



Department for
Business, Energy
& Industrial Strategy

EVALUATION OF THE REFORMED RHI

Synthesis report: 'interim applicant' research
Findings Summary

BEIS Research Paper Number 2019/019

September 2019



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Executive Summary

Introduction

This report presents findings from the evaluation of the reformed Renewable Heat Incentive (RHI). This theory-based evaluation is being undertaken for the Department for Business, Energy and Industrial Strategy (BEIS) by CAG Consultants, in partnership with Winning Moves, Hatch Regeneris, EREDA Consultants and UCL.

In particular, the focus of this report is on the impact of the Government's announcement in December 2016 of a package of RHI reforms and the subsequent delays to the implementation of these reforms. The evidence presented does not assess whether the reforms achieved their aims, this question will be addressed in future reports from this evaluation.

To understand the impacts during the period between March 2016 and September 2017, this report synthesised findings from fieldwork which took place in late 2017 and early 2018:

- Quantitative surveys of pre-reform RHI applicants applying before September 2017 (separate surveys for domestic, non-domestic, and biomethane and biogas)
- Qualitative research with pre-reform domestic heat pump applicants and non-domestic medium-scale biomass applicants
- The evaluation's initial sustainable markets assessment (involving desk-based analysis of market data combined with stakeholder consultations)
- Desk-based analysis of RHI application data.

Policy background

There are two parts to the RHI scheme (domestic and non-domestic), created to encourage uptake of renewable heat technologies amongst householders and businesses through financial incentives. The Government consulted on changes to the RHI schemes in March 2016 intended to reform the scheme to ensure it focusses on long-term decarbonisation, promotes technologies with a credible role to play in that transition, and offers better value for money. It subsequently published its proposals in December 2016, with an expectation that the reforms would come into force in Spring 2017. However, the implementation of these reforms was subsequently delayed as a result of interrupted Parliamentary legislative timetables¹. A first package of reforms – involving changes to tariff levels, domestic technology heat demand limits and the removal of tariff bands for non-domestic biomass – then came into force on 20 September 2017.

The Government reported to us that it recognised that applications to the RHI scheme have a historical trend which suggests the market can react quickly to proposed changes in the scheme or tariff levels (e.g. tariff degressions). As a result, in addition to the reforms targeting

¹ The reforms were delayed as a result of a General Election, called in April 2017 and held in June 2017. This interrupted Parliamentary legislative timetables, meaning that necessary legislation and regulations could not be introduced in the Spring, as originally intended.

long-term changes in RHI applications, short-term changes were likely in the period between the announcement of scheme reforms and the implementation of the reforms themselves. In recognition of these potential short-term impacts, the policy implementation approach intended to encourage consumers to continue installing renewable heating systems between the date of publication and the date the changes came into force, avoiding a hiatus in investment and consequential impacts on the supply chain.

Application trends during the interim period

During the period between the initial consultation on the reforms in March 2016 and the introduction of the first tranche of the reforms in September 2017, there were a number of spikes in applications to the domestic and non-domestic schemes. For the domestic scheme, there was variability in the number of heat pump applications in particular, with spikes in applications in March 2016, March 2017 and September 2017. Application numbers for biomass and solar thermal were relatively low and stable during this period.

In the non-domestic scheme, biomass applications per month fluctuated during this period, with the largest spikes occurring in March and June 2017 for medium biomass, whilst variability in applications for other technologies eligible under the non-domestic scheme was less pronounced. Biomethane applications dropped to their lowest levels since the scheme's start.

These spikes align with those technologies where the reforms potentially reduce RHI payments for some applicants, namely domestic heat pump applicants affected by heat demand limits and non-domestic medium-sized biomass applicants affected by merging of the biomass tariffs and other changes to scheme eligibility.

The following sections explore how the reform announcements and delays influenced applicants.

Extent to which reform proposals and delays affected these trends

Influence of the reforms

For the domestic scheme, the majority of applicants (61%) to the scheme during the April 2016 to September 2017 'interim' period reported being unaware of the March 2016 consultation on the draft reforms or the December 2016 proposed reforms. Among those who said they were influenced by the reforms (17%), the majority reported that the timing of their applications or installations had been brought forward as a result. This is supported by the application numbers which show a substantial increase in heat pump installations that would have been impacted by the introduction of the proposed heat demand limits in 2017. A small increase in domestic biomass applications was also received at this time, however this was less pronounced.

For the non-domestic scheme awareness of the reforms was highest among biomethane and biogas applicants, where only 12% were unaware of the reforms. Among the remainder of the non-domestic applicants, 31% were unaware of the reforms. Among those biomass applicants who reported being influenced (19%), 48% reported that it was the size of the installation that

had been influenced. This is consistent with introduction of reforms that removed tariff banding based on the capacity of the biomass installation.

For the large-scale non-domestic technologies (e.g. biomethane and large-scale CHP), the evidence suggested a hiatus in investment decisions resulted from an anticipation of the introduction of tariff guarantees and uplifted tariffs for biomethane/biogas installations. Installer evidence also suggested that the reform delays had prevented the installation of shared ground loops (as a result of the delays to deemed metering), however, social housing providers were reported to be more willing to proceed with these installations despite the uncertainty.

Influence of the reform implementation delays

The available evidence does not support conclusions to be made as to the impacts specifically resulting from the delays to the implementation of the reforms, however, the evidence suggests that the delays may have contributed to the overall sense of uncertainty around the RHI scheme.

General uncertainty about the future of the RHI, as well as the expectation of tariff depressions, was reported by participants in this research. This uncertainty was a driver that contributed to applicants applying or installing earlier than they otherwise would have. It is likely that the reform proposals and subsequent delays may have contributed to this general market uncertainty. Non-domestic biomass applications in particular seem to have been driven by the expectation of tariff depressions being triggered (particularly for the June 2017 spike in applications).

More broadly, evidence from RHI applicants suggested that general uncertainty about how long the RHI might continue (for example in reference to the budget cap), under what conditions and at what levels of subsidy, also appeared to have an influence on them. This uncertainty about the scheme created an opportunity for some installers to encourage installations to be undertaken during this period. Indeed, qualitative and quantitative evidence highlighted that installers and other third parties played a pivotal role in some customer decisions about technology choices and timing.

Conclusions

The findings highlight that the RHI reform announcements and their subsequent delays played a significant role in influencing a minority within the renewable heat market. Less than a fifth of applicants to the domestic and non-domestic schemes reported being influenced by the reforms or delays, however, two thirds of biogas and biomethane applicants reported being influenced.

The evidence indicates that the reform proposals and their delays had three distinct effects:

- Speeding up some applications and installations that stood to lose out when the reforms came into force. This was the case in particular for domestic heat pump applicants;
- Influencing applicant decisions about the size of their installation where applicants stood to lose out when the reforms came into force. This was the case in particular for non-domestic biomass applicants; and

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- Delaying or slowing down applications for large scale non-domestic technologies that stood to benefit from the reforms (particularly from tariff guarantees), such as biogas, biomethane and shared ground loops.

The general uncertainty about the future of the RHI, as well as the expectation of tariff degressions, also contributed to applicants applying or installing sooner than they otherwise would have. It is likely that the reform proposals and subsequent delays may have contributed to this general market uncertainty. The scheme reforms were designed to create a longer-term platform for investment, and included measures to reduce uncertainty, however, delays caused by external factors may have added to customer confusion in the short-term.

The extent of the impact of the reform announcements and delays on applicants was largely determined by a number of key factors:

- Customer awareness of the reforms proposals and perceptions about how the proposals would impact on them;
- The financial sensitivity of the installation (i.e. the extent to which changes in RHI subsidies would affect the viability of a renewable heat technology being installed); and
- Customers' ability to alter the timing of their installation.

For installers, the extent of the impact of reforms was largely determined by:

- The technology involved and the extent to which the reforms impacted on it;
- The ability of the installer to diversify into other areas (or the extent to which they had already diversified);
- The nature of the customer base, such as the extent to which their customer base was driven by the RHI subsidy;
- The nature of the installer's offer, such as their ability or willingness to respond to customer demands; and
- The lead-in times of the supply chain used by the installer.

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1. Introduction

This report presents findings from the evaluation of the reformed Renewable Heat Incentive (RHI). This evaluation is being undertaken for the Department for Business, Energy and Industrial Strategy (BEIS) by CAG Consultants, in partnership with Winning Moves, Hatch Regeneris, EREDA Consultants and UCL.

In particular, the focus of this report is on the impact of the Government's announcement in December 2016 of a package of RHI reforms and the subsequent delays to the implementation of these reforms. To understand this impact, this report synthesised findings from fieldwork which took place in late 2017 and early 2018. The evidence presented in this report does not assess whether the reforms achieved their aims. This question will be addressed in future reports from this evaluation.

Policy background

There are two parts to the RHI scheme (domestic and non-domestic), created to encourage uptake of renewable heat technologies amongst householders and businesses through financial incentives. The Government consulted on reforms to the RHI schemes in March 2016². It subsequently published its proposals in December 2016, with an expectation that the reforms would come into force in Spring 2017. However, the implementation of these reforms was subsequently delayed. A first package of reforms – involving changes to tariff levels, domestic technology heat demand limits and the removal of tariff bands for non-domestic biomass, then came into force on 20 September 2017.

The scheme reforms

The Government's key proposals – and subsequent amendments - for a reformed RHI scheme are set out below³.

For heat pumps, the reforms were intended to support growth in the size of the market and improvements in the quality of the supply chain. The key changes were increases in support for domestic heat pumps alongside a cap on annual payments received by larger properties, provision of support for ground source heat pump systems supplying multiple properties through a shared ground loop and a requirement that all new domestic heat pumps have electricity meters installed.

