by installation capacity reveals that installations at the lower (200-299 kW) and higher (900-999 kW) ends of the medium tariff band were the principal drivers of both spikes (see Figure 5). The sample therefore focused on applications at these two extremes of the band boundary.

Figure 5: Number of non-domestic medium-scale biomass applications per month by installation capacity (kWth), Mar16-Aug17



3.19 The percentage of applications from previous applicants (matching installation address) has increased steadily over time (see Figure 6). The rise is to be expected as the number of previous applicants rises over time. It doesn't follow the same pattern of spikes as the overall level of applications. However, the level of multiple applications for non-domestic medium-scale

biomass (over 30% in the June spike) was high and may be linked to mechanism 3, i.e. applicants may have been installing additional systems in order to access income opportunities that would not have been available after the reforms. The sample therefore include five multiple applicants to contribute to the testing of this theory.

Figure 6: Percentage of repeat applications (matching postal address) for non-domestic medium-scale biomass, Mar16-Jul17



3.20 The December 2016 reform announcements included general proposals to revise allowable heat uses (e.g. exclude drying of digestate and possibly other drying processes), to reduce perverse incentives for the use of renewable heat. It was not until September 2017 that specific proposals were made to narrow further the definition of eligible heat uses to exclude drying (potentially all drying), non-commercial swimming pools, aquaculture and non-domestic installations primarily serving a single domestic property. However, the general proposals in December 2016 may have impacted on some heat uses and contributed to the spikes.

3.21 Data analysis shows that the spikes in application for process heating are similar in scale to the spikes for other heat uses (space and water), and many applications incorporate multiple heat uses which makes such analysis harder to interpret. More detailed analysis by types of process heating is problematic because the detailed data on heat use in the RHI application database is free text. In order to explore whether the general proposals impacted on the level of applications, the free text data was utilised to include applications which made reference to including drying process uses and were not replacing a previous heating technology (those replacing an existing technology are thought to be more likely to have an eligible heat use).

3.22

Table 4: Sampling criteria for non-domestic medium-scale biomass applicants

Sample size	12
Sample frame	RHI application data
Sampling criteria	Purposive sampling with the following criteria:

	<ul style="list-style-type: none"> • 6 applicants for 200-299kW installations and 6 applicants for 900-999kW installations. Selected to explore the nature of the impact on the smaller and larger installations in the medium category • All applicants from either the March 2017 and June 2017 (based on accreditation date), to explore the reasons behind the spikes • Applicants across all three types of heat use, but using free text data to identify and include 4 applicants for drying uses which are not replacing existing systems, to explore the impact of the reform announcements regarding allowable heat uses. • 6 applicants who have made multiple applications for the same postal address, and 6 single applicants, to explore the drivers behind making multiple applications <p>Where numbers are low (e.g. multiple applications for water and space heating) these to be replaced by sample from the process use category when necessary.</p>
Filters	<p>Email and telephone number present in the application database</p> <p>Application status – approved</p>

3.23 Challenges in recruiting sample in accordance with the above criteria led to some differences between the desired sample and the achieved sample:

- The balance between larger and smaller installations was slightly different, with 7 larger (900-999kW) and 5 smaller (200-299kW). This was caused by seeking 6 multiple applicants in the sample, and there were a smaller number of multiple applicants at the smaller end of the medium band.
- The balance between single and multiple applicants was slightly different, with 7 single and 5 multiple applicants. This change was made in response to the challenge of meeting the other sampling criteria with a smaller number of multiple applicants.
- More installations than anticipated were found to incorporate some form of process use, so the sample ended up including 5 installations with a process use. These uses included:
 - Log drying
 - Recycled wood drying
 - Pellet production
 - Drying of multiple biomass products
 - Drying of poultry litter

Installers of medium-scale biomass technologies and domestic heat pumps

3.24 The installer sample was primarily generated by securing installer contact details from RHI applicants. It was felt that this would develop more of a 'case study' approach by allowing comparison of evidence provided by the applicant and installer of the same installation. The sample was supplemented through sampling domestic heat pump installers from the MCS register. There is no equivalent database of non-domestic installers so these were gathered through taking suggestions from:

- The Wood Heat Association (WHA); and
- Ricardo-AEA (technical advisers on the evaluation).

3.25 The theory included reference to the possibility of new installers entering the GB market to capitalise on the pre-reform market opportunities. The MCS register includes the date of registration, which allowed the identification of newly-registered installers of domestic heat pumps. For non-domestic medium biomass installers, identifying new installers was more

difficult. We sought to identify biomass installers who were newly registered with the MCS and checked their websites to see whether they also installed larger, non-domestic systems.

3.26 Whilst this generated a sample which included some companies who were newly-registered with the MCS, the research subsequently revealed that none of the companies were actually new to the market. They had either previously been registered with the MCS under a different name or had been operating in the market for some time but had only recently registered with the MCS.

3.27 sample for their views on the activities of others in the market.

3.28 Table 5 provides details of the installers included in the sample. As can be seen in the table, some of the biomass installers also installed heat pumps and some carried out domestic and non-domestic installations.

Table 5: Installer sample

Participant ID (installer)	No. of MCS registered domestic installations	Source of contact	Install biomass (Y/N)	Install GSHP (Y/N)	Install ASHP (Y/N)	Domestic, Non domestic or both
INST-BIO-1	N/A	Applicant interview	Yes	No	No	Non-domestic
INST-BIO-2	1	MCS	Yes	No	No	Both
INST-BIO-3	2	WHA	Yes	Yes	No	Non-domestic
INST-BIO-4	N/A	WHA	Yes	No	No	Non-domestic
INST-BIO-5	1	MCS	Yes	Yes	Yes	Both
INST-BIO-6	N/A	WHA	Yes	No	No	Non-domestic
INST-HP-1	40	Applicant interview	No	Yes	Yes	Both
INST-HP-2	18	MCS	No	Yes	Yes	Both
INST-HP-3	284	MCS	No	Yes	No	Both
INST-HP-4	12	MCS	No	No	Yes	Domestic
INST-HP-5	10	Applicant interview	No	Yes	Yes	Domestic

Recruitment

3.29 CAG Consultants developed a recruitment process, agreed with BEIS. Recruitment involved the following stages:

- Selection of initial sample to be contacted (as per the process described above).
- Recruitment log developed to track communications to and responses from selected participants.
- Invitation email sent to applicants and installers in the sample. The email outlined details about the study and what their involvement in it would entail. It is also included a briefing note

which provided information about consent terms, topics to be covered and interview practicalities.

- Follow-up telephone call after two working days of initial email, using agreed telephone script.
- Selected participants could opt-out at any time. No contact after opt-out.
- Maximum of four attempts at contact (two emails and two telephone calls – where voice messages are left this will count as one contact) with each potential participant. We did not attempt more than one contact per day per participant.
- New sample to be identified and contacted for each opt-out. Process to be followed as above.

3.30 The recruitment materials can be read in full in Appendix C.

Data collection

3.31 The research involved undertaking semi-structured in-depth telephone interviews, conducted between December 2017 and February 2018. Interview length was approximately 45 minutes per interview.

3.32 Topic guides were developed for each participant type (domestic heat pump applicants, non-domestic biomass applicants, domestic heat pump installers and non-domestic biomass installers). The topic guides were focused on the two theories being tested (the demand theory and the interim applicant theory).

3.33 Interviewers attended briefing sessions on the policy and technical background to the research, as well as the use of the topic guides. Interviewers were encouraged to use the guides to explicitly test different propositions within the theory to test whether they applied, using the topic guide flexibly to achieve this outcome.

3.34 In advance of the interview, Interviewers were provided with basic information about the applicant from the administrative data. This enabled the interviewer to have an informed conversation with the applicant and reduce time collecting information the applicant had already provided elsewhere.

3.35 The main topics covered in the applicant interviews were:

- Introductions and consents
- Participant background
- Reasoning and contexts behind the following decisions:
 - to install a new heating system;
 - to install a heat pump or biomass system in particular; and
 - the timing of the installation
- Role of the RHI subsidy in influencing the decision to install a heat pump or biomass system
- Role of the RHI reform announcements and their delayed implementation in influencing the nature or timing of the applicant's application or installation
- Installer details
- Final reflections
- Thank you and close

3.36 The main topics covered in the installer interviews were:

- Introductions and consents
- Business background and customer offer

- The role of the RHI reform announcements in influencing the installer's business activities to install a new heating system
- Installer insights into how applicants were affected by the reform announcements and subsequent delays
- Views on the future of the market
- Final reflections
- Thank you and close

3.37 The topic guides are attached separately in Appendix D.

3.38 Interviews were recorded for research and quality assurance purposes and transcribed.

Analysis

3.39 The analysis employed both Computer Assisted Qualitative Data Software Analysis (CAQDAS) and Excel spreadsheets. CAQDAS was used to code interview transcripts⁷ and other data sources, including application data and survey evidence. The coded material was then exported to Excel. A framework was created within Excel to further code and analyse the evidence against contexts, mechanisms and outcomes (C-M-Os) and the two theories being tested. Data not covered in the theories was also analysed and captured in this framework.

3.40 We analysed the extent of support for different CMOs in the framework and the potential for refining existing, or developing new, CMOs (see Table 6 for an explanation of CMOs). The coding and analysis was undertaken by two researchers and was quality checked for consistency by another research team member not directly involved in the coding and analysis process.

Table 6 CMO glossary

CMOs	Context-Mechanism-Outcome configurations. These are realist hypotheses about how the policy is expected to work, which are tested during the evaluation. See 'realist evaluation'
Context	The circumstances which affect whether a policy 'works' and for whom. Consideration of 'context' forms an important part of realist approaches to evaluation.
Mechanism	A change in people's reasoning, brought about through the resources provided by a policy, which leads to a policy outcome. Identification of causal 'mechanisms', which operate in particular 'contexts', forms an important part of realist approaches to evaluation.
Outcome	A change in the state of the world, brought about as a result of a policy or other influences. Realist approaches to evaluation attempt to identify the 'contexts' and 'mechanisms' that lead to a particular 'outcome'.
Realist evaluation	A realist approach ⁸ to evaluation emphasises the importance of understanding not only whether a policy contributes to outcomes (which may be intended or

⁷ Coding involved a process of indexing, sorting and categorising interview transcript data, by case and by theme, so that it could then be analysed.

⁸ Pawson and Tilley (1997), Pawson (2006)

	unintended) but how, for whom and in what circumstances it contributes to these outcomes.
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Limitations

- 3.41 The research involved a relatively small sample of applicants and installers. The sample was not sufficiently diverse to get an in-depth understanding of the whole of the theory, i.e. the theory was not comprehensively tested. For example, for a number of the CMO configurations not found in our sample at all, but we do not have sufficient evidence from this round of research to discount them. In the findings sections, we have highlighted where we have less confidence in the theory and where there are gaps in the evidence.
- 3.42 In future rounds of qualitative research, it will be important to apply this learning, in order to ensure that sample size aligns with the scope and complexity of the theory being tested. It is also important to note however, that our understanding of the demand theory can be built on throughout the course of the evaluation.
- 3.43 As noted in paragraphs 2.10 to 2.28, various challenges were encountered in developing the sample and recruiting interviewees. This led to some distinctions between sampling criteria and the achieved sample. A particular gap in the sample was in relation to installers who entered the British market during the interim period. No reliable sample frame was secured for this group, and this impacted on our ability to explore some aspects of the theory relating to installers.
- 3.44 More generally, there is likely to have been a degree of self-selection bias in the sample. Due to low response rates for non-domestic biomass applicants, invitations had to be sent out to relatively large numbers of potential interviewees in order to meet the sampling criteria. This may have introduced some bias to the sample.
- 3.45 Finally, some applicants were being interviewed 12 months after their installation had taken place and some of the interview questions were about decisions and actions which had taken place much earlier than the installation. In a small number of cases, this impacted on the applicant's ability to recall some of the details being requested in the interviews. Similarly, in the installer interviews, some confusion was apparent regarding the timing and nature of the reforms and their relationship to tariff degressions. It should be noted however, that this was not simply an issue of recall but also reflected a lack of understanding on the part of some installers of the reform timelines and the distinctions between the reforms and the degressions.

4 Influence of the RHI on renewable heating system decisions

- 4.1 This chapter describes the fieldwork findings in relation to the influence of the RHI in general on domestic heat pump and non-domestic biomass applicants. In particular, this chapter explores:
- Factors (or 'triggers') influencing applicants' decision to install a new heating system.
 - Factors influencing applicants' decision about which heating system to install.
 - The influence of the RHI on the decision to install a new heating system (i.e. the *demand theory*).
 - The influence of the RHI on the timing or size of applicants' renewable heating system installations.
- 4.2 The findings draw on depth interviews with ten domestic heat pump applicants and ten non-domestic biomass applicants, as well as applicant and survey data from these applicants.

The renewable heating system decision journey

- 4.3 This chapter explores the factors that influenced applicants' decisions about the installation of a new heating system, and the subsequent reasoning of applicants.
- 4.4 As Figure 7 highlights, there are four main decision points explored in this chapter. These stages aren't necessarily sequential; an applicant could, for example, make each decision together or at different times.
- 4.5 The RHI in general, as well as the reform announcements explored in the chapter 4, could potentially have been an influencing factor for any of these decisions. Indeed, a core aim of the fieldwork was to understand this dimension of RHI influence.

Figure 7 Renewable heating system decision points



- 4.6 The sections below explore the types of circumstances that influenced applicant decisions at each of these stages.

Factors influencing decision to install new heating system

Domestic heat pump applicants

- 4.7 Factors that triggered domestic heat pump applicants' decision to install a heating system fell into six main categories:

- **Heating system led factors.** Decisions to install a new heating system were triggered in cases where participants felt that their existing heating system was ineffective or not meeting their needs. For example, participants who cited this as an important factor behind their decision to install a new heating system felt their existing systems were old, inefficient, expensive to run, difficult to maintain, or a combination of these.

