Department for Energy Security & Net Zero

Social Housing Decarbonisation Fund (SHDF) Wave 1

Process Evaluation Report

By IFF Research, Technopolis Ltd, Building Research Establishment (BRE) and University College London (UCL)

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Disclaimer

This report was compiled by IFF Research, Technopolis Ltd, Building Research Establishment (BRE) and University College London (UCL) for the Department for Energy Security and Net Zero prior to the recent general election in the United Kingdom in July 2024. As such, any references to government policies, commitments, or initiatives may reflect the stance of the previous administration and were accurate at the time of fieldwork and writing.

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Glossary

Term	Description
Co-funding	There was a co-funding requirement to maximise the number of properties that can be retrofitted with the funds available. DESNZ required grant recipients to provide co-funding of at least one third of the total fund requested.
Cost caps	To maximise value for money across Wave 1, cost caps were implemented for each home, varying depending on the EPC of a particular property.
Delivery Partner (DP)	The DP - environmental consulting services company Ricardo - acted as a first point of contact for all social housing landlords (SHLs) that received funding. Responsibilities included frontline engagement with projects, monitoring progress and risks and providing expert support and assurance where necessary.
Energy Company Obligation (ECO)	ECO is a government energy efficiency scheme in Great Britain designed to tackle fuel poverty and help reduce carbon emissions.
Energy Performance Certificate (EPC)	EPCs provide information on how energy efficient a building is, using a rating from A (very efficient) to G (inefficient).
Fuel poverty	Fuel poverty or being fuel poor is where a household is living in a property with a fuel poverty energy efficiency rating of band D or below in a home that cannot be kept warm at reasonable cost without bringing their residual income below the poverty threshold. Fuel poverty in England is measured using the Low Income Low Energy Efficiency method (LILEE).[1]
Supply chain stakeholders	The term given to individuals in this evaluation who had responsibility for the installation of measures. This included individual installers responsible for fitting measures, managers of installation teams, senior managers at principal contractors, and retrofit coordinators.
Integrated Delivery Team at DESNZ (IDT)	The Integrated Delivery Team at DESNZ (IDT) managed the SHDF scheme, including setting the policy for the fund and ensuring the fund delivered against agreed key performance indicators and programme benefits.

[1] Fuel poverty statistics methodology handbooks - GOV.UK (www.gov.uk)

Monitoring and Delivery Officers (MDOs)	MDOs were staff from the DP engaging closely with SHLs to provide guidance and monitor delivery.
PAS 2035:2019	To be eligible for funding all projects had to be compliant with PAS 2035:2019 requirements, the British standard for retrofitting dwellings.
Scheme delivery representatives	The term given to individuals in this evaluation who took part in qualitative interviews and focus groups representing the DESNZ IDT, DP and TAF.
Social Housing Landlords (SHLs)	Organisations in receipt of Wave 1 funding, i.e. registered providers of social housing, including private and local authority providers.
Social Housing Retrofit Accelerator (SHRA)	The Social Housing Retrofit Accelerator (SHRA) was established to provide technical support for all SHLs interested in applying for Wave 1 funding, to ensure applications to the fund were fit for purpose and their knowledge of retrofit delivery was sufficient. Also known as the Technical Assistant Facility (TAF). Turner & Townsend were the third party organisation appointed to deliver the SHRA support for Wave 1.
Tenant Liaison Officers (TLOs)	TLOs were employed by SHLs to liaise with residents.
Trustmark	Trustmark is the Government Endorsed Quality Scheme that covers work a consumer chooses to have carried out in or around their home. Installers in Wave 1 had to be approved by Trustmark or equivalent.

Executive Summary

Introduction

The UK has legislated to reduce greenhouse gas emissions to net zero by 2050. To achieve this, it is necessary to almost entirely decarbonise homes. The Social Housing Decarbonisation Fund (SHDF), a ten-year Conservative manifesto commitment from 2019 of £3.8 billion and administered by the Department for Energy Security and Net Zero (DESNZ), seeks to improve the energy efficiency of social housing in England through the installation of energy efficiency measures. After completion of the SHDF Demonstrator (SHDF(D)) to test innovative approaches to deep retrofit, Wave 1 of the Main Fund launched in Summer 2021, with the next wave, Wave 2.1, launched in September 2022.

The Wave 1 process evaluation report forms part of ongoing process, impact and economic evaluations, commissioned by DESNZ, of the delivery of Wave 1 and Wave 2.1. This report examines how effectively Wave 1 has been implemented and delivered, its achievements to date and early indications regarding the benefits to residents, covering the period from scheme launch through to March 2024, shortly before the scheme ended.

Methodology

The evaluation adopted a theory-based approach, with a Theory of Change (ToC) informing evaluation questions and the design of relevant methodological activities. Primary data collection covered a range of surveys, interviews and focus groups with: residents; social housing landlords (SHLs); scheme delivery representatives representing DESNZ, the Delivery Partner (DP), and the Technical Assistance Facility (TAF); and supply chain stakeholders. Secondary data covered a range of data sources including project bid data and scheme monitoring data. The evaluation also incorporated a case study methodology to explore projects and themes of particular note (individual Wave 1 case studies are published separately to this report).

The methodology was subject to some limitations which were mitigated where possible. For example: 20 out of 65 projects were not represented in the resident survey; a lack of interviews with residents that opted to not take part in the scheme limited a broader assessment of the resident experience; and inconsistency in monitoring data supplied by some projects limited the extent of secondary analysis possible. Despite these limitations, the considerable volume, quality and range of primary and secondary data used in this evaluation ensures that the conclusions drawn are reliable and robust.

Design and application process

The design of Wave 1 successfully drew on learnings from the preceding SHDF(D) pilot scheme.[2] Improvements were made to the competition process via: earlier and wider market engagement with SHLs; extending the bid window by two weeks; and developing the role of the Social Housing Retrofit Accelerator (SHRA), to support SHLs with less experience of energy efficiency retrofit with their application. DESNZ also ensured applications were more systematically structured and evaluated.

Changes were also made to scheme management to clarify delivery roles (in particular, empowering Monitoring and Delivery Officers [MDOs] to support project delivery) and streamline processes, such as thresholds for change control approval to speed up decision making (to avoid all project changes requiring ministerial sign off), and a process to deal with closure delays. Wave 1 sought to manage costs and value for money more closely through the introduction of the minimum co-funding requirement of 33% and cost capping.

SHLs typically applied for Wave 1 funding to support and expand their existing decarbonisation plans, and to improve residents' living standards. Scheme delivery representatives felt that the reach and impact of marketing and engagement activities with SHLs was effective, evidenced by Wave 1 receiving more bids than anticipated.

Some SHLs found it complex to collate the information required in the application, and the bidding window too short (particularly for large consortia), with a few lacking knowledge of the PAS 2035 requirements for installers. The modelling requirements (such as housing stock modelling) were also considered onerous, especially where the data was not readily available. Several successful SHLs reported drawing on their previous experience of delivering energy efficiency retrofit projects, including existing delivery partnerships, to inform their application.

Some applicant and non-applicant SHLs alike found scheme requirements challenging. These included: finding the 'worst first, fabric first'[3] requirement too prescriptive and not necessarily aligned to their existing plans; having to provide higher levels of co-funding to install the desired measures under the cost caps (e.g. External Wall Insulation [EWI] which was expensive to install and typically took up the entire budget for each property); and finding timescales might be too short to deliver high quality retrofits.

Nearly all of successful SHLs (96%) accessed support from the SHRA to prepare the bid and develop their retrofit plans, and scheme delivery representatives agreed that the SHRA improved the quality of the bids (e.g. providing guidance on purpose of sections and acting as a 'critical friend'). There were some concerns that, as SHLs' resident engagement plans and

[2] The joint evaluation of the SHDF(D) and Whole House Retrofit competition was published in June 2023 and is available here.
[3] 'Worst first' encourages SHLs to treat their worst performing homes first (i.e. with the lowest EPC rating) and 'fabric first' encourages SHLs to implement insulation and heat loss prevention measures before installing other energy efficiency measures.

consortium management approach were not incorporated into the application criteria, this could have contributed to e.g. higher resident refusal rates and less effective partner working.

The Wave 1 scheme awarded £19 million more than the original budget of £160 million, across 69 project bids. Successful bids on average proposed 50% match funding, well in excess of the 33% minimum. This informed the 50% minimum co-funding requirement for SHDF Wave 2.1.

The competition requirements stipulated that only Local Authorities (LAs) or Combined Authorities (CAs), working with social housing providers, could lead bids. Over half of bids were from consortia (52%). Successful applications planned for 43,763 measures to be installed across 20,299 properties (0.5% of England's social housing stock), with a mean project spend per home retrofitted of £23,610.

Delivery

As of March 2024, 16,617 properties had received, or were planned to receive, installations, of which 30,679 measures had been installed in 15,564 properties. This is 18% fewer properties than the 20,229 properties estimated by successful projects at application stage.[4] Most of this difference was due to descoping properties as agreed with DESNZ, but in addition four of the 69 successful projects withdrew from the scheme.

The original Wave 1 end date was March 2023, but this was extended during delivery to March 2024. Around a half (54%) of treated properties were completed after March 2023. On average, projects changed their completion dates four times, and six projects changed their completion dates seven or more times.

Properties considered harder-to-retrofit (and therefore to decarbonise), such as those with low EPC ratings or flats, were more likely to be descoped. For instance, 47% fewer flats and 49% fewer properties with an EPC rating of E were completed compared to initial project plans.

Loft Insulation (8,378 measures delivered or planned as of March 2024), Ventilation (8,116) and EWI (7,834) were the most common measures installed. Underfloor Insulation (−91%, which can be challenging to gain resident access for), as well as Draughtproofing (−58%), and Cavity Wall Insulation (CWI: −37%) were the most likely measures to be descoped compared to initial project plans. In contrast a much higher proportion of Solar Panels (+76%) and Ventilation (+55%) were installed.

Delivery costs varied according to the measures installed in each home. All measures costed, on average, substantially more to install than budgeted at application stage primarily due to cost inflation, including Loft Insulation (+134%), CWI (+82%), Ground Source Heat Pumps (GSHP, +80%), and Storage Heaters (+78%). Complementary measures which typically support a main energy saving measure (e.g. Ventilation) had even higher cost increases

[4] While the final delivery figure is expected to be higher than 16,617, with installations expected to complete in March 2024 it is not anticipated that this figure will increase significantly.

relative to plans, of more than 200%. Costs per property were on average around £13,531 for properties of pre-installation EPC rating D, and between £20,590 and £22,006 for all other pre-installation EPC ratings. The most expensive measures were GSHPs (£23,471 per install), followed by EWI (£18,395 per install). There was evidence of substantial economies of scale, with projects treating a larger number of homes typically reporting a cheaper average measure cost.

The Integrated Delivery Team (IDT) at DESNZ led scheme delivery, with Ricardo appointed as the DP to deal with all frontline engagement with projects. The Technical Assistance Facility (TAF), via the SHRA support service, supported SHLs with their applications. All of these stakeholders are referred to as scheme delivery representatives in this report.

Project mobilisation at this scale was enabled through the pairing of experienced staff at either DESNZ or the DP with more inexperienced colleagues to ensure effective upskilling. Some projects experienced delays at set up and scheme delivery representatives felt that improved DESNZ and DP communication with the SHL could have mitigated this.

Scheme delivery representatives and SHLs reported that project monitoring, and the process of collecting good quality data, was a significant burden. Coordinating the provision of data could be especially complicated for SHLs working within large consortia, and when monitoring data requirements changed during scheme delivery.

Scheme delivery representatives welcomed refinements to the change control process since SHDF(D). They felt it was more stringent and gave them better oversight of the schemes as it allowed them to track the impact of changes on benefits in real time. SHLs were less positive about the process, with some finding it onerous, that it lacked guidance and could have been avoided with more realistic original timescales.

Experiences of clawback, in instances where funding was required to be returned to DESNZ, were mixed. Some scheme delivery representatives found the tracking and timescales effective enough, but others felt there needed to be greater transparency.

Having learned lessons from SHDF(D), Wave 1 scheme governance was improved through clarification of the roles of the DP as the first point of contact for projects to help reduce burden on DESNZ staff. However, a lack of technical expertise among some MDOs often meant DESNZ staff were required to respond to SHL questions, while some scheme delivery representatives had concerns that the DP reduced the level of control the Department had over delivery.

The risk management process set up for the scheme was seen as sufficient. Scheme delivery representatives suggested that SHLs often focused on risks they had little control over, and did not have mitigation strategies other than to de-scope or accept project delays. For example, poor weather was one of the most common risks cited, and which prevented the installation of certain measures such as EWI as projects often did not have effective contingency plans to mitigate this.

The main barriers faced by projects included supply chain availability, higher than expected costs, a lack of familiarity with the PAS 2035 requirements among SHLs, resident engagement (especially if residents were refusing access to their property), the quality of works (typically relating to pre-work assessments failing to identify particular issues in properties), the weather, and issues with other third party stakeholders. Of all the measures, EWI faced the most challenges often due to particular property features, such as balconies, not being considered in pre-work assessments. Residents also appeared less likely to permit access for the installation of Ventilation measures and Internal Wall and Underfloor Insulation.

Developing and managing the supply chain

Supply chain stakeholders were motivated to take part in SHDF contracts by the long-term job security, the opportunity to upskill their workforce, and the opportunity to help the UK tackle climate change. Almost all supply chain stakeholders interviewed had experience of working on projects funded by other government schemes, particularly the Energy Company Obligation (ECO) scheme.

While the capacity of the supply chain was a barrier to delivery, the supply chain involved in Wave 1 and interviewed for this evaluation typically reported that they had no difficulty with their own capacity. However, many reported that they had not taken on other work, so they could focus on Wave 1 delivery.

To be eligible for funding, all projects had to be compliant with PAS 2035:2019 requirements, the British standard for retrofitting dwellings. Supply chain stakeholders generally viewed the PAS 2035 standards positively, seeing them as driving quality through the requirement for assessors and qualified retrofitters. However, there were challenges reported in ensuring and recording compliance across the supply chain.

The localised nature of many projects meant supply chain stakeholders achieved significant cost savings through bulk material purchases, reduced transportation and storage costs, decreased scaffolding expenses and labour efficiency. However, there were concerns about the scheme's vulnerability to cost inflation (due to higher quantities of materials needed), while some supply chain stakeholders felt there was an over-reliance on large national suppliers, who were able to meet bulk orders, which could potentially limit the development of smaller companies in the sector.

Resident engagement and installation experience

The evaluation incorporated a survey of 1,498 residents during or shortly after measures were installed in their home. Residents in retrofitted properties said that they agreed to having the measures installed mainly to make their home warmer/more comfortable (71%) and to save money on energy bills (64%). One in two (50%) residents did not think they had a choice whether the works went ahead in their home and nearly one in three (31%) did not know they could opt out.

Across a number of metrics, the survey determined that around two thirds of all residents were satisfied with the installation process. Key findings included:

- 65% of all residents were satisfied with the communication from their SHL, and 68% were satisfied with the communication from their installer.
- 65% of all residents found the installation scheduling convenient.
- Interviewed residents who were happy with the installation process tended to be happy to deal directly with the installers. Those who had difficulties with the scheduling, such as not being offered a choice of date, or the installer turning up unexpected, tended to want more involvement from their SHL to oversee the work and communication.
- 67% of residents with ongoing or completed installations were satisfied with the installation process overall. Between 64% and 69% were satisfied with particular aspects such as quality, noise levels, number of visits and inspections, cleanliness, and general disruption to the household.
- Those who were less satisfied with the installation process tended to experience more disruption, limited access to their property during the works and sometimes damage to their belongings or property.
- Close to half (47%) of residents with ongoing or completed installations at the time of the survey reported receiving no support or guidance for their installation, either from their installer or their SHL.

Resident benefits

Almost nine in ten (88%) residents surveyed reported experiencing at least one problem with the condition of their home prior to installation, with over half reporting difficulties with draughts or heating their home to a comfortable temperature as well as condensation problems.

Among Wave 1 households where it was possible to combine EPC records with survey responses on income, 82% were estimated to be in fuel poverty prior to installations (using the Low Income Low Energy Efficiency (LILEE) fuel poverty definition).

Although the survey was conducted shortly after installation of the measures, six in ten residents with works completed (60%) said they were now prouder of their home. Residents that now use a different form of heating (72%) and those who had new doors and windows installed (63%) were more likely to say they were now prouder of their homes.

Around half of the residents who mentioned previous problems with their home before the installation said these were having a negative effect on either their physical or mental health (53% and 49% respectively). Overall, around one in five residents where works had been completed in their home reported that their mental (21%) and physical (18%) health had already improved since having the measures installed.

Over half of residents with works completed (54%) said it was now more affordable to maintain a comfortable temperature in their homes and over two fifths (43%) agreed they use less energy since the installation of measures. With the widespread installation of insulation

measures, there was a clear reduction in all types of heating used: over two fifths (43%) of residents with works completed who previously used portable or plug in heaters reported using them less often, while a similar proportion (38%) of those with mains gas central heating also reported lower levels of use. Those who received a heat pump were more likely to agree that it was more affordable to maintain a comfortable temperature post installation (72%).

Over six in ten residents (63%) would consider other energy saving installations in the future, with evidence from the qualitative interviews suggesting that positive experiences of Wave 1 installations may have increased residents' awareness of their energy usage and interest in energy efficiency measures.

1 Introduction

Introduction to the Social Housing Decarbonisation Fund

The UK has legislated to reduce greenhouse gas emissions to Net Zero by 2050. The UK has some of the oldest and least energy efficient homes in Europe. To reach Net Zero, it is necessary to almost entirely decarbonise homes. The Social Housing Decarbonisation Fund (SHDF), for which the Conservative manifesto committed £3.8 billion of new funding in 2019 over ten years, is administered by the Department for Energy Security and Net Zero (DESNZ) and seeks to improve the energy efficiency of social housing in England through the installation of energy efficiency measures.

The SHDF Demonstrator (SHDF(D)) Fund was announced in the 2020 Summer Economic Update and awarded £62 million for SHLs to test innovative approaches to retrofitting at scale. Building on the SHDF(D), the SHDF Main Fund has taken a waved approach. Wave 1 of the Main Fund ran from Summer 2021 until Spring 2024, awarding £179 million to successful SHLs. Wave 2.1 launched in September 2022, awarding £778 million of funding, and is due to close in September 2025. The Wave 2.2 'top-up' competition allocated a further £75.5 million of funding in April 2023, and is due to close in March 2026.

Evaluation aims and objectives

Aims of the evaluations

DESNZ commissioned separate process, impact and economic evaluations of both SHDF Wave 1 and Wave 2.1. The overall aim of the evaluations is to evaluate delivery and assess how successful the schemes have been in working toward their objectives. In addition, the evaluations aim to:

1. Provide accountability for public spend on the SHDF.
2. Improve the design and delivery of future waves of the SHDF.
3. Provide case-related insights into key barriers and drivers to effective delivery and impact.
4. Provide an evidence-based narrative and summary of the impact of the SHDF.

The evaluations cover nine overarching research questions (each with a number of subsidiary questions); these are presented in the Technical Annex.

Purpose of this evaluation report

This is the final report for the Wave 1 Process Evaluation, which assesses how Wave 1 was delivered and how learnings can inform future waves. This report primarily responds to the following four research questions:

1. How effectively has Wave 1 been implemented and delivered?
2. To what extent and how have Wave 1 projects performed as intended?
3. To what extent and how has Wave 1 incorporated lessons learned from other DESNZ energy efficiency schemes and the SHDF(D), to inform the design and delivery of the waves?
4. To what extent and how has the design of Wave 1 effectively supported both wave-level and overall SHDF achievements?

The report also provides early findings related to the following research question: “To what extent, and how, has Wave 1 delivered benefits for social housing residents, including delivering warm, energy-efficient homes, improved resident health and wellbeing outcomes, and reduced risk of fuel poverty?”.

Data collection and analysis for this process evaluation concluded shortly before scheme completion. The report draws on primary data collection with residents in retrofitted properties, SHLs (successful, unsuccessful and non-applicant), scheme delivery representatives, and installation stakeholders, as well as analysis of scheme data up to February 2024.[5]

The report includes the following chapters:

- Chapter 2: Methodology.
- Chapter 3: Design and application process.
- Chapter 4: Delivery.
- Chapter 5: Developing and managing the supply chain.
- Chapter 6: Resident engagement and installation experience.
- Chapter 7: Early resident outcomes.
- Chapter 8: Conclusions.

Throughout the report there are references to analysis contained within separate case study reports. These case studies explored specific projects and themes in greater depth and have been published separately. The Wave 1 Impact and Economic Evaluation Report will be produced in Spring 2025 for publication later in 2025.

[5] As evaluation activities concluded before final project delivery completion, findings should not be considered final. Where relevant, the Wave 1 Impact and Economic evaluation report will contain updated findings following subsequent evaluation activities.

2 Methodology

This chapter summarises the methodological approach underpinning this evaluation. A full methodology is available within the Technical Annex accompanying this report.

Methodological approach

The SHDF Wave 1 evaluation takes a mixed methods approach to assess the process of delivery, analyse key scheme outcomes, and assess value for money. This process evaluation report draws on surveys and interviews with stakeholders and beneficiaries and secondary data, synthesising findings against process evaluation questions (these are presented in the Technical Annex).

In an initial scoping phase, the evaluation team first developed a Theory of Change (ToC), from which evaluation questions and a methodological approach, incorporating both primary and secondary data, was established. As part of this, the evaluation team engaged an expert panel to provide scrutiny and quality assure the approach. The analytical approach is described in the next section.

While this report covers Wave 1 as a whole, the evaluation approach also incorporated a case study methodology to explore projects and themes of particular note. This informed the sampling for interviews with SHLs, supply chain stakeholders and residents. This resulted in nine Wave 1 case studies covering six projects and three thematic areas (PAS 2035, hard-to-treat properties and retrofit activity of SHLs not participating in Wave 1). Separate reports have been published on each case study but are referenced throughout this report.[6]

Primary data collection

The process evaluation drew on primary data collected among participating and non-participating residents, scheme delivery representatives, SHLs and supply chain stakeholders. Fieldwork occurred between May 2023 and February 2024. Table 1 summarises fieldwork activities with each audience. A detailed summary of all methodological strands is included within the Technical Annex.

Table 1: Primary data sources used within this report

Data source	Description	Timings	Content
Participating residents	1,498 responses via an online and telephone survey, from an issued sample of	Tranche 1: May-June 2023	Background information (e.g. measures installed, demographics), installation experiences and emerging

[6] The third thematic case study on “Retrofit activity of SHLs not participating in Wave 1” will be written and published later in the evaluation and therefore will not be published alongside the Wave 1 Process Report.

	5,235. The sample covered 45 out of 65 projects and was weighted to ensure representativeness of all Wave 1 projects.	Tranche 2: July-Aug 2023 Tranche 3: Jan-Feb 2024 Survey answered during or shortly after installation.	outcomes (e.g. thermal comfort, issues in home, affordability).
Participating residents	150 in-depth interviews with residents from 40 projects who took part in the survey. Conducted on an opt-in basis.	Tranche 1: July 2023 Tranche 2: Sept 2023 Tranche 3: Jan-Feb 2024	More detailed experiences of installation process, exploration of concerns, issues and perception of benefits of measures.
Non-participating residents	3 in-depth interviews with residents who opted to not take part in Wave 1.	June 2023	Background information and motivations for not having measures installed.
Scheme delivery representatives	4 individual interviews with 4 DESNZ senior officials.	Oct 2023	Lessons learned for scheme design, pre-competition engagement, application and appraisal processes, project delivery, and scheme management, outcomes, and impacts.
Scheme delivery representatives	4 focus groups: - 1 with DESNZ Integrated Delivery Team (IDT) - 1 with Technical Assistance Facility (TAF) representatives - 2 with Delivery Partner (DP) representatives	TAF and first DP group: July 2023 IDT and second DP group: Oct 2023	Pre-competition engagement, application and appraisal processes, project delivery, and scheme management, outcomes, and impacts.

Participating SHLs (from projects selected to be case studies)	14 semi-structured interviews with representatives of 6 projects.	Tranche 1: May 2023 Tranche 2: Oct 2023	Pre-existing retrofit plans and activity, application process, project delivery (enablers, barriers, support sources), and project monitoring, outcomes, and impacts.
Participating SHLs (from non-case study projects)	15 semi-structured interviews with project leads from 15 SHLs.	Tranche 1: May 2023 Tranche 2: Oct 2023	Pre-existing retrofit plans and activity, project delivery, outcomes and impacts.
Participating SHLs (from non-case study projects)	1 focus group with 5 representatives of 3 projects.	Oct 2023	Experience of installing measures in hard-to-treat properties, enablers and barriers in implementing PAS 2035, impacts of PAS 2035 on projects.
Unsuccessful SHL applicants	2 in-depth interviews with SHLs who were not successful in their application.	May & June 2023	Retrofit activity undertaken outside of Wave 1, and views and experiences of applying to Wave 1.
Non-applicant SHLs	3 in-depth interviews with SHLs who engaged with the Social Housing Retrofit Accelerator (SHRA) but did not apply to Wave 1.	May & June 2023	Retrofit activity undertaken outside of Wave 1, views and experiences of TAF support and reasons for not applying to Wave 1.
Supply chain stakeholders	37 in-depth interviews with installers, installation managers, senior managers at principal contractors and retrofit coordinators .They represented 23 projects, and 9 were from 3 case studies.	Tranche 1: July-Sept 2023 Tranche 2: Sept 2023 -Jan 2024	Motivation for and involvement with SHDF, communications with the SHL, challenges to delivery, quality of work delivered, training and accreditation, value for money of installations, and broader view on Government retrofit schemes.

Secondary data sources

The process evaluation also made use of extensive secondary data, including bid data, scheme monitoring data, and statutory data, as shown in Table 2.

Table 2: Secondary data sources used within this report

Data source	Description	Content
SHDF Wave 1 Business Case	Overall scheme approach	Sets out the environmental and economic rationale for the scheme, the scheme's aims, proposed approach to delivery and rationale.
Project Bid Data (data available up until February 2024)	Bid data: portfolio review analysis	Data on project plans compiled at the point of submission of bids to DESNZ, including unsuccessful bids.
Project Bid Data (data available up until February 2024)	Bid data after contract award	Baseline data on initial project plans for successful bids, compiled and updated after the initial contract award, including information on measure and tenure type.
DESNZ monthly delivery data (from the Data Management System completed by projects as of February 2024)	Property details	Provides details of each property retrofitted, including costs, where projects have submitted this data.
DESNZ monthly delivery data	Measure details	Provides details of all measures installed, including costs, which can be linked to properties.
DESNZ monthly delivery data	Project summary: risk register	Includes risks, levels of risk and mitigation actions.
DESNZ monthly delivery data	Project summary: activities and plans	Summarises activities undergone by individual projects each month.
DESNZ monthly delivery data	Project summary: total number of installers	Number of apprentices trained, or installers recruited, where projects have submitted data.

Statutory data	Statistical Data Return (SDR) and Local Authority Data Return (LADR)	Background data on SHLs and their housing stock.
Statutory data	English Housing Survey (EHS)	Background data on SHL housing stock.
DESNZ project performance management data	Lessons Learned Log	Detail of issues experienced by projects and solutions.
DESNZ project performance management data	Change Control register (data available up until end of March 2024)	Summary of project plans, and changes to individual project timelines, scale and scope.
Delivery Partner summaries of activity	Monthly project reports	Detail of monthly issues experienced by projects and relevant solutions, from the point of view of SPOCs (Single Points of Contact) at the Delivery Partner.
SHDF Official Statistics (published in May 2024 and presenting latest statistics to the end of March 2024)	Monthly releases of SHDF statistics	Provides number on properties that have received retrofits and number of measures installed up to March 2024.
SHRA Impact Report	A review of TAF support up to March 2022	Provides information on number of bids supported, and the type and number of resources produced.

Analysis

Quantitative data from the participating resident survey was weighed to make it representative of the Wave 1 resident population. Further details on the weighting approach are provided in

the Technical Annex. Only responses between sub-groups that are statistically significant at the 95 percent confidence level are highlighted in this report.

Interviews and focus groups were coded and analysed thematically using a framework analysis approach that mapped topics back to the evaluation questions. This enabled the evaluation team to determine common themes, relationships between themes, and how experiences and attitudes compared between different stakeholder types.

A triangulation approach was used to synthesise evidence. This helped to enrich the analysis, as data from one source could contextualise or add nuance to data from another source. To support triangulation, themes covered in primary data collection, as well as secondary data sources, were mapped against the relevant process evaluation questions, to show where different sources informed the same research question. The report emphasises where findings are consistent across different data sources.

Research limitations

Although this report draws on multiple sources of primary and secondary data, it is still subject to some limitations:

- **Representativeness of resident survey**. The volume of contact details for Wave 1 residents supplied to the evaluation team was lower than anticipated, which led to a lower achieved sample size than planned (1,498 compared to a target of 2,000). This reduces the statistical robustness of the survey. Furthermore, 20 of the 65 projects are not represented in the resident survey, while other projects are under-represented relative to the number of properties they retrofitted. We have applied weighting to the survey data to mitigate this issue.
- **Self-selecting nature of qualitative research with residents**. Residents opted in to in-depth interviews following the resident survey. They may be more likely to be 'engaged' residents and have motivations to take part in voluntary research, introducing bias. To help mitigate against this, residents with different personal and property characteristics were selected for interviews.
- **Lack of interviews with non-participating residents**. Owing to poor quality sample, the evaluation captured only three interviews with residents that decided not to take part in the scheme. This means the evaluation is limited in its assessment of how well SHLs promoted Wave 1 to residents, and the barriers experienced by residents to participate in Wave 1, given the vast majority of feedback is from residents who received measures.
- **Interviews with non-applicant and unsuccessful SHLs form a small sample** and so are not necessarily representative. This limits the evaluation's assessment of the Wave 1 design and application process, as successful applicants may have had a more favourable outlook on this.
- **Quality of delivery data,** while much improved from early monitoring, was a limiting factor on some analyses. A small number of projects (six) were excluded from analyses since they had not (as of end February 2024) submitted completions of properties or measures despite other sources indicating these projects had completed. In addition, some projects

included measures which were not in-scope, not SHDF funded, or auxiliary works (e.g. scaffolding) while some projects did not include auxiliary works (e.g. ventilation) which were SHDF funded. Where this is suspected to have affected analysis, for example inflating the count of measures classified as 'other', this was flagged in the report. In addition, data on employment of installers and apprentices appeared inconsistent from project to project,[7] resulting in limited analysis of this information and therefore less meaningful findings.

- **Use of scheme data and official statistics**. Throughout the report we have used published official statistics for measurement of delivery where available, including number of properties retrofitted and measures installed. Where official statistics were not available (e.g. for sub-group analysis of properties retrofitted, or planned to be retrofitted), we used delivery data compiled monthly by projects. Delivery data is the source used for official statistics.[8] Information on project plans as of March 2024 (referred to in the report as 'properties retrofitted or planned to be retrofitted', or 'measures installed or planned to be installed') was taken from Change Control data, as this does not feature in official statistics.

3 Design and application process

This chapter covers the design of SHDF Wave 1, and the process of applying for funding. This includes how the SHDF(D) phase informed the design of Wave 1, how and whether Wave 1 reached the intended group of applicants for grants, and the extent to which the SHRA and the design of Wave 1 effectively supported this. Additionally, this chapter examines the targeting of measures as outlined in bids relative to the goals of the policy, and the extent to which installations might have happened without SHDF.[9] This chapter primarily draws on evidence from interviews with SHLs and scheme delivery representatives, the SHDF Wave 1 Business Case and project bid data.

Design

Learnings from SHDF(D) were successfully incorporated into Wave 1 design, including eligibility requirements, the application process, and scheme management approach.