For biogas and biomethane, the reforms intended to vastly improve the carbon cost-effectiveness of further support. New feedstock requirements, requiring new plant to produce at least half their biogas and biomethane from waste-based feedstocks to receive

² Department of Energy and Climate Change (2016), *The Renewable Heat Incentive: A reformed and refocused scheme*, 3 March 2016. Available at: <https://www.gov.uk/government/consultations/the-renewable-heat-incentive-a-reformed-and-refocused-scheme> [accessed: 24 May 2018]

³ Taken from: Department for Business, Energy and Industrial Strategy (2016), *The Renewable Heat Incentive: A reformed scheme – Government response to consultation*, 16 December 2016. Available at: <https://www.gov.uk/government/consultations/the-renewable-heat-incentive-a-reformed-and-refocused-scheme> [accessed: 24 May 2018]

support for all their production, were accompanied by small uplifts in the biomethane tariff and maintenance of the biogas tariff.

For biomass, the reforms were intended to support further deployment where the technology offers best value for money and is likely to have a long-term role, such as in high-temperature industrial processes. The reforms introduced one level of support for all new non-domestic biomass boiler deployment. The reforms also introduced a cap to the annual payments for new domestic biomass systems installed in larger properties alongside a slight increase to the tariff for new domestic biomass systems to allow the technology to continue to deploy.

The reforms were also intended to provide improved certainty for investors in larger projects through the introduction of “tariff guarantees”⁴. These were designed to help address the current dominance of RHI spending on smaller scale systems by providing certainty to investors regarding the tariff they will receive earlier in the project lifecycle. Without this reform, the Government was concerned that large-scale projects would continue to be relatively rare or would require significantly higher tariffs.

Additional reforms were proposed, including the introduction of ‘assignment of rights’ to allow the development of third-party financing arrangements in the domestic RHI scheme, while eligible heat uses under the non-domestic scheme were amended to remove such uses as wood drying. These proposals are not explicitly covered by this research report.

To avoid a hiatus in investment and consequential impacts for the supply chain, the Government included measures within the reforms to encourage consumers to continue to install renewable heating systems between the date of reform publications and the date the changes came into force. This included making all applicants eligible for tariff uplifts from the date the reforms were announced (payable from the date they came into force), as well as providing flexibility to biogas and biomethane applicants applying during the interim period to choose the scheme rules under which they would operate⁵.

The December 2016 Government consultation stated that the reforms would come into force in Spring 2017, however, the implementation of these reforms was subsequently delayed as a result of interrupted Parliamentary legislative timetables⁶. To maximise certainty in the market, those reforms which could be brought into force without active approval of Parliament were introduced in September 2017⁷. The remainder of the central package of reforms came into force in May 2018.

⁴ A tariff guarantee allows applicants to the non-domestic RHI to secure a tariff rate before their installation is commissioned and fully accredited on the RHI.

⁵ See pages 19 and 34 of Department for Business, Energy and Industrial Strategy (2016), *The Renewable Heat Incentive: A reformed scheme – Government response to consultation*, 16 December 2016. Available at: <https://www.gov.uk/government/consultations/the-renewable-heat-incentive-a-reformed-and-refocused-scheme> [accessed: 24 May 2018]

⁶ The reforms were delayed as a result of a General Election, called in April 2017 and held in June 2017. This interrupted Parliamentary legislative timetables, meaning that necessary legislation and regulations could not be introduced in the Spring, as originally intended.

⁷ A Statutory Instrument laid under the negative procedure becomes law on the day the Minister signs it and automatically remains law unless a motion to reject it is agreed by either House within 40 sitting days. <https://www.parliament.uk/site-information/glossary/negative-procedure/> [accessed 24 May 2018]

Study aims and objectives

This synthesis research was designed to understand how and why the announcement of the reforms influenced RHI applications and the wider renewable heat market in the period leading up to those reforms coming into force, and the role that the elongated period of implementation played within this.

There were a number of spikes in applications to the domestic and non-domestic schemes during the 'interim period', the between the announcement of the reforms in December 2016 and the introduction of some of the reforms in September 2017. During 2017 and 2018 this research sought to understand the drivers of these spikes and the contexts in which they were happening in more detail. The research activities focused in particular on those technologies with the largest application spikes, providing a detailed understanding from domestic heat pump and non-domestic biomass applicants.

The evaluation questions which the synthesis process has sought to address were:

- How have the successive reform announcements in 2016 and 2017, and the way that they have been implemented, influenced RHI applications?
- For whom (applicant types, supply chain sectors, technology types) and in what contexts has this influence been most marked and why?

2. Methodology

A summarised evaluation plan for the overall evaluation is provided in Appendix A.

The evaluation is theory-based and informed by the principles of realist evaluation⁸. This involves developing, testing and refining 'realist' theory about the reformed RHI as the scheme proceeds. The reformed RHI is expected to contribute indirectly to a more sustainable market for renewable heat, and associated long-term carbon savings, through a series of linkages and feedback loops in the supply and demand system. These are summarised in the overall policy map in Appendix B.

The overall policy map was used to shape the full scheme evaluation. However, specific theories were developed about how the extended announcement period for the reforms (and the delays and uncertainties associated with these reforms) may have influenced the supply and demand for renewable heating systems. These 'interim applicant' theories provide the foundation on which the research for this report were developed – see Appendix C.

Evidence sources

This report synthesises findings from four evaluation workstreams.

Applicant surveys: Quantitative online surveys⁹ of RHI applicants applying before September 2017 provide insight into applicant experiences and decision making. Response rates were 21% for domestic applicants, 10% for non-domestic and 23% for biogas and biomethane applicants.

Qualitative interviews: Qualitative research with applicants applying before September 2017 who were identified as priority groups impacted by the reforms. Depth interviews were conducted with 10 domestic heat pump applicants, 12 non-domestic medium biomass applicants and 11 installers of domestic heat pumps or non-domestic biomass.

Sustainable markets assessment: Analysis of existing evidence and consultations with renewable heat bodies and market stakeholders covering evidence up to September 2017¹⁰.

RHI administrative data: Desk-based analysis of RHI administrative data was conducted to provide evidence of scheme wide application details.

No evidence collection was conducted with applicants who applied after the reforms came into force. These applicants will be the subject of future evaluation reports.

⁸ R Pawson, R, and Tilley, N. (1997) *Realistic Evaluation*. London: SAGE Publications Ltd; and Pawson, R. (2006) *Evidence-Based Policy*. London: SAGE Publications Ltd.

⁹ Applicants with multiple applications participated via the telephone so answers were interpreted correctly.

¹⁰ Stakeholders included Renewable Energy Association, Sector bodies and manufacturers, Renewable Energy Finance Forum, BSRIA, Anaerobic Digestion & Bioresources Association, WRAP

Evidence collected underwent a process of realist synthesis to answer the evaluation questions. The key steps to this process are:

Step 1. Data at the workstream level were analysed and findings summarised.

Step 2. Relevant data from across the three workstreams was mapped against the interim applicant theory and other key elements of the theoretical framework.

Step 3. Additional analysis was conducted where the initial mapping process identified opportunities for generating a deeper understanding.

Step 4. Assessment of evidence to establish the extent to which it supported the existence of outcomes, mechanisms and contexts in the interim applicant theory.

Step 5. Assessment used to confirm, refine or revise the Context-Mechanism-Outcome (CMO) configurations for the interim applicant theory.

3. 'Interim period': application and installation trends

This section summarises high-level trends for RHI applications, and the renewable heat industry, during the 'interim period' between the announcement of reforms in December 2016 and implementation of the first wave of reforms in September 2017. Subsequent sections of the report explore why these trends may have occurred.

Application trends during the interim period

During the period between the initial consultation on the reforms in March 2016 and the introduction of the first tranche of the reforms in September 2017, there were several spikes in applications across the domestic and non-domestic schemes. This continued a trend seen within the RHI scheme, where application numbers peaked in advance of tariff depressions or other scheme changes. There was also evidence of a hiatus in applications from some technologies.

Domestic RHI scheme

Since the start of the domestic RHI scheme in April 2014¹¹ and up to March 2018, there were 61,691 accredited domestic applications. Of these, air source heat pumps comprised 51% of accredited applications, with ground source heat pumps representing a further 15%. Biomass systems represented 20% of accredited applications while solar thermal has represented 14%. However, biomass systems generated more than half of the heat generated under the domestic RHI scheme up until that point. The average capacity of air source heat pump applications since April 2014 was 10.2 kW, ground source heat pumps had an average of 14.9kW and biomass applications had the highest average capacity at 27.2 kW¹².

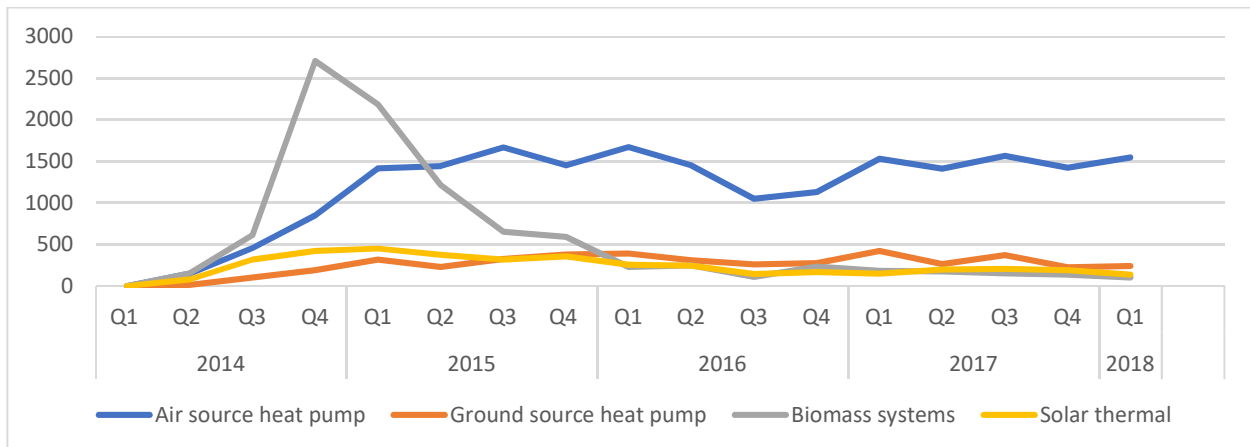
Figure 1 shows that domestic biomass applications peaked in 2014 but then fell to much lower levels (in line with tariff depressions¹³), while heat pump and solar thermal applications were more stable.