We inherited a legacy boiler; a very inefficient, old boiler, and we were going through oil at a fairly phenomenal rate, especially in winter. All told, it was noisy. It was over 20 years old, and not very efficient.

Domestic heat pump applicant

- **Property led factors.** Major renovation works or self-build projects influenced or triggered decisions to install a new heating system. These extensive works required a new heating system as part of a wider set of works being undertaken.
- **Financial factors.** The desire to save money was an influence on the decision to install a new heating system. One participant, for example, reported that they were encouraged to install an air source heat pump because they thought that a combination of the RHI subsidy and lower running costs would save them money compared with their existing gas boiler.
- **Environmental considerations.** The desire to be more environmentally responsible was an influence on decisions to install new a heating system.
- **Behavioural factors.** Changes to energy use within the property were an influence on participants' decision to install a new heating system. One participant, for instance, said that their father had recently moved into their home, which had substantially increased their heat usage. This, combined with dissatisfaction with their existing heating system led them to wanting to install a new heating system.
- **Marketing influences.** Approaches from heat pump sales people also influenced decisions to install a new heating system. These approaches were influential in combination with other triggers, such as financial ones.

Well, someone came around after we'd had solar panels. He started to talk about this and I didn't quite understand it, to be honest, so I got my son-in-law to listen in, because he's more technically-minded than me. It turned out that it was going to be for free because we get a rebate from Ofgem, or something, and also that it wouldn't cost us as much in gas because it was going to be run off electric, and we've got solar panels anyhow. So I thought, "Oh, it sounds like a good idea."

Domestic heat pump applicant

4.8 The need for a new heating system could be been triggered by one or more of the factors described above.

Non-domestic medium-scale biomass applicants

4.9 install a new heating system included:

- **Commercially led factors.** Examples of commercial triggers were:
 - To capitalise on a business opportunity, such as drying fuel or extending the growing season for indoor crops;
 - To accommodate business expansion, such as new premises with a heating requirement; and
 - To reduce heating costs;

- **Property led factors**, related to works on a property (such as a refurbishment);
 - **Heating system led factors**, related to the need to replace an existing heating system. Note that we did not observe cases in which the need to replace an existing heating system was cited as the sole principal trigger. Where this was a trigger, it also aligned with a commercial trigger.
- 4.10 A combination of more than one of these could also have led to the decision to install a new heating system.
- 4.11 The factors influencing domestic heat pump applicants' decision about which heating technology to install are set out in Table 7, over the page. The table presents factors that contributed to applicants' decisions to install a heat pump of any type, as well as factors that influenced their decision to install either a ground source or air source heat pump in particular.
- 4.12 For non-domestic biomass applicants, the interviews generally revealed that a less complex set of factors influenced the decision to install a biomass boiler. The factors that influenced this decision are therefore integrated with the section on the influence of the RHI to install a biomass system.

WORKING PAPER

Table 7 Factors influencing domestic RHI applicants' decisions about which heating technology to install

Category	Heat pump (either)	Air source heat pump	Ground source heat pump
Financial	<p><i>Financial motives.</i> Financial considerations were a key driver</p> <p><i>RHI subsidy.</i> Considered the RHI subsidy as a key part of their financial considerations about which technology to install</p> <p><i>RHI subsidy.</i> Attracted by the RHI subsidy for heat pumps</p> <p><i>Running costs.</i> Concerned about running costs of alternative solutions (e.g. oil, biomass)</p> <p><i>Capital costs.</i> Concerned about capital costs of alternative solutions (e.g. oil, biomass, linking to mains gas)</p> <p><i>Experience of Feed-in-Tariffs (FiTs).</i> Experience of FiTs made them more receptive to / enthusiastic about RHI subsidy</p>	<p><i>Running costs.</i> Thought an air source heat pump would be cheaper (or no more expensive) to run than alternatives</p> <p><i>Capital costs.</i> Concerned about capital costs of a ground source heat pump</p>	<p><i>Running costs.</i> Thought running costs would be no more expensive than alternatives</p>
Property	<p><i>Property design.</i> Wanted a system that was compatible with their particular property design/requirements</p>	<p><i>Space.</i> Did not have sufficient space to install a ground source heat pump</p> <p><i>Property design.</i> Wanted a system that worked well with underfloor heating</p>	<p><i>Space.</i> Had sufficient space to install a ground source heat pump</p>
Installation influences	<p><i>Ease of install.</i> Wanted an 'easy to install' system</p>	<p><i>Disruption.</i> Concerned about disruption involved in installing a ground source heat pump and/or thought an air source heat pump would involve less disruption to install than alternatives.</p>	<p><i>Fit with wider property works.</i> Refurbishment of property provided scope for disruption of installing GSHP</p>
Heating system performance		<p><i>Performance.</i> Thought their chosen RHT would perform better than alternatives</p>	<p><i>Performance.</i> Thought a ground source heat pump would perform better than alternatives</p> <p><i>Noise.</i> Concerns about noise of an air source heat pump</p>

Category	Heat pump (either)	Air source heat pump	Ground source heat pump
Human influences	<p><i>Expert advice.</i> Influenced by the advice received from 'expert' source (e.g. architect, installer)</p> <p><i>Peer advice.</i> Influenced by the advice received from friends, family or colleagues</p>		
RHT knowledge and experience	<p><i>Experience.</i> Had first-hand experience of seeing a heat pump in other properties</p> <p><i>Well-informed.</i> Had conducted their own research about the best solutions</p>		
Marketing influences	<p><i>Approached by sales person.</i> Approaches by heat pump sales people influenced their decision about technology choice or timing</p> <p><i>Persuaded by business case made by sales person.</i> Influenced by sales person that a heat pump was the right choice for them</p>		
Self-sufficiency	<p><i>Self-sufficiency values.</i> General desire to be more self-sufficient</p> <p><i>Fuel supply independence.</i> Wanted to avoid dependence on external fuel supplies (e.g. oil, biomass)</p> <p><i>Maximising solar PV.</i> Had solar PV panels and wanted to use these to power new heating system</p>		
Environmental	<p><i>Environmentally-motivated.</i> Motivated by environmental considerations and wanted an environmentally friendly heating system</p>		

Influence of RHI on decision to install a renewable heating technology

The candidate demand theory

- 4.13 The demand theory in the evaluation's theoretical framework seeks to explain the influence the RHI has on consumer decisions to install renewable heat technologies. In essence, it is an 'additionality' theory, in that it seeks to set out the circumstances in which consumers are influenced by the RHI in their decisions about whether to install a renewable heat technology.
- 4.14 For RHI applicants, the demand theory centres around four CMO sets, or propositions. As the fieldwork only focused on RHI applicants (rather than non-applicants), in all cases, the outcome for these CMOs was that the participant installed a heat pump or biomass boiler. It was the mechanisms in these four CMOs that were a particular focus of this research. The mechanisms that were tested for each applicant were:
1. The RHI subsidy made it worthwhile for them to invest in a renewable heating system (i.e. the RHI was the main reason they installed a renewable heating system).
 2. They invested in a renewable heating system primarily for one or more other reasons, and the RHI subsidy was a bonus (i.e. they would have gone ahead with the installation anyway).
 3. They invested in a renewable heating system for a mixture of reasons, but the subsidy helped them to go ahead (i.e. the RHI provided the applicant with a nudge but there were also other reasons they went ahead).
 4. They would have invested in a renewable heating system anyway but the details of RHI subsidy and rules influenced their choice of technology, scale or timing (i.e. the RHI did not influence the applicant's decision to install a renewable heating technology, but it did influence the nature of the installation).
- 4.15 The full candidate theory is set out in full in Appendix A.
- 4.16 For this research, these mechanisms / propositions were adapted slightly so that they were more straightforward for interviewees to understand when referred to during interviews. Furthermore, an additional mechanism (see 5) was added, after the research team hypothesised that in some cases choices about systems or RHI applications may have been made by a third party on behalf of an applicant.
1. You wouldn't have gone ahead with a renewable heat installation without the RHI subsidy.
 2. You were interested in installing a renewable heat system anyway, for other reasons, and the RHI did not affect any aspect of your decision (such as choice of technology or timing) - the subsidy was just a bonus.
 3. You invested in a renewable heating system for a mixture of reasons, including the
 4. You would have invested in a renewable heating system anyway but your choice of technology/timing were influenced by RHI rules or subsidy.
 5. You are not sure, because the choice of a renewable heat system and/or the application for RHI were made by another organisation (e.g. an adviser).
- 4.17 One of the main aims of this research was to test these propositions with those interviewed in order to understand the factors that resulted in the RHI being influential or not in their decision-making.

- 4.18 This section explores the findings in relation to the demand theory. In other words, it explores the influence of the RHI on applicants' decisions to install a heat pump or biomass system.
- 4.19 In doing so it explores both the mechanisms⁹ observed in relation to the theory, as well as the contexts that contributed to these mechanisms occurring. In all cases, the 'outcome' was the same: the participant installed a renewable heat technology (heat pump or a biomass boiler) through the RHI.

Domestic heat pump applicants

- 4.20 In the interviews with domestic heat pump applicants, the first four candidate mechanisms were observed. No cases were observed in which the choice about a renewable heat system, or the application for the RHI, were made by a third party (i.e. mechanism 5 was not observed).
- 4.21 Table 8 Influence of RHI on decision to install a heat pump – contexts and mechanisms observed sets out the contexts in which contributed to each mechanism occurring.

⁹ In realist philosophy, mechanisms are causal forces or powers (Wong, Westthorp, Pawson and Greenhalgh, 2013). Westthorp (2014) defines them as "*the interaction between what the programme provides and the reasoning of its intended target population that causes the outcomes*". The short-hand for this in realist circles is 'reasoning and resources'. The implication is that the evaluator needs to identify what resources, opportunities or constraints were in fact provided, and to whom; and what 'reasoning' was prompted in response, generating what changes in behaviour, which in turn generate what outcomes."

Table 8 Influence of RHI on decision to install a heat pump – contexts and mechanisms observed

CMO	Primary factors influencing decision to install a heat pump <i>All of these applied in every case</i>	Secondary factors influencing decision to install a heat pump <i>One or more of these may have applied in each case</i>	Mechanisms
<p>1 “RHI drove my decision”</p>	<p><i>Financial motives.</i></p> <ul style="list-style-type: none"> Financial considerations were a key driver <p><i>RHI subsidy.</i></p> <ul style="list-style-type: none"> The RHI subsidy formed a key part of an applicant’s financial considerations about whether to install a heat pump 	<p><i>Financial</i></p> <ul style="list-style-type: none"> Thought their chosen RHT would be no more expensive to run than alternatives Concerns about capital costs of alternative solutions Experience of FITs <p><i>Heating system performance</i></p> <ul style="list-style-type: none"> Thought their chosen RHT would perform better than alternatives <p><i>Property</i></p> <ul style="list-style-type: none"> Wanted an RHT compatible with property design/requirements On or off the gas grid <p><i>Marketing influences</i></p> <ul style="list-style-type: none"> Approached by sales company/installer Persuaded by sales person/installer of benefits of RHT <p><i>Human influences</i></p> <ul style="list-style-type: none"> Influenced by the advice received from ‘expert’ source (e.g. architect, installer) <p><i>Self-sufficiency</i></p> <ul style="list-style-type: none"> Wanted to be more self-sufficient Wanted to avoid dependence on external supplies Wanted to use solar PV to power new heating system <p><i>Environmental</i></p> <ul style="list-style-type: none"> Motivated by environmental considerations and wanted an environmentally friendly heating system 	<p>I wouldn’t have gone ahead with a heat pump installation without the RHI subsidy</p>

<p>2 “RHI was just a bonus”</p>	<p><i>Wanted ‘best’ heating system, regardless of the RHI</i></p> <p>Applicant wanted ‘the most efficient, cost-effective heating system for their property type’</p> <p>(Mixture of contexts but the RHI subsidy was not one of them)</p>	<p><i>Financial</i></p> <ul style="list-style-type: none"> Concerned about running costs of alternative solutions (e.g. oil, biomass) Concerned about capital costs of alternative solutions (e.g. oil, biomass, linking to mains gas) Thought their chosen RHT would be no more expensive to run than alternatives <p><i>Heating system performance</i></p> <ul style="list-style-type: none"> Thought their chosen RHT would perform better than alternatives <p><i>Property</i></p> <ul style="list-style-type: none"> Wanted an RHT compatible with property design/requirements Off the gas grid <p><i>Human influences</i></p> <ul style="list-style-type: none"> Influenced by the advice received from ‘expert’ source (e.g. architect, installer) <p><i>Self-sufficiency</i></p> <ul style="list-style-type: none"> Wanted to avoid dependence on external supplies 	<p>I was interested in installing a heat pump anyway, for other reasons, and the RHI did not affect any aspect of my decision - the RHI subsidy was just a bonus</p>
<p>3 “RHI contributed to my decision”</p>	<p><i>Financial motives</i></p> <ul style="list-style-type: none"> Financial considerations were a key driver <p><i>RHI subsidy</i></p> <ul style="list-style-type: none"> The RHI subsidy formed a key part of an applicant’s financial considerations about whether to install a heat pump <p><i>Plus one or both of:</i></p> <p><i>Environmental</i></p> <ul style="list-style-type: none"> Motivated by environmental considerations and wanted an 	<p><i>Financial</i></p> <ul style="list-style-type: none"> Concerns about capital costs of alternative solutions <p><i>Property</i></p> <ul style="list-style-type: none"> Wanted an RHT compatible with property design/requirements Off the gas grid <p><i>Installation</i></p> <ul style="list-style-type: none"> Thought an air source heat pump would involve less disruption to install than alternatives. <p><i>RHT knowledge and experience</i></p> <ul style="list-style-type: none"> Had conducted their own research about the best solutions. <p><i>Self-sufficiency</i></p>	<p>I invested in a heat pump for a mixture of reasons, including the availability of RHI subsidy.</p>

	<p>environmentally friendly heating system</p> <p><i>Human influences</i></p> <ul style="list-style-type: none"> Influenced by the advice received from 'expert' source (e.g. architect, installer) 	<ul style="list-style-type: none"> Wanted to be more self-sufficient 	
<p>4 “RHI influenced my technology or timing choices”</p>	<p><i>Marketing influences</i></p> <ul style="list-style-type: none"> Approached by sales company/installer <p><i>Financial</i></p> <ul style="list-style-type: none"> Experience of FiTs made them more receptive to/enthusiastic about RHI subsidy <p><i>Environmental</i></p> <ul style="list-style-type: none"> Motivated by environmental considerations and wanted an environmentally friendly heating system 	<p><i>Financial</i></p> <ul style="list-style-type: none"> Thought their chosen RHT would be cheaper to run than alternatives Attracted by the RHI subsidy for heat pumps <p><i>Property</i></p> <ul style="list-style-type: none"> Off the gas grid <p><i>Human influences</i></p> <ul style="list-style-type: none"> Influenced by the advice received from friends, family or colleagues <p><i>Marketing influences</i></p> <ul style="list-style-type: none"> Approached by sales company/installer Persuaded by sales person/installer of benefits of RHT <p><i>RHT knowledge and experience</i></p> <ul style="list-style-type: none"> Had first-hand experience of seeing a heat pump in other properties <p><i>Self-sufficiency</i></p> <ul style="list-style-type: none"> Wanted to use solar PV to power new heating system 	<p>I would have invested in a renewable heating system anyway (possibly not a heat pump) but my choice of technology/timing were influenced by RHI rules or subsidy</p>

CMO1 “RHI drove my decision”

4.22 In the first observed mechanism (see CMO 1), applicants reasoned that they would not have gone ahead with a heat pump without the RHI subsidy.