During delivery of SHDF(D), measures were more costly than applicants had projected in their bids due to rising costs. In order to manage the risk of rising costs and promote value for money in Wave 1, DESNZ introduced a co-funding requirement of at least 33%, as well as a cost cap system to limit the funding available for each property retrofitted according to their original EPC rating. Applicants were also required to provide evidence of a thorough cost analysis and estimation.

[7] E.g. definitions of 'installer' varied from numbers of individuals to numbers of main contractors. Data on apprentices was unaffected by this, but it only measured the number of apprentices working in a given month, rather than a cumulative number of those who started apprenticeships or successfully completed them.
[8] Figures differ since the cleaning process is different. In the few cases where delivery data was used instead of official statistics (three tables in the report) this was clearly signalled and explained in the footnote to the table.
[9] Evaluation questions addressed in this chapter: 1.1, 1.2, 1.3, 1.4, 3.1, 4, 4.1, 4.3, and 6.1.

DESNZ made several other changes to the Wave 1 competition process to incorporate lessons learnt from SHDF(D). These included:

- Earlier engagement with a broader range of SHLs, coordinated with other government schemes.
- Provision of the SHRA support to improve the accessibility of Wave 1 funding to SHLs with less experience and knowledge of energy efficiency retrofit (see 'SHRA support for applicants' section for more details).
- The Wave 1 application window was two weeks longer than that of SHDF(D), in order to allow applicants more time to develop a comprehensive bid.
- Owing to the length of application forms and the time intensive and complex moderation process, the scheme transitioned from Word-based applications (with no word limit) in SHDF(D) to Excel-based applications in Wave 1.
- The application moderation process for Wave 1 followed a stricter marking system to provide greater consistency and to make the process easier.

> *"We learned a lesson with the Demonstrator that if you have a really open marking system, you're going to have a really un-unanimous way of marking, making moderation and selection difficult. So we did have a very strict marking process." Scheme delivery representative*

Scheme delivery representatives also reported that DESNZ made further changes to Wave 1 scheme management to address the following SHDF(D) learnings:

- During SHDF(D), scheme delivery representatives felt there was a level of overlap between the role of the DP and that of the internal delivery team, resulting in duplication of work. Roles were clarified for Wave 1.
- Monitoring Officers of SHDF(D) were changed to be Monitoring and Delivery Officers (MDOs) for Wave 1 to empower them to support project delivery further.
- The process of signing and returning Memorandums of Understanding (MoUs) during SHDF(D) was considered inefficient. DESNZ have since streamlined the contracting process for Wave 1.
- The change control process for SHDF(D) was also considered inefficient, as every project change was routed up to the Minister. In Wave 1, DESNZ implemented a threshold-based process (using low, medium, and high thresholds) to determine what approval was required for project change.
- During SHDF(D), DESNZ felt underprepared to deal with closure delays. The scheme delivery team have since implemented a process in order to deal with closure delays in Wave 1 and reported feeling better equipped to deal with these.

SHDF(D) highlighted that SHLs struggled to quickly mobilise projects in the short delivery timescale. While Wave 1 retained a short delivery window, the scheme delivery team implemented three steps to mitigate this issue for both SHLs and DESNZ:

- Firstly, milestones for 'having a project team in place' and for passing early phases of PAS 2035 requirements were introduced.[10]
- Secondly, DESNZ held kick-off meetings and launch events following funding award, to highlight key lessons from SHDF(D), and allow quick establishment of relationships between SHLs and scheme delivery representatives.
- Finally, MDOs engaged closely with SHLs during the early phases of projects to provide guidance. MDOs were also asked to provide DESNZ with an indication of any projects which required additional focus.

Promoting the scheme to Social Housing Landlords

Marketing of Wave 1 was effective in targeting the desired audience of SHLs. Key motivations for applying included accessing support for existing retrofit plans (and increasing their scope), decarbonisation through improving the energy efficiency of housing stock, and, to a lesser extent, improving resident living standards.

Scheme marketing

Scheme delivery representatives reported taking several steps to promote engagement with Wave 1. They first undertook a stakeholder mapping exercise to produce a targeted list of SHLs that might apply. Scheme delivery representatives then worked with stakeholder and industry groups to attend their events, and held online and in-person events and masterclasses to introduce the scheme. The team also set up a website and a LinkedIn page with regular updates about the scheme.

SHLs reported hearing about Wave 1 in a variety of ways, including via email lists and social media. Scheme delivery representatives felt that their marketing efforts – which included activities undertaken by SHRA/TAF – were effective overall, as Wave 1 received a high number of quality applications (detailed in the later section 'Profile of Bids'). They reported that their activities helped attract interest in the scheme, as well as providing information to make the experience more accessible for potential applicants.

SHL motivations for applying to Wave 1

The majority of interviewed SHLs reported applying for Wave 1 funding in order to support existing plans for retrofit and energy efficiency installations.

SHLs typically described decarbonisation as a high priority issue within their organisations. Energy efficiency retrofits would help pave the way to achieving their Net Zero targets. Some SHLs stated they had an objective to get their social housing stock to EPC C by a certain year, such as the national target to get all homes to EPC C by 2035. Many felt that the funding would increase the pace or scope of their plans, either by adding more expensive or intensive measures (i.e. measures which are harder to install or require more disruption to the building)

[10] To be eligible for funding all projects had to be compliant with PAS 2035:2019 requirements, the British standard for retrofitting dwellings.

or by increasing the number of properties they were able to improve to EPC C. Around half of SHLs interviewed reported that Wave 1 objectives aligned with their own overarching strategies.

> *"I think it's quite a big ticket issue in the council. Obviously it's quite high profile - people's energy bills increasing, carbon footprint, etc. And we've got a climate change plan within the [organisation] and it's just factored into all of those elements." Successful SHL*

> *"The bid was announced and we knew that we needed to get our social housing stock up to EPC band C by 2030. It was a case of, we're here at the minute and we need to get there, there's a pot of funding that will enable us to do that." Successful SHL*

Case Study: Coventry City Council

Both the Coventry City Council and Citizen, the Housing Association involved in the project, have policies that prioritise domestic retrofit to decarbonise housing stock, reduce fuel poverty, and improve resident wellbeing. In 2021, the Council adopted the One Coventry Plan 2022-2030, which outlines key priorities for the community including increasing economic prosperity, tackling inequalities, and reducing the impact of climate change. The Council felt that the SHDF programme supported all three of these goals.

"SHDF cuts across all three goals [of the One Coventry Plan]… so it immediately got traction/support from senior management." SHL Interviewee

The scheme's prioritisation of a fabric first approach further aligned with consortium goals. The project team felt that Wave 1 funding allowed them to stretch their internal funding ringfenced for energy efficiency retrofits further.

Around half of SHLs interviewed reported applying in order to improve resident living standards, including improving their comfort and wellbeing, addressing damp and mould, reducing energy bills and reducing rates of fuel poverty.

> *"We had homes that were occupied by residents that were just energy inefficient, and people were feeling the pain, and we knew that we could use this fund to improve their well-being." Successful SHL*

Application process

While some SHLs found the application process straightforward, others found it challenging, in part due to tight timescales and complex requirements. SHLs received SHRA support positively, and scheme delivery representatives felt it improved the quality of the bids received. More bids were received than expected, but there were concerns from scheme delivery representatives over their quality.

Enablers to the application process

Some SHLs reported that previous experience with energy efficiency retrofit projects was useful for their applications. This included regional and national programmes such as the SHDF(D), the LA Delivery Schemes, the Home Upgrade Grant, and the Energy Company Obligation, as well as specific projects within LAs to install measures such as External Wall Insulation (EWI) and solar PV to their social housing stock and privately owned homes. Experience with previous retrofit projects provided insights into aspects such as resident needs, organising retrofit, working with the supply chain, and working in difficult housing archetypes.

Case Study: Coventry City Council

The project team highlighted key learnings and experiences from SHDF(D) which supported success in their Wave 1 project:

1) Knowledge to ensure retrofit work was replicable and realistic to fit within Wave 1 timelines.
2) Familiarity with PAS 2035.
3) Previous work on the same type of housing.
4) Implementation of Sava, an intelligent energy system, which enabled the team to efficiently model properties to identify and plan the measures to be installed to improve the homes to EPC C and above.

"We benefitted with the experience we had – with lessons learned from Demo. [We] were aware of where the pitfalls were in delivering the project." SHL interviewee

Case Study: Crawley Borough Council

Crawley Borough Council have gained valuable retrofit experience through previous participation in several national and local retrofit schemes, as well as internally funded work. This included work on 'quick build', non-traditional homes that are timber framed and have a very high risk of interstitial condensation if not damp proofed properly.

Some successful SHLs reported that existing and positive relationships with project partners contributed to the success of their application. This included housing providers (consortium members), contractors, and other members of the supply chain. Some SHLs who worked in a consortium reported that they combined different expertise from across the consortium to develop their bid.

> *"We benefitted with the experience [our partner] had, and with lessons learned from Demonstrator [we] were aware of where the pitfalls were in delivering the project." Successful SHL*

Finally, some successful SHLs reported that the SHRA support provided by the TAF improved bid writing, helped develop projects and build consortia. This is discussed in more detail in the later 'SHRA support for applicants' section.

Challenges with the application process

Both successful and unsuccessful applicants reported challenges and barriers to applying to Wave 1. Issues with the application process itself included its complexity, the timescales and timing of the bid, data and modelling requirements, and some projects having many consortium members:

- Complexity of the application process and the application form itself being difficult to use and prone to errors (reported by around half of the SHLs interviewed). Some SHLs reported that the use of an Excel-based form with multiple sheets (as opposed to Word- or online-based) made it especially difficult to navigate. Some SHLs also reported they needed to engage external consultants to get support to complete the application.

  > *"I think the process was painful. The application form itself was complex and difficult to evaluate. [It was] quite difficult to actually put the right numbers in. So that could have been much easier and much clearer." Successful SHL*

- Half of interviewed applicants felt that – despite a longer application window compared to SHDF(D) – the timescales and timing of the bid posed significant challenges. Some SHLs felt that there was limited time to pull together the high level of required data and information. One SHL further commented that the timing of application was inconvenient, given it was in August (and therefore holiday season).

  > *"I think the challenge in terms of applying is just the timescale to get your bid submissions in, and a lot of work goes into putting bids together." Successful SHL*

- Some SHLs felt that application data and modelling requirements (such as housing stock modelling) were onerous given the short bid timescales, particularly in instances where the required data was not readily available. For example, some SHLs installing measures in hard-to-treat properties reported a lack of existing or up to date data (e.g. EPC data) as a challenge during the application and planning stage. Some smaller or less experienced SHLs felt the process favoured more experienced or larger applicants, who already had the required data or had more capacity to collect it. One unsuccessful SHL stated they would require support from DESNZ to effectively access this data. Further, two successful SHLs reported that the modelled data they used in their application was inaccurate when it came to project delivery as it was out of date, and the properties originally selected were not actually suitable for Wave 1. This led to the submission of multiple project change requests.
- Some SHLs reported issues with having several partners in their consortium, as it made it difficult to collate all the required information from multiple housing providers. One SHL reported that it was difficult to support their housing providers in the application process, as they all had differing levels of experience in retrofit.

Some SHLs also reported challenges in developing their application to adhere to scheme requirements:

- 'Worst first, fabric first' requirements[11] were challenging, as they made the process too prescriptive and hard to fit within their plans.
- They perceived proposed delivery timescales for Wave 1 were too short to deliver high quality retrofits.
- Issues with the co-funding requirement, reporting that they had to provide higher levels of co-funding in order to install the desired measures under the cost caps. An example given by one SHL was EWI, which was expensive to install and reportedly took up the entire budget for each property.
- PAS 2035 requirements, especially for applicants with no previous experience of this. One SHL reported paying for an external consultant to navigate this requirement.

Non-applicant feedback reflected the same challenges that successful SHLs raised on the application process:

> *"It was quite clear that we didn't have the data we needed. We were implementing a new asset management system at the time as well. So we were hoping that once we were up and running back, Wave 2 might be a better option for us." Non-applicant SHL*

SHRA support for applicants

The TAF, via the SHRA support service, supported 66 of the 69 successful bids for Wave 1, and 12 out of the 24 unsuccessful bids. Many applicants praised the SHRA support. Some SHLs reported that it improved their understanding of how to write a high-quality application, through aspects such as:

- Guidance to understand what DESNZ was looking for in each question, and provision of exemplar answers in 'storyboarding' sessions.
- Guidance to understanding the trickier parts of the application, such as the annexes.
- After writing their bids, some SHLs had them proof-read and checked by SHRA staff in a 'critical friend' review. SHLs found this to be useful, and a scheme delivery representative reported that bid quality improved thanks to this feature.

Other SHLs praised the SHRA support for helping them develop their project delivery plans, via:

- Understanding what kind of measures should be implemented.
- Understanding the financial requirements (i.e. the split between capital costs and admin and ancillary costs).
- Guidance on the PAS 2035 requirements.

[11] 'Worst first' encourages SHLs to treat their worst performing homes first (i.e. with the lowest EPC rating) and 'fabric first' encourages SHLs to implement insulation and heat loss prevention measures ahead of other energy efficiency measures.

- Guidance on resident engagement strategy (one SHL noted that this was mostly in the form of hearing about what other projects were doing).
- One non-applicant reported that the bid requirement information made them realise they were not in a position to develop a successful bid.

However, some SHLs highlighted gaps in the support. For example, some SHLs felt that SHRA staff sometimes lacked depth of knowledge or real retrofit experience. While the SHRA offered good practical and administrative support, some projects required more assistance with the technical and retrofit delivery side of the project. This was reported more frequently by SHLs with more experience in retrofit and accessing government funding. Furthermore, one SHL specifically would have liked to have a template for how to communicate with residents about the scheme and the retrofit works on offer.

Scheme delivery representatives reported that SHRA support helped make introductions between people and organisations in the same region, potentially to develop bid consortia. Scheme delivery representatives thought this to be especially useful for housing associations (HAs) or registered housing providers (RPs) who needed to engage with a LA in a consortium to submit their Wave 1 application. This was not reported by any SHLs during interviews, but this may be due to small sample size.[12]

> *"Turner & Townsend,[13] I have to say were excellent. I thought their workshops were interesting, but I think the one-to-ones were better. And I think the other thing that was found very helpful was having the same person doing the one-to-one because they already understood where you've got to in the application."*
> *Successful SHL*

Efficiency of the application process

Scheme delivery representatives felt the application and moderation process was executed more efficiently than during SHDF(D). The primary difference was reported to be the outsourcing of the moderation process to the DP, which was recognised as complicated and resource intensive during SHDF(D). Scheme delivery representatives reported that moderation was also carried out more efficiently as a result of more rigid and clear guidelines for marking. In SHDF(D), the 'open marking' system was thought to be confusing and open to interpretation, but clear guidelines for what was expected from each question in Wave 1 removed this ambiguity. The scoring matrix was designed based on answers complying with scheme design and criteria. There were concerns this resulted in harsher penalties when applicants misinterpreted the questions, however scheme delivery representatives felt that the provision of application support via TAF mitigated this risk for applicants. Scheme delivery representatives also praised the DP's support ahead of application submission, in which they created an FAQ document for applicants to support the bid writing process (though this was not mentioned by any interviewed SHLs).

[12] Six case study SHLs were asked about SHRA support.
[13] Turner & Townsend was the third party organisation appointed to deliver the SHRA support for Wave 1.

However, one scheme delivery representative reported that there was a big variation in assessors. While some assessors were thought to have a good holistic view of what a good application should have looked like, others with more technical expertise potentially took a more segmented view. This may have resulted in inconsistencies in the moderation process, and DESNZ had to get more involved than they had intended. The budget was intended for one individual from DESNZ to take part in moderation, but three individuals in total were involved. Furthermore, one successful SHL reported that the application questions felt repetitive, and they entered the same information for multiple questions. This may indicate extra effort on behalf of the moderators, as they were assessing the same information multiple times.

Quality of bids

Some scheme delivery representatives were pleased with the quality of the bids received, and felt it was reflective of the successful promotion of Wave 1 and the provision of the SHRA support. However, other scheme delivery representatives raised concerns over the quality of the bids received, potentially resulting in project delivery difficulties.

Firstly, as there was no specific request for details of applicants' resident engagement plans, there were concerns from one scheme delivery representative that applicants had overlooked this. They felt this could result in projects failing to plan resident engagement strategies adequately, which can be a key barrier to meeting delivery targets. The majority of interviewed SHLs reported experiencing resident refusal and drop out to some extent. Many SHLs felt this was for reasons outside of their control, such as disruption in their home or personal circumstances and vulnerability.[14] However, some SHLs felt that more extensive or successful resident engagement would have helped to minimise resident refusal or drop out.

Another scheme delivery representative reported that SHLs often lacked sufficient understanding of costs to enable them to accurately budget for their project. They reported only around 10% of SHLs had accurately costed project delivery in their bids. SHLs reported cost increases in relation to inflation and rising material or labour costs (rather than lack of accurate costing in the bid). This resulted in an increase in co-funding amounts from SHLs and, in some cases, reduced scope of project delivery.

Several scheme delivery representatives reported concerns that SHRA support may result in SHLs submitting similar answers in their applications. One scheme delivery representative felt there was a risk that SHLs may not have fully understood what they had committed to during delivery, resulting in challenges. While no SHLs explicitly reported a lack of understanding that resulted in challenges during project delivery, many SHLs did encounter challenges while carrying out retrofits. These are explored in later chapters, particularly Chapter 6, 'Resident Engagement and Installation Experience'.

[14] The small number of interviews (3) conducted with non-participating residents meant the evaluation was unable to robustly assess reasons for non-participation. However, evidence from the few that were conducted suggested that fears over disruption (such as moving furniture and having installers in the house) were a key barrier to engagement.

> *"I think the TAF was really good in helping Local Authorities show people how to write an application. But obviously what that does is that can sometimes generate similar answers for similar questions." Scheme delivery representative*

Finally, multiple scheme delivery representatives suggested that there should have been an application question asking how consortia were managed and how they would have worked together. Scheme delivery representatives suggested that, in some cases, consortia were formed of entirely discrete retrofit projects with their own contractors that were just presented under one umbrella. This meant that the consortium was assessed as a whole, and therefore not considering the strengths and weaknesses of individual projects, their suitability for funding, or their ability to deliver.

Profile of bids

The SHDF Wave 1 scheme was oversubscribed, ultimately awarding £19 million more than the £160 million originally budgeted for the scheme. Successful bids involved a range of organisations, including around two thirds (67%) of England's largest Private Registered Providers (PRPs).[15] Successful bids on average achieved 50% match funding, well in excess of the minimum of 33%.

Scale of bids and match funding

In total, £179 million was awarded to 69 successful Wave 1 projects, from a total of 92 applications (75%).[16] Successful bids involved 164 organisations in total (including leads and partner organisations in consortia). The total grant funding was £19 million more than the £160 million[17] that was initially allocated to the fund for 2021/22.

Table 3 shows the costs and scale of successful bids, demonstrating the wide range of sizes of Wave 1 projects. The total planned spend, including co-funding or 'match' funding from SHLs, amounted to £365.6 million across all successful bids, and per-project spending ranged from £0.6 million to £26.4 million (£5.3 million on average).

On average, successful bids planned to provide 50% of expected costs through co-funding (£187 million in total). This was higher than minimum co-funding requirement of 33% of project costs. The average (mean) planned spend per home was £23,610, although it ranged from £3,427 to £73,737.

Successful bids proposed a slightly lower percentage of co-funding than unsuccessful bids (50% on average across successful bids, compared to 54% on average across unsuccessful

[15] Defined as those with 25,000 or more units of housing regulated by the Regulator of Social Housing under management.
[16] Nine of the 69 successful Wave 1 projects had received funding through SHDF(D).
[17] BEIS (2021) Social Housing Decarbonisation Fund: Competition Guidance Notes. Accessed at: https://www.gov.uk/government/publications/social-housing-decarbonisation-fund.

bids), and a lower average total spend per home than unsuccessful bids (£23,610 on average for successful bids compared to £26,537 on average for unsuccessful bids).

Table 3: Profile of successful Wave 1 project bids

Measure	Minimum	Mean	Median	Maximum	Total
Total costs proposed across projects (£million)	0.6	5.3	2.9	26.4	365.6
Grant funding proposed across projects (£million)	0.3	2.6	1.6	14.9	178.5
% co-funding proposed across projects	30%	50%	49%	75%	n/a
Number of properties to be retrofitted across projects	24	296	136	1,570	20,229
Total proposed spend per home at a project level (mean)	£3,427	£23,610	£22,559	£73,737	n/a

Source: SHRA Wave 1 Bid Analysis Spreadsheet, n=69 projects.

Consortia formation

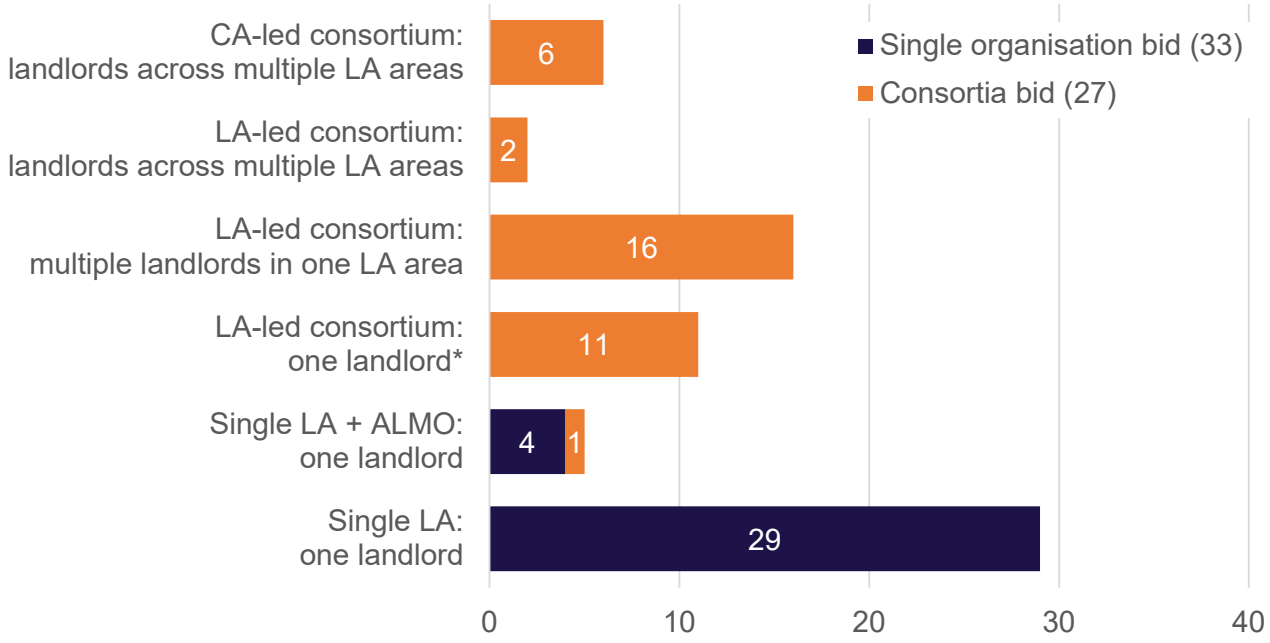
Bids made were almost evenly split between consortia and single organisation bids (44 vs 48 respectively), with those from consortia being awarded at a higher rate (81% vs 69%). This resulted in 36 successful bids from consortia, and 33 from single organisations.[18]

The majority of successful bids were led by LAs (63 out of 69), and six by CAs, as shown in Figure 1[19] In total, eight projects (12%) involved properties in multiple LA areas, and 24 (35%)

[18] Some LAs with Arms Length Management Organisations (ALMOs) applied as a single organisation in their capacity as property owner (but not manager), while some applied as a equal consortium with their ALMO included in the application.
[19] Bids had to be led by an LA or a CA, as Wave 1 deployed Section 31 of the Local Government Act, meaning PRPs could only apply as part of a consortium.

involved multiple SHLs.[20] The average consortium involved 4.0 organisations, including an average of 3.3 SHLs,[21] with fewer than ten consortia having five or more SHLs involved.

Figure 1: Organisational structures of projects – consortia and single organisation bids



Source: SHDF Wave 1 bid data; Housing Regulator SDR (Statistical Data Return); Housing Regulator LADR (Local Authority Data Return); National Federation of ALMOs. *Where an LA was not a landlord but still led the project administratively.

SHL involvement in Wave 1

Overall, 75 PRPs (primarily HAs), 68 LAs (42 of whom held social housing stock), 14 Arms Length Management Organisations (ALMOs) and one unregistered housing charity were involved in successful bids.

As shown in Table 4, successful Wave 1 bids involved two-thirds (67%) of the largest PRPs in England (i.e. those with 25,000 or more units), and around two-thirds (63%) of ALMOs. More than a quarter of England LAs holding social housing stock (29%) were involved.

While around half of PRPs with 10,000 to 24,999 units were involved in successful bids (52%), this fell to about a quarter (27%) among those with 5,000 to 9,999 units. Only a minority of SHLs with fewer than 5,000 units were involved, suggesting a significant quantity of housing owned by smaller SHLs (who manage about 11% of all PRP-managed housing in England) is likely to remain untreated after Wave 1.

[20] This is lower than the number of consortia because some consortia (11 projects, 16%) involved one SHL with a non-stock-holding local authority in the consortium in a purely organisational capacity.
[21] Four PRPs included in consortia, and counted here as social landlords, did not manage any stock but owned stock. In all cases these were small landlords (e.g., housing co-operatives), where the stock was managed on a day-to-day basis by another member of the consortium.

Table 4: SHL involvement in SHDF Wave 1 successful bids, among organisations managing social housing in England, by type of organisation

SHL type	Number of social rented properties managed in England	Number of SHLs involved in Wave 1	Number of SHLs in England	% of SHLs involved in Wave 1
LAs (managing social housing stock)	1,301,000	42	143	29%
ALMOs	239,000	14	22	63%
PRP: 25,000+ units	1,315,200	22	33	67%
PRP: 10,000 to 24,999 units	657,500	23	44	52%
PRP: 5,000 to 9,999 units	339,200	14	51	27%
PRP: 1,000 to 4,999 units	205,000	10	81	12%
PRP: 100 to 999 units	78,000	2	218	1%
PRP: <100 units	16,000	0	467	0%

Sources: SHDF Wave 1 bid data; Housing Regulator SDR (Statistical Data Return); Housing Regulator LADR (Local Authority Data Return); National Federation of ALMOs

Successful bids were more likely than unsuccessful bids to have been involved in prior government energy efficiency schemes. As shown in Table 5, only 12% of successful bids were led by an organisation who had not previously received government funding from the SHDF(D), Sustainable Warmth or the Green Homes Grant (Local Authority Delivery, LAD), all schemes for which data on previous grants was available. This compared to 23% among organisations leading unsuccessful bids.

Overall, around two-thirds (64%) of lead organisations for Wave 1 bids – successful or unsuccessful – had applied for Sustainable Warmth funding. Excluding this funding source, around two-thirds (64%) of organisations that led successful bids had applied for at least one of the other schemes shown in Table 5, compared to 36% of those who led unsuccessful bids.

Table 5: Percentage of successful and unsuccessful bids whose lead organisations had previously received funding from other government energy efficiency schemes

Wave 1 bid status	% received SHDF(D) funding	% received Sustainable Warmth funding	% received Green Homes Grant LAD1a funding	% received Green Homes Grant LAD1b funding	% no prior funding
Successful	13%	64%	28%	36%	12%
Unsuccessful	5%	68%	18%	27%	23%

Source: SHDF Wave 1 Bid Analysis, 69 successful bids and 23 unsuccessful bids.

Properties planned to receive installations

20,229 properties were planned to be retrofitted by the projects funded by Wave 1. Targeted properties consisted of a mix of housing stock, with houses (31% terraced and 24% semi-detached) being most common. The majority of properties to be retrofitted had an EPC rating of D or below (97%).

Profile of properties planned to receive installations

A total of 20,229 properties were planned to have measures installed by Wave 1 projects, accounting for 0.5% of England's social rented housing stock. The majority of properties (55%) were houses, either terraced (31% of all properties) or semi-detached (24%; see Table 6). Compared to housing stock reported for social landlords in the English Housing Survey (EHS), houses and bungalows were slightly over-represented among Wave 1 properties, with flats considerably under-represented (31% in the scheme compared with 45% in the social housing stock).

Table 6: Type of properties to have measures installed by Wave 1 projects, compared to EHS housing stock

Property type	Number of properties planned to have measures installed under Wave 1	% of Wave 1 properties which are of this type	Number of social rented properties in England (EHS)	% of social rented properties in England (EHS)
Terraced	6,199	31%	1,058,000	27%
Semi-detached	4,910	24%	653,000	16%
Detached	77	<1%	26,000	1%

Bungalow	2,616	13%	426,000	11%
All flats	6,319	31%	1,798,000	45%
Other	9	<1%	n/a	n/a
Unknown	99	<1%	n/a	n/a
Total	**20,229**	**100%**	**3,961,000**	**100%**

Source: SHDF Wave 1 bid data (after successful applications finalised); English Housing Survey 2021-22, Table DA1101.

The majority of properties planned to have measures installed had a pre-installation EPC rating of D (74%) while 19% had a rating of E (see Table 7). Based on initial baseline estimates provided by projects after their applications were accepted, 92% of properties retrofitted would have a final EPC rating of C and 5% would have a rating of B. Analysis of Wave 1 and EHS data together indicates that social rented properties in England rated E were the most likely to be targeted by Wave 1. In total, it is estimated that 3.6% of all social rented properties in England with an EPC rating of E were included in plans for Wave 1, compared to 1.2% of those rated D, and 2.3% of those rated F.

Table 7: Proportion of Wave 1 and EHS properties by prior EPC level

	Number of properties planned to have measures installed under Wave 1	% of properties planned to have measures installed under Wave 1	Number of social rented properties in England (EHS)	Approximate % of all social rented properties in England planned to be treated*
Band A to C***	584	3%	2,595,000	0.0%
Band D	14,908	74%	1,222,000	1.2%
Band E	3,825	19%	105,000	3.6%
Band F	767	4%	33,000	2.3%
Band G	51	<1%	**	n/a
Unknown	94	<1%	n/a	n/a
Total	**20,229**	**100%**	**3,961,000**	**0.5%**

Source: SHDF Wave 1 bid data (after successful applications finalised); English Housing Survey 2020, Table DA7101. *Assumes all properties treated are social housing as defined by the English Housing Survey. Although a small proportion of those treated may not be, this gives a close approximation to the true percentage.
**Too low for detection in EHS.

***Assumes all properties in bids not reported as having EPC bands D to G are in bands A to C. This may contain some properties with unknown EPC rating.

Properties planned to have measures installed were fairly evenly distributed across regions in England. The highest number of properties planned to have measures installed was in the North West (15%), London and the East of England (both 14%), and the lowest was in the South West (5%). Compared to the distribution of social housing stock reported in the EHS, properties in London (14% compared to 19%), the South East (6% compared to 13%), and South West (4% compared to 8%) were somewhat under-represented.

Measures planned

At grant funding award, 43,763 measures were planned to be installed across 20,229 properties, with the most common measure types being EWI and Loft Insulation. Clean heat measures accounted for 4% of measures and 5% of funding, and were planned to be installed in 8% of homes retrofitted. Most projects that planned to install clean heat measures were generally planning to install the same or greater numbers of insulation measures compared to projects that did not plan to install clean heat measures, suggesting a fabric-first approach was being taken.

This section explores the range of measures planned to be installed by successful Wave 1 projects. Analysis presented within this section draws upon the profile of measures agreed by the end of the bidding process.