¹¹ These statistics are derived from the number of accredited applications for new and 'legacy' installations from April 2014 to March 2018. 'Legacy' refers to systems installed before the launch of the domestic RHI scheme on 9 April 2014 which subsequently applied for domestic RHI. (Source: BEIS, [Non-Domestic RHI and Domestic RHI monthly deployment data](#), March 2018).

¹² These averages represent the mean capacity for all domestic RHI applications for these technologies, up to end February 2018. Solar thermal is not included as capacity is not an appropriate measure for solar thermal systems. (Source: BEIS, [Non-Domestic RHI and Domestic RHI monthly deployment data](#), March 2018).

¹³ Annual budgets for the RHI are fixed so Government needs to ensure that the scheme stays within budget. The means of controlling the budget for the RHI is through depression, which operates by gradually lowering the tariffs which can be paid to new applicants as more renewable heating systems are installed. Tariffs are only reduced as estimated spend on the scheme reaches certain expenditure thresholds or

Figure 1: Applications to domestic RHI scheme by quarter, by date of first application



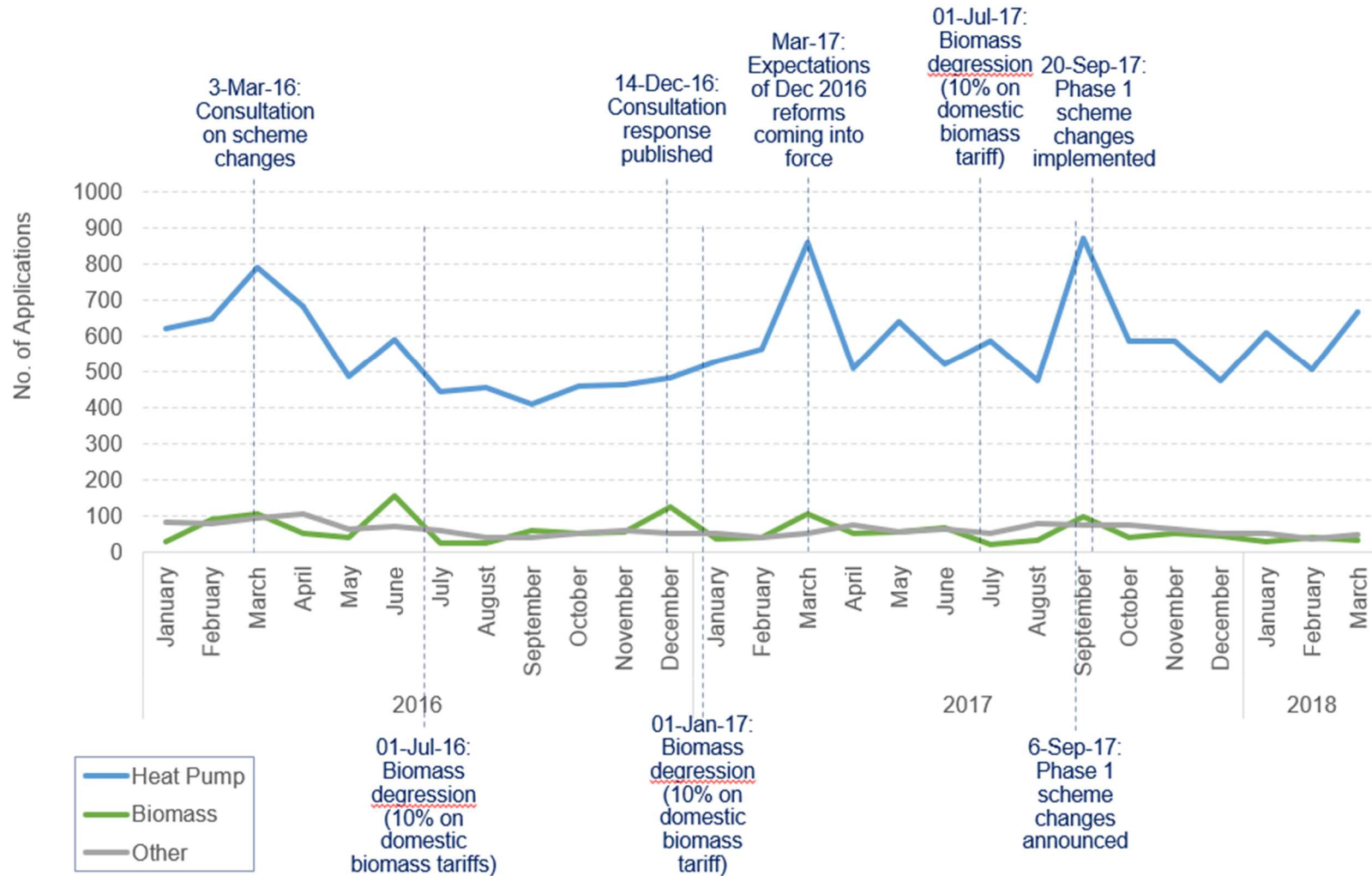
Source: BEIS, [Non-Domestic RHI and Domestic RHI monthly deployment data](#), March 2018

Figure 2 provides more detail on applications up to March 2018. While there was no overall direction to the trend in heat pump applications over 2016 and 2017, there was a spike in heat pump applications around spring 2017, the date when the reforms were expected to come into force. A second spike in applications took place in September 2017, aligned with when the reforms affecting the domestic scheme came into force after a series of delays.

These observed spikes in heat pump applications informed the decision to focus the first wave of evaluation research on understanding the impact of the reforms on domestic heat pump applicants. In chapter 4, we analyse heat pump applications in more detail and explore the extent to which applications during the interim period were influenced by the reform announcements and delays in reform implementation.

“triggers”. Where required, tariff depressions are applied at the start of a quarter (e.g. 1st January, April, July or October).

Figure 2: Number of applications received for the domestic RHI scheme, and timeline of potential scheme-related influences on domestic RHI applications, by date of first application

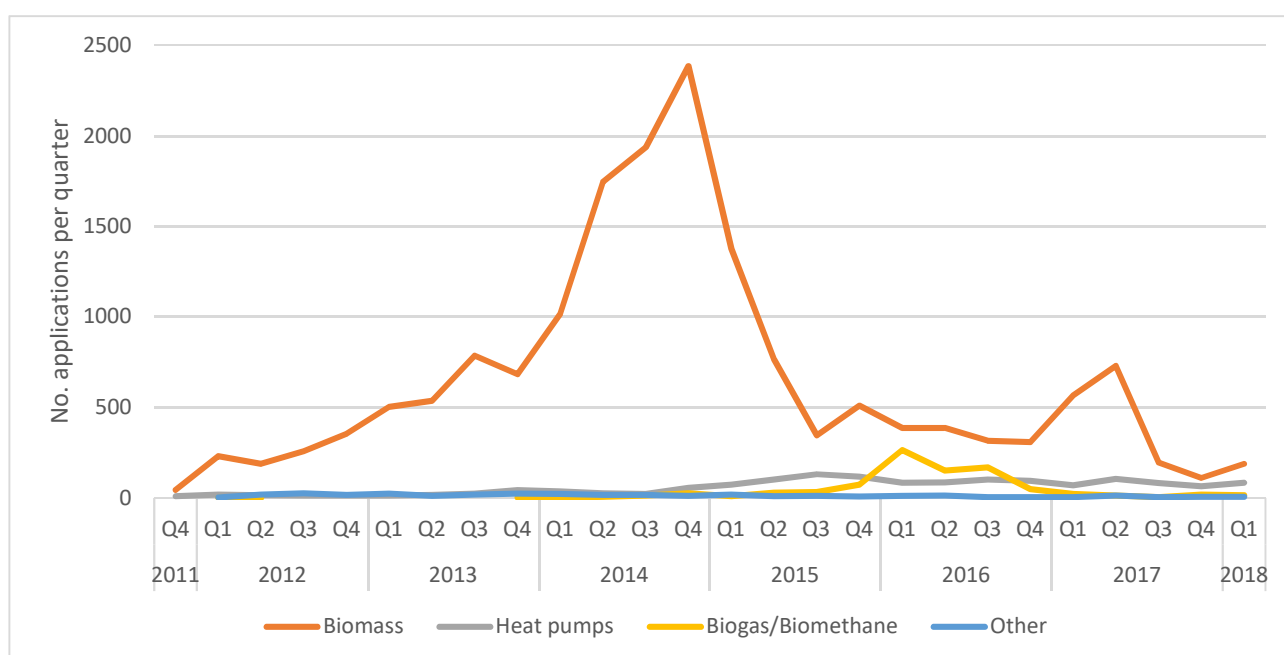


Source: BEIS, [Non-Domestic RHI and Domestic RHI monthly deployment data](#), March 2018

Non-domestic RHI scheme

Since its start in November 2011, biomass applications have dominated the non-domestic RHI scheme, as shown in Figure 3. Applications for small-scale biomass boilers (up to 200 kW) peaked at over 2000 per month at the end of 2014. Extensive tariff degenerations then had the effect of reducing small-scale biomass applications to lower levels (e.g. fewer than 40 per month in 2017). Applications for medium-scale biomass boilers (between 200 kW and 1 MW) remained higher (averaging more than 100 per month during 2017), while there were fewer than 5 large-scale biomass boiler applications per month (more than 1 MW) during 2017.