4.23 The interview findings suggested there were two critical contexts in these cases:

- Financial considerations were a key driver for the applicant.
- The RHI subsidy formed a key part of these considerations.

With it costing twice as much upfront, in reality with it costing twice as much, I'm not sure that I would have [installed a heat pump], no.

Domestic heat pump applicant

4.24 As Table 8 highlights, one or more of a range of other factors may also have been secondary influences on the decision to go ahead with a heat pump installation. For example, environmental, self-sufficiency or property-related factors may have also been factors that influenced an applicant's decision, even though the RHI and wider financial considerations were the primary influencing factors.

4.25 This was the only CMO group that included applicants who were on the gas grid. This indicates that the RHI subsidy itself was a key factor in persuading households who have the option for gas heating to choose a renewable technology instead. This is potentially because the RHI helped to make renewable heating options financially attractive compared to gas, something that would not have been the case to these applicants without the RHI subsidy. Whereas for applicants falling into other CMO groupings, who were off the gas grid, gas was not an option, and alternatives to renewables were not as financially attractive as gas, meaning that these applicants were less likely to choose a non-renewable alternative on cost alone.

We had a strong motivation to think about renewables, but frankly (£42,000) was pretty eye-watering, so had it not been for the assistance of the [RHI], not necessarily at the current level but certainly at a meaningful level, I think we'd have found it pretty hard to justify the capital to do that. I think probably what we'd have done is gone ahead with our investment in significant insulation to the property and maintained our gas boiler and seen what that did for our bills, and kept an eye on the price of technology.

Domestic heat pump applicant

CMO2 “RHI was just a bonus”

4.26 In the second mechanism (CMO 2), applicants would have gone ahead with the installation of a heat pump anyway and the RHI was considered a 'bonus'.

I was going to install it anyway so for me, the RHI is just a nice bonus really.

Domestic heat pump applicant

4.27 This mechanism was observed in one case in the interviews. In this instance, the key influencing factors were the applicant's desire to install the 'best' system for their property. Their considerations included the capital and running costs of the system, its performance, its fit with their property design (this was a self-build) and advice from their architect about which system to install. This finding is supported by installer evidence, in which an installer said that for self-builders and those undertaking major refurbishment works, the RHI is not a key influencing factor.

CMO3 “RHI contributed to my decision”

- 4.28 In the third mechanism (CMO 3), applicants invested in a heat pump for a mixture of reasons, with the RHI subsidy being one of a mixture of deciding factors.

And effectively, I saw it as a way of gaining back some of the capital, because it's a significant capital outlay for a heating system. And when I spoke to friends or colleagues, they couldn't believe how much a boiler would cost because it's obviously so much more than just installing a combi boiler. So the fact you can get some support with that was quite helpful, is very helpful

Domestic heat pump applicant

- 4.29 In these instances the RHI subsidy and financial considerations were primary influencing factors but there was also at least one other key driver, such as environmental or self-sufficiency motivations. In other words, without the RHI subsidy, these applicants would have been less likely to go ahead with a renewable heat installation, but may have gone ahead anyway for other reasons (such as environmental motives).

CMO4 “RHI influenced my technology or timing choices”

- 4.30 In the fourth mechanism (CMO 4), the applicants reasoned that they would have invested in a renewable heating system anyway but their choice of technology, or the timing of their installation, was influenced by the RHI rules or subsidy.

- 4.31 In one case, for example, the existence of the RHI subsidy influenced the timing of their installation. They had planned to install a heat pump at some future point for environmental reasons. However, a ‘cold call’ from an installer, combined with general uncertainty about how long the RHI subsidy would exist (influenced by their experiences of FiTs changing at short notice) meant that they decided to go ahead with their installation earlier than they otherwise would have.

Partly it was the pressure, I think, from the company. I think it was a bit of a sales pitch that both my wife and I, at the time, might have got taken by. That's my only personal thinking, if I'm honest ... Also, the timing of how long that incentive might last because we were a bit late on the solar panel thing.

Domestic heat pump applicant

- 4.32 As highlighted earlier, marketing approaches from installers or third party sales organisations were important influencing factors in triggering some applicants' decision to install a heat pump. Without these initial approaches, installations may not have gone ahead, or would have gone ahead but at a later point.

Non-domestic biomass applicants

- 4.33 influenced their decision in some way. Candidate mechanisms 2, 4 and 5 were not observed, i.e. no applicants reported that the RHI did not affect any aspect of their decision (mechanism 2), and no applicants were unsure of the influence of the RHI because the decision was made by another organisation (mechanism 4).
- 4.34 It is worth noting that a caveat was raised during the interviews with regard to mechanism 1. It was questioned whether the presence of the RHI had led to the costs of boilers or installations

being artificially inflated. The suggestion was that, if the RHI were not present, their installation may not have been so dependent on it as the costs may have been lower.

Would the biomass boilers cost so much if it wasn't for the RHI? I was looking at pellet boilers, different types of pellet boilers. I noticed the ones that work on air only and don't heat water, and therefore can't claim RHI, were an awful lot cheaper. I'm just surmising that the RHI is affecting the boiler price a bit.

Non-domestic biomass applicant

4.35

observed. Outcomes are not listed since in each case the outcome was the installation of a biomass heating system. The factors were far less complex than in the case of domestic heat pump applicants so two separate columns for primary and secondary factors was not necessary. The equivalent of the primary factors are those shown in bold, i.e. the contexts that were found in all cases in the particular CMO are shown in bold.

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Table 9: Influence of RHI on decision to install biomass – contexts and mechanisms observed

CMO	Key contexts <i>Primary factors highlighted in bod</i>	Mechanisms	Notes
1a “RHI drove my decision” (commercial operation)	<p>Applicant was a commercial operation</p> <p>RHI was fundamental to the business case for the installation¹</p> <p>Had sufficient space to accommodate the installation - boilers, fuel storage</p> <p>Commercial factors motivated the decision to install, e.g.:</p> <ul style="list-style-type: none"> • The installation was related to a specific business opportunity² • There were perceived marketing benefits from having a biomass installation³ <p>Applicant had confidence in the biomass fuel supply⁴</p> <p>Alternatives to biomass were perceived to be limited⁵</p> <p>Previous heating system was in need of replacement</p> <p>Positive impression of biomass gained from experience of others (e.g. peers/friends)</p>	<p>I wouldn't have gone ahead with a biomass installation without the RHI subsidy</p>	<p>¹RHI being seen to be fundamental to the business case appears to have been a critical context but this does not necessarily imply that the business case is marginal, but that the scale of returns is critical to the applicant.</p> <p>²The business opportunity may have been related to the RHI, e.g. fuel drying, but this was not necessary</p> <p>³This was on a spectrum, from those who welcomed it as a co-benefit to those for whom it was a significant driver.</p> <p>⁴This could be that the applicant has their own fuel supply, has the ability to produce it in the longer term (through starting a plantation) or had confidence in the local supply chain.</p> <p>⁵This could simply be a function of the site being off-gas or due to other constraints, e.g. CHP prevented by lack of grid connection; insufficient land for GSHP; concern about electricity costs associated with GSHP.</p>
1b “RHI drove my decision” (non-commercial operation)	<p>Applicant was not a commercial operation</p> <p>Previous heating system was in need of replacement</p> <p>Had sufficient space to accommodate the installation - boilers, fuel storage</p> <p>RHI was fundamental to the business case for the installation⁶</p> <p>Wider strategic drivers (e.g. carbon) were additional motivations for the installation</p>	<p>I wouldn't have gone ahead with a biomass installation without the RHI subsidy</p>	<p>⁶In this CMO, the RHI is fundamental to the business case in the sense that the business case is marginal and is sensitive to even minor reductions in the tariffs.</p> <p>The research generated limited evidence in relation to this CMO so the key contexts are less clear.</p>
3 “RHI contributed	<p>RHI made biomass more financially attractive</p> <p>Applicant had a need for new heating system</p>	<p>I invested in a biomass boiler for a mixture of reasons,</p>	<p>²The business opportunity may have been related to the RHI, e.g. fuel drying, but this was not necessary.</p>

<p>to my decision”</p>	<p>Had sufficient space to accommodate the installation - boilers, fuel storage</p> <p>Alternatives to biomass were perceived to be limited⁵</p> <p>Positive impression of biomass gained from experience of others (e.g. peers/friends)</p> <p>There were perceived marketing benefits from having a biomass installation³</p> <p>Applicant had confidence in the biomass fuel supply⁴</p> <p>Personal motivations were a factor in the installation, e.g.:</p> <ul style="list-style-type: none"> • Environmental concern • Desire for self-sufficiency⁷ <p>The installation was related to a specific business opportunity²</p>	<p>including the availability of RHI subsidy.</p>	<p>⁵This could simply be a function of the site being off-gas or due to other constraints, e.g. CHP prevented by lack of grid connection; insufficient land for GSHP; concern about electricity costs associated with GSHP.</p> <p>⁷Where an applicant had their own fuel supply, a desire to be self-sufficient in their heating could be a factor</p>
<p>4 “RHI influenced my technology or timing choices”</p>	<p>Had sufficient space to accommodate the installation - boilers, fuel storage</p> <p>RHI was fundamental to the business case for the installation</p> <p>The installation was related to a specific business opportunity²</p> <p>Applicant had confidence in the biomass fuel supply</p> <p>Alternatives to biomass were perceived to be limited⁵</p>	<p>I would have invested in a renewable heating system anyway (possibly not a biomass boiler) but my choice of technology/timing were influenced by RHI rules or subsidy</p>	<p>²The business opportunity may have been related to the RHI, e.g. fuel drying, but this was not necessary</p> <p>⁵This could simply be a function of the site being off-gas or due to other constraints, e.g. CHP prevented by lack of grid connection; insufficient land for GSHP; concern about electricity costs associated with GSHP.</p> <p>The research generated limited evidence in relation to this CMO so the key contexts are less clear.</p>

CMO1a and CMO1b “RHI drove my decision”

- 4.36 In the first two CMOs, the mechanism was the same: the biomass installation would not have gone ahead without the RHI subsidy. However, there was a distinction between a commercial setting (CMO 1a) and a non-commercial setting (CMO 1b). In a non-commercial setting, wider strategic drivers (e.g. carbon reduction) may have resulted in biomass being selected even where more alternatives were available. For example, CMO 1b could apply in an on-gas location.

energy targets, it ticked lots of boxes.

Non-domestic biomass applicant

- 4.37 In contrast, in CMO 1a the alternatives were perceived to be limited or sub-optimal in some way, e.g. through providing lower grade heat than the biomass alternative.

I think probably if the RHI hadn't been there we might have just kept struggling along with electric and LPG

Non-domestic biomass applicant

CMO3 “RHI contributed to my decision”

- 4.38 Many of the contexts in CMO 3 were similar to those observed in CMO 1 but the key distinction was that the need for a new heating system anyway was a primary driver, i.e. it wasn't necessarily related to a specific business opportunity. Since investment in a new heating system was required anyway, this meant that RHI was less significant in the business case, even though it did make the biomass option more financially attractive.

No, it would have been less so [financially attractive in the absence of RHI]. The numbers, I've outlined to you suggest it's not massively financially- We're at early days, so I don't quite know how it's going to work out. I would say it's marginally financially attractive with the RHI, and I think without it, I think it would still have been more financially attractive than trying to heat all the properties with oil, for example.

Non-domestic biomass applicant

CMO4 “RHI influenced my technology or timing choices”

- 4.39 In the fourth CMO, as in CMO 1, the RHI was fundamental to the business case for the biomass option. However, unlike in CMO 1, a renewable heating system would have been pursued anyway. Examples of this CMO were limited, so the contexts which might trigger this mechanism were less clear than in the other CMOs.

Other observations

- 4.40 Physical context was critical in all of the CMOs. All needed sufficient space to accommodate the plant and fuel storage. Linked to this, the physical context may have constrained other options, e.g. insufficient space for the ground loops in a GHSP or the lack of a grid connection for a CHP or wind turbine may have constrained the renewable technology alternatives.
- 4.41 There were commercial contexts in which the RHI was fundamental to the business case for the installation, and therefore the installation would not have taken place in the absence of the RHI. Such contexts are likely to be sensitive to degressions and other tariff changes, assuming installation costs remain static. By contrast, there were commercial contexts in which a

replacement heating system was required anyway, where the RHI was a less significant factor in the biomass installation. Such contexts may be less sensitive to depressions and other tariff changes. The need for a replacement heating system anyway was identified as a key factor in distinguishing between the two but other factors are also likely to be significant and these would benefit from further investigation.