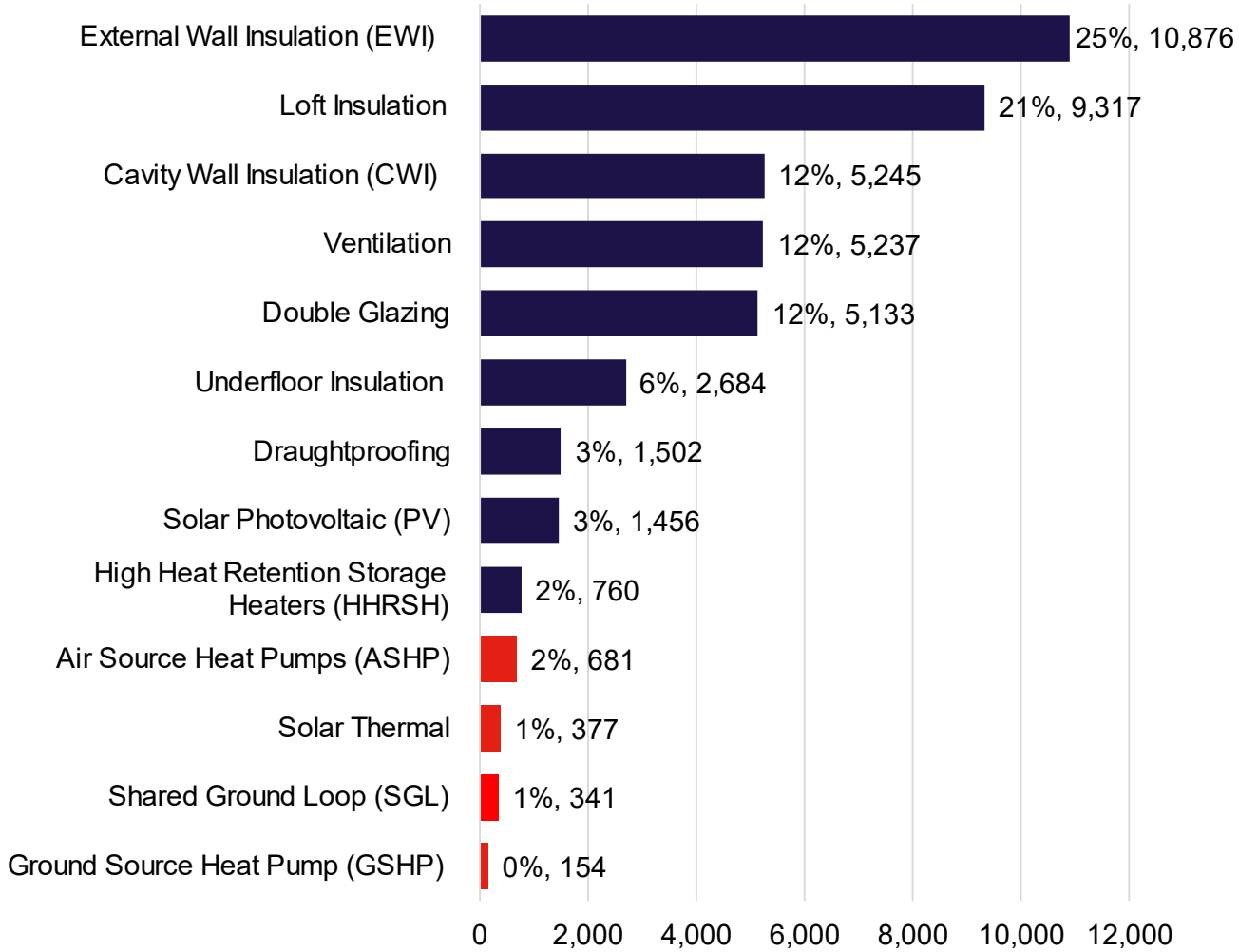
Profile of measures proposed at bid stage

In total, 43,763 measures were planned to be installed across 69 projects, according to plans associated with successful bids.[22]

Figure 2 shows that the most common measures to be installed were EWI, Loft Insulation, Cavity Wall Insulation (CWI), Ventilation and Double Glazing. In total, nearly two thirds (64%) of all measures planned to be installed were insulation measures. This was in line with the requirement in Wave 1 to focus upon improving fabric first.

[22] This differs slightly from the original profile of bids, since some bids were modified during the process of scrutiny and acceptance by DESNZ.

Figure 2: Number of measures planned to be installed as part of Wave 1 at project start

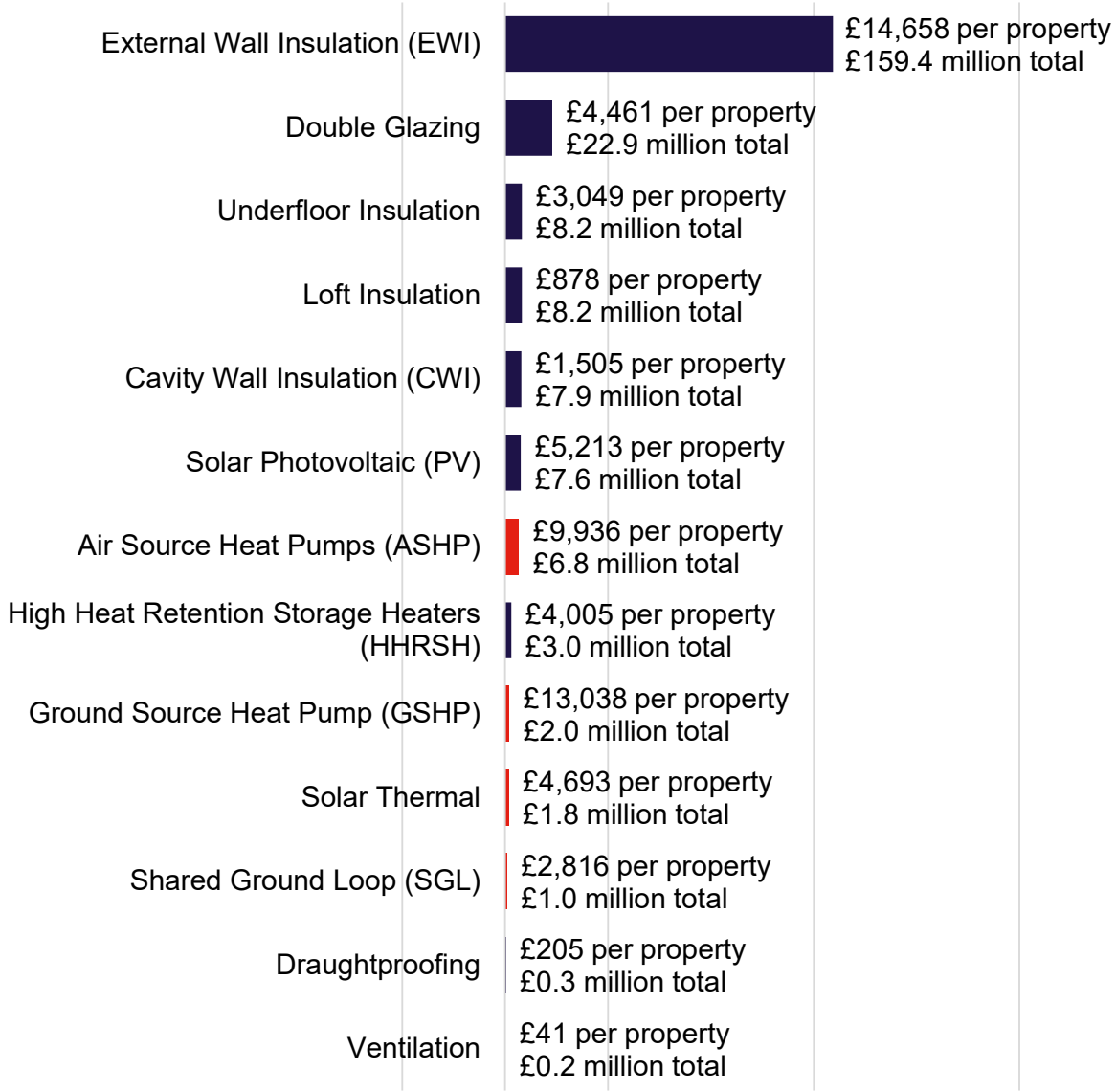


Source: SHDF Wave 1 bid data (after successful applications were finalised), n=43,763 measures. Measures shown in red are clean heat measures.

Figure 3 shows the spending outlined in bids for each of the measure types. Most of the measures delivered in large quantities had a low unit cost (Loft Insulation at £878, CWI at £1,505, and Ventilation at £41), other than EWI (£14,658) and Double Glazing (£4,461). Nearly three quarters (70%) of all planned spending, including co-funding, on measures was for EWI (£159.4 million in total), and a further 10% on double-glazing (£22.9 million). One scheme delivery representative felt that there was too much focus on EWI in Wave 1, as described below:

> *"From a policy point of view there was too much External Wall Insulation (EWI) in Wave 1 which was an extremely costly measure at the time and went up more than other measures. In terms of value for money, we didn't want that. In terms of measures, this didn't match expectations. In terms of benefit-cost ratios, this didn't match expectations for DESNZ or the insurers." Scheme delivery representative*

Figure 3: Planned spending on measures per property and overall as part of Wave 1 at project start (excluding VAT)



Source: SHDF Wave 1 bid data (after successful applications were finalised), n=43,763 measures. Clean heat shown in red.

Planned delivery of clean heat

Clean heat measures were relatively uncommon among Wave 1 projects, accounting for only 4% of the total number of measures planned to be installed (1,553 measures), across 22 out of 69 Wave 1 projects (32% of projects). Of these 22 projects, nearly all (77%) were consortia, and 14 (64%) involved more than one SHL.

Since multiple clean heat measures would not normally be installed in a single property, this suggests 8% of Wave 1 properties[23] were planned to receive clean heat measures. Based on data shown in Figure 3, total spending on clean heat was planned to be £11.5 million (£7,407 per property to have measures installed), or 5% of total spending.

[23] 1,553 measures spread across 20,229 properties; 1,553 ÷ 20,229 = 8%.

Of all planned clean heat installations, Air Source Heat Pumps (ASHPs) were the most common (681, 2%). This analysis does not include Solar PV (3% of installations, 1,546 measures) which can be used to generate heat through its ability to produce electricity.

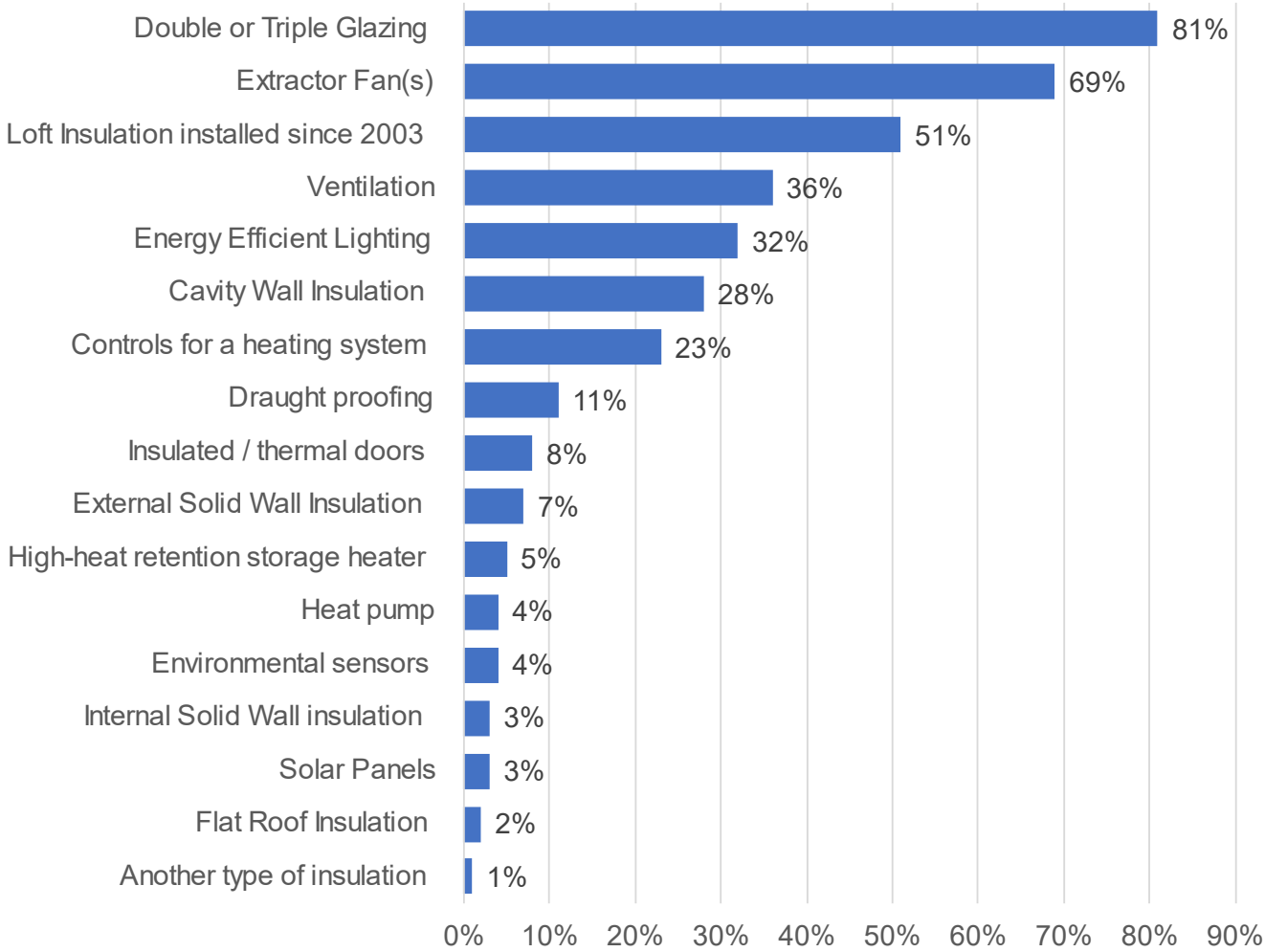
All except one project that planned to install clean heat measures also planned to install an equal or higher number of EWI and CWI than clean heat measures, suggesting they were planning to insulate homes receiving clean heat measures, therefore following a 'fabric first' approach. This was verified at a property level in delivery data: of the 396 ASHPs installations logged as completed, only 14 (4%) were installed alone, with an average of 2.9 further measures installed together with a ASHP installation.

Targeting of measures

Evidence from the resident survey showed that nearly all residents (95%) already had at least one of the measures eligible for installation under Wave 1 installed in their home prior to participating in the scheme (Figure 4). Eight in ten residents (81%) already had Double or Triple Glazing, two thirds had an extractor fan (69%) and half (51%) had had Loft Insulation installed since 2003. Just over a quarter of residents' homes[24] (28%) were fitted with CWI, which has been standard in new homes for many years, indicating that many of the surveyed residents were living in poorly insulated homes.

[24] Those without CWI would include homes without cavity walls.

Figure 4: Energy saving measures that were already installed in residents' homes before Wave 1 installations started



Source: Wave 1 Resident Survey. Question C4: Thinking about the time before these installations started, did you already have any of the following installed? (n=1,498).

Low carbon heating systems were rare in homes prior to installation of Wave 1 measures, with only 4% of residents already having a heat pump installed in their homes. Of these residents, the majority (46%) were unsure about the type of heat pump installed in their home, whereas one third (32%) reported having an ASHP, and 14% a GSHP.

Additionality

SHLs would generally be undertaking retrofit without Wave 1 funding, but this would be to a more limited extent and possibly to a lower quality.

Most successful SHLs had used other government funding to undertake retrofit works in the past, from schemes including: the Energy Company Obligation (ECO); the Local Authority Delivery scheme (LAD); the Home Upgrades Grant (HUG); the Sustainable Warmth Competition (SWC); and the Renewable Heat Incentive (RHI). A number of SHLs reported previously not being able to secure other funding on their social housing stock which was targeted in Wave 1. Most SHLs also reported having internally funded energy efficiency

initiatives in other properties in their housing stock or in the same homes targeted for Wave 1, which included installing measures such as EWI, heat pumps, and solar PV.

Many successful and unsuccessful applicants reported that, as a result of internal budget constraints, Wave 1 funding has or would have enabled them to increase the scale of their retrofit plans and the number of properties to have measures installed. One successful applicant stated that without Wave 1 funding, they could not consider progressing their intended plans for retrofit.

> *"I think at the time it was a case of if we didn't get the funding, we'd still do the works but to a third of the properties […] so we'd be doing the same sort of work but to about 300 homes rather than 900 or as it turned out nearer 1200."*
> *Successful SHL*

Most successful SHLs reported that Wave 1 funding allowed them to broaden the scope of their retrofit plans and implement measures that they had not installed before. For example, some SHLs highlighted that some measures were quite complex and expensive to implement, and Wave 1 enabled them to access options including EWI and Flat Roof Insulation to raise the EPC of their buildings. Another reported that using their internal budget meant they would have had to focus on installing just one measure, rather than employing a whole house approach[25] as under Wave 1.

Finally, some successful SHLs reported that Wave 1 improved the quality of the retrofits. For example, the PAS 2035 requirements and the whole house approach ensured additional works were done, such as ventilation, to eliminate damp and mould. One SHL also reported that making a conscious effort to look at the specifications of properties meant that measures such as brick finishing were implemented to improve the quality of homes.

> *"[Without the Wave 1 requirements we] wouldn't have followed PAS 2035 to the letter. [We] would have established a generic design/outcome and processed it as a means of going through a reputable contractor and working through them. [It] would have been a compromise in what was affordable and deliverable."*
> *Successful SHL*

However, some unsuccessful Wave 1 applicants and non-applicants reported a preference for undertaking work internally, because they felt there were fewer requirements. One unsuccessful SHL reported that they still undertook retrofits to the same scale and scope using internal funding, but without a whole-house pre-installation EPC rating assessment, which enabled a faster approach to implementing measures. Similarly, some SHLs, both unsuccessful applicants and non-applicants, reported a preference for internal funding given the high resource needed for administrative and application tasks with external funding schemes.

[25] Instead of focusing on isolated improvements, a whole house approach considers the entire building as an interconnected system. It aims to optimise energy efficiency, comfort, and health by addressing various aspects such as insulation, ventilation, heating, and lighting.

> *"[The] SHDF, due to [its] admin and paperwork, would be very difficult to deliver if we had been successful. It is much easier for us to make all the retrofit with internal funding, and we do not have to compete for the funding." Unsuccessful SHL*

Little evidence was collected regarding the reasons why SHLs chose to install certain measures, beyond adhering to scheme requirements and cost caps. One SHL reported choosing measures which would get homes to EPC B, in order to comply with a regional target. A scheme delivery representative also speculated that the short delivery window pushed SHLs to choose measures which would not involve lengthy planning permission processes. One SHL reported that they had to discount certain measures, including double glazing, due to tough planning permission processes in their area. Another SHL reported choosing to install just one measure in all of their homes (EWI) due to the short delivery timescales.

With regards to area, some SHLs chose to include homes geographically close to one another, in order to maximise efficiencies during installation. One SHL specifically chose to work in an area which had seen low levels of retrofit activity in the past.

In terms of archetype, two SHLs reported dedicating Wave 1 funding to their worst performing homes, in order to make the biggest difference to residents. For example, one SHL chose homes with the worst fuel poverty rates (which therefore influenced measure type, as these were solid-wall homes with little insulation). Some other SHLs chose to work in hard-to-treat properties, as described below.

Case Study: Installing measures in hard-to-treat properties

Hard-to-treat properties include those with low EPC ratings (F or G), bungalows, high-rise flats, non-traditional archetypes (such as Wimpey No-Fines), rural properties, properties off the gas grid, and older properties (built pre-1945). SHLs gave the following reasons for including hard-to-treat properties in their projects include:

- These properties have often been neglected in the past.
- Predictions that treating these properties was most likely to reduce fuel poverty, or address problems such as damp and mould.
- Expectations that treating these properties would deliver the biggest economic and environmental benefits.

"So, in the past I would imagine most people went for the low hanging fruit first […] now we're sort of coming to the stage where we've got to tackle the harder properties." – SHL focus group participant

4 Delivery

This chapter explores the enablers and barriers affecting delivery of Wave 1, and how effectively learnings have been collated and used. It seeks to understand how projects have been managed, the role of supporting organisations, and how PAS 2035 has affected delivery. It uses evidence from qualitative fieldwork with scheme delivery representatives, the supply chain, as well as analysis of multiple secondary data sources (outlined below).

Data sources

Throughout this chapter, a range of secondary data sources are used to analyse planned and completed delivery at different time periods. This is to account for the level and quality of detail provided within different data sources (e.g. project dropouts, projects submitting invalid completion dates), whilst providing the most up-to-date analysis possible. In summary, it includes:

1. Total number of properties retrofitted and total number of measures installed: SHDF official statistics (based on delivery data submitted by projects up until end of March 2024; published mid-May 2024).
2. Total number of properties retrofitted, *or* planned to be retrofitted, and total number of measures installed *or* planned: Change Control data[26] (up until end of March 2024).
3. Subgroup analysis of properties retrofitted, *or* planned to be retrofitted (e.g. by property type, starting EPC, region): updated bid data after contract award, and delivery data submitted monthly by projects (up until February 2024).

Official statistics were used to report the number of properties retrofitted and measures installed as of March 2024. Where official statistics were not available (e.g. for sub-group analysis of properties retrofitted, or planned to be retrofitted), delivery data submitted monthly by projects was used. Delivery data is the source used for official statistics, however the cleaning process is different. In the few instances where delivery data was used instead of official statistics (three tables in the report), this was clearly signalled and explained in footnotes to relevant tables. Information on project plans as of March 2024 (referred to in the report as ‘properties retrofitted or planned to be retrofitted’, or ‘measures installed or planned to be installed’) was taken from Change Control data, as this does not feature in official statistics.

Unless otherwise specified, analysis relates to the delivery data up until the end of February 2024.

[26] Scheme data which summarises changes to individual project timelines, scale and scope, updated by DESNZ on a regular basis.

Properties retrofitted

This section explores the overall volume of properties planned to receive installations at bid award stage compared to current delivery data, the volume of installations over time, and the distribution of projects receiving installations across property types, EPC ratings, and regions.

Overall volume of delivery

As of March 2024, 16,617 properties had received, or were planned to receive, installations, of which 30,679 measures had been installed in 15,564 properties.

At bid award stage, 20,229 properties were planned to receive installations by the 69 successful SHDF Wave 1 projects.

As of data available up to March 2024, 16,617 properties had received, or were planned to receive, installations, of which 15,564 properties had been completed by 60 projects.[27,28]

This represents 3,612 (18%) fewer properties receiving or planned to receive installations than originally intended at bid award stage. Most of this change was due to descoping, explored in more detail below. For 15% of these properties (i.e. 3% of all properties planned to receive installations), this was due to four project dropouts, three of which were in London.

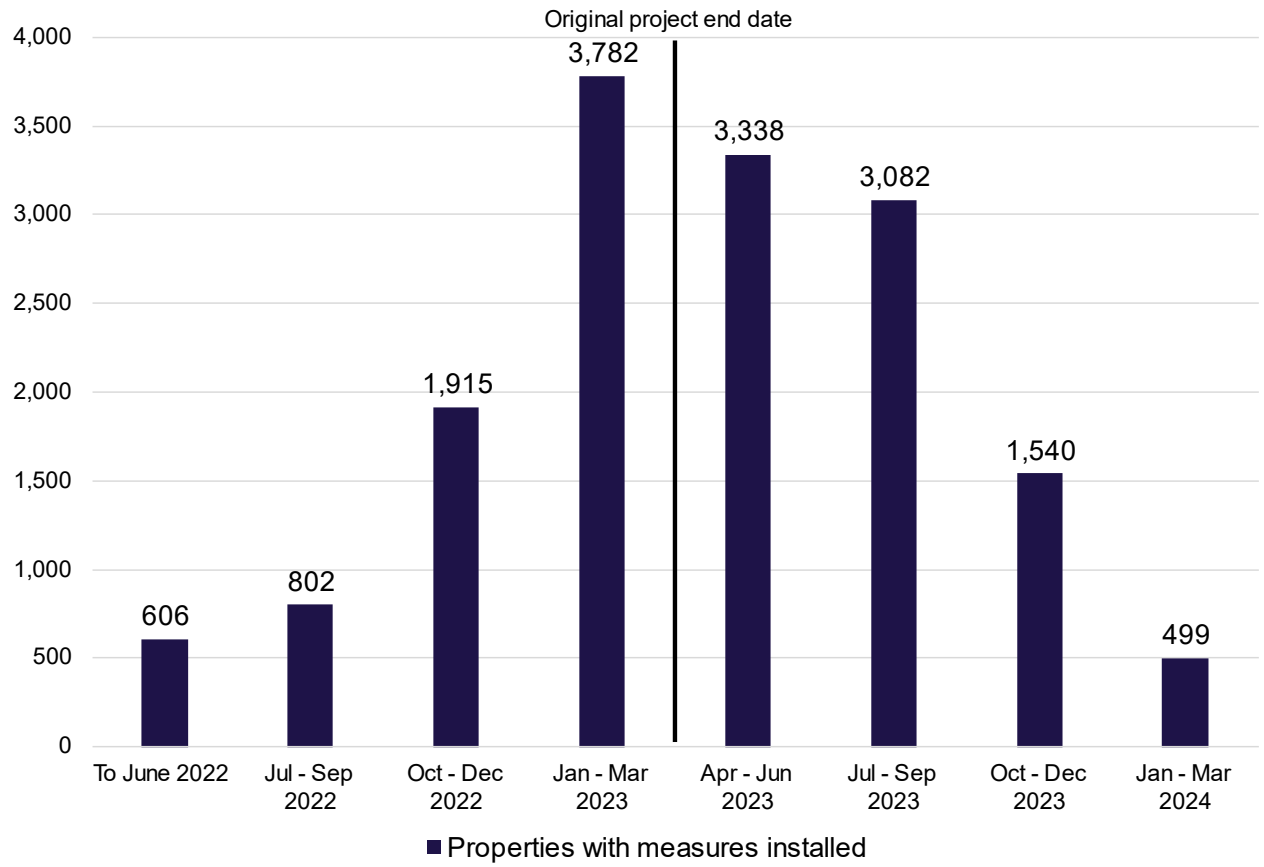
Projects experienced a range of challenges in delivery which led them to request changes in the scope of their projects through the 'Change Control' process; these are explored in the 'Barriers to delivery and mitigations' section.

Delivery over time

Just under half (46%) of completed project delivery took place by the end of March 2023 (the original scheme end date) (see Figure 5). January – March 2023 saw the most properties with measures installed, with 24% of delivery being completed in this period.

[27] Department for Energy Security and Net Zero (2024). Social Housing Decarbonisation Fund statistics: May 2024 Accessed at: SHDF_Release_May_2024.xlsx (live.com)
[28] Five fewer projects than the 65, which had not dropped out, indicating some non-reporting.

Figure 5: Number of properties with measures installed in Wave 1 as of the end of March 2024, by quarter

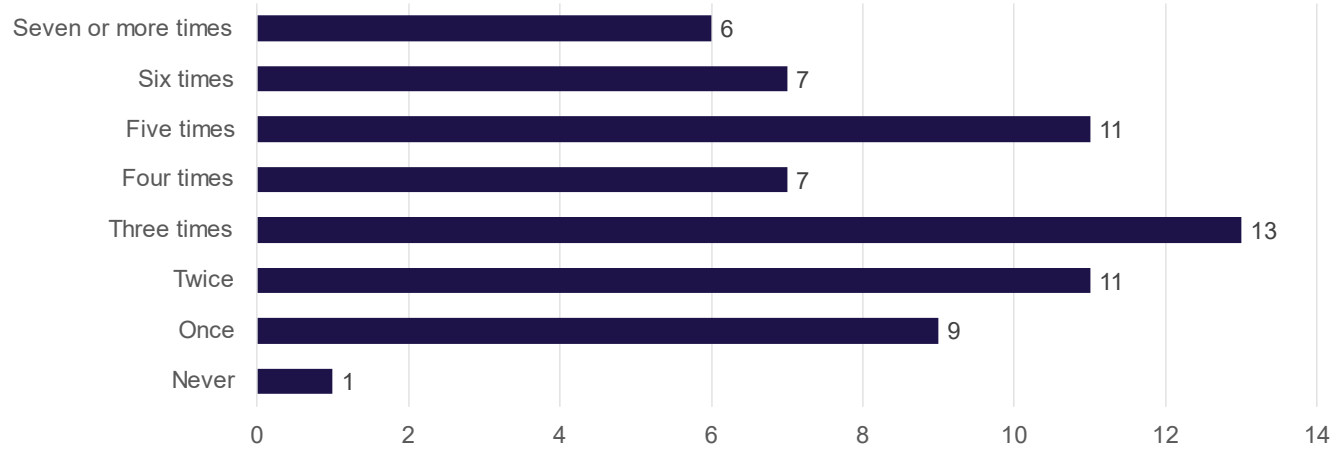


Source: Social Housing Decarbonisation Fund Official Statistics May 2024 (i.e. with latest statistics to the end of March 2024), n= 15,564 properties

As shown in Figure 6, nearly all projects experienced delays to their completion date, in line with the overall delivery timescales shown above. On average, projects changed their completion dates four times, and six projects changed their completion dates seven or more times.

Smaller projects (i.e. with less than 100 homes receiving retrofits) changed their completion dates four times on average, whereas larger projects (i.e. with 100 or more homes receiving retrofits) changed their completion date three times on average.

Figure 6: Number of times project completion dates were delayed, up to end of March 2024



Source: DESNZ SHDF Change Control data.

Distribution of properties

Looking at delivery data as of February 2024, houses were the most common property type to receive measures, accounting for 62% of the total. This was followed by flats (20%) and bungalows (16%) (see Table 8).

The table below also shows the scale of descoping that took place across projects by property type. Flats (which are typically harder to retrofit) were the property type most likely to be descoped, with 43% fewer flats having measures installed vs planned (as of February 2024).

Table 8: Properties planned to have measures installed in Wave 1 by property type, post-bid baseline vs reported delivery data as of February 2024

Property type	Number of properties planned to be retrofitted at bid stage*	% of properties planned to be retrofitted at bid stage	Number of properties retrofitted	% of properties retrofitted	% change in properties retrofitted vs planned
Bungalow	2,389	13%	2,369	16%	−1%
Flat	5,844	29%	3,076	20%	−47%
House	10,523	57%	9,299	62%	−12%
Not known	107	1%	268	2%	n/a
Total	**18,863**	**100%**	**15,012****	**100%**	**−20%**

Source: SHDF Wave 1 bid data (after successful applications finalised); SHDF delivery data, February 2024.
* Filtered for projects submitting valid completions data to DESNZ by February 2024 – 93% coverage.

** Given official statistics do not provide data on the number of properties retrofitted by property type, delivery data was used for this analysis. For this reason, the total number of properties retrofitted does not reflect that reported by official statistics from March 2024.

Over nine in ten properties (92%) that received measures had an EPC rating of D or below before installations took place, with EPC D being the most common rating (78%). A minority (5%) of properties had an EPC rating of C or above before installations (see Table 9).

Table 9 indicates that properties with lower EPC ratings (E to G) were more likely to be descoped across projects. However, it is not possible to tell from the data whether projects swapped properties originally selected for retrofit with others that had higher EPC ratings, or whether they reassessed starting EPC ratings for the same properties and found them to be better than previously reported. In interviews, SHLs mentioned that data on EPC ratings at bid stage (including at contract award) was often uncertain.

Table 9: Properties planned to have measures installed in Wave 1 by EPC rating, post-bid baseline vs reported delivery data as of February 2024

Property EPC rating before measure installation, assessed by provider	Number of properties planned to be retrofitted at bid stage*	% of properties planned to be retrofitted at bid stage	Number of properties retrofitted*	% of properties retrofitted	% change in properties retrofitted vs planned
C+	486	3%	793	5%	+63%
D	13,916	74%	11,718	78%	−16%
E	3,595	19%	1,821	12%	−49%
F	726	4%	244	2%	−66%
G	46	0%	26	0%	−43%
Not known	94	0%	410	3%	n/a
Total	**18,863**	**100%**	**15,012****	**100%**	**−20%**

Source: SHDF Wave 1 bid data (after successful applications finalised); SHDF delivery data, end February 2024.
* Filtered for projects submitting valid completions data to DESNZ by end February 2024 – 93% coverage.
** Delivery data was used for this analysis instead of official statistics because of the two-month lag between publication of official statistics and delivery month reported. Therefore, to use the latest data available at the time of analysis for this report, we agreed to use delivery data. For this reason, the total number of properties retrofitted does not reflect that reported by official statistics from March 2024.