Figure 3: Applications for non-domestic RHI scheme by quarter, by date of first application¹⁴



Source: BEIS, [Non-Domestic RHI and Domestic RHI monthly deployment data](#), March 2018

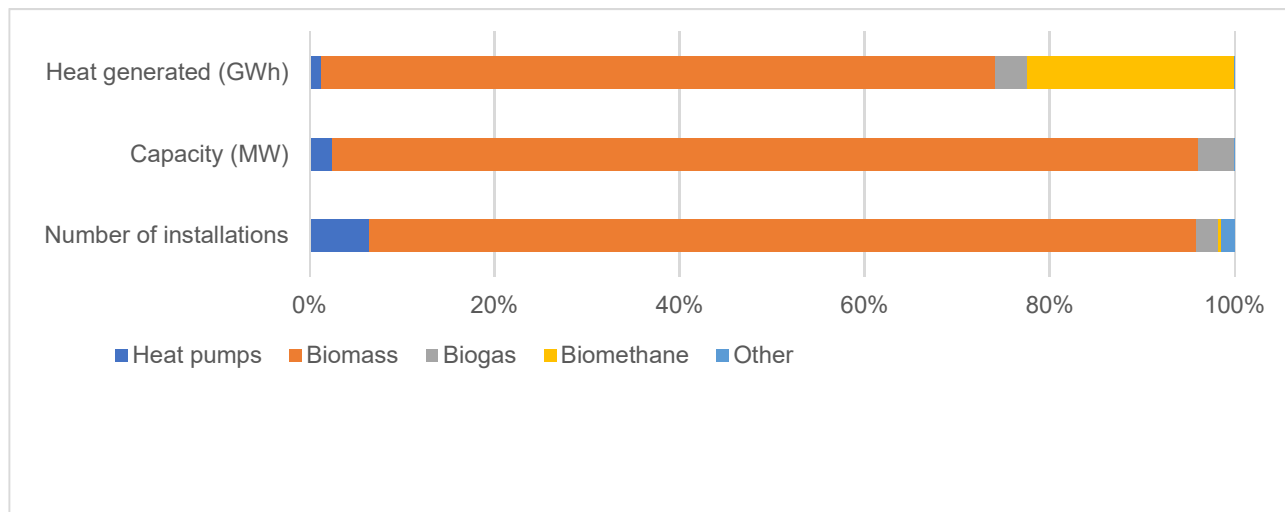
While low in numbers, individual biogas and biomethane schemes typically involved large-scale investment with a considerable lead-time. These applications peaked in early 2016, prior to degenerations affecting their tariffs and the announcement of the reforms. Non-domestic applications for heat pumps (ground source, air source and water source) remained fairly low despite stable or increasing tariffs over time.

Figure 4 shows that biomass installations dominated the number of installations, the capacity installed and the heat generated by the non-domestic scheme since it was introduced in November 2011. In total, 16,593 GWh of heat was generated and paid for by the non-domestic RHI scheme up to March 2018. Included in this total is 4,903 GWh of

¹⁴ CHP plants are included in the biomass figures. The 'Other' category comprises solar thermal and geothermal (although there have been not applications to date for the latter). A small number of installations are undisclosed in published RHI statistics, to avoid disclosure – these are shown as 'undisclosed'.

heat that could have been generated from gas produced by the 56 biomethane plants that have been receiving RHI payments up to March 2018¹⁵.

Figure 4: Breakdown of non-domestic scheme outputs by technology



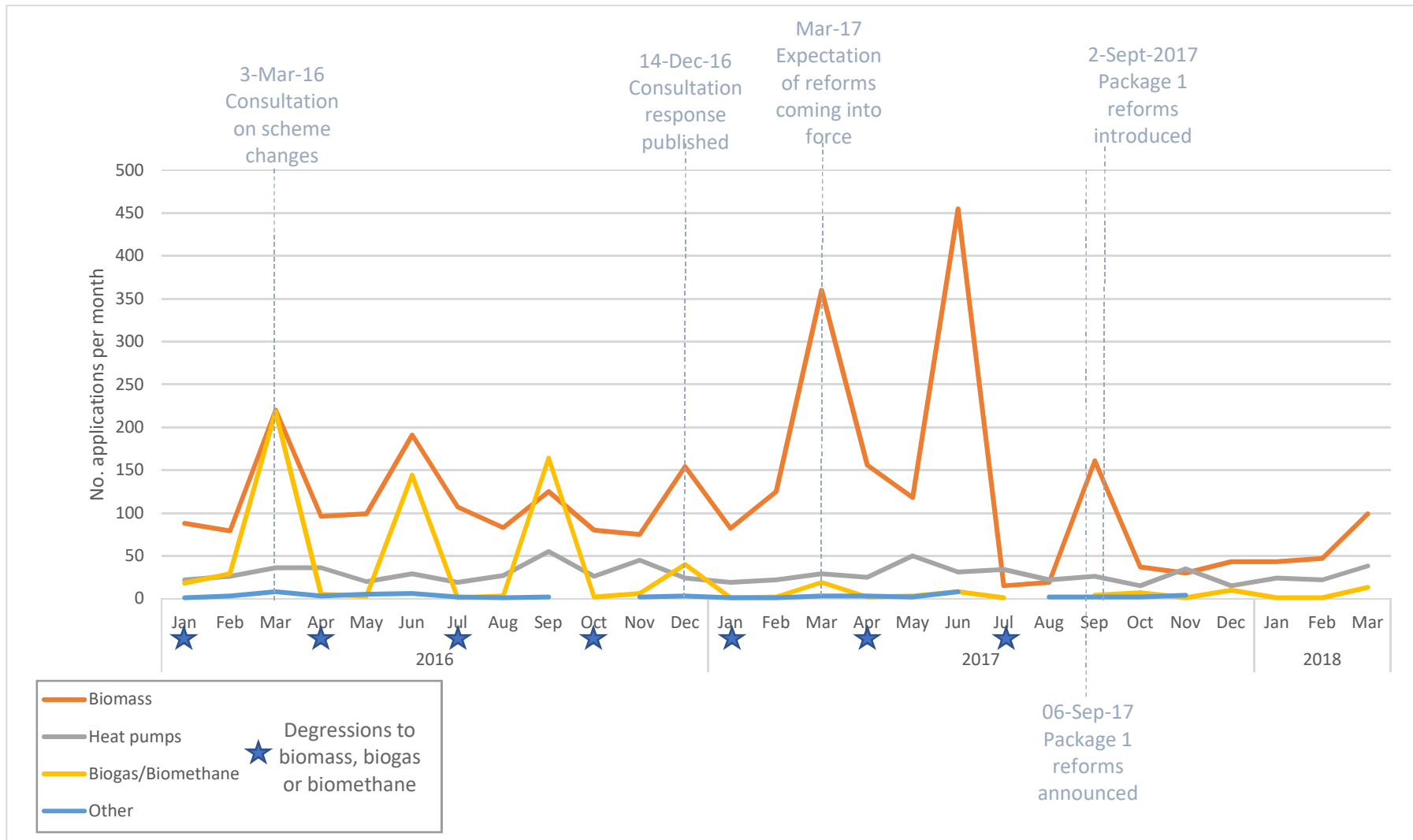
Source: BEIS, [Non-Domestic RHI and Domestic RHI monthly deployment data](#), March 2018

More detailed examination of application numbers over the last two years reveals a pattern of biomass applications that aligns with key reform milestones and tariff degressions, as shown in Figure 5. The largest spikes in the number of biomass applications occurred in March and June 2017, both aligning with the expected spring 2017 introduction of the reforms. The June 2017 spike also aligns with a tariff depression on 1st July. A smaller spike can be observed in September 2017, aligned with the delayed introduction of reforms to remove the ‘small-medium-large’ bands for biomass, which had the effect of reducing future tariffs for medium-scale biomass plants.

Despite the flexibility built into the changes to the biomethane and biogas tariff (as described on p9), there appeared to be a hiatus in investment decisions for some large-scale technologies (e.g. biomethane and large-scale CHP). Evidence from industry stakeholder consultations suggested applicants in these sectors were holding off investment in anticipation of the introduction of tariff guarantees. Installer evidence also suggested that the reform delays had prevented or delayed the installation of shared ground loops (as a result of the delays to the introduction of deemed metering for shared ground loop installations on the non-domestic scheme), however, social housing providers were reported to have been more likely to have continued with installations on the expectation they could apply for the RHI once the deemed payments were introduced.

¹⁵ Biomethane plants generate gas rather than heat. Their capacity is not included in this chart as it is measured in different units, however, the heat generated from gas produced by these technologies is included in the ‘Heat Generated’ statistics.

Figure 5: Number of full applications (by date of first submission) received for the non-domestic RHI scheme, and timeline of potential scheme-related influences on non-domestic RHI applications



Source: BEIS, [Non-Domestic RHI and Domestic RHI monthly deployment data](#), March 2018

Chapters 5 and 6 of this report provide additional evidence to explore the extent to which non-domestic applicants were influenced by reform announcements and delays during the interim period. Evidence was strongest for medium-scale non-domestic biomass applications where in-depth interviews were conducted.