- 4.42 The impact of the RHI on installation costs was questioned by some applicants, i.e. it was suggested that the presence of RHI may have artificially inflated installation costs. This impacted on some of the reasoning articulated by applicants, e.g. it led to a questioning of the from further investigation.

Influence of RHI on installation size

- 4.43 The following mechanisms from the candidate theory were tested in relation to the influence of the RHI on the sizing of the new biomass heating system:

1. You were able to expand your activities, and increase your heat demand, because of RHI benefits.
2. Your heat demand, and the scale of your heating system, would have been the same scale, irrespective of the RHI subsidy.
3. The sizing of the heating system was determined by another organisation (e.g. an adviser), and you're not sure why it was chosen.

- 4.44 Following our analysis, we revised the first of these mechanisms and added a further two that were observed in the interviews:

1. Having made the decision to install a renewable heating technology, the nature of RHI benefits enabled you to increase your heat demand.
2. Your heat demand, and the scale of your heating system, would have been the same scale, irrespective of the RHI subsidy.
3. The sizing of the heating system was determined by another organisation (e.g. an adviser), and you're not sure why it was chosen
4. The sizing of the heating system was determined by another organisation, but you believe that the scale of your heating system, would have been the same, irrespective of the RHI subsidy.
5. You installed multiple renewable heating technologies (e.g. biomass boilers) rather than a single one as a result of the nature of RHI benefits.

- 4.45 These revisions are explained in the sections below.

Domestic heat pump applicants

- 4.46 Table 10 shows the contexts, mechanisms and outcomes observed in the fieldwork in relation to the influence of the RHI on the size of the domestic heat pump installations.

Table 10 Influence of RHI on installation size of domestic heat pumps – contexts, mechanisms and outcomes observed

CMO	Key contexts	Mechanisms	Outcomes
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3 “Not sure why my system size was chosen”	<p><i>Third party led.</i> Applicant followed the advice of a third party / installation company about size of system</p> <p><i>Applicant knowledge.</i> Applicant had no or limited knowledge of the sizing needs for their heating system</p>	The sizing of the heating system was determined by another organisation (e.g. an adviser), and I’m not sure why it was chosen.	Heating system size may or may not have been unaffected by the RHI
4 “I do not think the RHI influenced the system size”	<p><i>Third party led.</i> Applicant followed the advice of a third party / installation company about size of system</p> <p><i>Applicant knowledge.</i> Applicant had (at least) some informed knowledge of the sizing needs for their heating system</p> <p><i>Technical constraints.</i> Site constraints restricted the size of the installation</p>	The sizing of the heating system was determined by another organisation, but I understand that the scale of my heating system, would have been the same, irrespective of the RHI subsidy.	Heating system size unaffected by the RHI

4.47 There were two mechanisms observed for domestic heat pump applicants in the interviews. For both, the interviews did not provide any evidence to suggest that domestic heat pump applicants’ decisions over system sizing was influenced by the RHI.

CMO3 “Not sure why my system size was chosen”

4.48 In the first observed mechanism (CMO 3), the size of the heating system was determined by a third party organisation and the applicant did not appear to have an informed view of whether the sizing was appropriate for their heating needs.

I think it was chosen for me. I don’t remember making any decision about the size of the thing.
Domestic heat pump applicant

We were basically entirely guided by the installation firm as to the calculations based on the size of the property, number of occupants, and therefore the capacity of the system we would require in order to be able to consistently heat the house.
Domestic heat pump applicant

CMO4 “I do not think the RHI influenced the system size”

4.49 In the second (new) mechanism (CMO 4), the size of the heating system was also determined by a third party organisation.

Well, obviously, you’ve got to trust the professionals when it comes to this sort of thing. They have ways of working out what energy levels were needed within the house to maintain it at a reasonable temperature and you’ve just got to take whatever specs they give you, really.
Domestic heat pump applicant

4.50 The difference between this mechanism and the one above, however, was that the applicant had at least some knowledge about their heating requirements, sufficient that they could take a more informed view about whether the sizing of their system was property led or affected by

the RHI subsidy. This informed view could have been the result of the applicant's own technical knowledge or because their information corroborated their installer's advice about the sizing of their system.

Now, what gave me confidence was that the few people were involved came up with similar answers. So therefore, it seemed like there was a similar calculation and methodology behind the kilowatt unit I needed.

Domestic heat pump applicant

4.51

supply, which limited the size of the heat pump they could install.

I think we have gone for the biggest system we got and the three-phase and the one-phase was the only thing that's limiting us going bigger, which I would have done to eliminate the boiler.

Domestic heat pump applicant

Non-domestic biomass applicants

4.52 For non-domestic biomass applicants, we found cases of all three mechanisms. On reflection however, the wording of mechanism 1 could have been more precise. It could be argued that this mechanism applied to all installations where the RHI was fundamental to the business case and where the heat use was new. However, this aspect of the theory was intended to be focused on the sizing of the installation *once the decision to install had been made*. This is how it was presented in the research interviews so it does not materially affect the robustness of the findings. However, the following revised wording would clarify the theory and is utilised in the table below:

1. Having made the decision to install a biomass boiler, the nature of RHI benefits enabled you to increase your heat demand.

4.53 A further mechanism was also identified in the research. There were cases in which the nature of RHI benefits meant the applicant had installed multiple boilers rather than a single boiler. Some applicants indicated that this resulted in an overall installation size that was larger than it would have been in the absence of the RHI but in other cases the impact on overall installation size was less clear. The following fourth mechanism has therefore been added to the theory:

4. You installed multiple boilers rather than a single boiler as a result of the nature of RHI benefits.

4.54 Table 11 shows the contexts, mechanisms and outcomes observed in relation to the influence of the RHI on the size of the biomass installation. Contexts that were found in all cases in the particular CMO are shown in bold.

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Table 11: Influence of RHI on installation size of non-domestic biomass – contexts, mechanisms and outcomes observed

CMO No.	Key contexts	Mechanisms	Outcomes	Notes
1a “RHI led me to install a larger boiler”	The installation was related to a specific business opportunity The applicant had future growth or expansion plans The applicant followed the advice of a third party ¹	You’ve been able to expand your activities, and increase your heat demand, because of RHI benefits.	Installed larger boiler than currently necessary	¹ Could be an installer, a consultant or the boiler manufacturer
1b “RHI led me to increase my heat demand”	The installation was related to a specific business opportunity Business benefit of having more heat beyond the core demand ² Followed advice of third party ¹		Installed boiler which allows 'generous' supply of heat ³	² e.g. warmer working environment, greater seasonal flexibility ³ In this CMO, the RHI had not impacted on the size of the boiler but had impacted on its use, e.g. allowed it to be used for longer or at higher temperatures.
2 “RHI did not influence the system size”	Installation was informed by applicant’s own knowledge of heat demand Followed advice of third party ¹ Site constraints restricted the size of the installation Heat demand happened to align with optimal size in terms of RHI returns ⁵	Your heat demand, and the scale of your heating system, would have been the same scale, irrespective of the RHI subsidy.	Heating system size unaffected (or only marginally affected ⁴)	⁴ e.g: space limitations for the boiler or fuel storage, concern about vehicle movements for fuel deliveries ⁵ Those applicants whose heat requirements were close to a band boundary may have chosen a boiler on one side of that boundary or the other depending on the RHI tariff available but the boiler size was not significantly impacted by the RHI.
3 “Not sure why my system size was chosen”	Followed advice of manufacturer/installer Applicant had no or limited knowledge of the heat demand	The sizing of the heating system was determined by another organisation (e.g. an adviser), and you’re not sure why it was chosen.	Heating system size may have been influenced by RHI	The research generated limited evidence in relation to this CMO so the key contexts are less clear.
5 “RHI led me to install multiple boilers”	Applicant had a desire for greater flexibility in heat use or greater security of heat supply ⁶ Followed advice of third party ¹	You installed multiple boilers rather than a single boiler as a result of the nature of RHI benefits.	Installed multiple medium-sized boilers	⁶ Greater flexibility, for example, in responding to changes in external temperatures or changes in the process capacity needed. Greater security of

			to meet demand	heat supply, for example, from introducing a new additional heat source to the business operation. In some cases this CMO resulted in an overall installation size that was larger than it would have been in the absence of the RHI. In other cases it was unclear so further research would be needed to establish whether there is a need for two CMOs here, i.e. one in which the overall size is larger as a result of RHI and one in which the overall size is unaffected.
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CMO1a & CMO1b “RHI led me to install a larger boiler or increase my heat demand”

4.55 In CMOs 1a and 1b, the RHI enabled the applicant to expand their activities and the resulting heat demand as a result of RHI benefits. However, the specific outcomes between the two CMOs was distinct:

- In CMO 1a, the RHI had allowed the applicant to install a larger boiler than currently needed. This was with a view to future growth or expansion plans associated with the business, which the larger boiler would be able to service.

Well it was basically, because the tariff was more appealing on 200 kW - but, also the fact that, I thought, “If we are going to install the system, we might as well install a system that is future proof for the rest of the site development.

Non-domestic biomass applicant

- In CMO 1b, the RHI had not impacted on the size of the boiler but had impacted on its use, e.g. allowed it to be used for longer or at higher temperatures. A key context here was a business benefit from having more heat beyond the core demand, such as having a warmer working environment than might have been accepted otherwise or having the ability to run the heating system for more of the year.

I think we’d definitely have to heat the place, but I think we’d have found ourselves, sort of- I don’t know, it’s hard to say. It would have probably been oil and probably we would watch it a bit more, because you’re a bit more aware of the cost of it. You buy some wood chip and it doesn’t seem too expensive for some reason.

Non-domestic biomass applicant

CMO2 “RHI did not influence the system size”

4.56 In CMO 2, the heat demand and scale of the heating system installation was unaffected, or only marginally affected. An example of the latter would be an installation in which the estimated heat requirements were close to a band boundary and the applicant may have chosen a boiler on one side of that boundary or the other depending on the RHI tariff available.

The advice I had was, “You need around 200, and at some points in time, it’s better to be just under, and at other points in time, it’s better to be just over. At the moment, it’s better to be just over, so that’s what we’ll do.” I think that was the way the discussion went, but I remember, there was much discussion of it by the experts. This was a while back. But it was only at the margin whether we just tried to get under 200 or over 200, but around 200 was what we needed anyway, so it wasn’t a difficult decision.

Non-domestic biomass applicant

4.57 The alignment of heat requirements with the optimal size from the perspective of RHI tariff income could lead to this outcome, but other contexts were observed. For example, where physical constraints dictated a particular installation size.

CMO3 “Not sure why my system size was chosen”

4.58 Following the advice of a third party could be a context in each of the CMOs. However, whereas in CMO 2, the applicant would demonstrate some knowledge of their heating

requirements, in CMO 3 the applicant was wholly reliant on the advice of the third party. They were therefore unaware of the impact of the RHI on the installation size.

CMO5 “RHI led me to install multiple boilers”

- 4.59 As outlined above, in CMO 5 the applicant had installed multiple boilers rather than a single boiler as a result of the RHI benefits.

We've gone for the seven systems because up to 1MW you get a higher RHI. If we were to go over 1MW the RHI would be less, so that's the system we went for. Having the seven systems does give you a bit more flexibility as well, rather than having one. It was the RHI that drove it.

Non-domestic biomass applicant

- 4.60 Some applicants indicated that this resulted in an overall installation size that was larger than it would have been in the absence of the RHI but in other cases the impact on overall installation size was less clear. As well as maximising RHI tariff income, a key context in this CMO was that there were business benefits from having multiple boilers, such as greater flexibility or increased security of heat supply (through avoiding reliance on a single source of heat).

So I'm glad we've got the two of them there. There was one had broken down as well. I don't think you could rely on one purely on its own all the time. So I think if you had a big new unit, and it purely relied on heat 100% of the time, you would have another one as a back-up or you would have some secondary heat source as an emergency.

Non-domestic biomass applicant

WORKING DRAFT

5 Influence of the RHI reform announcements on applicants

- 5.1 This chapter describes the fieldwork findings in relation to the influence of the RHI reform announcements and subsequent delays on domestic heat pump and non-domestic biomass applicants. In particular, this chapter explores:
 - a. The influence of the reform announcements on domestic heat pump applicants.
 - b. The influence of the reform announcements on non-domestic biomass applicants.
- 5.2 The fieldwork focused in particular on the period between 14 December 2016, when the Government published its consultation response to the its proposed RHI reforms, and 20 September 2017, when the Government introduced a package of tariff-related changes to the RHI.
- 5.3 The findings in the chapter draw on depth interviews with ten domestic heat pump applicants and ten non-domestic biomass applicants. It is also informed by the findings from the interviews with five domestic heat pump installers and five non-domestic biomass installers.

The candidate interim applicant theory

- 5.4 The interim applicant theory in the evaluation's theoretical framework seeks to explain the influence the RHI reform announcements and subsequent delays had on RHI applications between December 2016 and September 2017. It focuses on the impact of the RHI reform announcements and delays on both applicants and installers. This chapter presents the findings in relation to the impact on applicants, whilst chapter 5 focuses on the installer findings.
- 5.5 For RHI applicants, the interim applicant theory centres around four CMOs, or propositions. It was the mechanisms in these four CMOs that were a particular focus of this research. The mechanisms that were tested are set out in the findings sections below. The full interim applicant candidate theory is set out in full in Appendix B.
- 5.6 One of the main aims of this research was to test these propositions with those interviewed and to understand the factors that resulted in the RHI reform announcements and delays being influential or not in their decision-making.
- 5.7 This section explores the research findings in relation to this theory. It explores the outcomes that were observed (whether the reform announcements or delays had any impact), the mechanisms¹⁰ observed in relation to the theory, as well as the contexts that contributed to these mechanisms occurring.