As of March 2024, properties with measures installed, or planned to have measures installed, were fairly evenly distributed across all regions of England (see Table 10). The distribution of delivery was similar to that of bids which, as discussed in Chapter 3, was broadly in line with the distribution of social housing across England.

The extent of descoping between bids and project completion (using Change Control data as of end March 2024[29]) varied by region. In London and the East of England (which borders London) there was around a one third reduction in delivery relative to plans, more than in any other regions.

Table 10: Properties planned to have measures installed in Wave 1 by region, post-bid baseline vs change control data as of March 2024

	Number of properties planned to be retrofitted at bid award stage*	% of properties planned to be retrofitted at bid award stage	Number of properties retrofitted or planned to be retrofitted as of March 2024	% of properties planned to be retrofitted as of March 2024	% change in properties planned to be retrofitted as of March 2024 vs bid award stage
East Midlands	2,592	13%	2,115	13%	−18%
East of England	2,784	14%	1,962	12%	−30%
London	2,780	14%	1,870	11%	−33%
North East	2,340	12%	2,327	14%	−1%
North West	3,022	15%	2,526	15%	−16%
South East	946	5%	822	5%	−13%
South West	911	5%	830	5%	−9%
West Midlands	2,198	11%	2,014	12%	−8%
Yorkshire and the Humber	2,656	13%	2,151	13%	−19%
Total	**20,229**	**100%**	**16,617**	**100%**	**−18%**

Source: SHDF Wave 1 bid data (after successful applications finalised); Change Control data, end March 2024.
*Classified according to the predominant region in which the delivery was focused. Projects spanning multiple regions were all apportioned to the main region of delivery (since the data sources used provide data at a project level, and do not provide regional breakdowns within individual projects).

[29] This source was selected for comparison with bid data, rather than our analysis of delivery data (or official statistics based on delivery data), because non-submission of valid delivery data was a particular issue in the South West of England, causing anomalous results. It includes planned delivery by projects after reporting.

Measures installed

This section explores the delivery of measures (planned at bid stage compared to current delivery data), and the distribution of measures by specific type.

Overall volume of delivery

Once successful bids were accepted, contracts issued, and the intended delivery plans of projects established, 43,763 measures were initially planned to be installed across the scheme. As detailed above, project plans were modified over time through the Change Control process. As of data available up to March 2024, 39,236 measures had been delivered, or were planned to be delivered, of which 30,679 had been installed (across 15,564 properties).

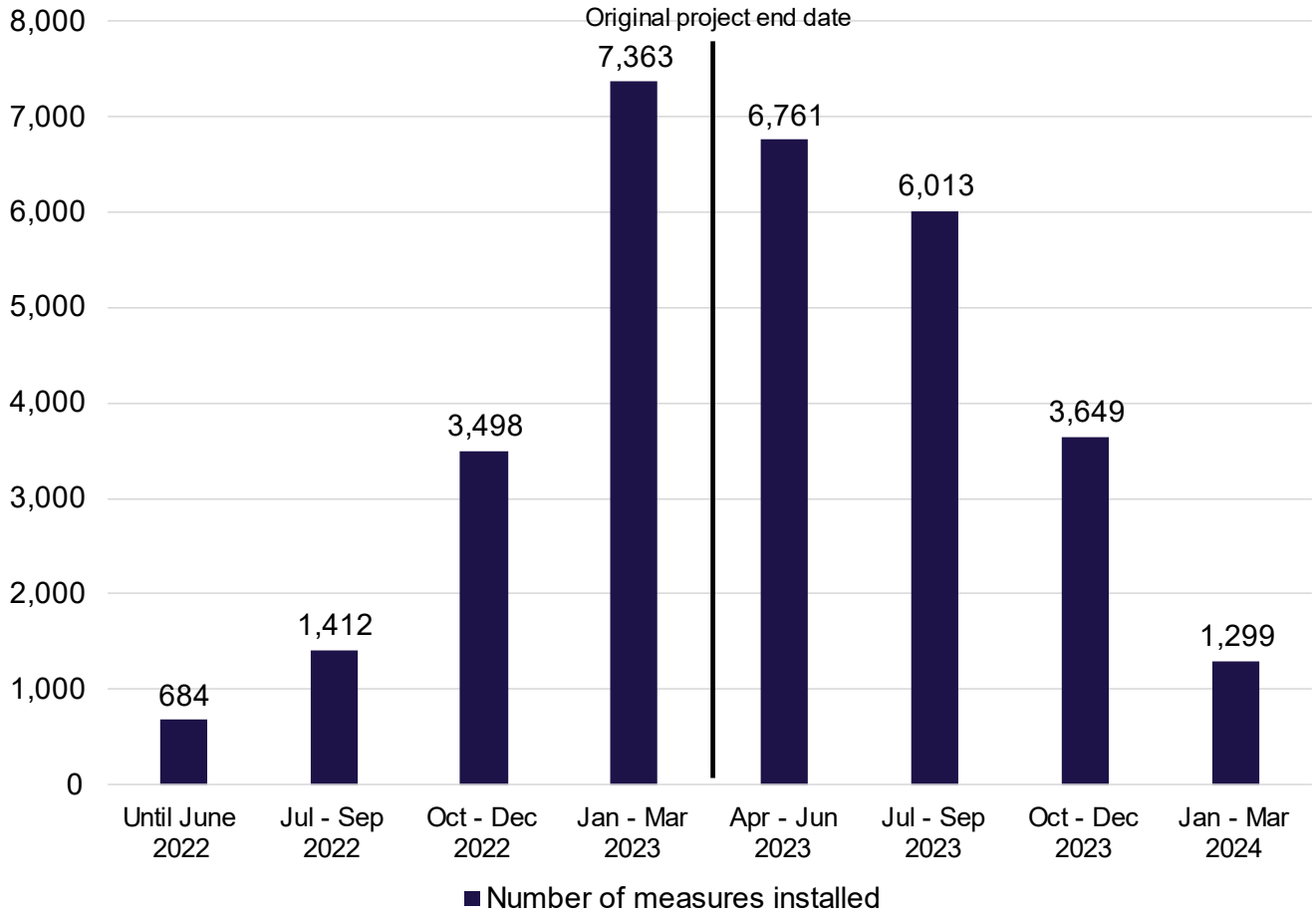
The change in project plans represents a 10% reduction in the number of measures delivered or planned. This is less than the reduction in the number of properties with measures installed, suggesting that the properties descoped[30] tended to be those with fewer measures planned. The average number of measures planned per property increased by 9% over the course of the scheme from 2.2 to 2.4.

Delivery over time

More than half (58%) of measures were installed (17,722) after the original project end date of March 2023, although the largest proportion of installations took place between January and March 2023 (24% of the total).

[30] This cannot be verified directly by examination of plans for individual properties since limited property-by-property data is available for descoped properties.

Figure 7: Number of measures installed in Wave 1 over time, by quarter



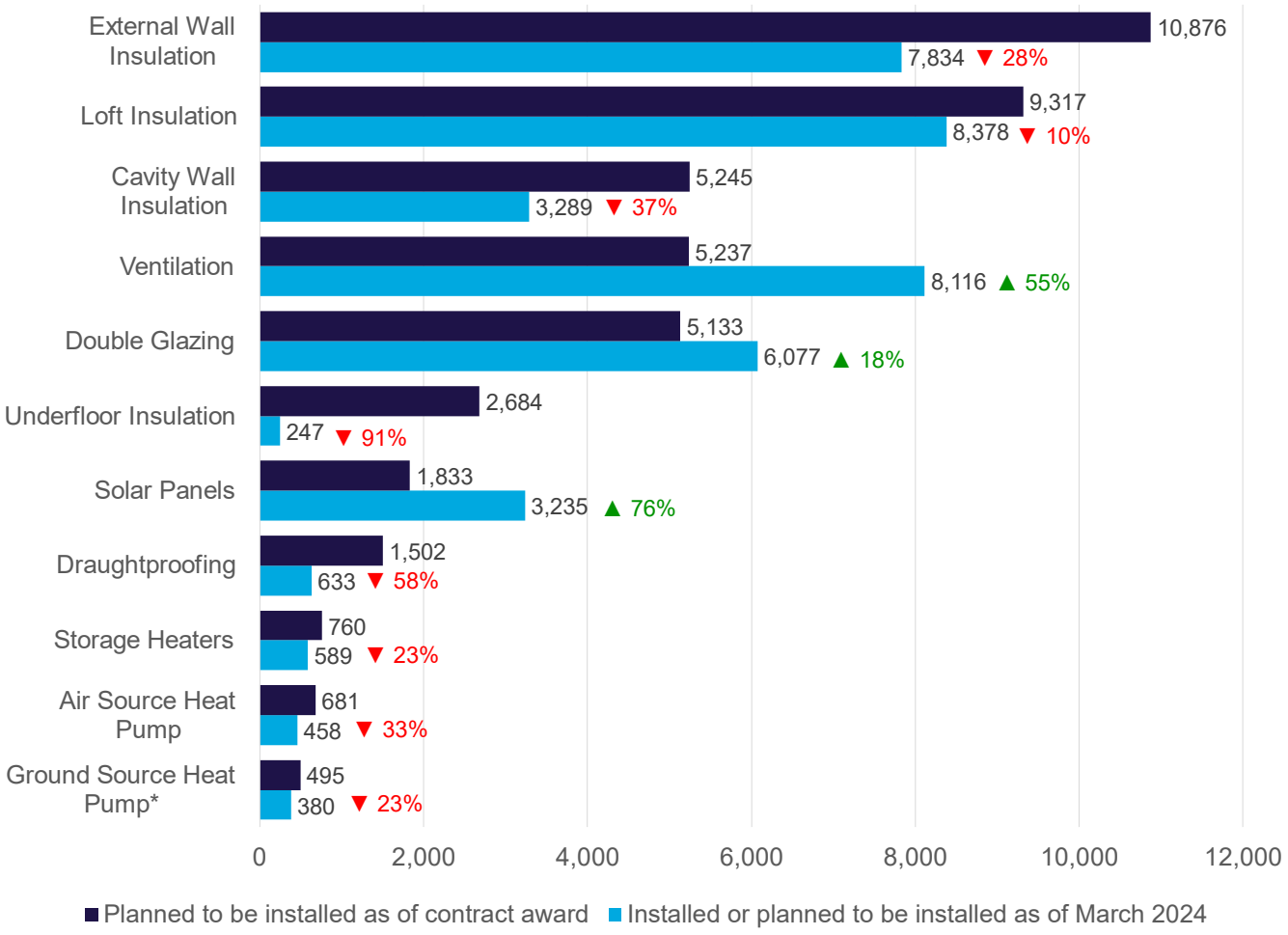
Source: Social Housing Decarbonisation Fund Official Statistics March 2024, n= 30,679 measures

Distribution of delivery

Across Wave 1 projects, as of March 2024, Loft Insulation was the most common planned or delivered measure, accounting for 21% of the total. This was followed by Ventilation (21%), External Wall Insulation (20%), and Double Glazing (15%). In line with the fabric-first policy approach of the scheme, 19,748 insulation measures (50%) were planned or delivered, compared to 838 clean heat[31] measures (2%).

[31] Defined in this report to include ASHPs, GSHPs, SGLs and Solar Thermal, but excluding Solar PV.

Figure 8: Measures planned to be installed at the post-bid baseline stage vs measures planned or delivered up until March 2024



Source: SHDF Wave 1 bid data at award of contracts, n=38,177 measures. DESNZ March 2024 Change Control data, n=39,236 measures. * Includes Shared Ground Loops.

As shown in Figure 8, the volume of specific measures evolved from bid stage (indicated by the red and green arrows on the chart).

Comparing measures planned to be installed in bid data with those planned or delivered as of March 2024 shows that the most substantial descoping affected underfloor insulation (−91%), draughtproofing (−58%), CWI (−37%), ASHPs (−33%) and EWI (−28%). Solar panel (+76%)[32] installation increased, perhaps as Solar PV tended to be cheaper than other measures being descoped. Measures such as ventilation (+55%) and double glazing (+18%), may have increased due to projects realising, during the course of the scheme, that properties required more enabling works than anticipated to enable the main measure (insulation or clean heat) to be installed.[33] This resulted in a reduction in insulation or cleat heat measures installed, since funding the additional enabling measures would increase cost per property. This was backed

[32] All delivered solar panels were Solar PV. In the baseline application data, 21% (377 installations) were Solar Thermal clean heat installations, none of which went ahead.
[33] Since property-by-property data was only gathered at delivery stage, rather than bidding / contract award stage, this cannot be tested through the data, but was supported by evidence from qualitative interviews with staff from projects.

strongly by evidence from interviews with SHLs, who indicated that their stock condition data was often weak at the start of projects.

Many of these changes reflect supply chain difficulties which are covered in more detail in the 'Risks and mitigations' section below, although practical issues encountered prior to and during installation were also a factor. This is explored further in the 'Challenges affecting particular measures' section.

Delivery costs

Delivery costs varied relative to the measures installed in each home, and measures varied significantly in cost per unit. On average all measures costed substantially more to install than was budgeted at bidding stage by projects, including loft insulation (+134%), CWI (+82%), GSHPs (+80%), and storage heaters (+78%).

On average, installations costed £15,273 per property.[34] This varied substantially depending on the starting EPC of properties. The average cost of properties with starting EPC D was £13,531, and varied between £20,590 and £22,006 for all other EPC ratings. However, individual property costs varied based on the measures installed.

As shown in Figure 9, the most expensive measures were GSHPs (£23,471 average per install), followed by EWI (£18,395 average per install). Overall, average delivery costs per measure were much higher than expected at the outset of Wave 1, ranging from 19% higher for ASHPs, to 134% higher for Loft Insulation. Complementary measures which typically support a main energy saving measure (e.g. ventilation) had even higher cost increases relative to plans, of more than 200%. This was supported by evidence from supply chain interviews which suggested significant underbudgeting for these activities, alongside optimistic assumptions (and poor information) around stock condition and the extent of enabling works required. In addition, a comparison of Change Control and delivery data suggests that projects did not record minor ventilation measures as part of monitoring data submissions[35]; instead, they may have been more likely to report only major ventilation works.

For most measure types, installation costs varied widely by property type:

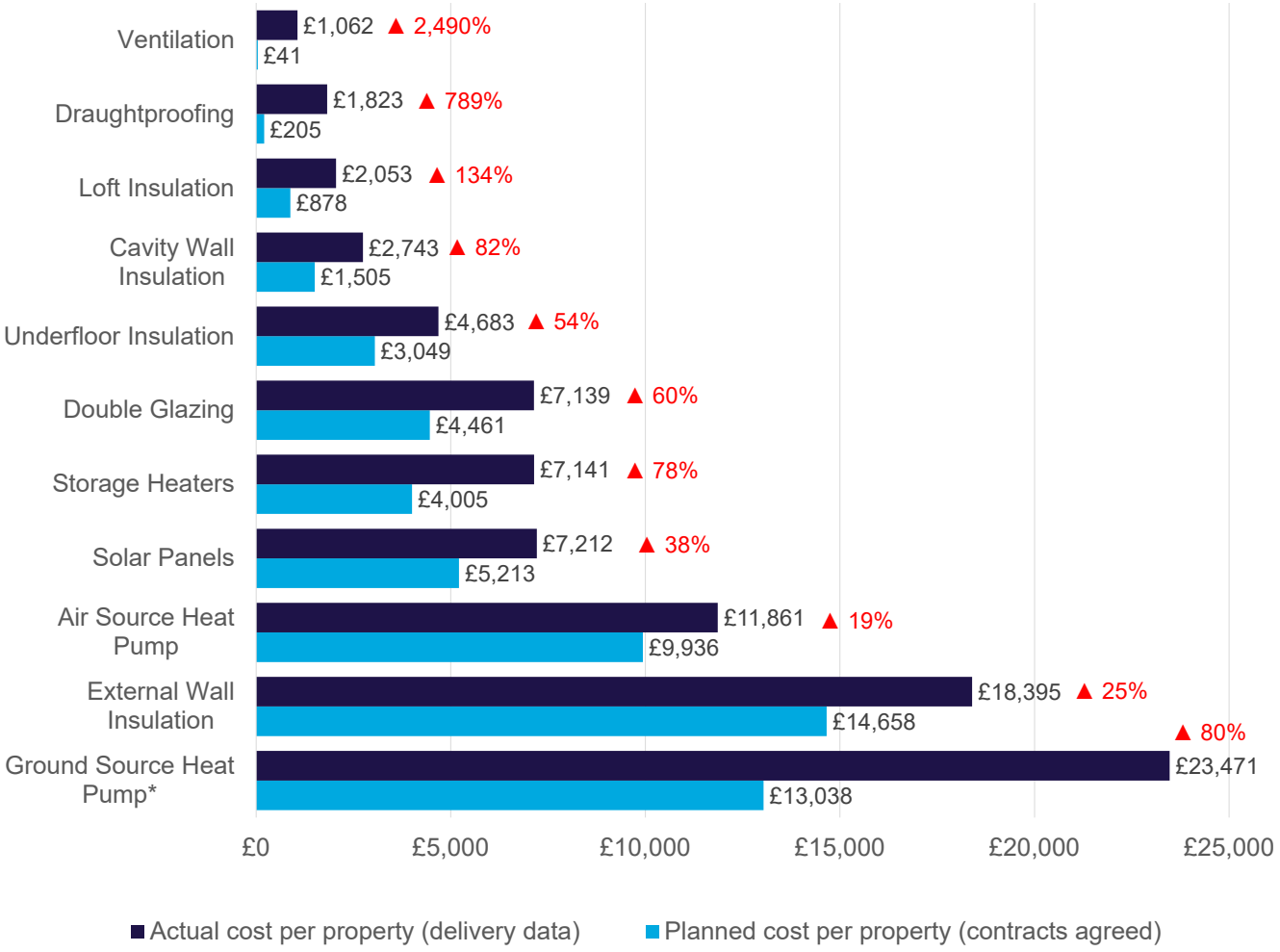
- EWI varied from £20,830 for houses and £18,193 for bungalows, to £13,858 for flats.
- Double-glazing varied from £8,859 for flats, to £6,697 for houses and £5,116 for bungalows.
- Draught-proofing varied from £3,513 for bungalows, to £1,529 in flats and £1,110 in houses.

[34] Calculated using SHDF delivery data available up until the end February 2024. Includes 53 projects supplying actual costs data for at least some properties (i.e. 82% of projects).
[35] Change Control data shows that projects had installed or planned to install 7,315 ventilation measures as of March 2024, but only 2,647 were reported as delivered in monitoring data submitted by projects. This issue did not apply to more substantive measures, where measure numbers were broadly similar between the two data sources.

- CWI varied from £3,213 in houses, to £2,733 in bungalows and just £1,594 for flats.

However, ASHPs cost almost the same across all dwelling types (£11,861 on average).

Figure 9: Costs per measure, and change in cost between bid and delivery data^



Source: SHDF bid data at award of contracts (planned costs, n=69 projects; aggregated data submitted by projects), SHDF delivery data for 53 projects (actual costs): Ventilation (n=2,222 measures), Loft Insulation (n=5,390 measures), Draughtproofing (n=649 measures), CWI (n=2,263 measures), Underfloor Insulation (n=105 measures), Solar Panels (n=3,071 measures), Storage Heaters (n=411 measures), Double Glazing (n=3,844 measures), ASHPs (n=347 measures), EWI (n=5,003 measures), GSHP (n=307 measures). * Includes Shared Ground Loops. ^ Delivery data was used for this analysis instead of official statistics because of the two-month lag between publication of official statistics and delivery month reported. Therefore, to use the latest data available at the time of analysis for this report, we agreed to use delivery data. For this reason, the data reported in this figure do not reflect that reported by official statistics from March 2024.

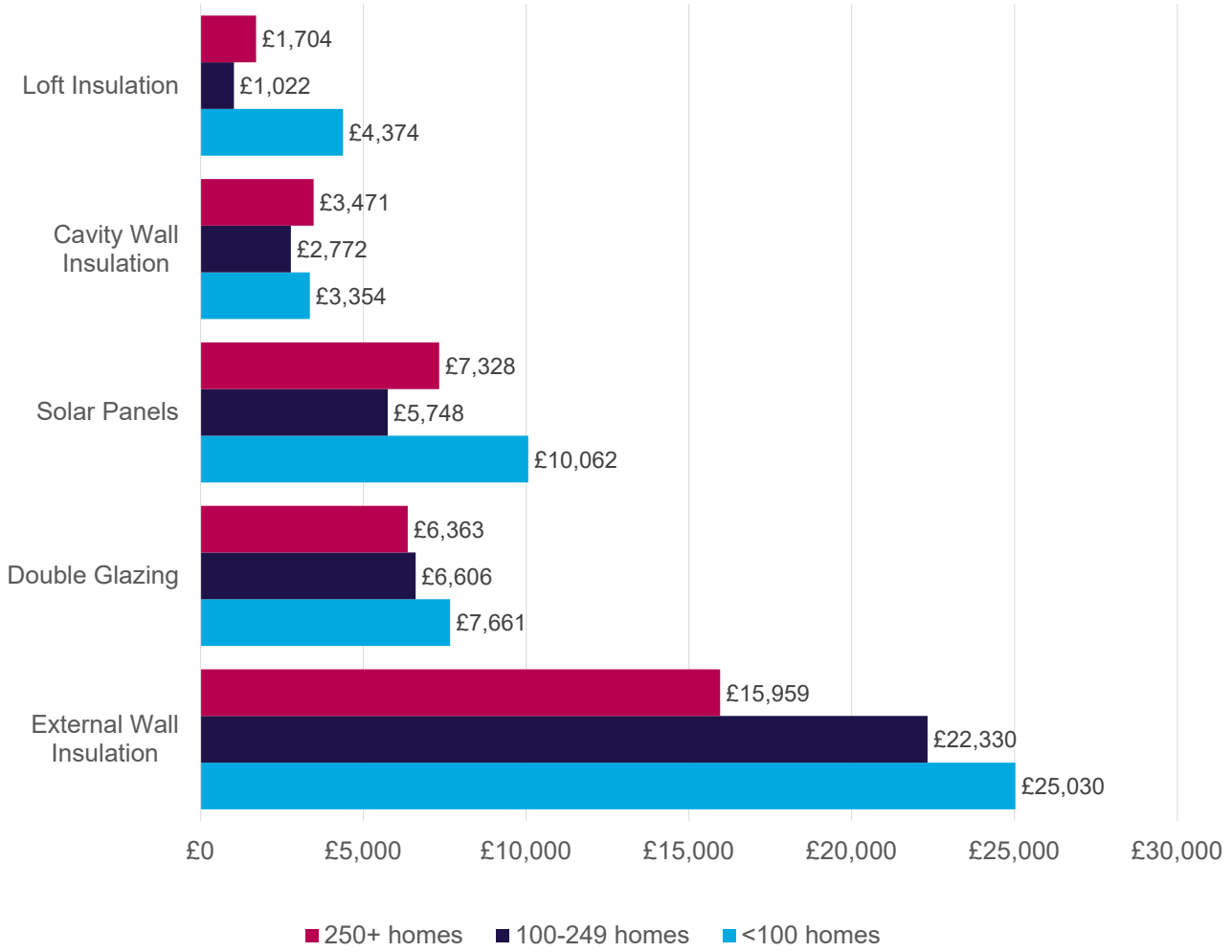
No clear trend in delivery costs over time or by region was observed across measure types.

However, there were substantive differences in cost of measures by project size, indicating substantial economies of scale, as shown in Figure 10, which is filtered to show only costs for (all types of) houses (excluding bungalows).[36] For some – but not all – measures, larger projects experienced economies of scale. For example, on average EWI cost £15,959 for a

[36] This is to avoid including widely different costs relating to blocks of flats, which tend to occur in larger projects.

house in a larger project (with 250+ properties to retrofit) compared to £25,030 in a smaller project (with less than 100 properties to retrofit).

Figure 10: Costs per measure by project size (houses only, excluding bungalows)*



Source: SHDF reported delivery data for 53 projects (actual costs), reported at measure level: Loft insulation 250+ homes (n=2,566), loft insulation 100-249 homes (n=936), loft insulation <100 homes (n=360), CWI 250+ homes (n=682), CWI 100-249 homes (n=427), CWI <100 homes (n=90), solar panels 250+ homes (n=1,574), Solar panels 100-249 homes (n=503), solar panels <100 homes (n=60), double glazing 250+ homes (n=1,141), double glazing 100-249 homes (n=385), double glazing <100 homes (n=431), EWI 250+ homes (n=1,017), EWI 100-249 homes (n=1,187), EWI <100 homes (n=756).
* Given official statistics do not provide data on the average cost of measures by project size, delivery data was used for this analysis.

Scheme management

The funding award process was generally straightforward, although communications with SHLs regarding delays to the funding award could have been improved. Typically, both SHLs and scheme delivery representatives felt the project monitoring requirements were overly burdensome, and this impacted the quality of monitoring data. The clarity of the DP role and their co-ordination with DESNZ was generally positive. However, SHLs reported that a lack of technical expertise among some MDOs negatively impacted delivery.

The following scheme delivery representatives were involved in the delivery of Wave 1[37]:

- The **Integrated Delivery Team (IDT) at DESNZ** designed the SHDF policy, managed the scheme, and ensured it delivered against agreed key performance indicators and programme benefits.
- DESNZ appointed Ricardo as **DP following a competitive tender process.** The DP acted as a first point of contact for all SHLs that received funding. Responsibilities included frontline engagement with projects via MDOs, monitoring progress and risks, and providing expert support and assurance where necessary.
- **Technical Assistance Facility (TAF).** The SHRA was established to provide technical support for all SHLs interested in applying for Wave 1 funding, and to ensure applications were fit for purpose and their knowledge of retrofit delivery was sufficient.

Managing project initiation

According to multiple SHLs, the funding award process was typically quite straightforward. However, scheme delivery representatives reported that in some cases there was a delay to funding allocation from DESNZ and subsequent notifications to SHLs. In addition, scheme delivery representatives suggested communication from DESNZ and the DP to SHLs could have been improved, as this had an impact on delivery:

- One SHL reported that they experienced a two-month delay between when they were supposed to receive the grant and when they received it. They were instructed by DESNZ not to start any works until they had received the grant. On reflection, they wished they had been given a disclaimer that funding was not guaranteed and to proceed at their own risk, rather than a strict instruction not to start. The SHL reflected that they would have undertaken the retrofit assessments irrespective of whether the funding was allocated, which would have avoided impacts on delivery timescales.
- Another SHL reported that delays to communications with the DP at the start of their project were significant and had knock on effects on delivery. The SHL reported that they appreciated the difficulties the DP were experiencing at the time, but looking back they felt like this could have been managed better.

Kick off meetings (KOM, the first meeting held between the project and the DP) were not explored in great depth in this evaluation, although scheme delivery representatives suggested it would have been useful to hold the KOM with SHLs before the Delivery Confidence Assessment (DCA). The DCA was the DP's assessment of a project's ability to deliver summarised in a Red-Amber-Green (RAG) rating. Holding the KOM beforehand would have meant that the DCA would be based on more up to date information than that submitted in the application form.

[37] A focus group discussion with the DP took place in July 2023, followed later by interviews with DESNZ staff, and two further focus group discussions (a second focus group with the DP and one with the DESNZ IDT group) in October 2023. While the evaluation consulted these teams or organisations involved in scheme management and delivery separately, some participant concerns about anonymity mean that we cannot specify which teams reported specific findings. We have therefore referred to 'scheme delivery representatives' throughout the report to cover all of these respondents. We have stated where there were differing views.

An important facet of the DP mobilisation stage was the decision to pair together DESNZ and DP project managers. As one scheme delivery representative reflected, this enabled more inexperienced colleagues in both DESNZ and the DP to upskill more quickly than they otherwise might have done.

Project monitoring and management

Wave 1 had the following monitoring requirements:

- A monthly data report to be submitted to DESNZ. This included details of measures installed and properties treated, progress against project milestones and project risks. The quality of this report was checked by the DP.
- Monthly meetings with the DP to discuss performance.
- A quarterly meeting with DESNZ to discuss delivery performance and any associated risks or issues.

Scheme delivery representatives and SHLs reported that project monitoring, and the process of collecting good quality data, was a significant burden. This had an impact on the data that was captured throughout the project, limiting its overall coverage and accuracy. Specific challenges included:

- **Difficulty using project monitoring forms.** Some SHLs reported that the Excel form they were asked to complete every month for monitoring purposes was difficult to use, and clear guidelines were not provided for several months on some of the specific information required (particularly providing Standard Assessment Procedure (SAP) box values). This impacted the volume, quality and consistency of scheme data captured throughout the scheme, affecting its reliability and utility for this evaluation.
- **Disproportionate or excessive volume of reporting** (e.g. Trustmark and EPC data, as well as monthly reporting requirements). This was more challenging and burdensome for SHLs installing measures on a large number of properties. One SHL reported that they were also collecting data on additional properties that they had carried out a survey for (i.e. ‘back-up’ properties if other properties were scoped out due to cost changes), creating additional burden.
- **Difficulties working within consortia**. One SHL who was part of a consortium noted that they had expected more support from the principal contractors with the project monitoring processes, as they had limited experience with the types of information required. Another noted that collating evidence from all consortium partners required a lot of organisation and coordination of inputs, and often resulted in delays or missing entries.
- **Changes in monitoring requirements.** The monitoring data requirements evolved over scheme delivery. Two scheme delivery representatives felt that changes occurred too frequently and that SHLs were often not prepared for these changes. For example, one SHL reflected that they had to adjust the project milestones they were reporting against. The associated milestone evidence they had to collect was therefore different, resulting in them asking for additional work from contractors that was outside the original contract. The scheme delivery representatives suggested that a clear roadmap of requirements should be provided at kick-off, and that DESNZ should justify requests for additional information.

Whilst project reporting was identified as a challenge, some SHLs understood the level of detail required was necessary for accountability, and that the reporting process was onerous but proportionate for a scheme of this size.

SHLs suggested the following improvements to the project monitoring process:

- **Being able to dictate their own key milestones.** One SHL noted that there were eight key milestones which required reporting on, and the same eight applied across all LAs. However, the SHL noted that in the SHDF(D), LAs could dictate what their own milestones would be which allowed them to prioritise their reporting.
- **Simplify guidance and offer training in earlier stages of delivery.** One SHL said they thought a simplified guidance should be given to SHLs on how to populate the monitoring document. One SHL reported that training provided by the DP on scheme data submission was valuable, but not timed appropriately as the SHL had started submitting scheme data five months before.

Change control

Any significant changes from what was in the original project proposal were subject to a robust change control process. Through this process, changes and their impacts were assessed and categorised. A change control board at DESNZ was responsible for authorising, rejecting or deferring these requests.

Typically, scheme delivery representatives viewed the change control requirements positively, however views were more varied amongst SHLs.

Scheme delivery representatives noted that the process had improved since the SHDF(D). They considered it to be more stringent, it allowed for rejection of changes and for overall improved project tracking.[38] A particular advantage was the ability to track the impact of changes on benefits in real time.