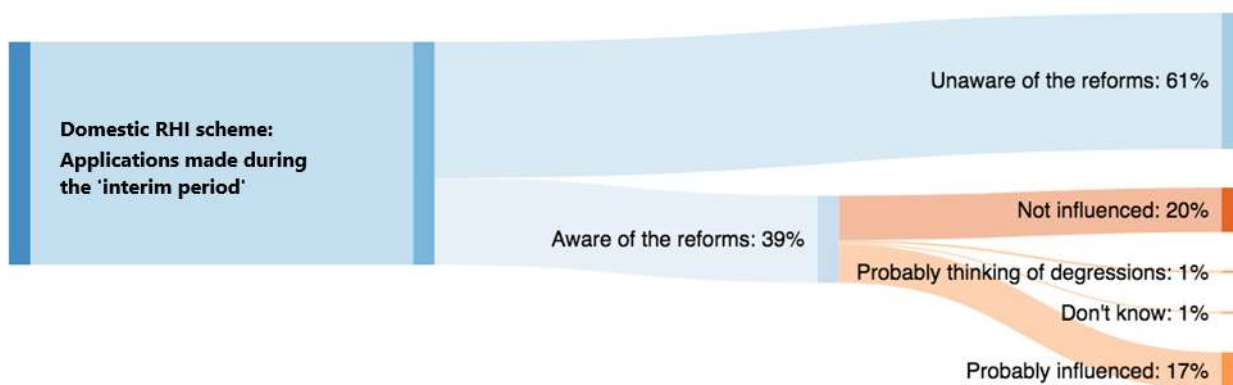
Extent to which reform proposals and delays affected these trends

The evaluation’s survey of RHI applicants found that, for applications between April 2016 and September 2017, 17% of domestic applicants and 19% of non-domestic applicants (excluding biogas and biomethane) reported being influenced by the reform proposals. Among biogas and biomethane applicants the influence of the reforms was much higher, at 69%¹⁶.

Open-ended survey comments were analysed to further understand the influence of the reforms, and the extent to which this could be separated from the influence of depressions or delays to the reforms. Applicants’ perceptions here revealed an overall lack of specificity in awareness of specific scheme reforms; it was more likely that applicants talked in general of tariff or eligibility changes.

For domestic applicants applying between April 2016 and September 2017, awareness of the reforms, and the impact they had on applicants is illustrated in Figure 6. Among the 17% of domestic applicants who said they had been influenced by the reforms, the majority reported that the timing of their applications or installations had been brought forward as a result¹⁷. As suggested in interviews with heat pump applicants (see chapter 4), this is likely, at least in part, to be a result of applicants with high heat demands seeking to avoid the implementation of the heat demand limits.

Figure 6 Proportion of domestic RHI applications (April 2016 – September 2017) for which respondents reported (a) being aware of at least one proposed reform and (b) being influenced by the reform proposals



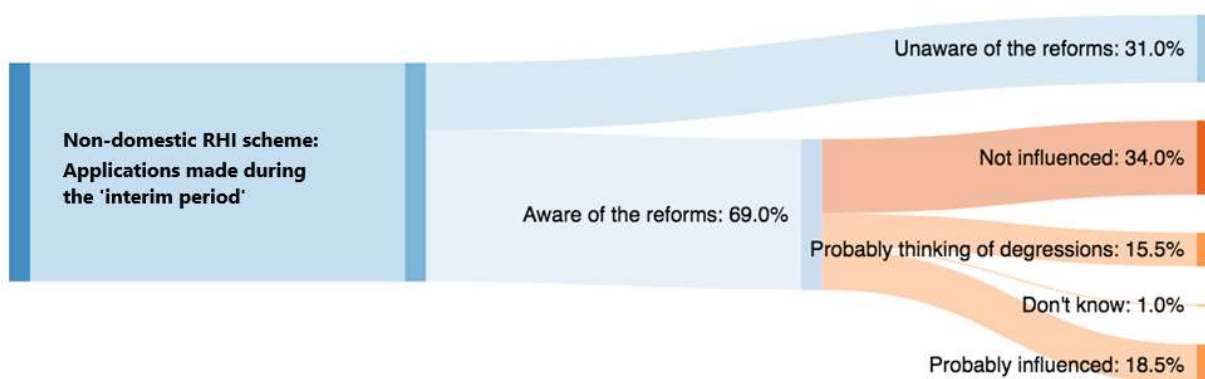
Source: Winning Moves, Domestic applicant monitoring survey with applicants successful from April 2016 to September 2017; (n=2,414)

¹⁶ Survey evidence covering applicants prior to April 2016 is available at <https://www.gov.uk/government/collections/renewable-heat-incentive-evaluation>

¹⁷ Applicants completing the survey could select more than one influence that the reforms had on them.

For non-domestic applicants applying between April 2016 and September 2017, awareness of the reforms, and the impact they had on non-domestic applicants (excluding biogas and biomethane) is illustrated in Figure 7. Among the 19% of non-domestic applicants reporting being influenced by the reforms, the majority said that the reforms influenced the timing of their installation or RHI application.

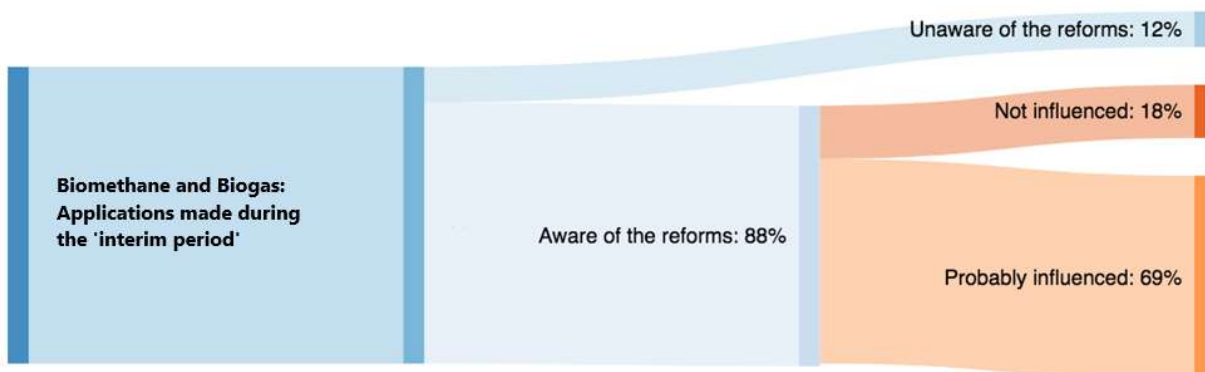
Figure 7 Proportion of non-domestic RHI applications (April 2016 – September 2017) for which respondents reported (a) being aware of at least one proposed reform and (b) being influenced by the reform proposals



Source: Winning Moves, Non-domestic applicant monitoring survey (excluding biomethane and biogas) with applicants successful from April 2016 to September 2017; (n=607)

For biogas and biomethane applicants applying between April 2016 and September 2017, awareness of the reforms, and the impact they had on applicants is illustrated in Figure 8. Among the 69% of biogas and biomethane applicants reporting being influenced by the reforms, around half said that the reforms influenced the timing of their installation or their RHI application. A further fifth said that the reforms influenced the size of their installation, the operation of their technology or their choice of technology.

Figure 8 Proportion of biogas and biomethane RHI applications (April 2016 – September 2017) for which respondents reported (a) being aware of at least one proposed reform and (b) being influenced by the reform proposals



Source: Winning Moves, Biogas and biomethane applicant monitoring survey with applicants successful from April 2016 to September 2017; (n=100)

4. Influence of reform announcements and delays: domestic heat pump applications

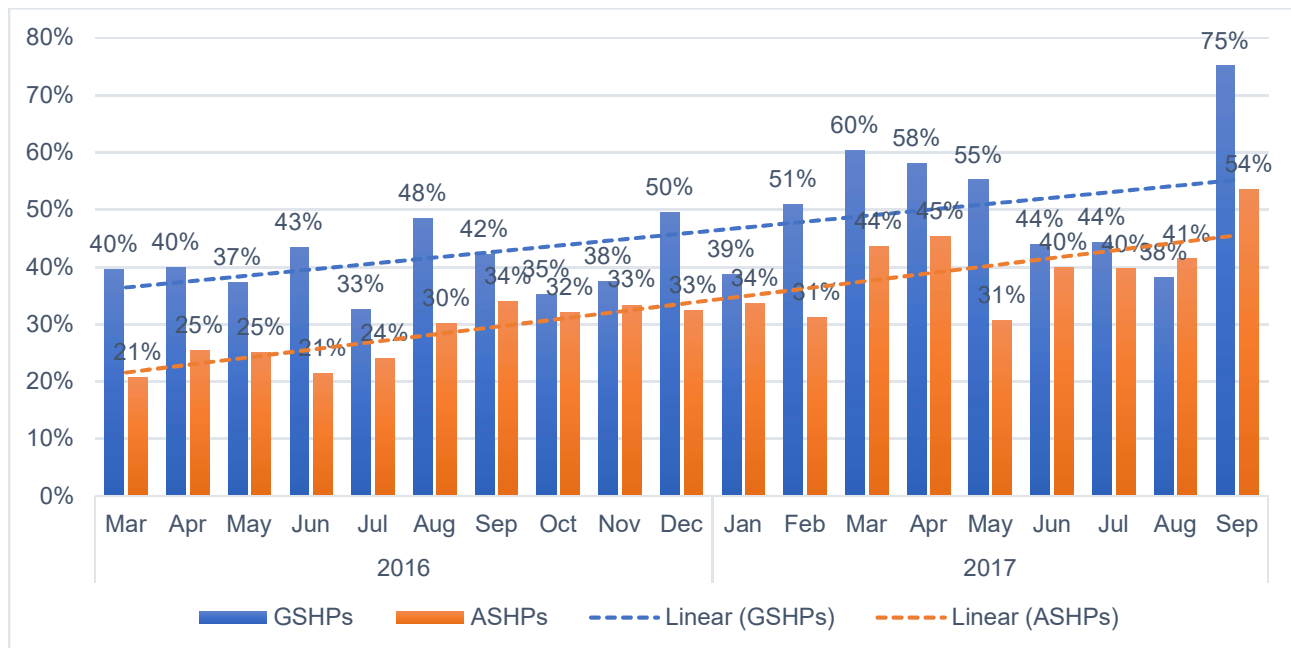
This chapter presents the findings in relation to domestic heat pump applications. This group was chosen for in-depth analysis due to the spikes in applications observed during 2016 and 2017. It sets out how and why domestic heat pump applicants were influenced by the reform announcements and the delays, and the circumstances which affected this influence.