¹⁰ In realist philosophy, mechanisms are causal forces or powers (Wong, Westhorp, Pawson and Greenhalgh, 2013). Westhorp (2014) defines them as “the interaction between what the programme provides and the reasoning of its intended target population that causes the outcomes”. The short-hand for this in realist circles is ‘reasoning and resources’. The implication is that the evaluator needs to identify what resources, opportunities or constraints were in fact provided, and to whom; and what ‘reasoning’ was prompted in response, generating what changes in behaviour, which in turn generate what outcomes.”

Applicants for domestic heat pumps

- 5.8 For domestic heat pump applications, as highlighted in chapter 2, there were spikes in applications in both March 2017 and September 2017. As a result, the research involved interviews with five March 2017 applicants and five September 2017 applicants. The purpose was to understand their reasoning for applying for the RHI at these times and to understand the role, if any, the RHI reform announcements and delays had on their applications.
- 5.9 Evidence from the March and September 2017 applicants is set out separately (below) as there

Interim applicant theory

- 5.10 The four mechanisms, or propositions, that were tested in the fieldwork were:
1. You wanted to install before proposed changes to the RHI [or were encouraged to do so by a certain date], affecting applications for larger homes, **because you thought installation would have reduced benefits after the reforms** [or you were told that RHI benefits would not be as great after this date]
 2. You wanted to install before proposed changes to the RHI [or were encouraged to do so by a certain date], affecting applications for larger homes, **because your installation would no longer be viable after the reforms** [or you were told that there was limited time to make an application].”
 3. You wanted to go ahead as soon as possible **because of general uncertainty** about the future of RHI subsidies.
 4. Your timetable for **installation of a heat pump system was unaffected** by proposed changes to the RHI

March 2017 applicants

- 5.11 In the interviews with March 2017 domestic heat pump applicants, candidate mechanisms 2, 3 and 4 were observed.
- 5.12 Table 12 sets out the contexts, mechanisms and outcomes identified in the interviews.

Table 12 Interim applicant theory for March 2017 heat pump applicants – outcomes, mechanisms and contexts observed

CMO	Key contexts <i>Most influential factors in bold</i>	Mechanism	Outcomes
<p>2 “Anticipated reforms sped up my application (installation not viable post-reform)”</p>	<p><i>Human influences</i></p> <ul style="list-style-type: none"> • Advice from installer, architect or other supply chain stakeholder to apply by a certain date (not explicitly reform-related) <p><i>Perceived impact of reforms</i></p> <ul style="list-style-type: none"> • Aware that heat demand limits could impact on RHI payments <p>NOTE: This CMO was not observed in the applicant interviews, but evidence from installer interviews showed that installers were advising customers to complete installations/applications by March/April because of anticipated Spring 2017 implementation of reform package. This CMO has therefore been surmised from installer interviews rather than directly from applicant interview evidence. The absence of applicant evidence means it is not possible to know whether applicants in this CMO were, or were not, aware of the reforms.</p>	<p>I wanted to install before proposed changes to the RHI [or I was encouraged to do so by a certain date], affecting applications for larger homes, because my installation would no longer be viable after the reforms [or I was told that there was limited time to make an application].”</p>	<p>Heat pump installation took place earlier than would have otherwise been the case</p>

WORKING

CMO	Key contexts <i>Most influential factors in bold</i>	Mechanism	Outcomes
3 “General RHI uncertainty sped up application”	<p><i>Awareness of reforms</i></p> <ul style="list-style-type: none"> Applicant aware of reforms OR applicant not aware of reforms <p><i>Influence of RHI on decision to install heat pump</i></p> <ul style="list-style-type: none"> Would not have gone ahead with installation without RHI (i.e. RHI payments critical to their decision to install heat pump) <p><i>Perceived impact of reforms</i></p> <ul style="list-style-type: none"> Applicant not sure what impact reforms would have on their RHI payments <p><i>Perceived impact of general potential RHI changes</i></p> <ul style="list-style-type: none"> Applicant thought end-of-quarter degeneration might negatively impact on their RHI payments Applicant uncertainty about how long RHI tariffs might continue <p><i>Human influences</i></p> <ul style="list-style-type: none"> Advice from installer, architect or other supply chain stakeholder to apply by a certain date (not explicitly reform-related) 	<p>I wanted to go ahead as soon as possible because of general uncertainty about the future of RHI subsidies.</p>	<p>Heat pump installation took place earlier than would have otherwise been the case</p>
4 “RHI reforms had no influence on application timing”	<p><i>Awareness of reforms</i></p> <ul style="list-style-type: none"> Applicant aware of reforms <p><i>Perceived impact of reforms</i></p> <ul style="list-style-type: none"> Applicant did not think reforms would impact on their installation or application <p><i>Property led</i></p> <ul style="list-style-type: none"> Timing of application and installation influenced / determined by the timescales of the refurbishment work Timescale determined by desire to install a new heating system quickly 	<p>My timetable for installation of a heat pump system was unaffected by proposed changes to the RHI</p>	<p>Heat pump installation unaffected by the RHI reform announcements</p>

CMO2 “Anticipated reforms sped up my application (installation not viable post-reform)”

- 5.13 Installers interviewed for this research highlighted that they had advised heat pump customers over the heat demand limits to complete installations and applications by the March or April 2017 because of the anticipated Spring 2017 implementation of the RHI reform package.
- 5.14 Whilst we did not come across evidence of this advice in the applicant interviews, installers suggested that their advice had a direct impact on some customers, who in response accelerated their installations and applications in anticipation of the reforms coming into force. One installer, for example, reported that they had put ‘all hands on deck’ following the December 2016 announcements to undertake 12 installations before the end of March.
- 5.15 This suggests that the March 2017 spike could in part be explained by expectations amongst both installers and applicants that the reforms would come into force in April 2017.

CMO3 “General RHI uncertainty sped up my application”

- 5.16 In the second mechanism (CMO 3), applicants reasoned that they wanted to go ahead with their application as soon as possible because of general uncertainty about the future of RHI subsidies. Their installation or application therefore took place earlier than would otherwise have been the case.

I was aware that they were going to be reviewed, and nobody really knew if they were going to stay the same, go up or go down, but I was aware they were going to be reviewed. So I kept an eye on the Ofgem website. But I was told if we got it up and running, I think it was before April, then that tariff is guaranteed up until a certain time. If we got it in before that time then the payments would be guaranteed at that level

Domestic heat pump applicant

- 5.17 Evidence from applicants who both were and were not aware of the reforms suggests that general RHI ‘noise’ was also a factor behind the March spike in domestic heat pump applications.
- 5.18 Key contexts influencing this reasoning included:
- *Influence of RHI on decision to install heat pump.* These were all applicants who would not have gone ahead with the installation without RHI (i.e. RHI payments were critical to their decision to install heat pumps). So ensuring that their application was submitted before any potential changes was very important to their financial business case for installing a heat pump.
 - *Perceived impact of reforms.*
 - Where an applicant was not sure what impact the reforms would have on their RHI payments, this contributed to uncertainty about the future of RHI payments.
 - *Perceived impact of general potential RHI changes.*
 - Similarly, applicants who thought that end-of-quarter tariff changes might happen, and that these might negatively impact on their RHI payments, were influenced to complete their applications by the end of March. Interviewees were not always clear whether they thought these changes would be end-of-quarter depressions or the reforms themselves, although the way they described them it seemed more likely to be the former.
 - General uncertainty about how long RHI tariffs might continue was also an influencing factor. There was a fear that the RHI might not continue for long, or that

the tariffs might be subject to cuts at short notice, based on applicant experiences or knowledge of the Feed-in Tariff cuts.

- *Human influences.* Advice from 'expert' third parties such as installer, architect or other supply chain stakeholder, to apply by a certain date (not explicitly reform-related) were also influencing factors. This was an apparently important factor for applicants with low levels of awareness about the potential RHI reforms.

CMO4 "RHI had no influence on application timing"

5.19

timetables were not influenced by the proposed RHI changes or the RHI more generally.

Never once did I refer to it or it made any difference to - all I cared about was getting my barn finished and heated. And the installation just came along with a timetable, which was driven predominantly by my builder and not anything else.

Domestic heat pump applicant

5.20 Key contexts influencing this reasoning included:

- *Awareness of reforms.* Applicants aligning with this CMO were aware of the proposed reforms.
- *Perceived impact of reforms.* However, they did not think the reforms would impact on their installation or application.
- *Property led.* Those aligning with this CMO were also focused on the completion of refurbishment work to their home. This refurbishment timescale was the key determinant of the timing of their installation and subsequent application. Although it is feasible that they may have been able to flex timings had they thought the RHI reforms may impact on them.

September 2017 applicants

5.21 In the interviews with September 2017 domestic heat pump applicants, candidate mechanisms 1, 3 and 4 were observed.

5.22 Table 13 sets out the contexts, mechanisms and outcomes identified in the interviews.

Table 13 Interim applicant theory for September 2017 heat pump applicants – outcomes, mechanisms and contexts observed

CMO	Key contexts	Mechanism	Outcomes
1 “Anticipated reforms sped up my application (perceived reduced benefits post-reforms)”	<p><i>Awareness of reforms</i></p> <ul style="list-style-type: none"> Applicant had some awareness of reforms <p><i>Perceived impact of reforms</i></p> <ul style="list-style-type: none"> Aware that heat demand limits could impact on RHI payments <p><i>Human influences</i></p> <ul style="list-style-type: none"> Advice from installer, architect or other supply chain stakeholder to apply by a certain date (RHI-related) <p><i>Property led</i></p> <ul style="list-style-type: none"> Sufficient flex in refurbishment/application timescale to submit application ahead of 20 Sep deadline 	<p>I wanted to install before proposed changes to the RHI [or was encouraged to do so by a certain date], affecting applications for larger homes, because I thought installation would have reduced benefits after the reforms [or I was told that RHI benefits would not be as great after this date]</p>	<p>Heat pump installation took place earlier than would have otherwise been the case</p>
3 “RHI uncertainty sped up application”	<p><i>Awareness of reforms</i></p> <p>Applicant had some awareness of reforms</p> <p><i>Human influences</i></p> <ul style="list-style-type: none"> Advice from installer, architect or other supply chain stakeholder to apply by a certain date (RHI-related) Advice from installer, architect or other supply chain stakeholder to apply by a certain date (not explicitly RHI-related) <p><i>Marketing influences</i></p> <ul style="list-style-type: none"> Special offer by sales person/installer if installation took place within certain timeframe (not explicitly RHI-related) <p><i>Experience of FiTs</i></p> <ul style="list-style-type: none"> Experience of Feed-in-Tariffs made them sceptical about Government payment schemes 	<p>I wanted to go ahead as soon as possible because of general uncertainty about the future of RHI subsidies.</p>	<p>Heat pump installation took place earlier than would have otherwise been the case</p>

CMO	Key contexts	Mechanism	Outcomes
<p>4 “RHI had no influence on application timing”</p>	<p><i>Perceived impact of reforms</i></p> <ul style="list-style-type: none"> • Applicant did not think reforms would impact on their installation or application <p><i>Human influences</i></p> <ul style="list-style-type: none"> • Advice from installer, architect or other supply chain stakeholder to apply by a certain date (not explicitly RHI-related, although the RHI reforms may have been an implicit driver) 	<p>My timetable for installation of a heat pump system was unaffected by proposed changes to the RHI</p>	<p>Heat pump installation unaffected by the RHI reform announcements</p>

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CMO1 “Anticipated reforms sped up my application (perceived reduced benefits post-reforms)”

In the first mechanism in

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- 5.23 Table 13 (CMO1), applicants wanted to install their heat pump before proposed changes to the RHI because they thought their installation would have reduced benefits after the reforms, as a result of the introduction of the heat demand limits.

From what I recall, there was a meaningful shift in the calculation of the amounts... we would have been capped, I think, in the amount that we could have received because we were going for a larger installation. I ran the numbers and it seemed to me that we would be significantly better off if we were in the uncapped. So ... I was particularly keen to get over line before that change took place.

Domestic heat pump applicant

- 5.24 There was also evidence from installers of customers rushing through installations and applications in order to beat the introduction of the heat demand limits.

- 5.25 Key contexts influencing this reasoning included:

- *Awareness of reforms.* Applicants had at least some awareness of reforms.
- *Perceived impact of reforms.* In particular, applicants were influenced by an awareness that the introduction of heat demand limits could impact on their RHI payments.
- *Human influences.* Advice from a third party about the reforms could also be an influencing factor. One applicant, for example, heard from another source quite late on that the September reforms might negatively impact on them, and so rushed through their application as a result.

I think it was somebody else who just happened to know I was doing it and said, "You do know it's changing at the end of September," or something. And I went, "I didn't know. Best I get it done then.

Domestic heat pump applicant

- *Property led.* Applicants falling into this CMO were carrying out refurbishment works, but had sufficient flex in their installation and application timescale to complete their installation and submit an application a little ahead of when they otherwise would have.

CMO3 "RHI uncertainty sped up my application"

- 5.26 In the second mechanism (CMO 3), applicants reasoned that they wanted to go ahead with their application as soon as possible because of general uncertainty about the future of RHI subsidies. Their installation or application therefore took place earlier than would otherwise have been the case.

- 5.27 Key contexts influencing this reasoning included:

- *Awareness of reforms.* Applicants had at least some awareness of reforms.
- *Human influences.* Advice from a third party, such as an installer, to apply by a certain date to guarantee RHI payments had an influence on applicants' reasoning.
- *Marketing influences.* A special offer by a sales person or installer to install within a certain timeframe was an influencing factor. One applicant, for example, reported that a sales advisor told them they would benefit from a special offer if they installed within a certain time as their installer would be undertaking other installations in the area at the same time.

If you did with this particular deal, because they were people that came from Essex, they wanted to get a lot of people around at the same time. All of their installers would be around the

place at the same time and not have to keep going backwards and forwards. That's how they actually sold it, that we were actually going to be getting it cheaper because we were on that type of scheme.