> *"One of the best things we did in managing the Wave 1 project was the change control output. So any change made, we were able to track in real time the impact it would have on our benefits. […] We were able to track them as part of a live database." Scheme delivery representative*

In addition, scheme delivery representatives reported that the monthly change control meetings within DESNZ worked well. Several scheme delivery representatives commented that the process for prioritisation of requests improved the change control management process. Once project change requests were received, they were categorised as either 'high', 'medium', or 'low' impact changes, which impacted the management and decision making process for each change. This helped improve the clarity of who should deal with which requests. One scheme delivery representative commented that this was helpful as, by the time

[38] The mechanism to reject a change request in SHDF(D) was rarely used, if at all. Because SHDF(D) was a pilot scheme, a number of change requests that may have otherwise been rejected were accepted to allow LAs to deliver under the scheme despite challenges and to provide learning.

requests reached the DESNZ change control board, the DP had already had discussions with the SHL about which requests would likely be accepted.

Feedback from SHLs on the change control process was mixed, with many SHLs finding the amount of detail required onerous, or significant in comparison with other schemes they had previously participated in. One SHL reported that the amount of paperwork they had to fill in for change requests took a long time, and they felt this distracted their focus from other things on the project. Another SHL reported that having to wait for an answer on their change request was difficult given the already tight timescales.

One felt that more realistic (i.e. longer) delivery timescales would have reduced the need for the number of change requests. One SHL reported that inaccurate data used at the application stage meant that they had to submit many project change requests during delivery. This may also have affected other SHLs given that others reported that they had used inaccurate model data in their application.

Another SHL reported that they did not feel like their MDOs facilitated the process.

> *"There didn't really feel like there was any input from [the DP]. They didn't give me any steer on whether what we were doing in those change requests was right. It was just kind of, well, as long as you filled all the boxes in, then we'll send it up. And then we'd get loads of questions back from DESNZ." Successful SHL*

However, a few SHLs commented that their MDO helped them navigate the change control process, so this appears to vary by MDO.

Clawback

Clawback refers to the process through which DESNZ 'clawed back' funding that had been allocated to SHLs but had been scoped out due to change requests. Scheme delivery representatives reported that tracking changes via the change control log worked well. Although it was reported that there were no issues with how the clawback process operated in practice, some potential concerns were raised. These included:

- A scheme delivery representative reported that the main drawback of the clawback process was that it took a long time take for the funding to be returned. However, they did not think this had caused any issues in practice.
- The same scheme delivery representative reported concerns about the lack of a legal requirement for SHLs to return the funding, as there was no clawback requirement in Section 31 of the Local Government Act 2003.[39]. However, another scheme delivery representative indicated that, in practice, they were not aware of any instances where SHLs had refused to return funding.
- As of April 2024, £18,975,490 has been requested, £17,742,603 of which had already been returned. A scheme delivery representative reported that the wait for the remaining £1,232,887 is likely to be explained by LAs wanting to complete Wave 1 works before returning funds, so they would have the most accurate costings.

[39] Local Government Act 2003 ,C.1, S.33. Available at: https://www.legislation.gov.uk/ukpga/2003/26/section/33

One scheme delivery representative noted that an area for improvement would be to ensure that retrofit coordinators check that all contractors were accredited with Trustmark in advance. They reported that, in some instances, they needed to remove certain measures from projects because of this, which created a risk of clawback.

Closure process

Findings from the Ricardo Monthly Reports showed that delays in project sign off after works had been completed occurred in a few instances. These delays were primarily attributed to Trustmark lodgements for measures. In these cases, the lodgements took longer than expected and delayed project completion even though the works themselves had been completed. Trustmark capacity was also mentioned as a risk in the SHDF Wave 1 Risk Register. More detail on this can be found in the Barriers to delivery and mitigations section.

Scheme governance and the role of the Delivery Partner

The DP was the point of contact for projects, through MDOs. They met with projects on a regular basis, and supported them with scheme delivery and meeting monitoring requirements. They also held monthly knowledge sharing sessions which allowed MDOs to come together and share learnings.

Scheme delivery representatives typically reported that the clarity of differences in roles between DESNZ and the DP was a strength of scheme governance. Unlike in SHDF(D), there was greater clarity that the DP was the projects' first point of contact and DESNZ were the escalation route. This created a more structured approach and meant issues and queries reaching DESNZ were more streamlined, allowing DESNZ to focus on policy.

As reported in Chapter 3 (Design and application process), MDOs established a more blended role in Wave 1 compared to SHDF(D), focusing on both monitoring and delivery. One scheme delivery representative said that emphasising the 'delivery' role of the MDOs cultivated a level of trust between SHLs and the MDOs, which they felt built a bridge between DESNZ and the DP (although one SHL felt the DP approach focussed too much on monitoring rather than support with delivery).

There was strong evidence from interviews with both scheme delivery representatives and SHLs to suggest that MDOs effectively supported delivery. Of particular value was their role in sharing guidance and learnings effectively (via monthly knowledge sharing lessons) and fielding a range of SHL questions, both ad hoc and through scheduled meetings, (on e.g. change control requests, reporting, finding solutions to lack of resident engagement etc.). This helped reduce the burden on DESNZ staff.

However, there were a number of reported challenges regarding the DP role. Scheme delivery representatives reported that while several MDOs were excellent, some were below the required standard and had to be swapped out of projects. Key challenges included:

- **A lack of technical expertise among certain MDOs**, meaning MDOs would often have to refer back to DESNZ to answer questions SHLs had raised in their monitoring meetings.

One scheme delivery representative mentioned that the DP had insufficient understanding of resident engagement and PAS 2035. This was perceived by SHLs as an additional layer of bureaucracy that SHLs had to deal with, and that the DP was acting as a middleman when the SHL could have approached DESNZ themselves, often leading to delays.

- **Multiple layers of governance,** which reduced the level of control DESNZ felt they had over the scheme.

> *"[DESNZ] are delivering through a delivery partner, who's delivering through the [SHL], so you've got about four people and that […] isn't necessarily the best way to do it. There are so many layers you lose control. As a project delivery professional, I don't like this way of project managing." Scheme delivery representative*

- **DESNZ and the DP project monitoring tools were not aligned.** This evaluation established that the DP invested in an in-house monitoring system which was not in the scope of their work. However, DESNZ had also developed their own system and required that data for reporting should be entered into their system. This meant that additional work was required to determine how these two systems would work together. In addition, a scheme delivery representative reported that some data reported by the DP was duplicated as a result of having two separate monitoring tools, and therefore did not add to the overall reporting process. They suggested that this was a blind spot which had arisen in the commissioning process.

Efficiency of scheme management

Scheme delivery representatives felt that Wave 1 had been managed and governed efficiently overall. This was especially true of aspects which had been improved based on learnings from SHDF(D), including better clarification of DESNZ and DP roles, and the change control process (these are detailed in Chapter 3, Design and application process).

One scheme delivery representative highlighted the efficiency of the 'triangle 'approach to project management (including DESNZ, the DP, and the project teams themselves), reporting that the roles of each organisation were more clearly defined compared to SHDF(D). They felt the DP's role freed up resource within DESNZ to manage other parts of the scheme (e.g. consideration of scope changes in line with evolving policy needs and handling escalated PCRs). For example, the DP RAG rated project delivery confidence in order to convey quick messages to the SHL delivery team, and reportedly dealt with many issues before DESNZ were aware.

However, one other scheme delivery representative felt that the number of people involved in managing and monitoring Wave 1 projects resulted in duplication of work in some instances. They felt that certain MDOs had limited technical knowledge (as detailed earlier in this chapter), which required DESNZ to step in to support SHLs in some cases. They reported that one SHL felt their project delivery was hindered by their MDO and only felt sufficiently supported when DESNZ worked with them. However, this finding was not corroborated by SHLs interviewed as part of this evaluation, and it was reported that some MDOs were

replaced midway through the scheme. This scheme delivery representative speculated that DESNZ may have saved money by upskilling their own staff to carry out the MDO role.

Additional support used by SHLs

There was some evidence of SHLs using other sources to get support for Wave 1 delivery, as outlined below:

- One SHL accessed technical support from Turner and Townsend to confirm a decision that their retrofit coordinator was advising on.
- In addition, a SHL struggling with resident resistance during project delivery found a session with SHRA useful. They took SHRA's advice to prepare videos of residents who were satisfied with the measures they received and show them to other residents. This was expected to help residents better understand the scheme.
- One SHL reported holding informal meetings with other LAs they had relationships with for them to share learnings.
- A scheme delivery representative attested to informal connections and information sharing from the National Housing Federation and other bodies. This helped LAs to link with people with experience in similar retrofits and gain useful knowledge.
- Events such as Midlands Net Zero provided platforms to share learnings, best practices and improving skills capacity as a region.

Risks and mitigations

The risk management processes were seen as appropriate by scheme delivery representatives and SHLs. However, areas for improvement were noted, including analysing monthly risks in more detail, and focussing on risks that could be mitigated. The most common risks reported by projects related to the supply chain.

Risk management

As defined in the SHDF Risk Register, the aim of the risk management process was to record risks, their causes, and actions (planned and implemented) to mitigate these risks. MDOs recorded the top two risks for each project every month as part of Ricardo Monthly reports.

Generally, most scheme delivery representatives and SHLs thought that risk management processes were appropriate and useful. A scheme delivery representative reported that at project and scheme level, there were solid processes in place to regularly review risks and deal with escalations when required. SHLs raised risks in their monthly data reporting, which were then explored in monthly meetings with the DP. One SHL felt the requirement was burdensome, as they had to revise their project risk table three or four times, and provide more detail than they had originally anticipated.

Scheme delivery representatives highlighted a handful of areas relating to risk management that could be improved:

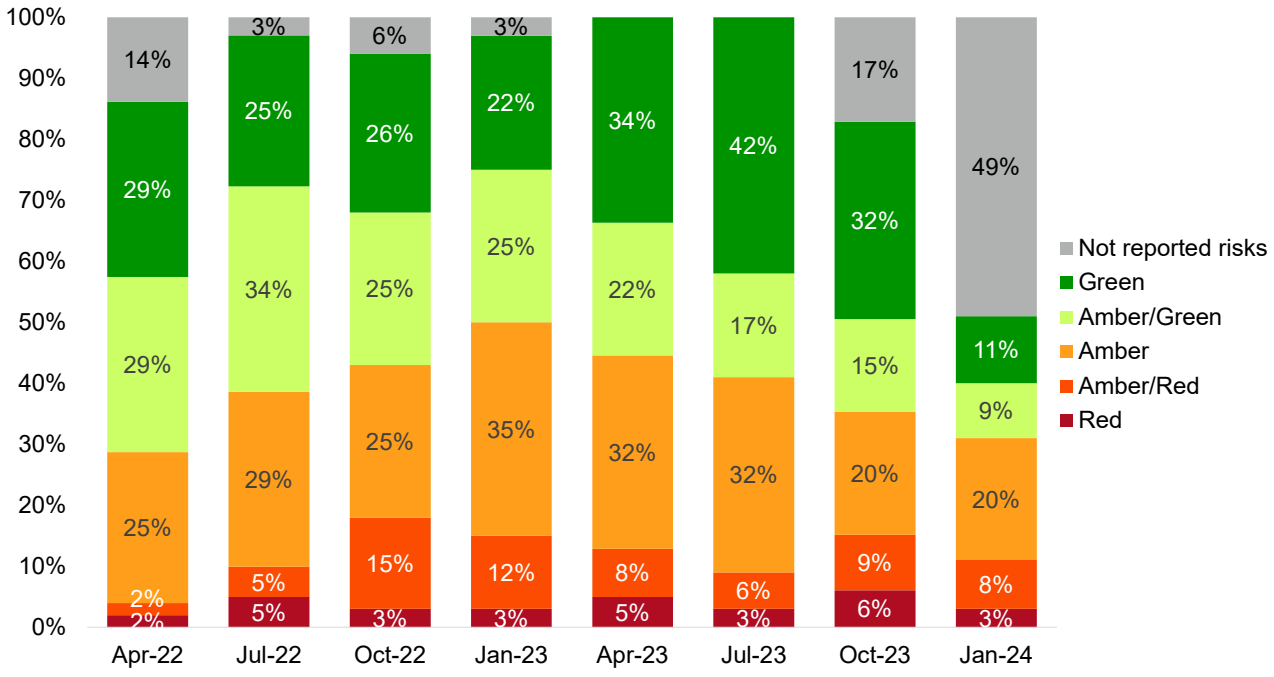
- One of them highlighted that although SHLs reported risks monthly, this was not an area the DESNZ delivery team had time to analyse in detail due to resource constraints. They felt this was frustrating as risk reporting held a lot of intelligence which they did not have a chance to explore in full.
- Another scheme delivery representative noted that although projects spent a lot of time identifying risks, they felt that they were not necessarily focusing on the right areas. They perceived that too much time was spent focusing on large risks that projects had little control over, rather than on risks that they could control. They gave the examples of the impact of COVID-19 in the SHDF(D), as well as delivery timelines and the pressure to deliver within a year for Wave 1.
- Another believed that they had not sufficiently captured errors and near misses in the fraud and error monitoring. An example reported of a near miss was an instance where a contractor was almost paid more money than they should have been. They highlighted there had been a lack of training on how to identify risk from fraud. However, they have now started to implement training and a larger focus has been put on fraud and error identification in monthly meetings. The scheme delivery representative believed they were better equipped to identify fraud.

Risks identified

This section summarises the main risks and associated mitigation strategies captured within project risk registers. The next section, ‘Barriers to delivery and mitigations’, expands on key risks and other barriers associated with project delivery. Project RAG statuses and up to five individual risks and their associated mitigations were reported monthly in the project summary by the Delivery Partner project SPOCs (Single Points of Contact) who were responsible for reviewing project progress.

As seen in Figure 11, the number of projects in Red, Amber/Red or Amber steadily rose until January 2023 before gradually reducing. Throughout most of scheme delivery, the majority of projects had a RAG status of Green or Amber/Green. Exceptions to this included Winter 22/23, and from September 2023 onwards, when projects were starting to complete.

Figure 11: Project RAG status over time, in the first month of each quarter



Source: DESNZ monthly delivery data (project summary: risk register, March 2024). Projects under 'Not reported risks' did not provide a project RAG status in the project summary for that month.

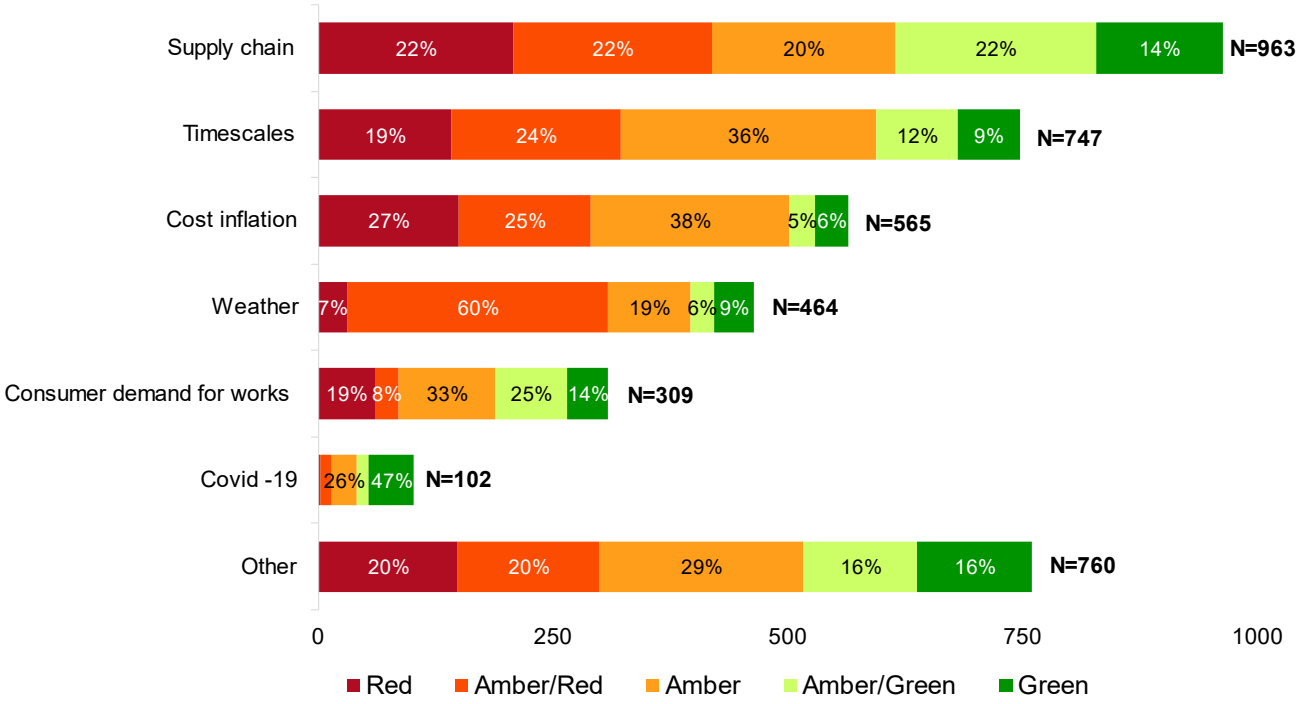
In January 2023, when Red, Amber/Red and Amber RAG statuses reached their peak, 63% of projects in the North of England were flagged in these categories compared to an average of 50%. Meanwhile projects with a larger number of homes to be treated were typically more likely to be flagged as Red, Amber/Red and Amber. For example, 65% of projects with 250+ homes had this status in January 2023, compared to only 43% of those with fewer than 100 homes. Projects that treated more than 250 homes were also more likely to mention risks such as weather and Covid-19, whereas projects that treated less than 100 homes were more likely to cite cost inflation.

The most common risks reported by projects between March 2022 and February 2024 (as shown in Figure 12) were supply chain risks, with 963 supply chain risks reported across all projects, of which 208 (or 21%) had a RAG status of red. Supply chain risks reported tended to include concerns over whether materials or labour could be procured in advance of works given market conditions. This was often attributed to shortages due to higher demand than expected or due to external factors such as the UK's exit from the EU or wider economic conditions such as inflation.

Timescale risks (n=747) were the next most common risk. While cost inflation (n=565) and weather (n=464) were less common risks, there were a similar number of Red and Amber/Red risks as for timescales. Indeed, cost inflation (typically relating to the risk of increasing material and labour costs affecting overall delivery costs) had the highest proportion of risks with a RAG status of red (26%), while almost nine in ten Weather risks were Red, Amber/Red or Amber.

This may suggest that SPOCs were concerned that weather related risks had a significant effect, with little mitigation possible.

Figure 12: Total number of risks reported throughout Wave 1 as of March 2024



Source: DESNZ monthly delivery data (project summary: risk register, March 2024). Risks categories reported less than 100 times not shown. 'Other' risks as categorised by SPOCs included grant underspending, Change Control submission requests, and poor baseline data.

Barriers to delivery and mitigations

Projects encountered various barriers to delivery throughout their lifecycle. Issues such as supply chain capacity and cost inflation contributed to delays and projects exceeding their initial budget. Additional barriers included issues with retrofit standards and installer accreditation, resident engagement, quality of works, weather, and third party relations. However, projects also put in place mitigations for the above issues such as alternative procurement strategies, and early resident engagement.

Barriers to delivery and mitigations were identified using the Ricardo Monthly Progress updates, the SHDF Wave 1 Risk Register, SHDF Project Summary entries, and interviews with SHLs, supply chain stakeholders, and scheme delivery representatives.

Supply chain capacity

Supply chain issues, alongside being the most common risks identified with a RAG status of red, were one of the barriers projects faced early in delivery. MDOs, SPOCs and SHLs noted shortages in materials, labour and contractors in the market. These shortages were attributed

to general capacity issues within the retrofit supply chain but were considered to be exacerbated by external factors such as the UK's exit from the EU, Covid-19 and inflation.[40]

Labour shortages led to both increases in costs, as demand for skilled retrofit labour rose, and to longer lead times for procurement, leading to overall project delays. The Ricardo Monthly Reports demonstrated that these issues were experienced among projects across the country.

SHLs employed various strategies to mitigate the risk of supply chain issues, including:

- Prioritising trusted contractors and suppliers, whom SHLs had worked with on similar retrofit activities previously. SHLs typically felt more confident they could rely on the agreed timing and quality of works with organisations they had worked with before.
- A range of alternative procurement strategies such as using open book costing models, adopting a staggered approach, employing Fusion21[41] or using the Dynamic Purchasing System.[42]
- Using existing supplier contracts and increasing their scope to carry out Wave 1 works to maximise efficiencies.

Cost inflation

Cost inflation of materials and labour was also a common barrier as well as a risk (as explored in section above), although it impacted some measures more than others. One MDO noted that measures such as EWI had seen a 45% increase in associated costs (no timeframe for this increase was given). A scheme delivery representative reported that only 10% of SHLs accurately costed their bids as the majority spent more than their initial cost estimates. Further detail on costs affecting the supply chain is covered in the 'Supply chain costs' section.

In interviews, some supply chain stakeholders reported they had to reduce their profit margin, or made a loss on the project overall, due to cost inflation and the nature of their contract they had agreed with their principal contactor or HA (which had not protected against cost inflation). They felt that SHLs and retrofit coordinators should have factored regular price reviews into their planning, to evenly distribute the burden of inflation and price rises.

For many SHLs, supply chain issues and cost inflation impacted the volume, timing or quality of planned delivery. Typically, these SHLs undertook one or more of the following actions to deal with supply chain and cost inflation issues; the effects of these on overall scheme delivery are covered in more detail in Chapter 4 (Delivery):

- Reduce the scale of planned works.
- Spend more than their budget and request more funding. One SHL reported having to pause work whilst they went to through the processes to secure additional match funding.

[40] According to the Office for National Statistics the consumer price inflation (CPI) rate was above 5% between November 2021 and September 2023. See https://www.ons.gov.uk/economy/inflationandpriceindices/bulletins/consumerpriceinflation/february2024
[41] Fusion21 is a consultancy firm which specialises in procurement.
[42] The Dynamic Purchasing System is a modern procurement tool aimed at replacing more traditional frameworks.

- Delay installation timescales so that the prices of materials would stabilise which led to delays in overall project timelines.
- Lower their EPC targets with many being reduced to EPC C, and therefore installing fewer measures in each property.

> *"Obviously, Brexit and the Russian invasion and the supply chain issues and the costs spiralling, all of that had a huge impact. I mean, we're nearly stabilised now, …. we've gotten to a point where people have to just reduce a lot of what they'd initially intended to do because the amount of money that was agreed no longer went as far as it was supposed to do at the beginning." Scheme delivery representative*

Mitigation activities reported in the Project Summary included setting aside risk pots for price increases, and learning from other projects to estimate delivery costs more accurately.

There was evidence that SHLs anticipated their experience of Wave 1 would help streamline retrofit costs in future. For example, one SHL reported setting up an energy efficiency framework after their Wave 1 project, which acted as a quick resource to find accredited contractors for the installation of different measures. Other SHLs also reported having better knowledge of how to access and engage the supply chain.

Case Study: Liverpool's experience of cost inflation.

Liverpool reported higher than expected costs for materials and labour. Reasons cited for this were cost inflation, underestimation of the works needed pre-installation, the costs associated with works for PAS 2035 compliance (this was estimated to have added £0.5 million to insulation costs), and having to use more costly measures than anticipated to reach EPC C. This resulted in increased overall project cost, changes in property and measure selection (EWI was descoped for 93 projects), and one member of the consortium dropping out.

Enabling factors cited included descoping more costly measures such as EWI, and the use of alternative procurement models.

Lack of familiarity with retrofit standards and accreditation requirements

As reported in the Ricardo Monthly Reports and in SHL interviews, another barrier projects experienced related to the requirement for PAS 2035 compliance and delays in Trustmark lodgements. A lack of understanding among supply chain stakeholders regarding the retrofit standards, or the lack of suitable accreditation at project start, led to project delays. One SHL, for example, estimated that within the entire windows and doors supply chain, only 5% of window and door installers were PAS 2035 compliant which led to delays and redesigns. In some cases, supply chain stakeholders considered that SHLs had selected properties for treatment without the necessary PAS 2035 expertise. This meant that planned works had to be revisited again by those with expertise, and subsequent rescoping and rebudgeting was often necessary. Examples of some of these issues included:

- Instances where only one half of a semi-detached house was selected to be part of Wave 1 (retrofit is typically more effective and efficient if both properties within a house are treated).
- Not planning for additional works which are typically found when installation commences (especially a factor for ventilation).

Although MDOs reported fewer issues with PAS 2035 as projects progressed, there was one major incident later in scheme delivery where one SHL discovered that a contractor already installing measures was not PAS 2035 compliant. This led to significant delays for that project as they had to source a new contractor who re-did all the works of the original contractor.

> *"What we underestimated was the impact of the PAS 2035 standard - financially and the paperwork. You know, the retrofit assessments, the evaluations, that side of it. We underestimated the impact." Successful SHL*

MDOs across many different projects encountered delays due to delayed or missing Trustmark lodgements. This was also cited as an open risk in the SHDF Risk Register due to concerns about Trustmark's own resource to process these accreditation lodgements due to a significant upturn in measures being lodged at once, as some projects waited to lodge installations in one go rather than throughout delivery.

Resident engagement

Residents refusing installers access to their properties was a consistent issue across projects. This often led to delays or projects having to select alternative properties for treatment.

Reasons for resident refusals identified by SHLs, supply chain stakeholders and MDOs included:

- Delays in project timelines leading to new schedules that were not suitable for residents.
- The perceived invasiveness of certain measures such as EWI, ventilation, or GSHPs.
- Residents' concerns around the cost of clean heat, for example that adopting these new measures would lead to higher energy bills due to the current high electricity prices.
- A lack of understanding of the benefits of the energy saving measures.
- Believing the works had already been completed leading to refusals for post work assessments and resulting in issues lodging works with Trustmark and assessing EPC ratings.
- Inconvenience and/or personal life circumstances including the presence of vulnerable or elderly household members, or those with a disability or other medical conditions, especially after the Covid-19 pandemic.
- Resident fatigue following multiple initial assessments and house visits to explain the scheme.

SHLs reported that resident engagement programmes helped reduce resident refusal and ensure successful delivery. Examples include:

- Door-to-door engagement, where SHLs typically explained the extent of the planned work, asked about residents' experience of their housing in summer and winter, and of fuel bills.

- Active customer participation in the retrofit process, with techniques including engagement events for fielding questions, satisfaction surveys and consultations through which SHLs disseminated educational and awareness materials.

Case Study: Coventry's Resident Engagement Strategies

Coventry carried out several engagement strategies such as events with residents, sending informative letters and leaflets, providing access to an Energy Advice Service, setting up bespoke plans for residents through tenant liaison officers and using a mobile van to display measures (Figure 13).

The project team credited the above resident engagement strategies as key enablers for success.

Figure 13: Westdale Display Van for SHDF Wave 1

Evidence from the Ricardo Monthly Reports demonstrated how critical the role of the resident liaison officer was in supporting residents through the retrofit process. These individuals typically disseminated information about works to residents and answered any queries they had in line with the projects' resident engagement strategies. Both the Coventry and Durham case studies contain more detail on this role.

One SHL acknowledged that resident engagement from the start of the process, especially with private homeowners, was important. For example, making residents aware of the need to give access to installers to avoid delays in works for neighbouring properties receiving treatment was often helpful.

> *"We've had a much higher number of complaints from residents during this project (Wave 1) compared to the previous one (Demonstrator). And my view is that all comes down to resident engagement. If we had a really successful*

> *resident engagement right at the beginning, if we had got all the residents really enthusiastic about the work, [and] we would have had much fewer complaints. So, it's been a challenging element of increasing the scale of the project whilst trying to keep all the residents happy at the same time." Successful SHL*

Findings also indicated that residents sharing their experience of the benefits of works potentially contributed towards other residents agreeing to installations.

> *"…once we've done a couple [of measures] and residents realised it was making their homes warmer and it showed that it didn't [increase] the bills, when everybody else's bills were going up massively, all of a sudden other residents started signing up for it and they wanted measures installed once they saw it." Successful SHL*

Quality of work

MDOs and supply chain stakeholders often reported that issues in pre-work assessments of properties caused several problems, including:

- Failure to identify damp, asbestos or woodworm or other structural issues.
- Failure to identify issues with the quality of recent (non-SHDF) works which would need extra work done alongside the SHDF works in order to reach EPC C or above.
- EPC assessments not being sufficiently accurate to determine whether works were needed. Many projects de-scoped properties once technical surveys deemed their properties invalid for selection as current measures were to a sufficient standard (EPC C or above).
- Installers being instructed to install measures which properties had already received. For example, one supply chain stakeholder reported in an interview that they were sent to one set of properties to install Loft Insulation which already had Loft Insulation.

These issues were often only discovered when the works were scheduled to take place, which either led to delays with the project or to measures being re-scoped (as mentioned in the 'Measures installed' section).

MDOs also reported instances where measures had been completed to a poor standard and had to be re-done, causing issues with charging contractors for work.

> *"The project has been billed for work but because it has been completed to such a poor standard, the team has yet to pay the contractor full amounts. This means that the PM [project manager] is finding it difficult to say where they are with grant spend." Scheme delivery representative*

The issue of quality of works was flagged in the SHDF Risk Register as there were concerns that this would result in a number of properties failing to achieve the EPC band C targets, however based on analysis of Change Control data this doesn't appear to have been the case. Only 234 properties were logged by projects, to February 2024, as having an EPC of band D or lower after treatment (2% of all properties registered as having any completed measures), although 1,528 post-treatment EPC ratings remained unknown at that point (10%).

The most effective enabler to ensuring high quality work appeared to be close collaboration across contractors, assessors and other partners, with the aim to build on each others' strengths and experiences in order to deliver works to the highest standard possible. SHLs also flagged the value of improving internal capabilities by running retrofit bootcamps and training for consortium partners, and undertaking pre-installation surveys of properties (this was vital in ensuring works were planned out as efficiently as possible).

Weather

Poor weather was a significant barrier and risk for projects, as reported in the Ricardo Monthly Reports. As projects experienced delays, work was extended into the winter months, which was a risk to certain measures such as EWI which cannot be installed in wet conditions. In one case, a project sent out a team to assess the site each day to see if works could take place given the weather forecasts, which was an inefficient use of time.

Mitigation strategies reported in the Project Summary file included regular reviews of timelines with project teams and coordinators in order to plan weather dependent works such EWI in the summer months. However, in most cases these reports mentioned that mitigation opportunities for weather-related risks were minimal as often projects simply had to wait for the weather to improve.

Issues with other third party stakeholders

Another barrier experienced by projects, that was raised in both SHL interviews and the Ricardo Monthly Reports, was related to issues with other stakeholders such as local planning authorities or Distribution Network Operators (DNOs). One project experienced delays due to issues over planning permissions, and with communications and progress updates between parties. For other projects, delayed sign off on heat pumps and overhead lines for solar panels from DNOs caused SHLs delays in delivery.

> *"[We have to] defend the project being open till the end of March to so that the DNO can come and do their work that they need to do before we install the air source heat pumps." Successful SHL*

Challenges affecting particular measures

Supply chain stakeholders typically reported facing more difficulty installing certain measures compared to others. These included:

- **External Wall Insulation (EWI):** This measure was identified as the most challenging due to various property type factors (e.g. pre-existing insulation levels, types of flooring, rotting wood etc.) not being considered in the pre-works assessments. Properties with external features such as balconies, bay windows, and porches posed specific challenges in insulating them properly, while the unpredictability of the state of properties (e.g. discovery of rotting wood) during installation caused problems where additional remedial works were installed first, or the EWI insulation was abandoned altogether. EWI was also significantly impacted by adverse weather conditions, as discussed in the 'Weather' section.

- **Ventilation**: As initial property assessments sometimes overlooked ventilation requirements, this was often the last measure to be installed. However, ventilation can be quite invasive as it requires access to all rooms in the property. In some instances, pre-existing ventilation was not working as well as required, resulting in additional work and costs after measures were installed. Residents sometimes refused giving access to their homes to install ventilation, especially if this was left at the end and they felt fatigued from works.
- **Internal Wall and Under Floor Insulation:** The need to remove possessions, floor coverings, and parts of the kitchen for installation made it more challenging to gain resident access.