Impact of the reform announcements and delays

The reforms originally announced in December 2016, and implemented in September 2017, increased the tariff payable to heat pumps while also introducing heat demand limits for domestic heat pump applicants, capping the financial support that applicants can receive for their annual heat use¹⁸.

These reforms aimed to support growth in installations while ensuring owners of larger homes were not over-compensated. This correlates with the finding that many applications during the ‘spike’ months, identified in **Figure 2**, had high heat demands. The mean heat demand for respondents in the ‘spike’ months was 17,969kWh compared to 14,129kWh for heat pumps in other time windows. Similarly, as shown in Figure 9, the proportion of applications for installations over the heat demand limits rose during this period.

Figure 9 Proportion of domestic heat pump applications per month that were for installations that exceeded the heat demand limits introduced at the end of September 2017



¹⁸ The cap is 20,000kWh per year for air source heat pumps, 30,000kWh for ground source heat pumps and 25,000 for biomass boilers and stove. These changes came into force on the 20 September 2017 and apply to all subsequent applications.

Source: BEIS, Domestic RHI application data

The domestic applicant survey findings show that by far the most common perceived influence of the reform announcements was on timing. The majority of respondents who said they were influenced by the reform announcements reported that the timing of either their application (70% for ground source heat pump applications, 63% for air source heat pump applications) or installation (88% for ground source heat pump applications, 73% for air source heat pump applications) had been affected. The survey responses confirmed that in these cases, applicants were bringing forward (as opposed to delaying) their applications and installations.

Understanding the impact of the reform announcements and delays

Qualitative interviews were conducted with 10 domestic heat pump applicants to provide further insight into the impact of the reforms. In line with realist methodology¹⁹, the interviews tested theories which were developed to understand how different contexts, resources and applicant reasoning lead to different outcomes²⁰.

It should be noted that for 21% of air source heat pump applications and 27% of ground source heat pump applications in the interim period, applicants stated that they did not know what they would have done in the absence of the RHI. Qualitative fieldwork highlighted that the RHI can be one of a mixture of reasons behind their decision (e.g. environmental motivations, self-sufficiency, heating performance, etc.). In these instances, the RHI subsidy appeared to provide an important 'nudge' in applicants' decision-making processes; it is not certain whether the applicants would have gone ahead with a heat pump installation without the RHI.

The research identified 4 types of domestic heat pump applicants, the summaries below outline how each applicant type was influenced by the reform announcements and delays. The first three applicant types are likely to have been present irrespective of the delays to the reforms, the size of each group may have been affected (for example a large window may have given more applicants the opportunity to complete their installation in time) however the size of each group cannot be conclusively determined with the available evidence. Due to the research methodology, other applicant types may exist but may not have been captured by the research.

Domestic heat pump applicant 1: "RHI had no influence on application timing"

These were applicants for whom the timetable for installation of a heat pump system was unaffected by the proposed changes to the RHI. This is likely the largest applicant type as 72% of ground source heat pump applications and 85% of air source heat pump applications during the interim period reported being unaffected by the reform proposals. This aligns with application data showing that 75%²¹ of heat pump applications during the reform period were under the proposed heat demand limits. A key difference between other applicant types, as revealed by the qualitative research, is that they did not think reforms would impact their application, or they were unable to flex the timing of their installation because it was

¹⁹ Realist evaluation involves developing, testing and refining 'realist' theory about the reformed RHI to identify 'what works in which circumstances and for whom?', rather than merely 'does it work?'. For an overview of realist evaluation, go to: https://www.betterevaluation.org/en/approach/realist_evaluation

²⁰ For more detailed evidence from this workstream, including interviewee quotes, see Appendix F: Interim Applicant Fieldwork Working Paper

²¹ [Domestic RHI monthly deployment data](#), March 2018, applicants applying between 1st April 2016 and 20th September 2017 with estimate heat demand in excess of the heat demand for their heat pump type.

determined by other factors (e.g. timetable for refurbishment of their home; or the need to fit expenditure within a certain financial year).

Domestic heat pump applicant type 2: “The anticipated reforms 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 reforms to ensure that they avoided the reduction in RHI payments that the reforms would have caused. The ability to flex the timing of their installation was key to this, as it was for applicant types 3 and 4.

Domestic heat pump applicant type 3: "The anticipated reforms sped up my application (installation not viable post-reform)"

Another reason why applicants sped up their heat pump applications and installations is likely to be that they either thought, or were told, that their heat pumps would not have been financially viable after the reforms because of the introduction of the heat demand limits. Whilst we did not come across direct examples of this applicant type in the qualitative interviews, interviews with installers suggested that this group is likely to have existed.

Applicant type 4: “General RHI uncertainty sped up application”

For this group, general uncertainty about the future of the RHI, or uncertainty about potential tariff changes (for example due to depressions), motivated applicants to speed up the timing or of their installation or application. This is the group for whom the delays to the reforms are most likely to have been a factor as ongoing delays led to increased uncertainty across the industry.

In these cases, applicants believed that there might be forthcoming changes to the RHI - possibly including the reforms - which would negatively impact on their ability to benefit from the RHI. Qualitative interview evidence illustrated that applicants were not always clear what these changes might have been but had either been told of upcoming changes to the RHI (for example by installers) or had their own belief, based on their own research, that there might be changes to the RHI which would reduce their benefits.

5. Influence of reform announcements and delays: non-domestic biomass applications

This chapter presents the findings in relation to non-domestic biomass applications. It sets out how and why non-domestic biomass applicants were influenced by the reform announcements, and the circumstances which affected this influence. This group was chosen for in-depth analysis due to the spikes in applications observed during 2016 and 2017.

Impact of the reform announcements and delays

The reforms announced in December 2016 and implemented in September 2017 made changes to the banding of the non-domestic biomass tariff, so as to support deployment where the technology offers best value for money and is likely to have a long-term role. The reforms introduced one level of support for all new non-domestic biomass boiler deployment, replacing the three previous tariffs which varied depending on the size of the installation. Additional changes were made to the tiering levels whereby a lower tariff rate is paid to heat generated above a certain proportion of system capacity.

The technologies previously falling into the 'small' and 'medium' sized categories were most affected by the reform announcements, as they were likely to see a reduction in the tariff they would receive. There were spikes in medium sized biomass applications in the months leading up to the introduction of the reforms²². 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 contributors to both spikes. These spikes (reaching around 450 applications per month) should, however, be seen in the context of the overall peak for biomass installations in late 2014 where monthly applications peaked at over 2,300. See chapter 3 for details of biomass deployment since the start of the scheme.

Applicant surveys showed that, 27% of non-domestic biomass applications were reported as being influenced by the reform announcements, with a further 22% saying they were influenced by the reforms but who were probably referring to the tariff degressions²³. Of those reporting being influenced by the reform announcements, 48% said it was the size of the installation that had been influenced.

Understanding the impact of the reform announcements and delays

Qualitative interviews were conducted with 12 non-domestic medium sized biomass applicants to provide further insight into the impact of the reforms. In line with realist methodology, the interviews tested theories which were developed to understand how different contexts, resources and applicant reasoning lead to different outcomes during the interim period²⁴.

²² An additional factor contributing to medium sized biomass installations in 2017 could have been the degression of the small sized biomass tariff such that it was lower than the medium size tariff.

²³ Judgement based upon (a) their open-end response on the influence of the reforms (assuming they provided one / a clear one) and (b) the timing of their application i.e. If their application was near to one of the degressions.

²⁴ For more detailed evidence from this workstream, including interviewee quotes, see Appendix F: Interim Applicant Fieldwork Working Paper

Evidence from the surveys and interviews suggests that separating the impact of the reform announcements from the impact of the delays could not always reliably be achieved. Applicants often mixed up changes happening as a result of reforms and depressions, seeing them both as tariff reductions. Delays were an additional complexity added to this.

Several of the applicant types below reference speeding up installations to install and apply to the RHI before reductions in tariffs. Across these types, the impact of long lead times for medium biomass installations reported by applicants and installers, suggests that these applicants were reacting to the reform announcements, primarily aiming to bring their application forward such that they could apply to the RHI before the announced spring implementation. This is supported by application numbers, in Figure 5, which show the largest application peaks were in March and June 2017. The delays to the reforms therefore led to a smaller spike in September 2017 when the first set of reforms was announced.

The research identified 6 types of non-domestic heat biomass applicants. The summaries below outline how each applicant type was influenced by the reform announcements and delays.

Non-domestic biomass applicant types 1, 2 and 3: "The anticipated reforms sped up my application (for a variety of reasons)"

These three types of applicants all sped up their RHI application in order to be accredited to the pre-reform scheme. Although they all displayed the same behaviour (applying sooner than they otherwise would have), the motivations for doing this differed.

A key factor for all of these applicant types was the ability to flex the timing of their installation and application. Those already locked into installation timetables were unable to react to the reform announcements or delays.

Applicant type 1 perceived the installation to be so financially sensitive that it would only be viable if it took place in advance of the reforms or an anticipated depression taking place.

Applicant type 2 perceived that their installation would have still been viable after the reforms or an anticipated depression, but financial attractiveness would have been reduced.

The qualitative research highlighted a number of factors which impacted on the level of financial sensitivity and differentiated applicant types 1 and 2. A key factor was fuel supply. Those with access to their own fuel, i.e. landowners with existing forestry or the potential for forestry, may have had significantly lower fuel costs and therefore a less sensitive business case. In other cases, the business case may have been impacted by the nature of the business. In some cases, installing earlier was more attractive not just because of the anticipated reform impacts but also for wider business reasons, e.g. a desire to install prior to a period of higher heating demands in the approaching autumn/winter seasons.

Applicant type 3 describes cases in which installations were largely or solely driven by a desire to secure income opportunities that would not be available after the reforms were implemented.