Domestic heat pump applicant

- *Experience of the Feed-in Tariffs.* Experience of the sudden changes to Feed-in Tariffs also had an influence, as it made applicants more uncertain about the longevity of the RHI.

CMO4 “RHI had no influence on application timing”

In the third mechanism in

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5.28 Table 13 (CMO4), the timing of the installations and applications was unaffected because applicants' timetables were unaffected by the proposed RHI changes.

5.29 Two contexts influenced this reasoning:

- *Perceived impact of reforms.* Applicants who did not think the reforms would impact on their installation or application (even if they would), were unaffected by the proposed RHI changes.
- *Human influences.* Applicants may also have been influenced by advice from an installer, architect or other supply chain stakeholder to apply by a certain date (not explicitly RHI-related).

Applicants for non-domestic medium-scale biomass

Interim applicant theory

5.30 For non-domestic applicants, the four mechanisms, or propositions, that were tested were:

1. You wanted to install a biomass system anyway but thought it was **only viable if you installed before the reforms**
2. You wanted to install a biomass system anyway and it was **more attractive if you installed before the reforms**
3. You installed this biomass system primarily to **access RHI income opportunities that would not be available after the reforms**
4. The proposed changes in the RHI tariff or changes in eligible heat uses **made no difference** to your choice of heat technology or to the timing or scale of your installation

5.31 After testing these mechanisms in the field, the research team concluded that the wording of mechanism 3 was not clear enough to easily distinguish it from mechanism 1. Mechanism 3 was designed to describe examples of installations that were solely driven by income opportunities that would not be available after the reforms were implemented, such as heat uses that were specifically prompted by the pre-reform RHI. Given that the interviews were with applicants, it is perhaps not surprising that there were no non-domestic interviewees who felt that this description fitted their case. Nonetheless, there were applicants and installers who felt that this may have applied to other applicants. This aspect of the theory has not therefore been fully tested here, although other elements of the theory illustrate the significance of RHI in terms of accessing income opportunities – see, for example, the importance of responding to new business opportunities in the contexts described in Table 9.

5.32 It is also worth noting that the way that mechanism 4 is currently worded is not mutually exclusive from 1 and 2, i.e. applicants could have been concerned about viability and attractiveness but unable to do anything about it so that it made no difference to timing or technology choice.

5.33 A further complication was that there was a tendency among the applicants interviewed to conflate the reforms and the degressions in the biomass tariffs. In the course of what were wide-ranging interviews, it was not always possible to precisely delineate between the two. Even where this was attempted, it was apparent that applicants had difficulty in doing so. It has therefore not been possible to robustly distinguish between the two in our analysis.

5.34 In response to these complications, the wording of the mechanisms has been refined as follows:

1. You wanted to install a biomass system anyway but thought it was only viable if you installed before the reforms or an anticipated depression
2. You wanted to install a biomass system anyway and it was more attractive if you installed before the reforms or an anticipated depression
3. The proposed reforms and depressions did not impact on your thinking about your biomass installation and made no difference to your choice of heat technology or to the timing or scale of your installation

5.35 These mechanisms are utilised in Table 14 below, which shows the contexts, mechanisms and outcomes observed in the sample. Contexts that were found in all cases in the particular CMO are shown in bold.

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Table 14: Interim applicant theory for applicants - mechanisms and key contexts observed

CMO	Key contexts	Mechanisms	Outcomes	Notes
1 “Anticipated reforms sped up my application (installation not viable post-reform)”	<p>Applicant aware of reforms and/or degressions</p> <p>Installation was financially sensitive¹</p> <p>Ability to influence timing of installation²</p>	<p>You wanted to install a biomass system anyway but thought it was only viable if you installed before the reforms or an anticipated degression</p>	<p>Biomass installation took place earlier than would have otherwise been the case</p>	<p>¹Financially sensitivity could stem from, for example:</p> <ul style="list-style-type: none"> • A perception of significant financial risk associated with the project (such as a high level of borrowing). • A marginal business case, where the projected returns were already low. In such cases, other drivers (e.g. carbon) may have been significant in the installation decision. <p>²The ability to influence the timing was not constrained in these cases, e.g. they were not part of a wider refurbishment / building programme</p>
2a “Anticipated reforms sped up my application (perceived reduced benefits post-reforms)”	<p>Applicant aware of reforms and/or degressions</p> <p>Ability to influence timing of installation²</p> <p>Wider business drivers, e.g. seasonal heating demand³</p>	<p>You wanted to install a biomass system anyway and it was more attractive if you installed before the reforms or an anticipated degression</p>	<p>Biomass installation took place earlier than would have otherwise been the case</p>	<p>³In some cases, installing earlier was more attractive not just because of the reform impacts but also for wider business reasons, e.g. seasonal heating demands.</p> <p>⁴The ability to influence the timing was constrained in these cases, e.g. they were</p>

CMO	Key contexts	Mechanisms	Outcomes	Notes
2b “Unable to speed up my application (despite perceived reduced benefits post-reforms)”	<p>Applicant aware of reforms and/or degressions</p> <p>Inability to influence timing of installation⁴</p> <p>Wider business drivers, e.g. seasonal heating demand³</p>		Biomass installation unaffected	part of a wider refurbishment / building programme
3 “RHI had no influence on application timing or technology choice”	<p>Applicant unconcerned about impact of reforms⁵</p> <p>Applicant unaware of reforms</p>	The proposed reforms and degressions did not impact on your thinking about your biomass installation and made no difference to your choice of heat technology or to the timing or scale of your installation	Biomass installation unaffected	⁵ E.g. because their installation involved year-round operation which would be less impacted by changes to the tiering.

CMO1 “Anticipated reforms sped up my application (installation not viable post-reform)” and CMO2a “Anticipated reforms sped up my application (perceived reduced benefits post-reforms)”

5.36 In CMOs 1 and 2a, there was an awareness of the reforms and degressions coupled with an ability to influence the timing of the installation, although the extent of that ability may have varied. Both led to the same outcome – the installation taking place earlier than would have

- In CMO 1, the applicant perceived the installation to be so financially sensitive as to only be viable if it took place in advance of the reforms or an anticipated degression:

Well, the thing is, we would have already paid for it. As I say, it was in train. It was being paid for, it was being installed. The issue for me became one of, “Get your fingers out so I can actually get this registered.” It’s possible that rather than becoming an issue of not being delivered, it could have become a financial white elephant. Because of the change that was actually implemented partway through. That would have been particularly galling, actually, if that had happened.

Non-domestic biomass applicant

- In CMO 2a, the applicant perceived that the installation would have still been viable after the reforms or an anticipated degression, but it was more attractive financially if it took place in advance.

CMO2b “Unable to speed up my application (despite perceived reduced benefits post-reforms)”

5.37 In CMO 2b, the mechanism was the same as in CMO 2a, i.e. the installation was more attractive financially if it took place in advance of the reforms or an anticipated degression. However, in this CMO there was an inability to influence the timing of the installation so the timing was unaffected. Although not observed, it would be theoretically possible for there to be a similar additional CMO which included mechanism (1) but where the timing of the installation was unaffected because of constraints. In our cases, where we found mechanism (1), the applicants had gone to considerable lengths to ensure installation took place as soon as possible.

At the same time, because we were under the time constraints with the RHI, we started building the building before we had planning. We’ve only just got planning in the last two or three months. It’s been operational since the end of March, which didn’t go down well in the local press. We were going ahead without planning permission.

Non-domestic biomass applicant

CMO3 “RHI had no influence on application timing or technology choice”

5.38 In CMO 3, the applicant was either unaware of the reforms or unconcerned about their impact, so the installation was unaffected. Where the applicant was unconcerned about the impact of the reforms, this could have stemmed from, for example:

- The new heating system being necessary anyway, and therefore perceived to be less sensitive to changes in tariff income;

If it had been this March, we'd have still put them in, because you're still getting RHI to help to run it, do you know what I mean? It's just the way it happened, we did it last year. If we did it this year, there is a difference in RHI, but I think we still would have put them in, definitely, because the way they're heating the house, and heating our shed, and drying logs.

Non-domestic biomass applicant

- Or the particular installation being less impacted by the changes in banding and tiering, e.g. a process use operating year-round.

The simple reason is that I understand, from some figures which were being done for us by the installation team, that because we run our boilers almost all the year round, in that instance, rather than only using them on Tier 1 – we use them on Tier 1 and Tier 2 – and because we use them over longer periods, it wouldn't have such an impact. The tariff has fallen, but there is a longer tariff... Is it 30% to 35% now? Tariff 1 is at a higher rate, whereas, for ourselves, it's only 15% in Tariff 1.

Non-domestic biomass applicant

WORKING PAPER

6 Influence of the RHI reform announcements on installers

- 6.1 This chapter describes the fieldwork findings in relation to the influence of the RHI reform announcements and subsequent delays on domestic heat pump and non-domestic biomass installers. In particular, this chapter explores:
- The influence of the reform announcements and subsequent delays on domestic heat pump installers
 - The influence of the reform announcements and subsequent delays on non-domestic biomass installers
- 6.2 The fieldwork focused in particular on the period between 14 December 2016, when the Government published its consultation response to the its proposed RHI reforms, and 20 September 2017, when the Government introduced a package of tariff-related changes to the RHI.
- 6.3 The findings in this chapter draw on depth interviews with five domestic heat pump installers and five non-domestic biomass installers.

The candidate interim applicant theory

- 6.4 The interim applicant theory in the evaluation's theoretical framework seeks to explain the influence the RHI reform announcements and subsequent delays had on RHI applications between December 2016 and September 2017. It focuses on the impact of the RHI reform announcements and delays on both applicants and installers. This chapter presents the findings in relation to the impact on installers, whilst chapter 4 focused on the applicant findings.
- 6.5 For RHI installers, the candidate interim applicant theory centred around three outcomes:
- The proposed RHI changes **did not result in your business undertaking any additional installations** during the period from December 2016 to 20 September 2017 compared to what would have happened otherwise
 - The proposed RHI changes resulted in your business undertaking **fewer installations** during the period from December 2016 to 20 September 2017 compared to what would have happened otherwise
 - Your business undertook **additional installations** during the period from December 2016 to 20 September 2017 compared to what would have happened otherwise, as a result of the proposed RHI changes
- 6.6 Mechanisms were developed for each outcome. These are set out in full in the interim applicant below.

Domestic heat pump installers

- 6.7 Outcomes 1 and 2 in the interim applicant theory for installers were observed in the domestic heat pump installer sample. A variation on outcome 3 was also observed:

- 6.8 The proposed RHI changes **resulted in additional business enquires overall (but not installations)** during the period from December 2016 to 20 September 2017 compared to what would have happened otherwise
- 6.9 This 'new' outcome is explained in the commentary below.
- 6.10 Table 15 sets out the contexts, mechanisms and outcomes identified in the interviews.

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Table 15: Interim applicant theory for domestic heat pump installers – outcome, mechanisms and contexts observed

CMO No.	Key contexts <i>Primary factors in bold</i>	Mechanisms observed	Outcomes
1 “We carried on as normal”	<ul style="list-style-type: none"> • Heat pumps they install generally below the heat demand limits AND/OR customer demand unaffected by reform announcements • General scepticism about Government policy announcements • Already working at full capacity • Long-term strategic business approach (not reactive) • Heat pumps not main source of revenue 	I was aware of the proposed (domestic heat pump) reforms, but carried on as normal because I did not think the proposed reforms would have much impact on my business or my customers	The proposed RHI changes did not result in my business undertaking any additional installations during the period from December 2016 to 20 September 2017 compared to what would have happened otherwise
2 “We undertook fewer heat pump installations”	<ul style="list-style-type: none"> • Aware of reforms • Business based on high demand heat pump customers • Decided to switch business focus to shared ground loops as a result of the reform announcements • Focused shared ground loop marketing on commercial developers 	<p>a. Heat pumps were no longer regarded as a viable proposition to our (high consumption) customers, so we stopped selling to this market (and switched focus to another) in anticipation of the reforms being introduced, AND</p> <p>b. We saw the (shared ground loop) reforms as a valuable business opportunity, but there was general uncertainty about the future of the RHI so my customers were pushing back (shared ground loop) decisions until certainty was secured</p>	The proposed RHI changes resulted in my business undertaking fewer installations during the period from December 2016 to 20 September 2017 compared to what would have happened otherwise
4 “We increased business overall, but heat pump installations remained static”	<ul style="list-style-type: none"> • Installer well-informed about policy developments • Saw changes to shared ground loops (deeming) as a business opportunity • Focused shared ground loop marketing on social housing landlords 	<p>a. We were aware of the proposed (domestic heat pump) reforms, but carried on as normal because we did not think the proposed reforms would have much impact on our business</p> <p>b. We saw the (shared ground loop) reforms as a valuable business opportunity, and the reforms also increased customer demand but uncertainty</p>	The proposed RHI changes resulted in additional business orders overall (but heat pump installations remained unchanged) during the period from December 2016 to 20 September 2017 compared to

		about the future of the RHI meant customers began to push back (shared ground loop) decisions until certainty was secured	what would have happened otherwise
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CMO1 “We carried on as usual”

6.11 In the first CMO, installers were aware of the proposed reforms but did not make any changes to their business approach or see any changes in installation numbers between December 2016 and September 2017 as a result of them. All of these installers reasoned that the reforms would not have any significant impact on their business.

6.12

any impact on demand for heat pumps from their customer base. This was either because:

- a. They believed that the heat pumps they installed were generally below the proposed heat demand limits; or
- b. They felt that for their customer base, the RHI was not a key driver and therefore any changes to the RHI would not impact on customer demand. One installer, for example, said they did around 30 installations a year, almost exclusively with self-builders, for whom they said the RHI was not a key influencing factor in their heating technology decision.

6.13 Other factors that contributed to the installers not changing their business approach were:

- General scepticism about Government policy announcements and the extent to which they will result in actual change. This was based on their experiences and knowledge of Government policy-making to date – such as the Feed-in Tariffs – which had created a view that policies can change at short notice.