5 Developing and managing the supply chain

This chapter explores supply chain establishment for Wave 1 projects, already identified in the chapter above as a key barrier to delivery. It explores how effectively Wave 1 involved the supply chain, as well as supply chain views of the quality requirements for installation and the impact of delivery at scale on costs.[43] The chapter predominantly draws on evidence from interviews with supply chain stakeholders.[44]

Central supply chain development

Supply chain stakeholders were motivated to engage with Wave 1 due to the long-term security of job contracts, training opportunities for their workforce, and helping the UK tackle climate change. Most supply chain stakeholders had previous experience with government-funded retrofit energy efficiency schemes.

Engagement

Scheme delivery representatives noted that DESNZ undertook a range of engagement activities with the supply chain prior to the commencement of Wave 1. Engagement with the National Homes Decarbonisation Group[45] appeared to have been particularly worthwhile, with one scheme delivery representative reporting that their members carried out circa 95% of works on Wave 1. Scheme delivery representatives also reported engaging with suppliers at the Energy Efficiency Association awards.

Supply chain stakeholders typically reported in interviews that they had a positive relationship with the SHLs or principal contractors with whom they worked, and that this relationship often existed before the launch of Wave 1. While this pre-existing relationship appeared to be the

[43] Evaluation questions addressed in this chapter: 1.8, 1.9, 4.2 and 8.4.
[44] Supply chain outcomes and impacts will be explored in the Wave 1 impact evaluation.
[45] This is a membership group representing retrofit contractors, construction companies and repair, maintenance and improvement (RMI) businesses.

main factor for supply chain stakeholders committing to working on Wave 1, there were three recurring themes in the installation stakeholder interviews illustrating why working on SHDF Wave 1 appealed to these organisations:

- The job security of SHDF contracts was the most commonly reported motivation, given they were typically longer than other contracts in the retrofit industry.
- The opportunity to train their existing workforce and expand their workforce, given the anticipated increased demand for this type of retrofit work in future.
- The opportunity to do something "moral" in helping the UK tackle climate change and reach net zero.

Experience from other government energy efficiency schemes

Supply chain stakeholders were asked whether they had been involved in government funded initiatives before Wave 1, and if their capacity was affected by working on other schemes at the same time as Wave 1. Almost all supply chain stakeholders interviewed had prior experience of working on previous government-funded retrofit energy efficiency schemes.[46] They were most likely to report working on projects funded through the Energy Company Obligation (ECO) scheme alongside Wave 1. Two supply chain stakeholders reported that the skills and lessons learned on their involvement in ECO transferred well into their SHDF responsibilities, especially with regards to the standards, compliance and paperwork requirements.

While the previous chapter highlighted that the capacity of the retrofit supply chain was a key barrier to delivery, supply chain stakeholders undertaking Wave 1 installations did not consider their own capacity as a barrier to delivering to schedule. However, many reported they were at capacity and could not seek further work elsewhere whilst Wave 1 was ongoing.[47] One supply chain stakeholder discussed how the larger scale of the SHDF work compared to their other work streams meant they prioritised accommodating the demands and changing timescales of SHDF, at the expense of other contracts (which were smaller in scale and considered more flexible).

> *"Capacity hasn't been a problem. You will find that each scheme has a target audience or a target technology that they're trying to support, so we've chosen SHDF and ECO. That's down to choice, the client, and the work, rather than capacity." Supply chain stakeholder*

It was rare for supply chain stakeholders to report turning down non-SHDF contracts to work on Wave 1 projects, with only one organisation reporting they had paused working on ECO to focus on Wave 1.

[46] Schemes cited included Energy Company Obligation (ECO), Home Upgrade Grant, Green Homes Grant, Green Deal Homes Improvement Fund and the Boiler Upgrade Scheme.
[47] It is worth noting that the evaluation did not capture the views of supply chain stakeholders who did not engage with SHDF Wave 1, for whom capacity issues may have been a reason not to participate.

Upskilling and increasing capacity of supply chain

The accreditations and standards requirements within Wave 1 ensured high-quality installations, despite supply chain stakeholders experiencing challenges in implementing new standards.

Accreditations and training contribute to high quality installations

To be eligible for funding, all projects had to be compliant with PAS 2035:2019 requirements, the British standard for retrofitting dwellings. Installers also had to be approved by Trustmark or equivalent. As part of meeting these standards, installers were required to provide evidence that Wave 1 installations met PAS 2035 standards, by providing records of decision-making, and photographs.

Supply chain stakeholders generally felt the Wave 1 quality standard requirements contributed to higher quality installations overall. They felt that the need for assessors and qualified retrofitters ensured high standards were maintained, and that the necessary evidence to demonstrate the quality of works was provided. In addition, most supply chain stakeholders felt that without PAS 2035 requirements, a whole house approach would not be considered when planning and conducting installations. Furthermore, as shown in the 'Satisfaction with installation process' section, two thirds (66%, n=1,390) of residents were satisfied with the quality of their installation. This shows that, while the Wave 1 standards might have contributed to improved quality, a minority of residents (13%) were still dissatisfied with the quality of measures installed. Section 3.2 within the PAS 2035 Case Study contains more detail on the impact of PAS 2035 on the quality of installations.

Case Study: PAS 2035

Most SHLs interviewed felt that the principles of the PAS 2035 standard improved the retrofit process. For example, by:

1) Ensuring coherence of measures and focusing on the interactions between different measures.

2) Helping to future-proof properties and reduce future risk to their housing stock.

3) Formalising the retrofit process and offering a logical framework to follow when carrying out retrofit installations.

While some supply chain stakeholders reported they were already working to a high standard, others felt these standards increased the quality of installations across the sector and were likely to prevent bad practice amongst supply chain organisations.

"When PAS2025 came out I wasn't really afraid because I always thought that we were following the right systems and processes. […] It's better for the industry, it's better for the

end user, it's better for the clients, it's just better for everyone." Supply chain stakeholder interviewee

Wave 1 projects were also required to train apprentices, and about three quarters (74%) of projects reported doing so in monitoring data. About half of all projects reported employing one or two apprentices at any one time,[48] and a quarter (23%) reported employing three or more. In general, projects treating higher numbers of properties tended to employ more apprentices. The largest projects (with 250 or more properties treated) employed an average of 2.5 apprentices, compared to 1.7 among the smallest projects (with less than 100 properties treated).

Challenges with implementing required standards

Most supply chain stakeholders had to ensure personnel in their company undertook some form of training or accreditation before beginning works on Wave 1. Interviews with supply chain stakeholders and the delivery data both identified that the process of gaining accreditations for contractors often delayed projects, although sometimes delays to project start were utilised for additional training and capacity building.

Supply chain stakeholders who were less familiar with the level of evidence requirements for Wave 1 commonly cited record keeping as a challenge. Many did not have the processes in place to collect and organise evidence. One installation manager said they made a financial loss on the project as they did not realise the extent of documentation and evidence gathering required. However, many felt their participation in the project had increased their awareness and understanding of the most effective record keeping practices, which they hoped to employ again in future projects. Section 2.4 in the PAS 2035 case study contains more detail on the administrative burden of implementing PAS 2035 requirements.

Case Study: PAS 2035

Supply chain stakeholders reported an increased administrative burden resulting from PAS 2035 requirements, which led to delays and increased project costs. For example, one interviewee experienced issues with the high number of documents they were asked to complete for each property. Another interviewee felt this burden was exacerbated when working in consortia, as they had to duplicate paperwork and sign offs many times. Smaller organisations reported experiencing this burden most severely.

"The PAS requirements only became challenging when it came to the paperwork. The paperwork side is very admin heavy. We had to employ a full-time administrator just to control paperwork." – Supply chain stakeholder interviewee

[48] Projects were not required to report on apprentices starting or completing their studies.

Evidence from both Ricardo Monthly Reports and interviews with supply chain stakeholders showed that some residents were not comfortable with giving access to installers to take pictures of all rooms in their properties for post-project assessments. This often meant the assessor had to leave and return on another day, leading to delays in addressing outstanding installation issues or signing off projects as complete. Findings from the resident survey showed that 10% of residents were uncomfortable having installers in their home, as shown in the 'Experience of installation process' section.

Increasing supply chain capacity for the future

Most interviewed supply chain stakeholders said they had become accredited in PAS 2035 or Trustmark for the first time in order to work on Wave 1 projects. Retrofit coordinators and senior managers at principal contractors actively encouraged accreditation within their workforce and of the contractors they used prior to their involvement in Wave 1. This would help "future proof" their supply chain, enabling them to use newly accredited contractors in future installation work. Many supply chain stakeholders referred to challenges in delivering the projects as a "learning curve" that would hopefully inform cost reductions and efficiencies in future.

Supply chain costs

Supply chain stakeholders reported that installing measures on multiple homes in close proximity to each other was a cost-effective approach to decarbonising properties.

Some SHLs reported having taken advantage of economies of scale throughout their Wave 1 procurement activities. For example, one SHL reported being able to procure a cheaper contractor as a result of the high number of properties they were working on in their Wave 1 project. Another SHL reported getting the best rates for materials as a result of using a large contractor. However, scheme delivery representatives generally felt that economies of scale had not materialised as much as they had hoped, and that this was probably only achievable for large consortia working on a large number of properties. One scheme delivery representative mentioned that economies of scale might improve under future waves of SHDF.

Supply chain stakeholders typically agreed that the design of Wave 1 – and in particular the common approach taken to install multiple measures on multiple properties within close proximity to each other – was a cost-effective way to decarbonise social housing stock. Key aspects of this included:

- Being able to buy materials in bulk, which created cost savings.
- Transporting materials once for multiple properties, resulting in fuel savings.
- Storing materials in the same location for a site nearby was cost effective.
- Re-using scaffolding, thereby reducing costs.
- Being able to do more work in one day with properties being so close to each other, resulting in cheaper labour costs.

To provide an example of the scale of savings when installing multiple measures in multiple properties in close proximity, one installation manager installing windows and doors reported that individually the measures would normally cost £8,000 each, but due to the structure and volume of the requirement, each installation costed close to £3,000.

There was limited evidence of innovative techniques being used on Wave 1. Most supply chain stakeholders described their installations as standard, although the majority said they were on a larger scale and delivered in shorter timescales than they were used to. However, there was one example of an assessor using evidence photos to conduct assessments remotely rather than using site visits which they considered to have saved on costs and reduced resident disruption. Another insulation company spoke of how the use of thermoscopic lances reduced the need for scaffolding when insulating walls which also led to cost savings.

Despite the benefits of Wave 1 leading to large scale cost reductions, supply chain stakeholders reflected that the design of the scheme was vulnerable to cost inflation. They felt that, because properties were retrofitted with a range of measures, the higher quantities of materials needed meant they were more subject to inflationary increases. Supply chain stakeholders reported that in some cases the larger than anticipated outgoing costs on materials (owing to cost inflation and supply chain disruption) were not possible to meet as the organisations did not have the capital to pay for them. SHLs typically agreed that the cost of labour and materials increased over the course of their Wave 1 project as a result of inflation.

Additionally, a few interviewed supply chain stakeholders felt that SHLs and retrofit coordinators relied heavily on large national companies to carry out retrofit works, as they were more likely to have the capacity to deliver within the timescales. This may impact the extent to which the scheme can support the development of smaller companies in the sector. The lack of comprehensive delivery data regarding the supply chain companies involved in Wave 1 meant this evaluation was unable to assess whether retrofit companies that worked on Wave 1 were larger than average.

6 Resident engagement and installation experience

This chapter explores resident engagement and installation experience, including awareness of the installations and SHDF, motivations for taking part in the scheme, communications with SHLs and installers, satisfaction levels with the installation and any support received.[49] Differences by types of residents and their experiences of SHDF are explored where possible. The chapter draws on primary data from the resident survey (n=1,498) and qualitative interviews with residents and SHLs.

[49] Evaluation questions addressed in this chapter: 2.1, 2.2 and 2.3.

Progress of installations

Installations had been completed for 72% of residents at the time of the survey, were still ongoing for 20% of residents, and had not yet started for 3% of residents.[50]

At the time of the survey, installations had been completed for 72% of residents.[51] For the rest of surveyed residents, the installations were either still ongoing (20%) or had not yet started (3%). The installations were more likely to be completed for those living in a bungalow (79% compared to 72% living in a house and 64% living in a flat, apartment or bedsit), those who rented their property through a HA (76% compared to 64% renting through a LA) or did not experience previous problems in their property immediately before the installation (87% compared to 78% among those with previous issues). The installations were more likely to be still in progress for residents who had installations related to windows and doors (25% compared to 20% average across all installations).

Awareness of SHDF

Almost nine in ten residents surveyed (87%) were aware that the energy saving measures had been installed or were due to be installed in their home. Of these, 37% knew that the installations were funded by SHDF.

The majority of residents (87%) said they were aware that energy saving measures had been installed or were due to be installed in their home prior to taking part in the survey. Of these, 37% (or 28% of all surveyed residents) were also aware that the installations were funded by the SHDF.

Residents who previously had energy saving measures installed in their property were more likely to be aware of the installation of energy saving measures (88% compared to 74% among those who did not receive energy saving measures before Wave 1), suggesting this group may be more engaged with energy efficiency issues.

Engagement with the scheme

Residents agreed to have the energy saving measures installed to make their home warmer/more comfortable (71%), to save money on their energy bills (64%), to bring their homes up to modern standards (61%), and to reduce energy use for environmental reasons (53%). However, one in two (50%) thought they had no choice on whether the works would go ahead, and nearly one in three (31%) said they did not know they could opt out.

[50] Five percent responded 'Don't know'.
[51] Installations were complete for 77% residents in Tranche 1, 77% in Tranche 2 and 69% in Tranche 3.

Motivations for taking part in the scheme

Residents were asked why they agreed to have energy saving measures installed in their home after being notified of the scheme plans by their SHL. Nearly three quarters (71%) wanted to make their home warmer or more comfortable. Residents were also hoping to save money on their energy bills (64%), to bring their homes up to modern standards (61%), and to reduce energy use for environmental reasons (53%). More than half (59%) said the measures being offered for free motivated them to take part.

Nearly 9 in 10 (88%) of those who took part in the survey experienced some problems with their home immediately before they had the energy measures installed. Those who had experienced problems in their home prior to the installations (e.g. draughts, difficulty heating their home, mould or mildew) were more motivated to have the measures installed. For example, 75% of those that experienced problems in their property wanted to receive installations to make their home warmer or more comfortable compared to 57% among those with no prior issues. In the qualitative interviews, a few residents talked in more depth about their hope that the measures would also improve their health and wellbeing (particularly those who had experienced damp, mould or draughts in their home) and also to make their property look more attractive.

However, residents were not universally aware that the scheme was optional. One in two (50%) thought they had no choice whether the works would go ahead and nearly one in three (31%) said they did not know they could opt out. Residents renting their property from a LA were less likely to say that they had no choice whether the works will go ahead (45% compared to 51% of those renting from a HA and 54% of those renting from an ALMO). In interviews, residents raised the lack of clarity whether the scheme was optional in communications from the SHL, for example in the initial letter informing them about the works. They also assumed that they had to agree to the works given they did not own the property.

> *“I thought it was part and parcel of what was being done for everybody, which is why I was a little bit surprised when I was informed it was an opt in or opt out.” Resident*

> *“I didn't realise I had an option to opt out. That could have been me just not reading the letter properly… I was more of the mindset that if the SHL is arranging this for me to reap the benefit, I'm not going to look a gift horse in the mouth.” Resident*

Experience of installation process

The most common measures installed among surveyed residents included insulation, extractor fans, double or triple glazing, and ventilation. Around two thirds of residents were satisfied with the communication from their SHLs (65%) and the installers (68%), and found the installation scheduling convenient (65%). Nearly four out of five residents (77%) said they felt comfortable about allowing the installers into their home.

Types of measures installed or planned

Residents taking part in the survey were asked which energy saving measures will be or had been installed in their home by their SHLs. Insulation measures were most commonly mentioned by residents (65% Loft Insulation, 36% CWI, 35% EWI), followed by Extractor Fans (53%), Double or Triple Glazing (43%) and Ventilation (37%). A smaller proportion mentioned other types of measures such as energy efficient lighting (28%), solar panels (20%) or controls for a heating system (19%), and heat pumps (3% ASHP, 3% GSHP, 4% another type of heat pump). These broadly mirrored measures delivered i.e. insulation measures were typically more common, followed by glazing and ventilation, and clean heat measures were less common (see 'Measures installed' section for more details).

In interviews, residents were also asked what other measures they would be interested in having installed which their SHLs had not offered. While overall residents expressed satisfaction with the measures offered, some wished for other works to be carried out. Residents who had insulation-related installations but had continued to experience draughts in their home wished to also have windows and doors replaced. Others said they would have liked to have solar panels installed to further help save energy and reduce bills or to have more energy-efficient heating system (boilers, radiators or heat pumps) to make their place warmer.

Concerns about the installation prior to the works

In interviews, all residents were asked whether they had any concerns about the works ahead of the installations. Some of the drawbacks mentioned included potential disruption (e.g. having to move out, taking time off work to let the contractors in), damage to the property, lack of cleanliness of the installers, or noise levels. Overall, however, the pre-installation concerns were quite limited and residents looked forward to seeing the results of the works.

> *"Just the general disruption day to day, someone needing to be home, the noise, dust. I was a bit worried about the damage to the property." Resident*

Communication about the installation

During interviews, residents described how they were contacted about the works. This was done through primarily receiving a letter from their SHL or the council, or through other forms of communication such as phone calls, home visits by the SHL or meetings with other residents organised by either the council, SHLs or contractors. In interviews, SHLs reported that this range of methods used to engage residents helped build trust and awareness amongst residents and therefore ensure successful project delivery. The letter was well received, particularly when the residents felt that it clearly explained the purpose of the works, next steps and who to contact in case of any queries. Residents were less happy if the letter described general works conducted in the area rather than works being done to their property, or was vague about the timescales of installations.

Residents reported that follow-up communications were usually handled by installers. Residents who experienced little disruption and were satisfied with the overall experience of installation found this approach appropriate. Those who experienced some issues during

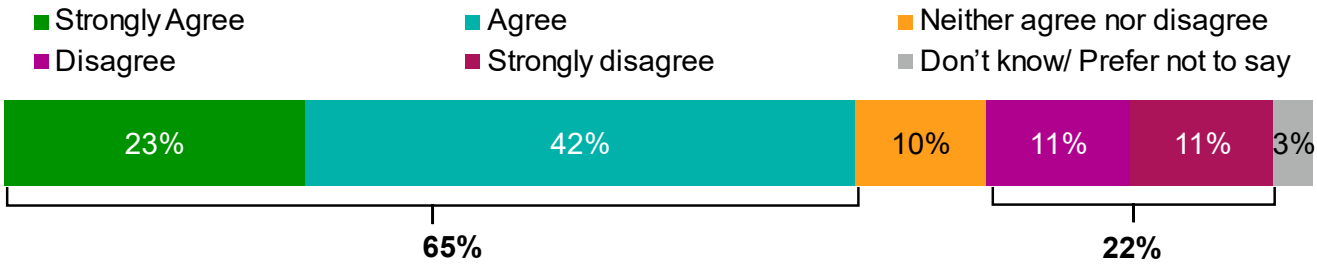
installations would have preferred their SHL or a housing officer to be more directly involved. Residents surveyed who were dissatisfied with communication from their SHL or installer were more likely than those who were satisfied to also be dissatisfied with all other elements of the installation process. For example, 86% of those satisfied with communication from their SHL were satisfied with the installation process overall, compared to 27% of those dissatisfied with SHL communication.

> *"This is one of the things during this installation and upgrade we feel that perhaps a housing officer should have been coming around every now and again just to make sure that everything was ok." Resident*

Installation scheduling

Two thirds of surveyed residents (65%) agreed or strongly agreed that the way the installation was scheduled was convenient for them, as shown in Figure 14, while around a fifth of residents (22%) disagreed.

Figure 14: Proportion of residents who agreed/disagreed that the installation scheduling was convenient



Source: Wave 1 Resident Survey. F2. How much do you agree or disagree with the following: The way the installation was scheduled was as convenient as it could have been, for me and my household. Base: All residents (n=1,498).

The following groups of residents were more likely to agree that the scheduling of installation was convenient:

- Older residents (77% of those aged 75 and over, compared to 61% of those aged 35-54).
- Male residents (70%, compared to 65% of female residents).
- Residents with no long-term health conditions (75%, compared to 63% of those with long-term health conditions).
- Residents living in single person households (71%, compared to 63% of those with four to five household members).
- Residents renting from a HA or LA (67% compared to 56% renting from an ALMO).
- Those who did not experience problems in their home before installation (75%, compared to 66% of those who did not experience previous problems).

> *"They phoned up to say they'd be here tomorrow at 8am and they were here at 8am, bang on time. It was great. The SHL wasn't involved that much (…). The*

> *contractors would phone up to say 'Can I come in and do this?'. They were clean and tidy, they were great." Resident*

> *"I thought the Contractors were great, and I got on really well with them, sometimes there was a knock at the door when you weren't expecting them, but usually you knew when they were going to turn up so". Resident*

Residents who disagreed or neither agreed nor disagreed that the installation was convenient were then asked for the reasons they felt so. The main reasons were the installer not turning up when expected (60%) and being given little or no choice of date and time for the works (58%). Other inconveniences reported were not knowing how long the installation would take (50%) and having to take time off work (26%).

> *"We had workmen turning up without the right equipment, people coming over that we weren't expecting, people turning up when they were not sure what they were supposed to be working on." Resident*

Communication with contractors and SHLs

Around two thirds of residents were satisfied with the communication from their SHLs (65%) and the installers (68%), whereas one in five (21% for SHL and 20% for installers) were dissatisfied, and 11% were neither satisfied nor dissatisfied.

Several factors were associated with satisfaction with communication from both SHLs and installers:

- Having works completed (68% satisfied with communications from SHLs compared to 53% with ongoing installations).
- Living in a flat, apartment or bedsit (74% satisfied with communications from installers compared to 65% living in a house).
- Being older (72% of those aged 75 and over were satisfied with communications from SHLs compared with 57% of those aged 18-34).
- Having no long-term health conditions (77% satisfied with communications from installers compared with 64% of those with no long-term health conditions).

There were also some differences in levels of resident satisfaction with installation scheduling and communications by the type of measure they received. For example, those who had lighting measures installed were more likely to agree that installation scheduling was convenient (72%), whereas those receiving measures related to windows and doors were the least likely to agree (61%). Similarly, residents with lighting-related installations were more likely to be satisfied with communications from their SHL than those with other types of installations (74% compared to 65% average).

Residents who took part in interviews described that the main way of communication during the installations was directly with the installers or site managers. Residents had little contact with their SHLs during the works. Those who received contact or a visit from their SHL to check about progress or any concerns felt appreciated and taken care of.

Residents who were satisfied with the installation process found dealing directly with the installers or site managers helpful, as they could get immediate updates and responses to their requests. Those who experienced issues with the installations wished for some involvement from the SHL to oversee the works, especially if they had complaints about the installers or could not communicate with them due to a language barrier.

Nearly four out of five residents (77%) surveyed said they felt very or fairly comfortable about allowing the installers into their home to install the energy saving measures (10% reported they felt uncomfortable). Those who had lighting measures installed were the most likely to feel comfortable (84%). Those who said they were overall satisfied with the installation process were more likely to say they felt comfortable (91% compared to 44% of those dissatisfied with the installation process).

There were also some demographic differences in how comfortable residents felt about the installers' presence in the home. Groups more likely to feel comfortable included:

- Older residents (90% of those aged 75 and over compared to 72% of those aged 18-34).
- Those with no long-term health conditions (86%, compared to 75% of those with long-term health conditions).

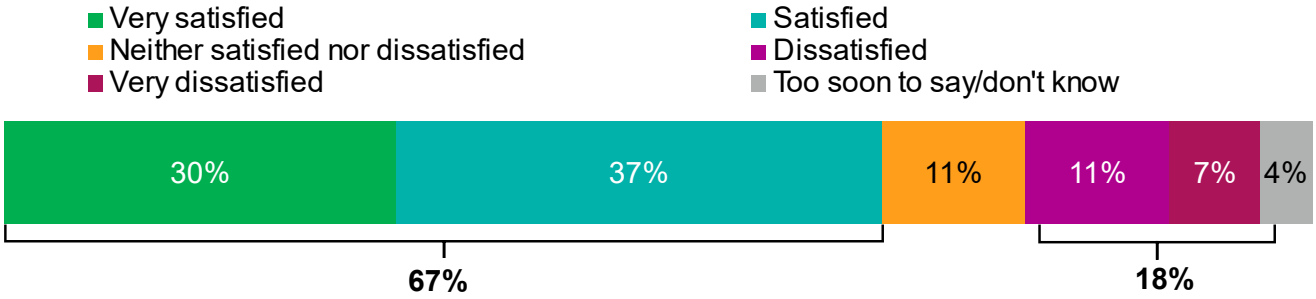
Among residents who were uncomfortable with allowing installers into their home, the most common reasons for feeling uncomfortable were a dislike for having strangers in the home (52%), followed by finding the installers rude or unprofessional (20%), and not trusting them (16%).

Satisfaction with installation process

Two thirds (67%) of residents surveyed said they were satisfied with the installation process, while less than one in five (18%) were dissatisfied. A similar proportion (66%) were satisfied with the quality of the installation. A third (33%) of those with works completed said that the installation took about the time they expected, whereas 45% said it took more time than expected.

All residents for whom works had started at the time of the survey were asked about their satisfaction with the installation process overall. As shown in Figure 15, two thirds (67%) said they were satisfied and less than one in five (18%) were dissatisfied.

Figure 15: Levels of resident satisfaction with the installation process overall



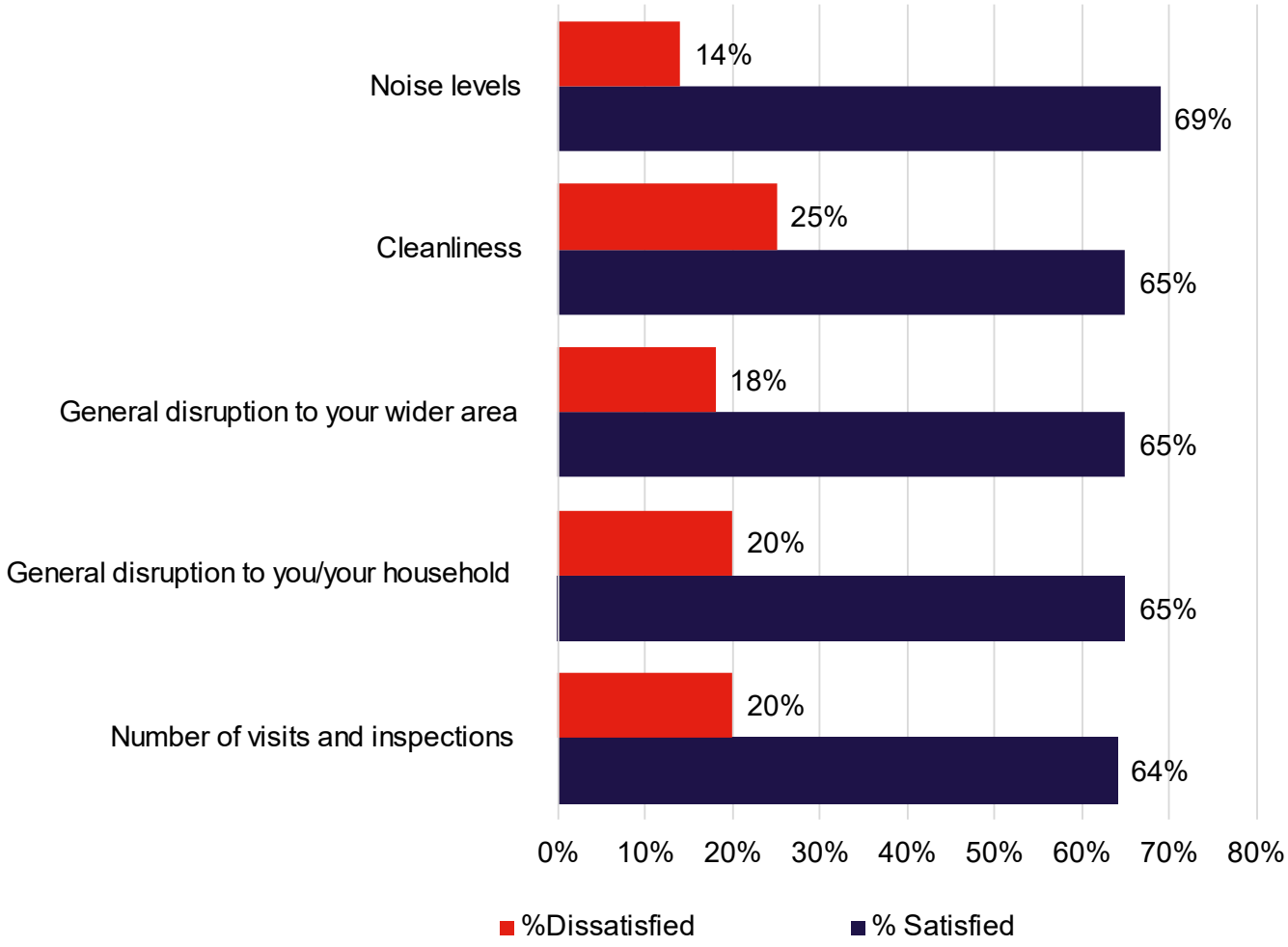
Source: Wave 1 Resident Survey. G4. Taking all your experiences into account, how satisfied, or dissatisfied are you with the installation process? Base: All residents with works completed/ongoing (n=1,390).

Groups more likely to say they were satisfied with the installation overall included:

- Older residents (78% of those aged 75 and over, compared to 61% of those aged 18-34).
- Those with no health conditions (76%, compared to 64% of those with long-term health conditions).
- Those living in single person households (71%, compared to 62% of those in four to five person households).
- Those not in paid work (71%, compared to 61% of those in full-time jobs).
- Those who had not experienced problems in their property immediately before installation (76%, compared to 66% of those with previous problems)
- Those with lighting-related installations (75%, compared to 67% average across all respondents).

Survey respondents were also asked about their satisfaction with specific aspects of the installation process. Around two thirds of residents were satisfied with aspects related to noise levels, cleanliness, general disruption to the area or to the household, and number of visits and inspections (Figure 16). Over half (57%) of respondents were satisfied with six or more of the eight aspects of the installation process they were asked about in the survey. Respondents who were satisfied with more than two of the eight aspects of the installation process were more likely to report being satisfied overall with the installation, than not.

Figure 16: Levels of resident satisfaction with specific aspects of the installation process



Source: Wave 1 Resident Survey. G1 Thinking about the installation process, to what extent were you satisfied or dissatisfied with the following? Base: All residents with works completed/ongoing (n=1,390).

During interviews, residents reported that satisfaction was likely to be higher if installers were professional and kind, works were completed swiftly or to time, and contractors left the property in a good state. If these elements were in place, residents were more understanding of any minor disruptions or adjustments they need to make to their daily schedules.

> *"Obviously there's disruption, but it was minimal for what we were having done. You can't have work done and not be inconvenienced a little bit." Resident*

> *"Everyone was incredibly polite. I was happy. They were so polite to the point that I was happy to just... leave them to crack on with it so absolutely no worries. So, everyone was brilliant, got the work done really nice and quickly." Resident*

Those who were less satisfied with the installation process mentioned experiencing problems such as poor communication with installers (e.g. showing up unannounced), mess and dust, limited access to the property at the time of repairs, and damage to belongings or the property. This was emphasised even more if the works being completed were more intrusive (e.g. putting up scaffolding on the building), or if the resident had multiple measures installed over a

long period of time. There were also comments made about the timing of the work, as scheduling them in the winter meant that some residents had cold properties, for example while the windows or doors were being replaced.