Examples of this included process heat uses that were new and were specifically prompted by the pre-reform RHI, as well as applicants who chose to install a renewable heating system instead of a non-renewable because they have access to biomass fuels which would generate an income under the RHI. It is perhaps not surprising that there were no applicant interviewees who felt that this description fitted their case, given that the inference is that some

uses were to some extent 'created' solely to benefit from RHI, however interviews with installers suggested that these applicant types existed.

The proportion of applicants who may have been of this type is unclear.

Non-domestic biomass applicant type 4: "I was unable to speed up my application (despite perceived reduced benefits post-reforms)"

This describes cases in which the installation was deemed to be more attractive financially if it took place in advance of the reforms or an anticipated depression. However, in this applicant type there was an inability to influence the timing of the installation, so the timing of the application was unaffected.

Non-domestic biomass applicant type 5: "RHI reform announcements had no influence on my application timing or technology choice"

This describes cases in which the applicant was either unaware of the reforms, and their delays, or unconcerned about their impact, so the installation was unaffected.

The survey data indicates that both of these groups (i.e. those unaware and those aware but not influenced) shared some similar characteristics:

- those who were replacing a previous heating system with a renewable heat system were more likely to be unaware or not influenced than those installing a new system;
- those in non-agricultural sectors were more likely to be unaware or not influenced than those in the agricultural sector; and
- those making single applications were more likely to be unaware or not influenced than those making multiple applications.

In terms of those who were aware of the reforms but unconcerned about their impact, the qualitative data suggested that 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; or
- the particular installation being less impacted by the changes in banding and tiering

Non-domestic biomass applicant type 6: "RHI reform announcements made me uncertain about the future of the RHI so I delayed or cancelled my installation"

This describes potential cases in which the RHI reform announcements or depressions made the applicant uncertain about the future of the RHI, i.e. they were concerned that further changes to the scheme might be introduced prior to their installation being completed, which would negatively impact on the financial attractiveness of their installation. The outcome was that a potential or planned installation was either postponed or cancelled. Evidence to support the existence of this applicant type came from installer interviews.

6. Influence of reform announcements: applications for other technologies

This chapter presents high-level findings about the influence of reform announcements and delays on other technologies, based on survey data and consultations with industry stakeholders. At this stage, we have not undertaken in-depth interviews with applicants or installers for these technologies so our insights on their reasoning are very limited.

Common themes emerging from the analysis of the technologies discussed in this chapter are that:

- Past tariff depressions for some technologies had a major influence on the timing of applications, tending to create quarterly spikes in demand in anticipation of potential depression.
- In the absence of evidence from in-depth interviews with applicants for these technologies, it is unclear whether applicant behaviour was really being influenced by anticipated tariff depression, by general uncertainty about the future of the RHI or by specific reforms for particular technologies.
- There appears to have been a hiatus in investment decisions for some large-scale technologies (e.g. biomethane and large-scale CHP), potentially in anticipation of the introduction of tariff guarantees or the uplift in biomethane tariff.

Biomethane

The reform announcements in December 2016²⁵ set out the intention to increase the tariff for new biomethane applicants and maintain the tariff for new biogas applicants, at the same time tighter restrictions were put in place around feedstocks. To support continued investment in this sector, the reform announcement stated that those applying after the announcement but before the reforms came into force would have the choice of the schemes rules under which they wished to receive RHI payments. Due to the scale of investment required for biomethane and many biogas installations, the introduction of tariff guarantees was also potentially important to this sector.

Despite the flexibility built into the reforms, applications for biomethane and biogas reduced during the interim period. Following a peak in biogas and biomethane applications in 2016 there have been fewer applications during 2017, illustrated in Figure 3. Over this period there were several depressions to the biogas and biomethane tariff, where the tariffs have decreased to around 40% of their original values. Evidence from industry stakeholders suggests that RHI policy changes and delays to reforms have contributed to the low level of applications during 2017²⁶.

²⁵ Department of Energy and Climate Change (2016), *The Renewable Heat Incentive: A reformed and refocused scheme*, 3 March 2016. Available at: <https://www.gov.uk/government/consultations/the-renewable-heat-incentive-a-reformed-and-refocused-scheme> [accessed: 24 May 2018]

²⁶ Anaerobic Digestion and Bioresources Association (ABDA) Market and Policy Report (November 2017) <http://adbioresources.org/adba-market-policy-reports/adba-market-policy-report-november-2017/>

The survey findings provided further evidence of the importance of the RHI to this sector. Across biogas and biomethane applications, 53% said that the reforms influenced the timing of their installation, while 48% said that it influenced the timing of their RHI application²⁷.

Early indications from installation figures following the introduction of scheme reforms in May 2018 showed an immediate rise in biomethane applications. This supports the evidence from industry stakeholder consultations suggesting applicants were waiting for the full package of reforms, including tariff guarantees, to become available.

Further evidence will be collected in 2019 to provide in-depth qualitative data into the influence that the RHI, the reforms and the delays has on biogas and biomethane investors' or potential investors' reasoning.

Domestic biomass installations

Domestic biomass applications dominated the early years of the domestic RHI applications, with successive depressions between 2015 and 2017 working to reduce applications from a peak of over 2,500 per quarter in Q4 of 2014 to around 200 per month in Q3 of 2017. The reform announcements stated that the domestic biomass tariff would be increased to the levels previously in place in late 2015, while heat demand limits were expected to affect a large number of biomass applications who had on average the largest capacity installations²⁸.

The pattern of applications for domestic biomass boilers shows small spikes in the months preceding the expected date the reforms would come into force (March 2017), or the final date when the reforms came into force (September 2017). This is not surprising given that 80% of applications between March 2016 and September 2017 appeared to be in excess of the proposed Heat Demand Limit.

The applicant survey evidence suggests a limited influence of the reforms, and their delays, among biomass applications, where only a minority reported being influenced by them. Among domestic biomass applicants who applied between April 2016 and December 2017, 61% stated that they were aware of proposed reforms. Two thirds of those aware said that the reforms had no influence on their actions, while the remainder were influenced either by the reforms or by the biomass tariff depressions.

Where applicants were influenced, they reported that the reforms generally influenced the timing of their installation or their application rather than their choice of technology or the size of their installation. This aligns with the pattern of applications where, although there was a slight upward trend in the average capacity of installations, this is much less pronounced than seen among heat pumps.

Other technologies

The other technologies, across the domestic and non-domestic scheme, are subject to fewer of the reforms originally proposed in March 2016. The main report includes a summary of the evidence available at this time relating to CHP, solar thermal and non-domestic heat pump

²⁷ Applicants completing the survey could select more than one influence that the reforms had on them.

²⁸ The average size of domestic biomass systems supported by the RHI up to February 2018 was 27 kW (for new and legacy installations), compared to 10KW for air source heat pumps and 14KW for ground source heat pumps. RHI Deployment data, February 2018, <https://www.gov.uk/government/statistics/rhi-deployment-data-february-2017> Accessed 24th March 2018.

applicants. Smaller installation numbers here limit the insights which can be drawn from survey data.

7. Influence of reform announcements and delays: installers

This chapter presents findings on the influence of the reform proposals on renewable heat technology installers. It focuses primarily on domestic heat pump and non-domestic biomass installers, as the majority of the interim period evaluation evidence was focused on these two groups, but some evidence regarding the wider installer market is drawn from the sustainable markets assessment workstream.

Assessing the impact of the reforms and delays on the number of installers of renewable heating systems is a challenge given the diverse market and lack of industry wide registration schemes. Installers in the domestic sector can be monitored through the Microgeneration Certification Scheme (MCS), where there was an overall decline in installer numbers from a peak in August 2014. The long duration of this decline suggests that wider market influences are playing a part, as opposed to the RHI reforms.

Further research is needed to understand the full causes of the decline in installer numbers. However, consultation with industry stakeholders highlighted potential factors including consolidation of smaller installers, ongoing changes in how the MCS scheme is run (including changes to higher fees for MCS registration), as well as changes in demand for renewable heat technologies (e.g. as a result of tariff degressions from 2015 onwards) and the influence of reform announcements and delays during the interim period.

To test the impact of the reforms, and delays, 11 installers were interviewed, including both domestic heat pump and non-domestic biomass installers. As a result of the small samples involved, 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 2017²⁹.

The interviews with installers suggested there were four main types of response to the reform announcements. Due to the qualitative nature of the research here it is not possible to estimate the proportions of installers that fall into each category. The evidence below highlights the situations in which each of these installer types is located.

Installer type 1: “We carried on as normal”

These were installers who were aware of the proposed reforms but did not make any changes to their business approach or experience any significant changes in installation numbers between December 2016 and September 2017 as a result of them.

This type of installer reasoned that the reforms would not have any significant impact on their business. This was either because (a) they believed that the technologies they installed would not be affected (for instance because they installed heat pumps 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 consumers were self-builders or renovators) and therefore any changes to the RHI would not impact on customer demand.

²⁹ For more detailed evidence from this workstream, including interviewee quotes, see Appendix F: Interim Applicant Fieldwork Working Paper

Installer type 2: “Business for our primary customer base remained static or shrunk, but we were able to diversify into other areas”

This describes installers whose business for their primary customer base (for example domestic heat pump or non-domestic biomass customers) remained static or shrunk, but who were able to offset the impacts to some extent by diversification into other areas.

In the domestic heat pump sector, an installer-manufacturer used the reform proposals (in particular, the switch from metered to deemed payments for shared ground loops) to secure increased orders of shared ground loops³⁰. The interview evidence suggested that social housing landlords were more prepared to go ahead with installations based on the reform announcements themselves³¹, whereas commercial developers seemed more risk-averse, and did not want to install until after the reforms had been implemented.

For non-domestic biomass, where installers worked across the small and medium biomass bands (and possibly domestic installations too) there were examples of installers being able to offset a decline in the number of smaller installations by increasing the number of higher value medium-sized installations, or focusing more on servicing.