You put things in place, but you don't commit. I think that's been the biggest issue throughout the whole period of renewable energy and the RHI. You almost want to say, “Right, I can build a business case around this in the business, and we'll set up ready for this,” but then it's been let down so many times that... I mean, how many companies have we seen go under where they've set a business up – “We're going to start selling PV” – and then, all of a sudden, the PV tariff gets cut overnight and thousands of people are out of business? So, yes, it's really hard to predict the business at the moment and build a business around the RHI. We haven't really done that now. We try and make it stand up on its own without the Incentive.

Domestic heat pump installer

- Businesses already working at full capacity felt that they did not have any need, or any capacity, to respond to the reform announcements, as they were felt their business was thriving regardless of the policy environment.
- There was also an installer view that their business had been built up, successfully, over many years, and a long-term, evolutionary, approach to business was a more sustainable model for them than making major changes in response to policy announcements.
- Having a diverse business offer. One business, for example, was a manufacturer and installer of other heating technologies, and this was a major part of its business. This diversification helped to provide them with security against any potential changes to the heat pump market.

CMO2 “We undertook fewer heat pump installations”

6.14 This CMO was observed in one installer interviewed for the research, so the findings may not be representative of the full range of experiences of installers who undertook fewer heat pump installations between December 2016 and September 2017.

- 6.15 This was an installer whose primary business – 90% of their heat pump installations - was the installation of domestic heat pumps to high heat demand customers. They were aware of the reforms and knew that the reforms would negatively impact on their business. As a result, they stopped marketing domestic heat pumps and informed customers in their existing pipeline that installations and applications would need to be completed by the end of March 2017, ahead of the anticipated reform implementation in April.

It was no longer a viable proposition.... We couldn't sell any of the bigger domestic properties from April because we didn't know. You can't realistically and ethically go to the customer and

Domestic heat pump installer

- 6.16 However, they decided to invest in a drilling rig so that they could focus their business instead on the shared ground loop market, which they regarded as a major opportunity (as a result of the changes regarding deeming), one that could more than offset losses to their domestic heat pump business.

We believed it could impact us very positively. Yes, they took the cap away but they were going to give us the shared ground loop ... But then that change was postponed (and still hasn't been confirmed) so we lost that potential increase in business.

Domestic heat pump installer

- 6.17 After the reforms were announced in December 2016 they signed contracts with commercial developers for shared ground loop installations. But these installations were subsequently postponed following the delays to the reforms.

CMO4 “We increased our installation business overall, but heat pump installations remained static”

- 6.18 This CMO describes an installer-manufacturer whose installation business increased overall between December 2016 and September 2017, with an increase in orders, but whose heat pump installations remained static.

- 6.19 For their domestic heat pump business, they felt that the reform announcements had ‘very little impact’ on their business or in terms of installation numbers. A key factor here was that domestic heat pump installations were only a very small part of their overall business.

- 6.20 However, it is worth noting that the interviewee reported that the reform announcements had a noticeable and major impact on its manufacturing business. They had ‘record sales’ between December 2016 and September 2017 for larger single-phase heat pumps. Sales then disappeared once the September reforms came into force. This increase in sales in large heat pumps was countered by declining sales in smaller heat pumps during the same period.

- 6.21 opportunity as a result of the reforms and reported that the proposed changes (switching from metered to deemed savings) had resulted in a large increase in enquiries, and subsequent installations, from social housing landlords. However, more recently, the delays in the reforms had meant that confidence and orders had begun to dry up. And those that had installed shared ground loops were now becoming ‘twitchy’ as they were still unable to submit their RHI applications.

I have to say people are getting quite twitchy now because some of them have got installations that are 12 months old that are awaiting RHI application that can't apply because the new regs aren't in and the systems for receiving those applications aren't in place. Now we're starting to see projects being put on hold because of it.

Heat pump manufacturer-installer

- 6.22 There appeared to be a number of key differences between this installer-manufacturer and the installer above who also viewed shared ground loops as a business opportunity. The most important was that this installer-manufacturer focused on social housing, whereas the installer above had focused its marketing on commercial housing developers.
- 6.23 The interview evidence suggests that the social housing landlords were more prepared to go ahead with installations based on the reform announcements themselves (and the statement that all installations after that date would benefit from the new arrangements, once the regulations came into force). Whereas the commercial developers that had contracted with the installer above seemed more risk-averse, and did not want to install until after the reforms had been implemented.

Non-domestic biomass installers

- 6.24 The outcomes identified in the non-domestic biomass interviews were all variations of outcome 2:
2. The proposed RHI changes resulted in your business undertaking **fewer installations** during the period from December 2016 to 20 September 2017 compared to what would have happened otherwise
- 6.25 The mechanisms and key contexts observed are shown in below in Table 16 . In addition, the table includes a more detailed description of outcomes observed. These more detailed outcomes are sub-sets of outcome 2, but provide greater insight into the impacts on installer businesses during the interim period. Contexts that were found in all cases in the particular CMO are shown in bold.

Table 16: Interim applicant theory for installers – mechanisms, contexts and outcomes observed

CMO	Key contexts	Mechanisms observed	Outcomes
2a We undertook fewer biomass installations overall (but more medium boilers)”	Installer previously undertook higher numbers of smaller (domestic and/or small non-domestic) installations	There was general uncertainty about the future of the RHI so your customers were pushing back decisions until certainty was secured	The business undertook fewer biomass installations overall during the period Dec 16 – 20 Sep 17 but higher numbers of medium-sized non-domestic boiler installations
2b We undertook fewer biomass installations overall (but more business in other areas)”	Installer had capability to switch focus to other related activities, e.g. servicing, spares, fuel supply, other RHTs		The business undertook fewer biomass installations overall during the period Dec 16 – 20 Sep 17 but expanded other areas of the business
2c We undertook fewer biomass installations”	Installer was focused on medium-scale non-domestic boilers Installer’s customer base was focused on larger, corporate customers		The business undertook fewer installations overall during the period Dec 16 – Sep 17
2d We undertook fewer biomass installations”	Installers customers were concerned about the timing of, and tariff returns from, their installations Installer uses boilers which have longer lead-in times than others in the market Installer’s approach to specifying installs makes them less financially attractive to applicants	For some reason relating to the business, you were not able to respond quickly to consumer demand, so you lost business to companies who could complete installations more quickly	The business undertook fewer installations during the period from Dec 2016 to 20 Sep 2017 compared to what would have happened otherwise, as a result of the proposed RHI changes

The CMOs described in

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6.26 Table 16 reveal that although all cases in our research reported fewer biomass installations during the period Dec 16 – 20 Sep 17, this masks a more complex reality. This is highlighted by the fact that the level of medium-scale installations was relatively high overall during this period and included two significant spikes in installation numbers. Part of the explanation for this may be that installer responses may have been disproportionately impacted by the significant fall in biomass installations during July and August 2017, so may not have been representative of the interim period as a whole. Exploring the mechanisms and contexts that led installers to report fewer installations also reveals that the impacts on installers during this period was highly dependent on business circumstances.

- In CMO 2a, the installer may have reported an overall decline in installations as a result of uncertainty in the market. However, in these cases, the installers worked across the small and medium biomass bands (and possibly domestic installations too) and the overall decline was caused by a decline in the small non-domestic and domestic installations resulting from previous depressions in these tariffs. The number of medium-sized installations carried out by these installers actually increased during this period.
- In CMO 2b, installers had other strands to their business which became a focus during this period of perceived uncertainty in the installation market.

We basically focused a lot more on service. So, the service website has probably been up and running for about six months now, six to nine months. So, we'd made a decision that we were going to focus much less on selling kit and developing projects with customers, and focusing much more on service, because the market for selling projects is so volatile, and the government seems to make snap decisions at a whim. There's no warning, or very little, or inadequate warning.

Non-domestic biomass installer

- In CMO 2c, installers reported a decline in medium-size installations. We had limited evidence in relation to this CMO but one potential key context was where the installer's customer base was focused on larger and more corporate customers. These were seen to be more risk-averse and, therefore, more likely to push back decisions during a period of uncertainty.

So, the only projects we did were with customers who were pretty gung-ho about it. Anyone with a corporate, kind of, mentality, where they like to work things through and understand the risks, just thought the risks were too great. So, anyone of a decent size, it was unlikely that they were going to go ahead, probably, but it just dramatically reduced the number of clients who had the appetite to do something.

Non-domestic biomass installer

6.27 In CMO 2d, the installer may have recognised spikes in installations during the interim period but lost out to others because of the nature of their business. For example:

- Where they imported boilers, they may have had longer lead-in times which made them less attractive to time-conscious applicants.
- Where other installers were sizing to maximise tariff returns and they were uncomfortable doing so, e.g. not specifying a medium-band boiler where a small better fitted the heat demand, as doing so would mean the boiler running inefficiently.

We believe, as a company, that we will size the boiler appropriately... When we go the customer, we might say to them, for example, "We think you need 100kW boiler." They will go

out to a competitor, who will say, “No, no, no, you can earn more money if you put a 200kW boiler in.” We’ll say, “But that will run very inefficiently, if you oversize the biomass boiler it’s fundamentally inefficient.

Non-domestic biomass installer

- 6.28 It was suggested by installers that this situation may have created opportunities in the market for less principled installers, i.e. those who could promise faster delivery and/or higher RHI returns, which may have impacted on the quality of installations during this period.

and they tell us that a competitor has advised something different because they can make more money. Because we don’t have any quality standards, any mandatory form at the front end. We don’t have the equivalent of building regulations, we just don’t have it in our industry. It’s a free-for-all, and in some cases a bit like the Wild West... There is a whole business out there, at the moment, going out to fix installations that have been badly conceived, badly installed, and where that installer has gone out of business or is no longer is interested.

Non-domestic biomass installer

- 6.29 This was also an assertion made by a domestic heat pump installer, who reported that they undertook 50 ‘repair’ jobs a year that involved fixing heat pumps that were not installed correctly originally.

The amount of installations we go to that bear no resemblance to the regulations whatsoever is unbelievable. Probably 90% of what we fix bear no resemblance to the regulations whatsoever, and most of those [installers] are running today ... with impunity. Because they’re putting some of the smaller units in, everybody ignores them.

Domestic heat pump installer

7 Other findings

7.1 This final chapter presents other findings from the fieldwork:

- It begins with a summary of findings in relation to the costs of installing renewable heat technologies and the extent to which the cost information in application data is accurate.
- This is followed by a summary of installer views about the future of the renewable heat market.

Installation costs

7.2 Applicants were asked about the costs of their installations so that this could be compared with the cost data in the RHI application database.

7.3 Robust conclusions about the accuracy of the cost data in the application database cannot be made on the basis of the findings from such a small sample. However, the findings provide an indication of why some cost data in the original applications may be wrong, and the extent of any errors that exist.

7.4 For domestic heat pump applicants, participants either reported that the figure they gave was an estimate and was therefore likely to include some error, or was broadly accurate. In cases where applicants had provided estimated costs in their application, the applicants had undertaken large-scale refurbishment works of their homes. In these instances, the costs of their heat pumps were part of the much larger costs of the refurbishment works. These applicants had therefore estimated a portion of the overall refurbishment budget as heat pump costs.

We had, effectively, the whole house gutted and redone with underfloor heating all downstairs and the radiators upstairs, and everything else as part of that same company who did the ground source. So I had to try and dig out the bits that did the ground sound, the bit that did the piling out the back, etc., and break it down. And it may have been a little bit wrong but I just know the numbers that they charged me at the end of the day for the whole work as opposed to the individual pieces... I could go through the paperwork but it didn't seem to need to be so accurate, so I just put down what I thought was roughly the right number.

Domestic heat pump applicant

7.5 Applicants who had provided an estimated figure were unable to say how accurate their estimates were compared to actual costs. However, given that their overall refurbishments costs were very high (in the tens or hundreds of thousands), any errors in estimation may also have been relatively large (thousands of pounds).

7.6 For the non-domestic biomass applicants, there were a number of cases where applicants reported that the cost data was inaccurate. In all of these cases, actual costs were higher than the estimates which had been included in the original RHI applications.

7.7 In some of the cases where cost data was inaccurate, the margin of error was so significant (e.g. 500% in one case) as to suggest a misunderstanding in terms of what was being requested in the RHI application. In others however, the margin of error may have simply been due to the cost estimates at the time of the application being lower than the actual costs because of unforeseen additional costs.

Installer views on the future of the market

Future impact of reforms

Heat pump installers

7.8 The domestic heat pump installers expressed a range of views about the future impact of the RHI reforms on the market. Most of these views centred on views about future customer demand.

7.9 Views about future customer demand were that:

- There will be an increase in customer demand for air source heat pumps over the long-term as a result of the tariff increases for air source heat pumps. One installer noted that they had already seen a significant increase in demand since the tariff increases were introduced in September 2017.

Well, we've had 90 enquiries in the last 20 days coming in. Going back six months, that would have been probably been nine in 20 days. So, yes, it does seem to be, especially after the increase in the tariff for air source. That's definitely made a big difference.

Heat pump installer-manufacturer

- The introduction of deemed payments for shared ground loops will provide an important business opportunity for heat pump installers. This new opportunity was regarded as important, as it could enable domestic heat pump installers to offset losses in business to high heat demand domestic customers. However, there was also a view that it could take 18-24 months for interest in shared ground loops to fully pick up again, following the delays and uncertainty about reform timings. As highlighted above, installers reported that interest in shared ground loops had begun to wane as a result of the delays to the reforms.
 - The tariff changes would not have any significant impact on demand for heat pumps. The installer who held this view believed that even with the tariff increases, the RHI subsidy would not be sufficient to pay the capital costs of heat pumps (both ground and air source). This was an installer who felt that their main customers were not driven by the RHI in any case.
 - In contrast, one installer estimated that the heat demand limits would result in a 90% reduction in its domestic heat pump business. Their customer base felt that heat pumps would no longer be financially viable highly without the RHI subsidy previously available.
- 7.10 There was also a concern that tariff guarantees would result in the RHI budget being spent early. The installer who expressed this view had heard that there were 6-7 anaerobic digestion plants in the pipeline and believed it would only take applications from two of them for the annual RHI budget to be spent.
- 7.11 Similar concerns were expressed by biomass installers. Particularly in the context of the shift toward larger boilers, there was concern about the risk that the budget for the scheme could be taken up by a relatively small number of large schemes, thereby increasing uncertainty in the market.