> *“It was like living in a cave ... It really affected my mental health: all my roses were dead, all my solar lights were broken ... It really put me out for something I didn't want ... The whole process was very demoralising and stressful.” Resident*

> *“They left two holes in my bathroom ceiling which has got the plastic cladding on, so it looks really bad, and they broke the pendant in the sitting room, which we have replaced ourselves.” Resident*

All residents with works completed or ongoing at the time of the survey were also asked about their satisfaction with the quality of the energy saving measures installed. Two thirds (66%) were satisfied with the quality of measures and 13% were dissatisfied.

> *"I am satisfied, I'm pleased with the overall look of the house. It just feels nice." Resident*

> *"I've had people coming to my house and saying, 'Oh! You've paid to have your house done? [Laughs] " Resident*

During interviews, those unhappy with the quality of the works complained about the quality of the installations, including damage to existing installations as part of the works (e.g. damaged pipe, drilling through electric cables), installations not fitted correctly (e.g. badly fitted door, window not opening correctly), incorrect parts being used (e.g. incorrect vent for the ventilation, missing components for the solar panels at initial installation, heating system being incompatible with the boiler) or the quality of the materials (e.g. smears and scratches in between panes, windows not being soundproof, gaps around the frames, windowsills with sharp edges, extractor fan not extracting moisture). Others complained that the quality of the materials previously used in their home were higher than the ones that were being offered.

> *“The workers didn’t seal the windows very well initially and they came round and re-sealed them; the extractor fan is not very good because they are not extracting moisture, and the windows steam up on the inside.” Resident*

> *"My house was the last one to be done on the street and I get the feeling it was a rush job." Resident*

Residents who had all works completed were also asked whether the installations took more or less time than expected. About a third (33%) said they took about the time they expected, whereas 45% said they took longer. Only 17% said they took less time than expected.

Those who were more likely to say the installations took longer than expected included:

- Those who had windows and doors installed (56%, compared to 45% average across all survey respondents).

- Those who experienced problems in their home immediately before installation (46%, compared to 36% of those who had not experienced problems with their home).
- Those with long-term health conditions (46%, compared to 39% of those with no long-term health conditions).
- Those renting their property from an ALMO (53%, compared to 40% renting from a LA).

Support with the installation

Less than half of surveyed residents (45%) received some form of support or guidance about the energy saving measures they received, the most common forms being support from the installers (34%) or the SHL (23%). A further 47%, however, said that they did not receive any guidance or support. Two thirds of residents (66%) who had all works completed were satisfied with the information provided at the end of the installation.

All residents with ongoing or completed installations at the time of the survey[52] were asked whether they received any support or guidance about the energy saving measures installed in their home. Less than half (45%) received some form of support, the most common forms being support from the installers (34%) or a SHL (23%). A further 47%, however, said that they did not receive any guidance or support.

Support was most likely to be offered to residents who had used different forms of heating since measures were installed (72% compared to 43% of those who had not changed forms of heating). As for the type of installation, those who had heat pumps or solar panels installed were most likely to have received support (65% and 54% respectively).

Residents who did not receive any support were then asked whether support or guidance would have been useful to them. Over half (53%) were of that view, but a third (28%) said support would not have been useful to them.

Groups of residents who were most likely to want further support included:

- Those who had solar panels installed (65%, compared to 53% average).
- Those who had used different forms of heating since measures were installed (74%, compared to 53% of those who had not changed forms of heating).
- Those with long-term health conditions (57%, compared to 46% of those with no long-term health conditions).

Two thirds of residents (66%) who had all works completed at the time of the survey were satisfied with the information provided at the end of the installation, whereas 13% were neither satisfied nor dissatisfied and 17% were dissatisfied.

During interviews, residents who were less satisfied with the information received at the end of installation complained about the lack of guidance post-installation and follow-up support. This

[52] Base =1,390

was particularly the case where the installation required learning on how to use a new piece of kit or technology, such as solar panel, sensors, or an app to control heating.

> *"There's some kind of website you can go on and check what your sensors are doing, but I'm afraid it's beyond my brain cells." Resident*

> *"They put them in and that was it, we don't know anything about the solar panels really" Resident*

Survey respondents who had their installations completed answered questions about their confidence using and maintaining the energy saving measures. The options presented to the survey respondents differed depending on what type of measures had been installed in their home. The majority of residents felt confident with the following tasks: ventilating their home (79%), changing the bulbs (77%), using locks and hinges (76%), and controlling the temperature (76%). Over half felt confident with cleaning the equipment (58%) or checking for signs of wear and tear (56%). Only around a third (38%) of those asked about emergency shutdown knew how to use this feature.[53,54]

Residents who did not feel confident with the tasks outlined above were then asked what type of support would have helped them. Most said having the installer or their SHL showing how to use the equipment would have been helpful (including 57% of residents who were asked how to use emergency shutdown features, and 41% of those asked about checking for signs of wear and tear).

Over a third of residents who did not feel confident using or maintaining the measures[55] would have liked to receive a leaflet with instructions (ranging from 34-42% across the different types of tasks).[56] Other types of support mentioned by residents included online instructions (ranging from 8-19% across the different types of tasks)[57] or making the equipment easier to access (ranging from 8-14% across the different tasks).[58]

[53] Base size: Those answering about ventilating your home=1061, changing the bulbs=272, using locks and hinges=479, controlling the temperature=236, cleaning the equipment=829, checking for signs of wear and tear=1092, knowing how to use emergency shutdown features=656.
[54] Residents that were asked about “Emergency shutdown” were those who reported having any of the following measures installed: Energy Efficient Lighting, Solar Panels, Controls for a heating system, Heat pump or ventilation.
[55] Base size: Those not confident about: ventilating your home=60, cleaning the equipment=74, checking for signs of wear and tear=212, knowing how to use emergency shutdown features=197; base sizes for other measures below 50.
[56] 42% of those not confident about ventilating the room, 34% of those not confident about cleaning the equipment, 38% of those not confident about signs of wear and tear, 39% of those not confident about using emergency shutdown features.
[57] 8% of those not confident about ventilating the room, 17% of those not confident about cleaning the equipment, 19% of those not confident about signs of wear and tear, 16% of those not confident about using emergency shutdown features.
[58] 8% of those not confident about ventilating the room, 12% of those not confident about cleaning the equipment, 14% of those not confident about signs of wear and tear, 11% of those not confident about using emergency shutdown features.

7 Resident benefits

This chapter uses evidence from the resident survey and interviews to explore impacts of installations so far, including on the comfort of residents' homes, their physical and mental health, any changes in behaviour in relation to energy use, and their attitudes to energy efficiency.[59] Differences by types of resident and measures installed are explored where possible.

Fieldwork for both the resident survey and interviews was split into three tranches, to account for different installation timescales across Wave 1 projects. The first tranche of the survey took place in May 2023, and the last tranche finished in February 2024.[60] Corresponding interview tranches took place shortly after survey tranches. These timings should be taken into consideration when reading this chapter:

1. Due to the range of installation schedules, some residents still had works ongoing at the time of the survey or interviews. Only surveyed residents with completed installations were included in the analysis reported in the 'Benefits of installations for residents so far' section below. Amongst these residents, works were completed shortly before the survey, meaning it is likely some impacts had not been fully realised at the time of the survey (such as reduced energy bills, or improvements in health).
2. Fieldwork for different tranches took place at different times of year. Residents' perceptions of energy use and subjective experiences of comfort may have been influenced by seasonal weather conditions, therefore introducing a level of bias into the findings.

Resident benefits will be explored in greater depth within the Wave 1 Impact Report due to be published in 2025.

Residents' experience of their home pre-installation

Almost nine in ten residents surveyed (88%) experienced at least one problem in their home prior to installation. Draughts (58%) were the most commonly identified problem, with around half of respondents also reporting difficulties heating their home to a comfortable temperature (54%), and condensation problems (51%). In interviews, residents tended to feel positively about their homes prior to the installations, but often identified cold-related issues such as draughts, damp, mould and condensation.

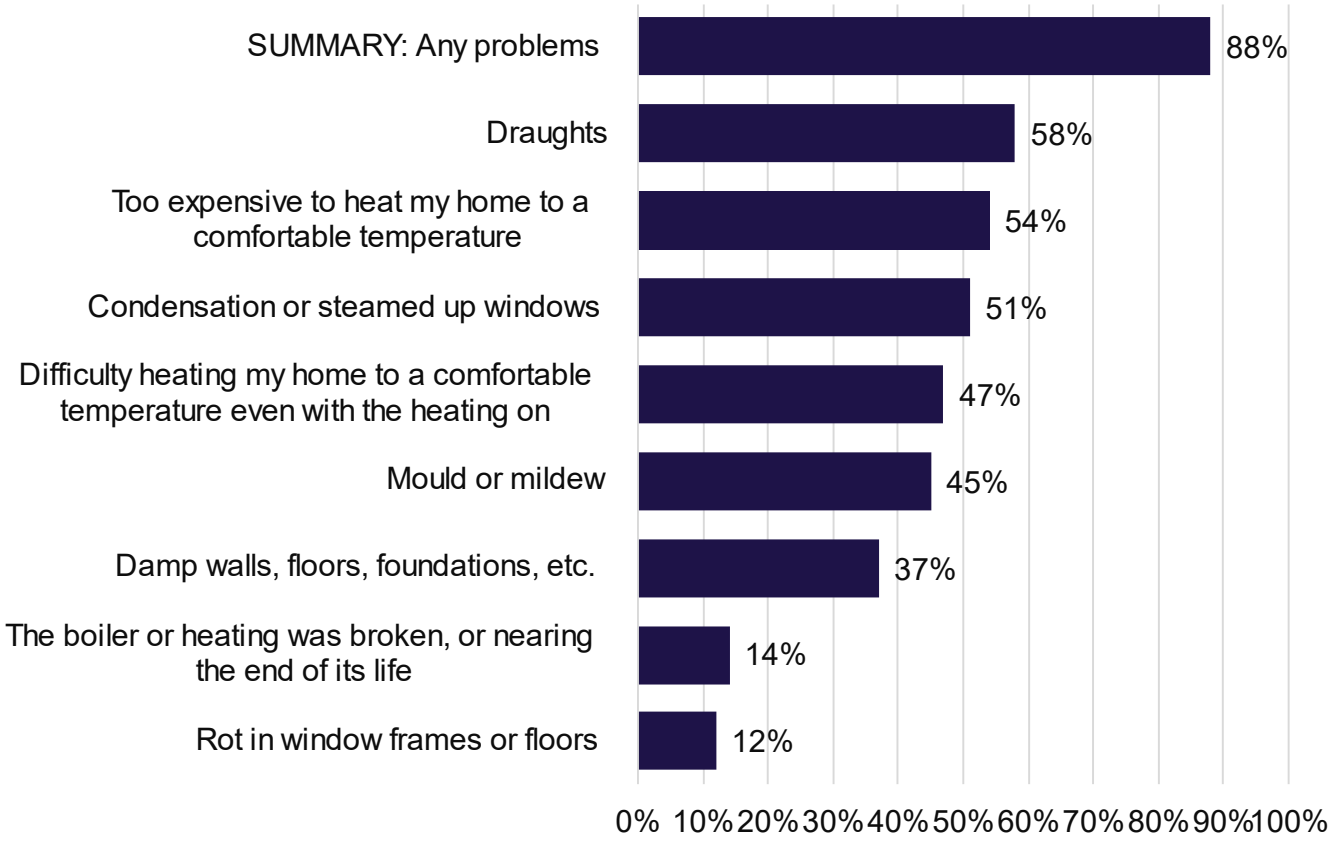
Cold-related problems in the home

In the survey, residents were asked about problems in their home prior to the installation of energy saving measures. As shown in Figure 17, just under nine in ten respondents (88%) had experienced at least one problem, with 73% experiencing two or more. The most common

[59] Evaluation questions addressed in this chapter: 5.2, 5.4, 5.5, 5.6 and 7.7.
[60] Full details of dates can be found in the Technical Annex.

problems reported by residents were draughts (58%), finding it too expensive to heat their home to a comfortable temperature (54%), condensation or steamed up windows (51%), and difficulty heating their home to a comfortable temperature even with the heating on (47%).

Figure 17: Issues that residents were experiencing in their homes prior to installation of energy saving measures



Source: Wave 1 Resident Survey. E1. Immediately before you had the energy saving measures installed, did you have any of these problems with your home? Base: All residents with works completed/ongoing (n=1390).

The incidence of problems experienced by residents varied by type of housing. Residents living in a flat, apartment or bedsit were more likely to find it too expensive to heat their home to a comfortable temperature pre-installation (69%), whilst those living in bungalows were less likely to think so (43%). Those living in bungalows were also less likely to experience draughts (50% vs 60% of those living in houses). There was a stronger difference in the incidence of problems by property type than by household income level alone, although those earning between £16,000 and £35,000 a year (92%) were more likely to have experienced 'any' problems prior to installation (compared to 88% of all respondents). In one interview, a resident living in a flat said that they had to use the stove for extra heating, as well as blankets and hot water bottles as they were unable to afford to heat their home.

Age of residents was also associated with reporting housing problems. Residents aged 35-54 were more likely to report problems with draughts (66%), compared to those 75+ (44%), though this may reflect the higher incidence of older residents in bungalows. Residents aged 18-34 were more likely to find it too expensive to heat their home (70%) compared to those aged 55-74 (46%) and 75+ (45%).

In interviews, a few residents expressed concerns about being able to afford their energy bills prior to the installation of energy saving measures, due to low income or increased energy prices:

> *“It's not easy... I'm a pensioner now and sometimes I do worry about it. I don’t want to be a pensioner who's choosing between heating and eating.” Resident*

> *"Because of the ways the bills for the central heating have shot up, I try to avoid putting the heating on if I can help it, because I can't afford it". Resident*

There were also residents who felt their homes were cold and poorly insulated. Some also felt that not being able to heat their home to a comfortable temperature impacted their health. For example, one resident said they needed a warm home to counter their arthritis:

> *“If it’s too cold my pains just go ballistic and really hurt.” Resident*

Those with long-term health conditions or illnesses were more likely than those without to report having any of the problems illustrated in Figure 17 (91% and 82% respectively). There was also evidence in interviews that residents with health conditions were often more negatively impacted by these problems. For example, some shared that they spent lots of time in their home due to their disability limiting some or all of their activity, and therefore had to heat their homes for longer periods of time, which in turn was expensive:

> *“I have to have the heating on all day and all night me, what with having COPD [Chronic Obstructive Pulmonary Disease], I have got to have the heat.” Resident*

The incidence of problems with housing also varied by gender of residents. Female residents were more likely than male residents to report several cold-related problems, including draughts (63% vs 50%), finding it too expensive to heat their home to a comfortable temperature (56% vs 46%), condensation or steamed up windows (56% vs 42%), and difficulty heating their home to a comfortable temperature even with the heating on (50% vs 40%).

Proportion of fuel poor households

Bringing together data from the resident survey and secondary data shows that 82% of households reached by Wave 1 were in fuel poverty.

Analysis of the proportion of households that were likely to be in fuel poverty prior to Wave 1 installations was carried out as part of the evaluation.[61]

This analysis used the after housing cost income collected through the resident survey and households’ EPC rating (see the Technical Annex for more information). Overall, 87% (1,123 households surveyed) of Wave 1 households were classed as low income based on their after

[61] One of the policy objectives of SHDF is to tackle fuel poverty, however the Wave 1 scheme did not set any eligibility requirements for or targets regarding fuel poverty.

housing cost income,[62] and 94% (1,164 households surveyed) of the homes were classed as 'low energy efficiency', i.e. having an EPC band rating of D or below prior to the scheme installations.[63]

In total, both EPC and household income data were available for 1,053 (70%) of the 1,498 respondents from the resident survey. Of these, 82% (831 households) were estimated to be in fuel poverty prior to installations.[64] These households were identified as likely to be low-income households living in low energy efficient homes under the LILEE fuel poverty definition. Looking at individual projects, the percentage of households estimated to be in fuel poverty before installations ranged between 70% and 96%.[65]

To provide some context as to how well Wave 1 reached fuel poor households, in 2023 13% of households in England[66] and 15% of social housing residents[67] were fuel poor. 73% of social homes had a Fuel Poverty Energy Efficiency Rating (FPEER) band A-C in 2023. Of households with band D-G rating in this tenure, 56% were fuel poor.[68] Although fuel poor households were not a direct target of the scheme, and fuel poverty status was not part of the eligibility criteria for residents to receive installations, Wave 1 was successful in reaching a high proportion of fuel poor households.

Benefits of installations for residents so far

Among residents with works completed, the installations have had a net positive impact on residents' perceptions of their homes. Over half (60%) of residents surveyed with works completed, agreed they are prouder of their home post-installation, and the majority saw improvements in cold-related problems such as draughts, damp, mould and condensation. There was also a small net positive effect on residents' physical and mental health. However, a minority felt that they had not seen improvements, or had experienced new problems.

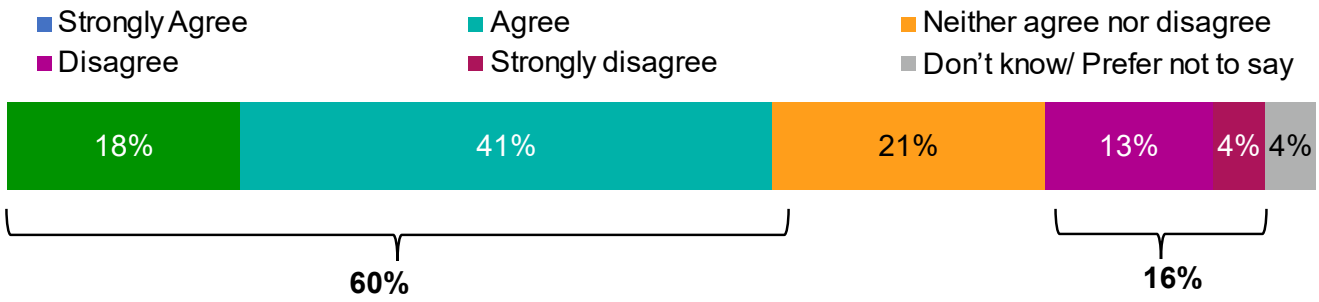
Over two fifths (43%) of residents with works completed reported they use less gas or electricity since the installations. Nine in ten (88%) were using the same main type of heating, but there was a net reduction in overall use across all types of heating used. Furthermore, over half (54%) agreed that it was more affordable to heat their homes after installations, although there was only a small net change in those who felt less worried about bills.

[62] Derived from household-level income data collected via the resident survey, n=1290 households with valid responses. This equates to 75% of all resident survey responses (n=1,498).
[63] n=1,233 households with valid EPC data. This equates to 78% of all resident survey responses (n=1,498).
[64] The EPC rating of the home was used as a proxy for the FPEER rating as there was insufficient data available to calculate FPEER ratings. See the Technical Annex for more information.
[65] Based on 13 projects with a base of 25 or more households that could be estimated as fuel poor or not.
[66] Annual fuel poverty statistics in England, 2024 (2023 data) (publishing.service.gov.uk)
[67] 2023-fuel-poverty-detailed-tables-xls.xlsx (live.com) (Table 20)
[68] Annual fuel poverty statistics in England, 2024 (2023 data) (publishing.service.gov.uk)

Pride in and comfort of homes

As shown in Figure 18, over half of survey respondents whose works were completed (60%) agreed that they were more proud of their homes since the installation of energy saving measures. One in five (21%) neither agreed nor disagreed, while (16%) disagreed.

Figure 18: Residents' pride in their home following the installation of energy saving measures



Source: Wave 1 Resident Survey. I1_4. To what extent do you agree or disagree with the following statement? The work has made me feel more proud of my home. Base: All residents with works completed (n=1,104).

This is broadly consistent with the responses to similar questions in the survey of residents who benefited from installations during SHDF(D), where two-thirds agreed that 'my property is more comfortable to live in' and a similar proportion agreed that 'my home is a nicer place to live' (68% and 63% respectively).[69]

The perception of installations was associated with increased residents' pride in their home, rising to 71% among those who were satisfied with the installation process. However, in the case of having new doors and windows installed, despite tending to be less satisfied with the process of installation, residents receiving these measures were slightly more likely to say they were more proud of their homes now the works were complete (63%).

Residents that reported using a different form of heating following the installation of energy saving measures showed higher levels of pride in their home post installation (72%) as did those with lower household incomes (less than £16,000 a year) (68%).

In interviews, many residents were confident that their homes felt warmer and more comfortable after the installations, especially where they felt the installations had been completed without issues. They mentioned needing to use the heating less to maintain a comfortable temperature, and their homes retaining heat better.

> *"It warms up so quickly, you think 'Oh god, do I need it on?' Honestly it is wonderful." Resident*

Some residents also pointed to improvements in the aesthetic of their home where the works had made a visible difference, for example where new windows and doors had been fitted, or

[69] DENZ (2024) Whole House Retrofit (WHR) and Social Housing Decarbonisation Fund Demonstrator (SHDF(D)) Joint Outcome and Economic Evaluation Report DESNZ Research Paper Number 2024/00

the outsides of their property had been re-pebble dashed after adding CWI. This was also associated with increased pride in their homes.

Although most residents perceived an improvement in the comfort and warmth of their homes, some felt it was difficult to tell if the measures had made a significant difference. This was often due to residents feeling it was too early to make a judgement, likely as a result of the relatively short period in between installation and data collection, with many saying that they would find out in the coming winter.

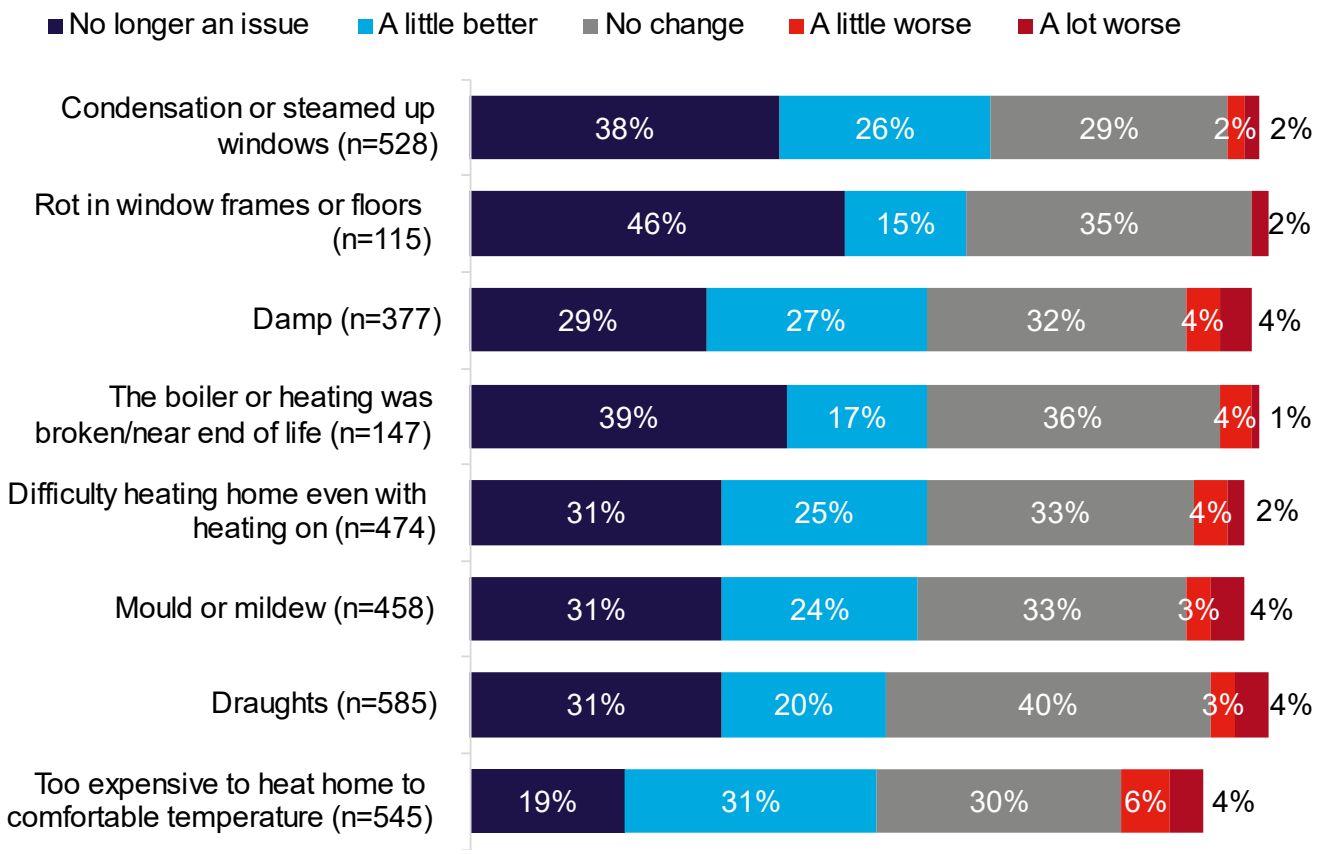
Some residents also felt that problems they experienced in their home stayed the same after receiving measures (29-40%), and a minority said they got worse (2-10%), as discussed in the section below. Residents' views on this were often related to their perceptions of the quality and appropriateness of the installations they received.

Addressing problems with residents' homes

Residents who mentioned specific issues with their home pre-installation were asked if the measures had led to an improvement. As shown in Figure 19, among those who had experienced each problem, between 51% and 64% said that it had gotten a little better or was no longer an issue since the installations. Around one third of residents said that there had been no change to the problem since the installation, and fewer than one in ten reported that the problem had worsened.

Some residents mentioned that the problem had improved to such an extent that it was no longer an issue for them. This ranged from 19% saying it was no longer too expensive to heat their home to a comfortable temperature, to 46% saying they no longer had an issue with rot in window frames or doors.

Figure 19: Change in problems experienced by residents since installation of energy saving measures (works completed)



Source: Wave 1 Resident Survey. E3. Since the energy saving measures have been installed, have the following problems got better, worse, or has there been no change? Base: All residents with works completed who had each problem with home before works. Some issues are not included in the chart due to low base sizes. Don't know responses (1-8%) not shown.

Changes in problems experienced by residents after installations varied considerably across the different types of energy saving measures installed in homes.

Those who had heat pumps installed were more likely to say the problem of it being too expensive to heat their home to a comfortable temperature had got better (73%), along with problems with heating their home to a comfortable temperature even with the heating on (84%). This may be linked to the fact that 58% of residents who had heat pumps installed said that the way they heat their home has changed since before the energy saving measures were installed. Prior to installation, nearly three in ten of those who had heat pumps installed (28%) were using a storage heater as the main way of heating their home.

Those who had heat pumps installed received on average a higher number of measures (4.2) than those who did not have heat pumps installed (2.9). They were also more likely than those who did not receive heat pumps to have had solar panels installed (45% vs 18%) and controls for a heating system (50% vs 22%). The higher count of measures may have helped reduce the expense and difficulty associated with heating their homes.

However, those who had heat pumps installed were less likely to receive fabric measures than those who did not have heat pumps installed (75% vs 94%), including insulation alone (70% vs 88%). They were also less likely to have previously had double or triple glazing (65%), extractor fans (46%), loft insulation installed since 2003 (31%), or cavity wall insulation (15%). This indicates that heat pumps played an important role in improving residents' thermal comfort.

Residents that received new windows and doors were more likely to see an improvement across all of the issues listed in Figure 19 (apart from problems related to the boiler or heating being broken).

Among residents surveyed who reported an improvement to problems they experienced, most of them (78%) had not had anything else done to solve these, suggesting that improvements were mostly a result of Wave 1 installations.

In interviews, when residents felt installations were carried out to a good standard, they often reported reduced cold-related problems. Many identified a reduction in damp and mould, often where new windows and doors and insulation had been installed. Both these measures were also attributed with reducing condensation and draughts in properties. Residents who saw improvements to cold-related problems such as damp and mould often focused on the benefits of these positive impacts in their homes more so than the reduction in energy use or bills.

> *"Before I used to get a bit of condensation at the bottom of the windows. I don't get that anymore." Resident*

However, some residents could not confidently say they had so far seen an improvement in the comfort or warmth of their homes, or any cold-related problems. In some cases, this was related to the poor condition of the homes prior to installations, and the types of measures offered to improve the home.

For example, one resident who had cracks in their walls did not see an improvement in the comfort of their home. They had Loft Insulation installed, which did not solve the problem of draughts. Similarly, if residents had pre-existing poorly fitted windows and doors and were not receiving new ones under the scheme, the new measures had limited impact. Another example included a home with a pervasive damp problem. Although the measures installed improved the warmth of the home, the resident felt the overall condition was still poor.

New problems with residents' homes

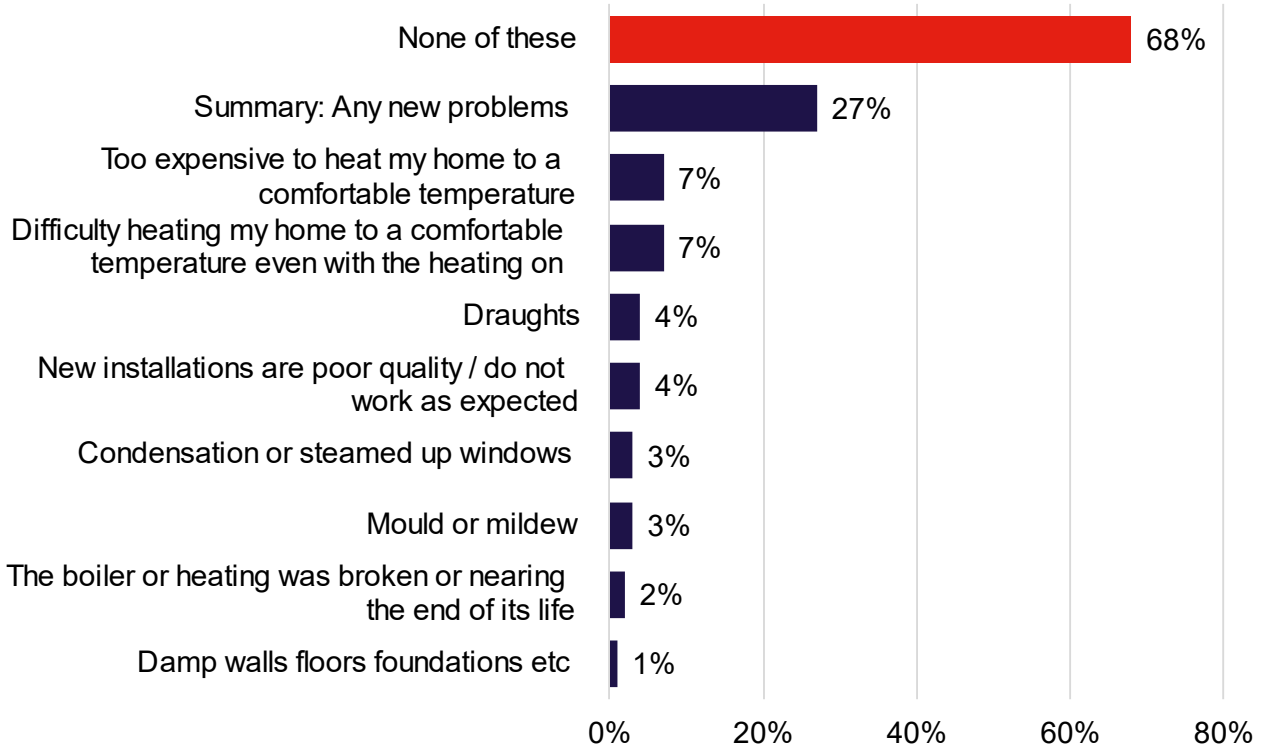
Residents were also asked whether they had experienced any new problems with their homes since the installations. As shown in Figure 20, seven in ten (68%) residents who had problems with their homes before installation and had works completed had not encountered any new problems after receiving measures. Of this group, those who were satisfied with the installation process were more likely to report not having encountered any new problems with their homes (76%). However, a small proportion now find it either too expensive (7%) or difficult (7%) to heat their homes to a comfortable temperature following the installation of measures, with lower proportions also reporting draughts (4%), mould (3%) and condensation (3%). While

27% of residents with works completed in their homes identified at least one issue since the installation, only 5% of them identified more than one new issue.