Installer type 3: “We undertook fewer installations or our business stagnated”

This installer type describes installers who experienced a decrease, or stagnation, in installations during the period from December 2016 to September 2017, as result of the proposed RHI reforms.

In the domestic heat pump sector, an example is an installer whose primary business was the installation of domestic heat pumps to high heat demand customers.

Installer type 4: “We undertook additional installations in the interim period”

This installer type was not observed in the qualitative interviews with installers. It is likely, however, that there were installers who were able to profit during the interim period. Non-domestic medium-scale biomass installations, for example, were significantly higher in the ten-month interim period than the preceding ten months (1,444 installations versus 833 installations). Installers who were specifically focused on specific sectors of the market may therefore have experienced additional demand for installations during the interim period.

³⁰ Note that this business reported a similar story for its manufacturing business, which experienced ‘record sales’ in large heat pumps (potentially a result of an industry ‘push’ to install larger heat pumps before the introduction of the heat demand limits) was countered by declining sales in smaller heat pumps during the same period.

³¹ As well as the statement in the reform proposals that all installations after that date would benefit from the new arrangements, once the regulations came into force.

8. Conclusions

This chapter presents the conclusions from this study. It considers how the evidence presented in the previous chapters help to answer the two key questions posed by BEIS for this synthesis report:

- How have the successive reform announcements in 2016 and 2017, and the way that they have been implemented, influenced RHI applications?
- For whom (applicant types, supply chain sectors, technology types) and in what contexts has this influence been most marked and why?

This research has focused specifically on the ‘interim period’ between the reform announcements and their introduction. It considered how the renewable heat market was influenced in the lead up to the reforms coming into force. The evidence presented does not support conclusions on whether the reforms achieved their aims, this question will be addressed in future reports from this evaluation.

The findings highlight that the RHI reform announcements and their subsequent delays played a significant role in influencing specific parts of the renewable heat market in the between March 2016, when the proposals were first consulted on, and 20 September when the first tranche of reforms came into force. This is consistent with historic scheme deployment, where scheme changes and degressions have resulted in short-term spikes in applications.

For applications between April 2016 and September 2017, 17% of domestic applicants and 19% of non-domestic applicants (excluding biogas and biomethane) reported being influenced by the proposed reforms. Among biogas and biomethane applicants the influence of the reforms was much higher, at 69%.

The evidence indicates that the reform proposals and their delays had three distinct effects:

- Speeding up some applications and installations that stood to lose out when the reforms came into force. This was the case in particular for domestic heat pump applicants;
- Influencing applicant decisions about the size of their installation where applicants stood to lose out when the reforms came into force. This was the case in particular for non-domestic biomass applicants; and
- Delaying or slowing down applications for large scale non-domestic technologies that stood to benefit from the reforms (particularly from tariff guarantees), such as biogas, biomethane and shared ground loops.

The reform announcements are most likely to have contributed to the spikes in applications in March and September 2017 for domestic heat pumps (driven by applicants wanting to avoid the expected introduction of heat demand limits) and the September 2017 non-domestic medium-biomass spike (driven by applicants wanting to avoid the removal of tariff banding).

However, it is also clear that general uncertainty about the future of the RHI, as well as the expectation of tariff degressions, were also drivers that contributed to applicants applying or installing sooner than they otherwise would have. It is likely that the reform proposals and subsequent delays may have contributed to this general market uncertainty.

This uncertainty suggests that consumers lacked clarity about the scheme during this period. Whilst the scheme reforms were designed to create a longer-term platform for investment, and included measures to reduce uncertainty (such as providing biomethane applicants applying before the reforms were implemented the choice over the pre or post-reform tariffs and requirement), it also seems that delays caused by external factors may have added to customer confusion in the short-term.

Qualitative and quantitative evidence highlighted that installers and other third parties played an important influencing role in some decisions about heating technology choice, sizing and installation timing. The evidence also suggests that the general uncertainty about the scheme created an opportunity for some installers to 'push' installations through during the interim period.

The influence of the reform proposals on applications is consistent with the concept that much of the renewable heat market remains subsidy-driven. But the evidence also highlighted that there are elements of the market that are less subsidy-dependent (such as domestic heat pump self-builders and renovators and the installers that service them).

The extent of the impact of the reforms on applicants was largely determined by a number of key factors:

- Customer awareness of the reform proposals and perceptions about how the proposals would impact on them;
- The financial sensitivity of the installation (i.e. the extent to which changes in RHI subsidies would affect the viability of a renewable heat technology being installed); and
- Customers' ability to alter the timing of their installation.

For installers, the extent of the impact of reforms was largely determined by:

- The technology involved and the extent to which the reforms impacted on it;
- The ability of the installer to diversify into other areas (or the extent to which they had already diversified);
- The nature of the customer base, such as the extent to which their customer base was driven by the RHI subsidy;
- The nature of the installer's offer (such as their ability or willingness to respond to customer demands); and
- The lead-in times of the supply chain used by the installer.

Glossary and definitions

Term	Definition
RHI stakeholders referred to in the report	
Applicants	Householders (domestic scheme) or organisations (non-domestic scheme) which have taken up or tried to take up the RHI
Multiple applicants	Householders (domestic scheme) or organisations (non-domestic scheme) which have made more than one application to the RHI
Participants	Individuals that took part in the qualitative interviews conducted as part of this evaluation.
Respondents	Individuals that took part in the quantitative surveys conducted as part of this evaluation
Methodological terms used in the report	
Theory-based evaluation	An approach to evaluation which provides an overarching framework for understanding, systematically testing and refining the assumed connections (i.e. the theory) between an intervention and the anticipated impacts. The focus of theory-based evaluations is not only on understanding whether a policy has worked, but why, and under what conditions a change has been observed.
'Realist' evaluation	A type of theory-based evaluation which typically asks: "what works, for whom, under what circumstances?" It begins by developing a set of hypotheses (or theories) on those factors or processes that explain why an intervention has had a particular result (called a mechanism), and what effect the context of an intervention has on these mechanisms.
CMO	Context-Mechanism-Outcome configurations (CMOs) are used as the main structure for realist analysis. They describe the theoretical connections between contexts, mechanisms and outcomes (i.e. 'in this context, that particular mechanism fired for these actors, generating those outcomes') which are tested and refined in the evaluation.
Technological terms used in the report	

Biomass boilers	Boilers that burn biomass (RHI-eligible fuels include wood logs, chips and pellets, straw and agricultural residue, food waste, sewage sludge and biomass residues from industry) to heat hot water used to heat buildings and/or provide hot water (potentially via local heat networks) or, in some cases, to provide process steam for manufacturing.
Combined Heat & Power (CHP)	Installations which involve the simultaneous generation of useable heat and power in a single process. Biomass CHP installations are eligible for RHI.
Ground source heat pumps	Electricity-driven pumps that extract ambient heat from the ground. This heat is absorbed into a fluid and then pumped into a building, usually for space heating or to provide domestic hot water.
Shared ground loops	A system where a ground loop is connected to two or more heat pumps. New regulations came into force on 22 May 2018 which made shared ground loops eligible for payments through deemed heat demand under the non-domestic RHI.
Air source heat pumps	Electricity-driven pumps that extract heat from outside air. This heat is absorbed into a fluid and then pumped into a building, usually for space heating or to provide domestic hot water. Air-to-air heat pumps, which use air as the heat carrier, are not currently supported by the RHI.
Water source heat pumps	Electricity-driven pumps that extract ambient heat contained in a body of water. This heat is absorbed into a fluid and then pumped into a building, usually for space heating or to provide domestic hot water.
Solar thermal installations	Roof or ground mounted panels containing 'evacuated tube' or 'flat plate' collectors which capture heat from the sun to heat water which is typically used to provide domestic hot water.
Biomethane	Installations which use anaerobic digestion, gasification or pyrolysis of biogenic materials (for example, food wastes or maize) to produce biogas, which is refined into biomethane and subsequently injected into the natural gas grid. As with natural gas, the biomethane can then be used for heating applications in homes and businesses.
Biogas	Installations which use anaerobic digestion, gasification or pyrolysis of biogenic materials to

	produce biogas, which is used to fuel a gas engine. This produces heat (and electricity in the case of CHP installations), which might be used for space heating, hot water or industrial 'drying' processes.
Deep geothermal installations	Installations which extract heat from depths of 500m or greater. This water can be extracted and used to provide space heating and hot water for buildings (usually via local heat networks).
RHI-specific terms used in the report	
Heat Demand Limits (HDL)	Heat demand limits cap the financial support that domestic RHI participants can receive for their annual heat use. Heat demand limits have been introduced for air source heat pumps, ground source heat pumps, and biomass boilers and stoves.
Degression	Annual budgets for the RHI are fixed so Government needs to ensure that the scheme stays within budget. The means of controlling the budget for the non-domestic RHI is through degression, which operates by gradually lowering the tariffs which can be paid to new applicants as more renewable heating systems are installed. Tariffs are only reduced as estimated spend on the non-domestic scheme reaches certain expenditure thresholds or "triggers".
Assignment of Rights (AoR)	An option within the domestic RHI which allows an "investor" to help fund the purchase and installation of a household or landlord's renewable heating system. Households and landlords are then able to assign their RHI payments to the investor, who is referred to in the RHI Regulations as the "nominated" investor. Assignment of rights will come into effect on 27 June 2018.
Tariff guarantees	A tariff guarantee allows applicants to the Non-Domestic RHI for some technologies and capacities to secure a tariff rate before their installation is commissioned and fully accredited on the RHI. It does not guarantee accreditation - each application will still need to comply with all of the regulations in place at the time of accreditation.
Other terms used in the report	

Microgeneration Certification Scheme (MCS)	A nationally recognised quality assurance scheme, which certifies renewable microgeneration technologies and installation companies. MCS is an eligibility requirement for the domestic RHI and for non-domestic installations with a capacity of 45kW or less.
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