We're also a bit more concerned about the fact that there is a budget cap. The difference between the amount of money that has been allocated and the budget cap is now much smaller. It isn't going to take many schemes of multi-megawatt to go and eat up that money.

Non-domestic biomass installer

- 7.12 Linked to this, there was some concern about the role that tariff guarantees might play. It was suggested that it may be possible for a significant proportion of the budget to be taken up by schemes getting a tariff guarantee, but then not actually implementing their schemes.

announced, whether they'll be a free for all with everybody going in a bit like planning applications and hoovering up the pot of money. BEIS or Ofgem allocating that money to certain projects with no guarantee that they're going to go ahead. Very similar to planning, just because somebody puts a planning application in to build 200 houses doesn't mean to say that they get built.

Non-domestic biomass installer

- 7.13 On biomass specifically, it was suggested that the extension of tier 1 would suit those with less seasonal heat demands – what one installer described as 'base load-type' boilers.

Because Tier 1 is now based on 35%, running your boiler for 35% at full capacity per year, it has really concentrated the mind. It's customers that really do have a demand for heat for a prolonged period of time, they're the ones that are going to be attracted to the scheme now.

Non-domestic biomass installer

- 7.14 The shift towards larger installations was expected to continue and some installers recognized the benefits of this in terms of the cost effectiveness of the scheme in terms of delivering carbon savings. A number of other potential impacts of this shift were put forward:

- It will impact on the supply chain in terms of the nature of the skills required for installations, the types of boilers being produced and the numbers of jobs that the market is likely to be able to sustain.
- It could increase the financial risks for installers, because of a reliance on a smaller number of installations which have longer lead-in times and which therefore also have an increased chance of not reaching completion.

We've gone back to the situation where you don't know if you're going to be eligible until you've put your application in. Which is the crazy situation. So, we could start talking to a customer now, in the knowledge that he's not going to be able to apply for his RHI for another 12 months, because you can't apply until you're commissioned, and anything could happen within that 12 months. So, you're talking to customers that, actually, six months down the line we might have to say goodbye to, because the scheme has changed again. That's the big killer, that we've got so many wasted days. Talking to people, doing design, trying to win people over to the idea of

Non-domestic biomass installer

- 7.15 It was also suggested however, that smaller installations will remain attractive in cases where other factors aid the business case, e.g. where a heating system is in need of replacement, where there is an existing plant room or where there is an on-site fuel supply, or where there are other significant drivers e.g. carbon reduction.

- 7.16 It was suggested that the changes to the tariffs for non-domestic biomass and for heat pumps mean that some larger, commercial customers are likely to find large scale GSHP more attractive than biomass now.
- 7.17 Given what was said about the impact of the reforms on the types of installers that were winning business during the interim period (see paragraph **Error! Reference source not found.**), it was suggested that this will be of benefit in the longer term to those in the servicing, spares and maintenance market.
- 7.18 The removal of certain drying uses from the RHI was welcomed by some installers, as it was seen to have represented an inefficient use of RHI subsidies. However, concern was expressed about the impact this would have on drying as part of the pellet production process and it was suggested that distinctions needed to be made in the rules to account for this.

It is an absolute requirement, to make wood pellets you have to dry the wood.

Non-domestic biomass installer

Longer term future of the market

Heat pump installers

- 7.19 There was a mixture of optimism and pessimism about the longer-term future of the market for heat pumps, post-RHI.
- 7.20 On the optimistic side, there was a view that government will introduce building regulations to restrict fossil-fuel based heating and that the market is moving away from night-storage heaters. These factors would help to stimulate demand for heat pumps post-RHI.
- 7.21 There was also pessimism about the future of market:
- One concern was that the regulatory system (and particularly Microgeneration Certification Scheme) was undermining the market.
 - Another view was that the ground source heat pump market is not mature enough to be sustainable post-RHI without another policy mechanism to replace it.
 - There was also a view that an oil price rise was necessary in order drive consumer interest in domestic renewable heat.

Biomass installers

- 7.22 Concern was expressed about the future of the biomass installation market beyond the closure of the RHI.

I think its closure will, at a stroke, stop the sales of new biomass boilers, because I think already the people who have a requirement for a biomass boiler, will already have been supplied with systems. I think if you were to pull the plug on RHI in, let's say, two years, that'll be it. I will stop selling boilers, but I will make a living out of selling spare parts, and servicing boilers, and brokering fuel

Non-domestic biomass installer

- 7.23 More generally, there was a desire for greater certainty around future government support for the biomass market, both in terms of maintaining support in the long term and in terms of avoiding significant depressions in the shorter term.

What I think that everyone's hoping for and looking for is, rather than the fantastic, you know, tariffs and subsidies that people were experiencing between 2012 and 2014, rather than that, that people want to have a clearer idea of what the long-term tariff plan is. So, you know, is the RHI going to be extended beyond RHI 2? When can more notice be given, with regard to future digressions, rather than a cliff edge drop every three months? Then, if there is no RHI 3, what is the long-term vision for biomass going forward, and where does it sit within the renewable energy blend?

Non-domestic biomass installer

- 7.24 Concern was expressed about biomass fuel supply and particularly about the management of the quality of fuel burnt. The burning of recycled timber was highlighted as a particular area of concern. Whilst there was a desire to see tighter controls on such fuels, it was also suggested that this could lead to higher demand and therefore higher prices for other fuels (particularly wood chip), which could be negative for the industry.

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Appendix A. Demand theory

Figure 8 Demand theory, page 1

RH demand theory (D) – reasoning by potential RH investors - page 1 - CMOs resulting in RH investment

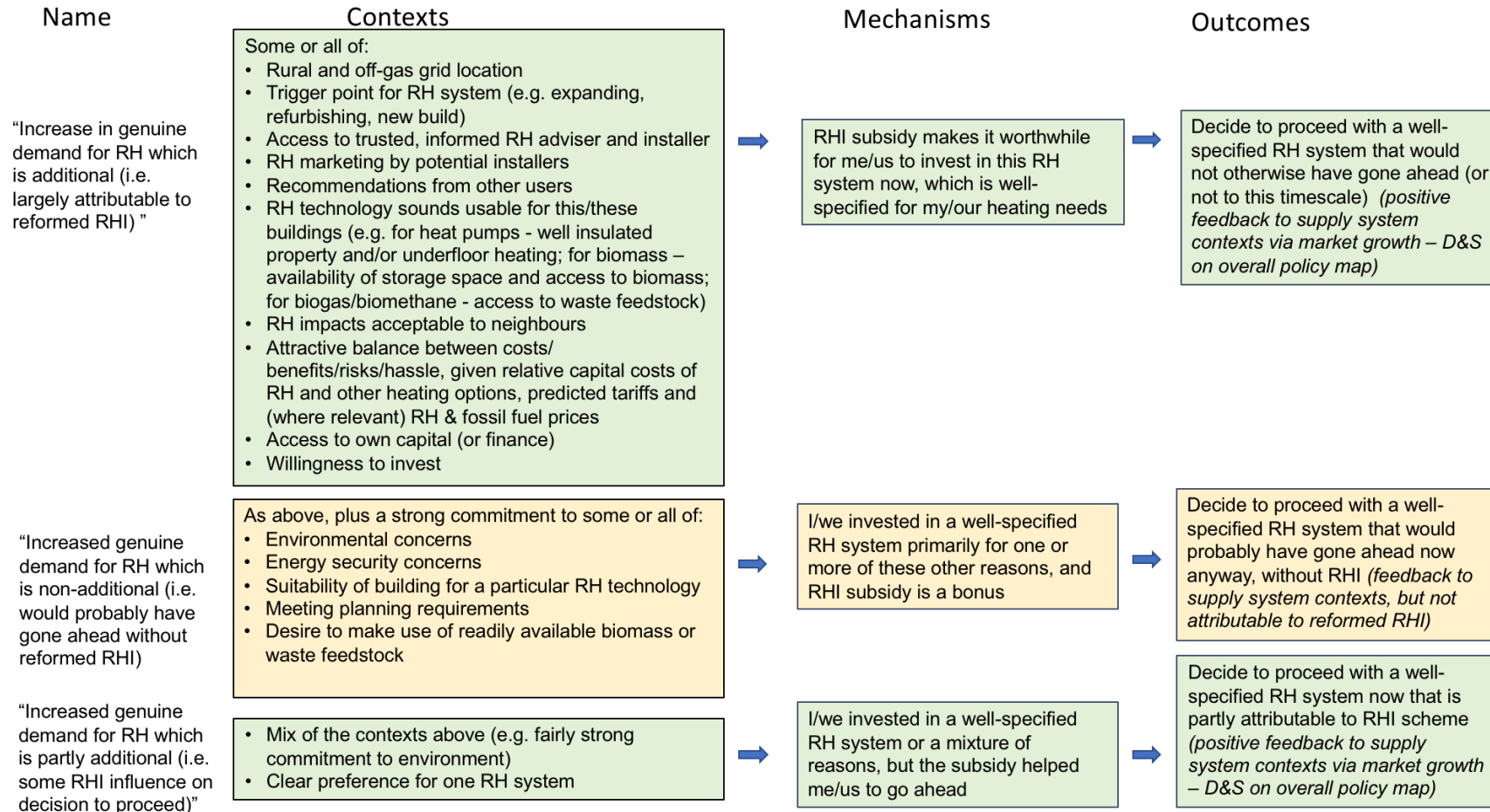
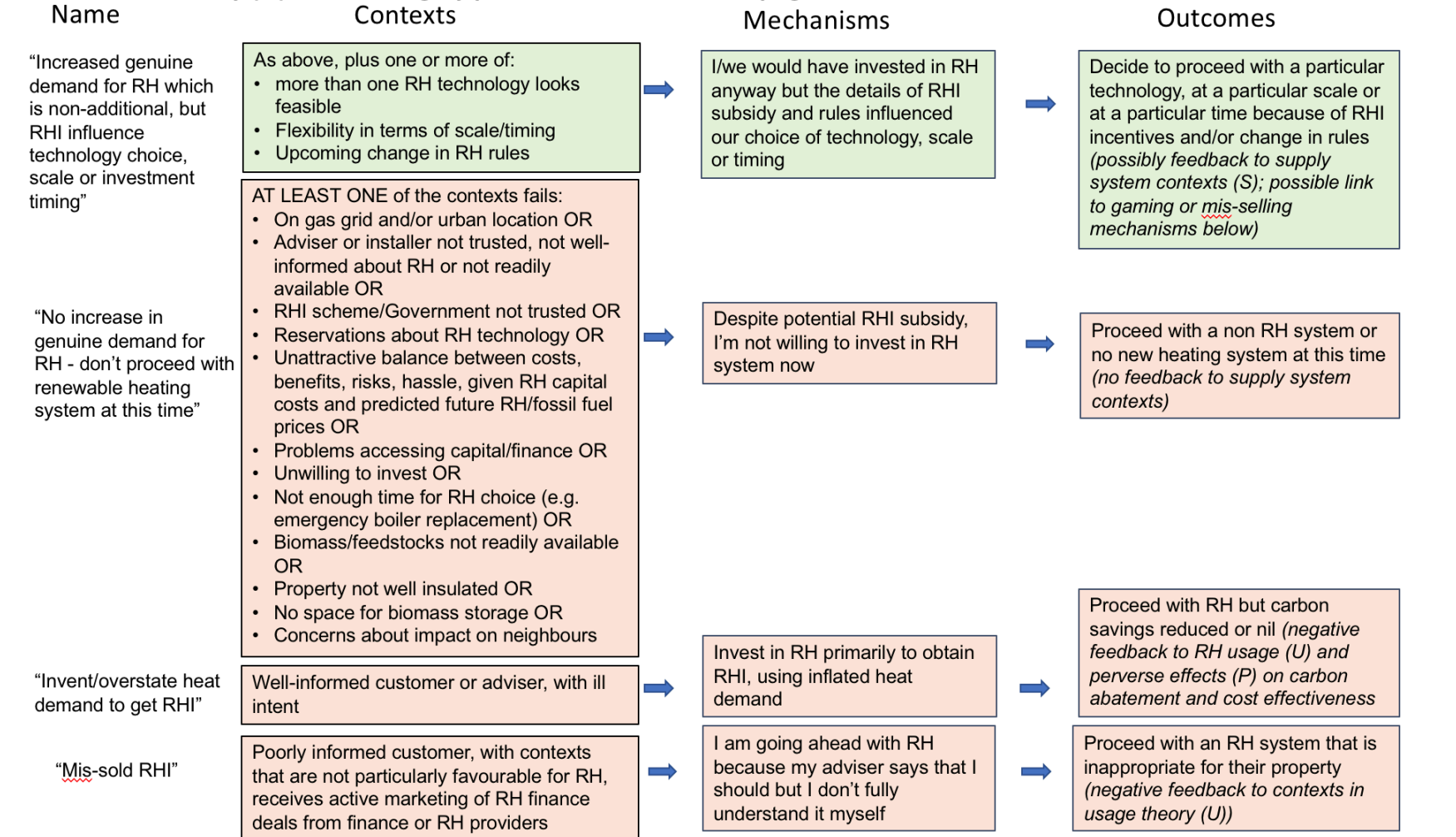


Figure 9 Demand theory, page 2

RH demand theory (D) – reasoning by potential RH investors - page 2 – further CMOs



Appendix B. Interim applicant theory

See separate attachment.

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Appendix C. Fieldwork recruitment materials

See separate attachment.

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Appendix D. Fieldwork topic guides

See separate attachment.

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