It is worth noting that while these are problems that have occurred since installations, they are not necessarily attributed to them. While fieldwork was designed to take place shortly after residents received measures, the different timings of installations across projects make it challenging to understand whether “new problems” are related to the installations.

Furthermore, as discussed in more detail below, interviews highlighted the many factors at play that potentially make it difficult to heat homes to a comfortable temperature. This included the time of year (interviews were conducted in three separate tranches, with most having been conducted in winter), energy price increases, changes in household heating needs, and income.

Figure 20: New problems experienced by residents in their homes following the installation of energy saving measures



Source: Wave 1 Resident Survey. E5. Since the energy saving measures have been installed, have you experienced any new problems in your home? Base: All residents with works completed who had issues before installation[70] (n=763). Note, codes below 1% not shown.

Mirroring the pattern of the survey responses, a minority of residents interviewed felt that problems they were already experiencing in their home had got worse following the installation or measures, or reported new problems. These residents tended to identify issues with the installations as the reason for a lack of improvement, or deterioration of existing problems.

[70] This question was only asked to residents in tranches 2 and 3 of the survey.

Those who identified new problems often mentioned new patches of damp or condensation due to poorly completed installations. For example, residents felt these might have been caused by Loft Insulation affecting ventilation in the property, or an overall lack of ventilation in newly fitted windows and doors. On the other hand, some residents also noted new draughts after new windows or insulation were installed poorly, or caused by holes drilled to fix solar panels in place, for example.

Although residents reporting new problems were a minority, evidence from the resident survey and interviews suggests that the PAS 2035 standards may have not always been rigorously upheld in installations, as these should in theory prevent the occurrence of such problems.

Health and well-being of residents

Just under two thirds (64%) of all residents surveyed had a long-term physical or mental health condition or illness. Those who were in fuel poverty were more likely to have a long-term condition than those who were not (69% vs 59%).

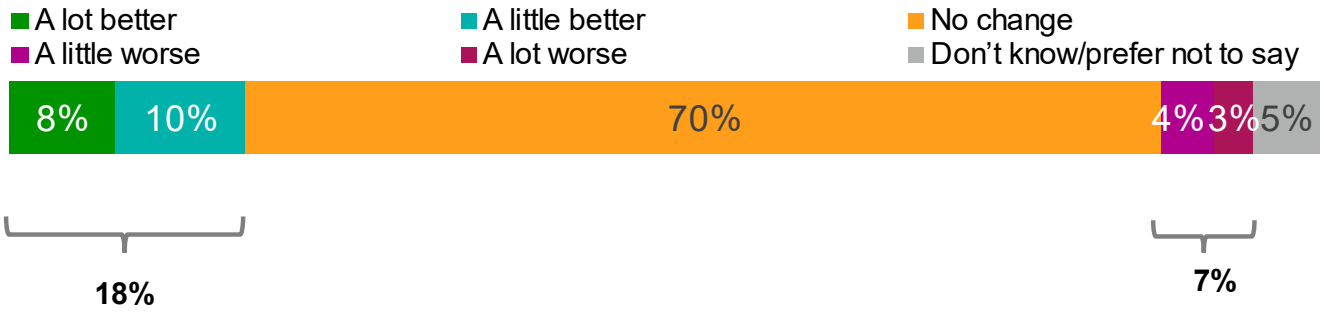
Around half of the residents in the survey who had mentioned problems with their home before the installation said that these were having a negative effect on either their physical health (53%) or their mental health (49%).

Among those who mentioned that their home was too expensive to heat before the installation of measures, over six in ten (63%) said this was having a negative effect on their physical health and 59% said it was having a negative effect on their mental health. Those with a long-term health condition or illness were considerably more likely than those without a health condition to say this issue was having a negative effect on their physical health (69% vs 46%) or their mental health (67% vs 41%). Those in fuel poverty were also slightly more likely than average to say that this was having a negative effect on their mental health (63%).

As shown in Figure 21 and Figure 22 among residents where the work was completed, most said that there had been no change in their physical or mental health since the new energy saving measures were installed in their homes (70% and 66% respectively). However, just over one in five (21%) said that their mental health had improved since the measures were installed. This rose to 42% among those who had had heat pumps installed in their homes.

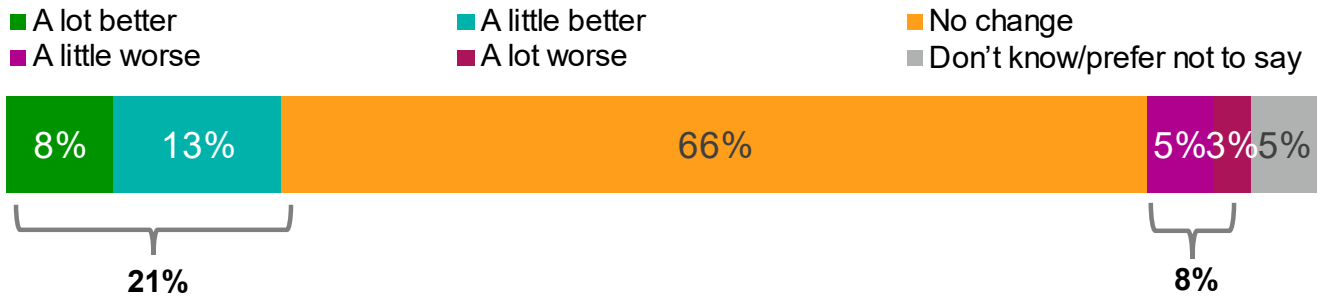
Just under one in five residents (18%) said that their physical health had improved after the installation of measures, rising to 35% among those who had had a heat pump installed in their home.

Figure 21: Change in residents' physical health since installations



Source: Wave 1 Resident Survey. I1b_1. Since the energy saving measures were installed in your home, has your physical health got better, worse or has there been no change? Base: All residents with works completed) (n=880).

Figure 22: Change in residents' mental health since installations



Source: Wave 1 Resident Survey. I1b_1. Since the energy saving measures were installed in your home, has your mental health got better, worse or has there been no change? Base: All residents with works completed (n=880).[71]

Residents with household incomes of between £16,000 and £35,0000 a year were more likely to report improvements to both mental (31%) and physical (25%) health since the measures were installed.

Of those who said their physical health had improved following the installation of measures, about half (52%) said it was because their property was warmer or more comfortable.

Those who mentioned that their mental health had improved tended to say that it was due to their house being warmer (26%), having less worries about bills (23%), and worrying less generally (14%).

Resident interviews revealed a similar pattern, with many residents experiencing no change, especially those without a physical or mental health condition, but others experiencing direct benefits. Among those who did report a change, they attributed this to the improvement in the comfort of their homes. For some, this meant physically feeling warmer in the home, which in some instances helped to reduce the severity of symptoms of long-term health conditions.

[71] Questions I1b_1 and I1b_2 were only asked to residents in tranches 2 and 3 of the survey.

These changes were much appreciated among those with poor health. For example, one resident suffering from arthritis noted that their pain levels had improved due to better heat retention in their home. Another mentioned that they were using their nebulizer for asthma less, and others had generally noticed reduced levels of inflammation and pain:

> *"Knowing I can stay here makes me feel really good. The energy bill reduction has had a big impact on me. It helps me physically because I'm not getting any swellings and pains. That's had an effect on me emotionally and mentally." Resident*

Some noticed benefits to their mental health post-installation, mainly because their home was more comfortable and warmer, and heating the home becoming less of a source of anxiety than before:

> *"If I am not having a good day, I feel that I can put the heating on of a morning, which I never used to do." Resident*

> *"I feel as if I'm getting something back, I am comfortable. Just after the insulation was done you just walk into a warmer room…" Resident*

Some residents mentioned in interviews that they were worrying less about paying their energy bills since the installations. However, it is also worth noting here that the installations, which took place from early 2023, coincided roughly with the end of a period of rapid energy price rises through to late 2022.

A minority of residents with works completed in their homes said that their mental health or physical health had worsened since the installation (8% and 6% respectively).

Among those with works completed, those with a long-term health condition were slightly more likely than those without a long-term health condition to say that their mental or physical health had got worse after the installation of measures. However, they were a minority (9% reported worse physical health compared to 2% of those without a long-term condition, and 10% reported worse mental health compared to 3% of those without a long-term condition).

Similarly, disabled residents were more likely to report negative effects to their health following the installation of energy saving measures. In one interview, a resident who suffered from a long-term health condition reported that "the installation landed him in hospital with pneumonia because of the dust".

Perceptions of energy use, behaviours and associated cost savings

Types of heating

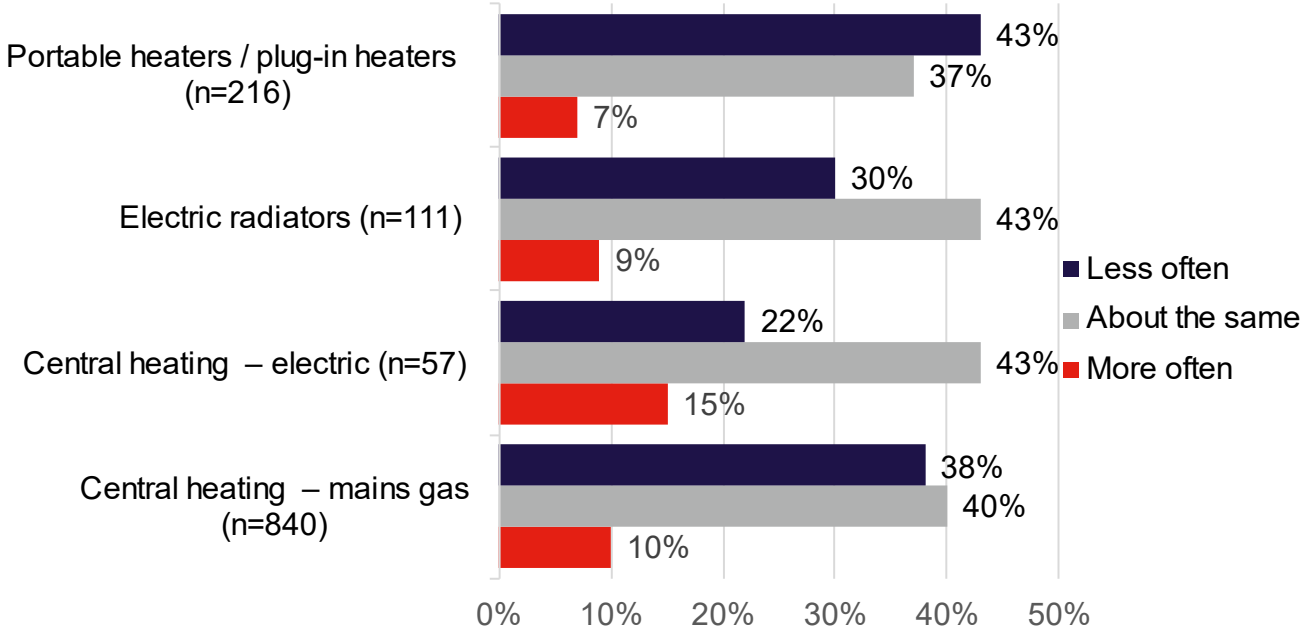
Residents whose works had been completed were asked whether the way they heated their homes had changed since the installations. Prior to the installations, four-fifths (82%) used central heating, including 74% that used mains gas, 5% that used electric and 3% that used another type of central heating. The next most common way for residents to heat their homes

was using electric radiators (4%), open fire or wood burning stove (2%), or portable/plug in heaters (2%).

Most residents (88%) said there had been no change in the way they heated their home following installations, with 9% saying they now use different forms of heating.[72] Those who had heat pumps installed in their homes were considerably more likely to say that the way they heat their homes has changed since installation (58%).

As shown in Figure 23, across all heating types there was a net reduction in frequency of use post installation of measures (i.e. more residents said they used them less often than more often). There was a particularly sharp decrease in use of portable/plug-in heaters, with two in five residents with works completed in their homes using these less than before (43%). Around two in five used mains gas central heating less often (38%), and three in ten used electric radiators less often (30%).

Figure 23: Change in use of different heating types following the installation of energy saving measures



Source: Wave 1 Resident Survey. D6. Thinking about the following types of heaters, do you use them more or less often since the energy saving measures were installed. Base: All residents who had works completed and reported using any of the same heating type before and after installations. Central heating – mains gas (840), Central heating – electric (n=57), Electric radiators (n=111), portable heaters (n=216) (Note, base sizes lower than 50 not shown, including mains 'other', wood burning stove, and heat pump).

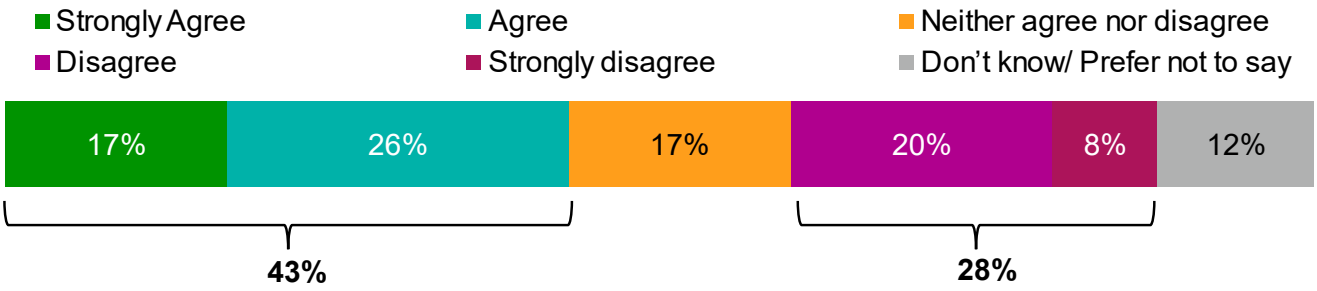
Overall energy use

Residents with works completed in their homes were also asked about the total amount of energy they use after the installation of measures. As shown in Figure 24, over two in five (43%) residents with works completed agreed that they use less gas or electricity since

[72] Some survey responses were edited to prevent contradictory answers at D1 or D2 and D4, for example, if answers show that the respondent uses at least one of the same heating types pre and post installation.

receiving measures, while just over one in four (28%) disagreed. This aligns with findings that there was a net reduction in the frequency of use of all types of heating, reported above.

Figure 24: Proportion of residents who agreed/disagreed they use less gas or electricity to heat their home following the installation of energy saving measures



Source: Wave 1 Resident Survey. I1_2. To what extent do you agree or disagree with the following statement? I use less gas or electricity to heat my home now. Base: All residents with works completed (n=1,104).

Residents with works completed in their homes who now use different forms of heating were more likely to say they are using less gas or electricity than those who had not changed heating type post-installation (60% vs 42%).

Perceptions of reduction in energy use were also associated with the types of measures installed. Those who received heat pumps (63%) and solar panels (50%) were more likely to agree they are using less energy.

One in six residents (17%) neither agreed nor disagreed about using less energy following the installation of measures, and a just over one in ten (11%) responded "Don't know".

Most residents interviewed said they used less energy since the measures were installed, and tended to say this was a direct consequence of installations. They explained this was because they put the heating on less often, and noticed that their property retained heat better. Many residents also felt they were more aware of their energy usage thanks to the new measures. This was especially the case where smart meters or heating controls had been installed.

> *"When you turned [the heating] off [before measures were installed] the house would get quickly very cold again. It's much easier now… the house does retain heat." Resident*

However, many residents were often uncertain about their exact energy usage, and especially how it had changed following the installation of measures. They often mentioned that the time of year and weather made it hard to compare to past usage, and therefore that it was "too early to tell" the impact of the measures on energy use.

Similarly, some residents who did feel aware and able to respond about their energy usage were unsure whether it was their changed behaviour that led to reduced energy use, or the energy measures themselves. Many residents had not yet experienced a winter season since the installation of measures in their homes (due to two of the tranches having been conducted

in Spring and Summer of 2023) which may explain the level of uncertainty concerning the direct impact on energy use.

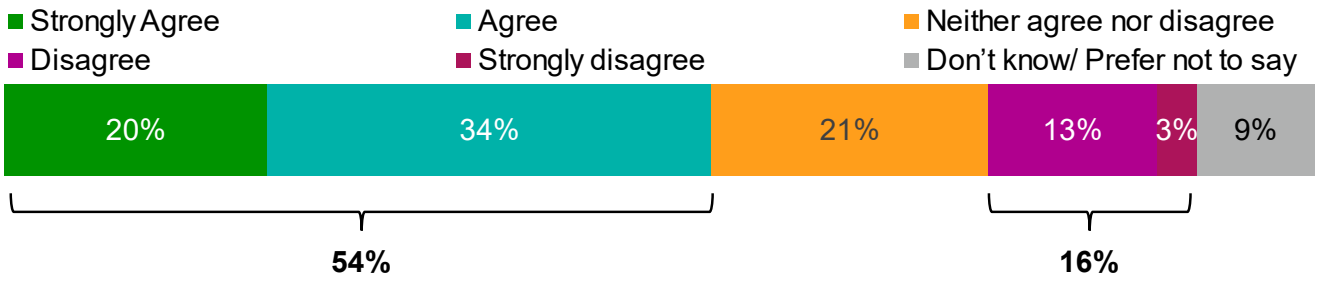
> *"When the winter comes that will be the test, won't it? Because when I got the walls done it was coming to the end of the cold months." Resident*

Affordability of heating homes

Residents surveyed were also asked about how the installations impacted the costs associated with heating their homes. As shown in Figure 25, over half of residents with works completed in their homes (54%) agreed that it was more affordable to maintain a comfortable temperature in their home than it would be without the installations, whereas around one in six (16%) disagreed.

Just under one in ten (8%) were unsure if maintaining a comfortable temperature in their home was more affordable now, and one in five (21%) neither agreed nor disagreed (1% preferred not to say). This is likely to reflect the complexity residents expressed when trying to estimate the impacts of these measures, as discussed below.

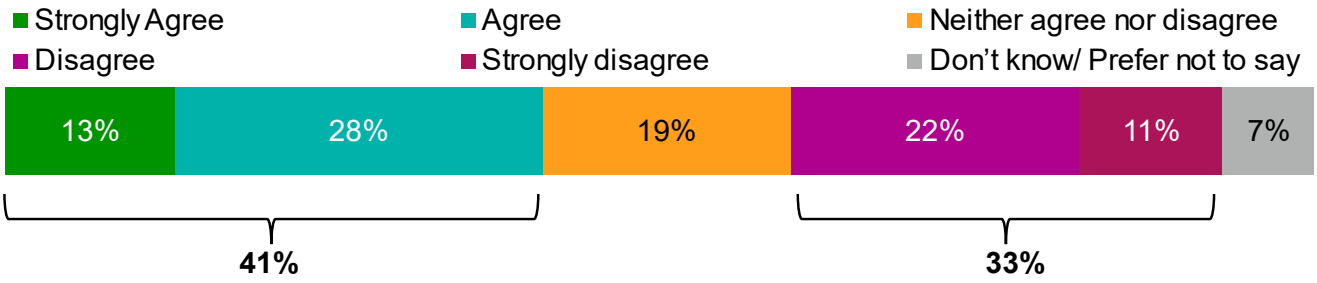
Figure 25: Proportion of residents who agreed/disagreed it was more affordable to maintain a comfortable temperature following the installation of energy saving measures



Source: Wave 1 Resident Survey. I1_1. To what extent do you agree or disagree with the following statement? It's more affordable to maintain a comfortable temperature in my home than it would be without the installations.
Base: All residents with works completed (n=1,104).

Residents were also asked whether they were less worried about being able to pay their energy bills after receiving the measures. About four in ten (41%) agreed they were less worried, and 33% disagreed they were less worried, as shown in Figure 26.

Figure 26: Proportion of residents who agreed/disagreed they were less worried about being able to pay their energy bills following the installation of energy saving measures



Source: Wave 1 Resident Survey. I1_3. To what extent do you agree or disagree with the following statement? I am less worried about being able to pay my energy bills. Base: All residents with works completed (n=1,104).

Perceptions of the costs of energy use varied by type of measures installed. Those who received a heat pump were more likely to agree that it was more affordable to maintain a comfortable temperature in their home (72%), in line with findings outlined above suggesting that those with heat pumps were also less worried about energy bills. This may be explained by the fact that 28% of these residents were using a storage heater as the main way to heat their home before receiving measures. Those who received controls for their heating system (62%) and new windows and doors (59%) were also more likely to agree that it was more affordable to heat their home to a comfortable temperature.

Similarly, residents who were satisfied with the installations of measures in their homes were more likely to say that it is more affordable to maintain a comfortable temperature in their home (63%) and that they worry less about energy bills now (50%).

Residents with lower household incomes (less than £16,000 per year) who had works completed at the time of the survey were more likely to agree that it was more affordable to heat their homes than before (61%) and that they were now less worried about paying their bills (47%). However, those in fuel poverty were more likely to disagree that it was more affordable to heat their homes than before, compared to those not in fuel poverty (19 vs 16%).

Residents aged 75 and over were also more likely to agree it was more affordable to maintain a comfortable temperature after the installation of measures (67%), and that they were less worried about their bills (54%). Residents with long-term health problems were less likely to agree that it was more affordable to maintain a comfortable temperature after receiving measures (51%) and were more likely to disagree that they worry less about their bills (36%).

In interviews, residents who felt their home was warmer and that they needed to use the heating less after receiving measures, also tended to say they had saved on bills. This was more common among those who were satisfied with the measures received, who reported improvements in cold-related problems in their home (such as damp and draughts), and did not have issues with the installation process.

However, there was uncertainty among many residents about the impact of measures on bills and on energy usage. Changes in the price of energy, overall pressures of inflation, and the cost of living, together with the issue of having knowledge of prior energy usage to compare to at a similar time of year, were often raised by residents in interviews who felt it was difficult to state whether they had seen any cost savings, or who said it was “too early to tell”. This may be because some interviews took place while work was unfinished, or within a month of work finishing, and also because residents paying for their energy by direct debit rather than via prepayment meters or on receipt of a bill, would not necessarily see a change in their monthly payment until their next annual review by their energy supplier.

Many residents said that it was hard to know the impact of measures on their energy bill because bills had risen so much recently. While many felt they used their heating less since the measures were installed, this did not always mean they were less concerned about the cost of energy.

> *"With me being on my own now, I have to watch everything, I have to find the money. The energy bills, you know, they've all gone up." Resident*

Those who had greater awareness of their energy usage and bills were more confident about the impact of the measures. Although this group was able to report a cost saving based on knowledge of their usual expenditure, they sometimes found it hard to disentangle this from background energy price fluctuations. These tended to be residents who had smart meters or controls for their heating systems installed, either during Wave 1 or prior to it, allowing them to track their usage more closely. This may explain why controls for heating systems were associated with making heating more affordable in the resident survey.[73] In interviews, residents who received solar panels mentioned a direct saving impact more often compared to those that received other measures. This may also be due to the ease of tracking the energy saving.

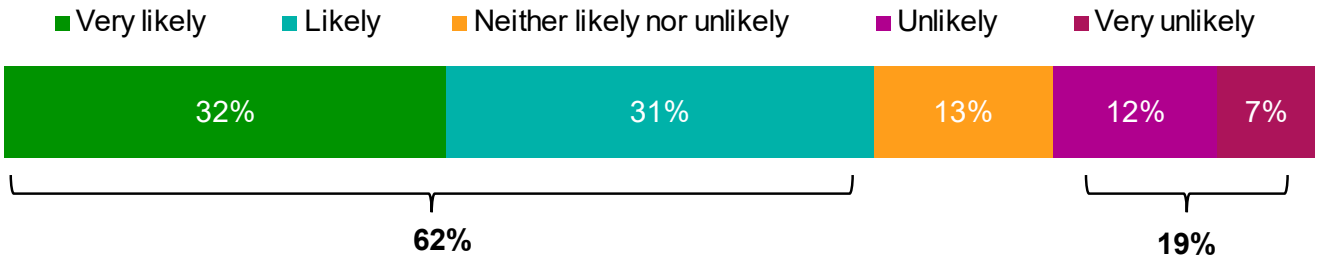
Resident views on energy efficiency and climate change

Six in ten residents surveyed (62%) with works completed or ongoing would consider other energy saving installations in the future. Evidence from interviews suggests that positive experiences with Wave 1 installations may have increased residents’ awareness of their energy usage and interest in energy efficiency.

In the survey, residents were asked how likely they would be to consider other energy saving measures in the future (beyond the ones currently planned). As shown in Figure 27, over six in ten residents surveyed (62%) stated they would be likely to consider energy saving measures in the future. Around one in five (19%) said they were either unlikely or very unlikely to consider future measures, with 13% neither likely nor unlikely.

[73] To note, with the evidence available it is not possible to tell the directionality of this association.

Figure 27: Residents' likelihood of considering future energy saving installations



Source: Wave 1 Resident Survey. J1 As a result of having energy saving measures installed in your home, how likely or unlikely are you to consider other energy saving installations in the future? Base: All residents with works completed/ongoing (n=1,390).

Older residents were less likely to consider future measures (50% of residents aged 75+ vs 64% of those aged 18-34 and 73% of those aged 35-54 and 59% of those aged 55-74).

Overall, residents' interest in future energy efficiency measures was largely impacted by their experience of Wave 1 installations.

Residents who were satisfied with the measures they received were more interested in future installations. Many of those who had noticed a reduction in their energy costs since installation expressed interest in other measures, despite very few residents having made plans for additional installations in their home. One resident who said they had been using the heating less since the Wave 1 installation said they wanted '*anything that would save me money*', despite having little awareness or knowledge about what other measures were available.

Many residents who said they were interested in installing future energy efficiency measures also mentioned this was because they had other issues with their home that had not been resolved by Wave 1 installations. Several residents expressed that they wanted specific energy saving measures, such as heat pumps and solar panels, but could not afford these without a government grant and were aware that they would be expensive.

> "*Maybe solar panels – there's one for you … it would be the cost – quite an expense and I don't think the council would do it for us." Resident*

Knowledge of other measures available was limited, especially among older residents. When asked about what measures they would like to have installed, residents often responded with a specific problem in their home that they wanted fixed.

Some residents who had negative experiences of the installations expressed being *'put off'* and uninterested in future works. This included damage to the interior of their home, dust left around the property after completion and negative interactions with installers, as highlighted in previous sections. Those who felt that the improvements to the warmth of their homes and reduced bills they expected had not materialised, were disappointed with the measures, and therefore not interested in further works.

Interest in energy efficiency and climate change

In interviews, residents' interest in climate change and energy efficiency overall was mixed. Residents who were the most proactive about saving energy were not always the most concerned about climate change. Residents often reported that their main engagement with climate change and energy efficiency was via small, consistent actions such as turning off lights, using the heating less, or reducing water usage.

Many older residents saw climate change as an important theme in the context of their families' futures. Some cited no longer owning a car and recycling as key actions they took to reduce their carbon footprint.

> *"I am at the back end of my lifespan now, but for my daughter I have to worry with things changing and the climate is changing fast." Resident*

Many residents who said they care about their environmental impact emphasised that while climate change was important to them, saving energy was often more about saving on bills. Lots of residents used smart meters to monitor energy use and thought it was important to save money on heating and water usage.

> *"It's not just about being green in the home, it's literally because everything has got so expensive. If it's cold, we'll put on a jumper rather than turn the heating on." Resident*

Impact of SHDF on opinions of energy efficiency and climate change

Overall, many residents interviewed reported that they were now more mindful of energy usage in their home because of energy saving measures. However, this did not necessarily translate to interest in installing further measures, unless they were offered by their SHL.

Residents often mentioned that their new smart meter allowed them to monitor their energy usage and spending more precisely. One resident said they used their smart meter to see when their solar panels were on, so they could use that time to do their washing. This increased awareness led some residents to use less energy overall.

> *"Very useful. You can see different usage on the electricity when you switch something on or when the shower is on. You can see the way it goes up and it fluctuates all the time." Resident*

Disabled residents and those with long-term health conditions often found reducing their energy use more of a challenge. Despite being keen on moderating their energy use, and showing concern for climate change, disabled residents often reported needing to use more heating because of illnesses that required them to maintain a comfortable temperature in their home, or that meant they could not leave the house often. One disabled resident said that they thought climate change should be taken very seriously, but due to their disability they could not use public transport so needed a car. Nonetheless, many disabled residents said they proactively took actions such as reusing and recycling to reduce their carbon footprint.

"We do our best to conserve as much as we can with our recycling… We take walks down the road instead of driving. We are quite aware of it." Resident

8 Conclusions

This chapter considers the key enablers and barriers in the design and delivery of Wave 1, synthesising evidence presented in this report.

Summary of delivery

A total of 69 projects successfully applied for Wave 1 funding, with £179 million awarded, higher than the £160 million planned. These bids targeted 20,229 properties, with terraced properties most common, and EWI and Loft Insulation the most common measures planned to be installed.

As of March 2024, 16,617 properties had received, or were planning to receive, installations, of which 15,564 properties had been completed. This is close to a fifth less than originally planned. The scheme incurred considerable delivery delays, with the planned end date of March 2023 extended by a year to March 2024. Loft insulation, Ventilation and EWI were the most common measures installed. Delivery costs varied depending on the measures installed in each home, however all measures costed, on average, more to install than was budgeted at bidding stage.

Enablers and evidence of successful design and delivery

The design of Wave 1 drew effectively on learnings from the SHDF(D). This included improvements to the tender process, delivery mechanisms, and consideration of value for money. Evaluation evidence suggested that this contributed positively to the scheme in the following ways:

- The SHRA provided effective support to SHLs in the bidding process, enhancing the quality of bids. This enabled a high level of response to the invitation for bids, with DESNZ ultimately awarding £19 million more than planned.
- Costs and value for money were manged more closely than in SHDF(D), with the introduction of the minimum co-funding requirement of 33%, cost capping and the requirement for bidders to evidence their cost estimation process. In the end, successful bids planned to provide 50% of expected costs through co-funding (£187 million in total), much higher than the minimum requirement of 33%.
- Compared to the SHDF(D), there has been greater clarity of differences in roles between the DP as projects' first point of contact, and DESNZ as the escalation route. This more structured approach enabled timely responses to queries and allowed DESNZ to focus on policy decisions.

- Refinements to the Change Control process, particularly the introduction of a threshold allowing approval at lower levels within DESNZ than in SHDF(D), enabled faster decision making and gave scheme delivery representatives better oversight of the projects.

SHLs generally felt that the scheme fitted well with their own decarbonisation plans enabling them to accelerate and improve the quality of these plans. Supply chain stakeholders corroborated this, noting that the PAS 2035 requirements led to a higher quality installation process.

While on average measure costs were higher than originally budgeted, there were cost efficiencies as well. The localised nature of many projects meant supply chain stakeholders achieved significant cost savings through bulk material purchases, reduced transportation and storage costs, decreased scaffolding expenses and labour efficiency. While there were mixed experiences of this, some SHLs were able to obtain cheaper supply chain rates than they otherwise might have due to the volume of Wave 1 properties selected for works.

Among Wave 1 households, where it was possible to combine EPC records with survey responses on income, 82% were estimated to be in fuel poverty prior to installations using the Low Income Low Energy Efficiency (LILEE) fuel poverty definition, demonstrating that Wave 1 was successfully targeting residents in need of support with their energy.

There were early signs of the scheme delivering positive benefits to participating residents. Prior to Wave 1 installations, nearly nine in 10 residents experienced at least one energy efficiency related problem with the condition of their home.

When asked about each of these problems after installation, generally half or more of residents previously reporting an issue said it was no longer a problem. Residents who received a heat pump were most likely to report that their ability to meet their cost of heating, and to heat their home to a comfortable temperature, had improved.

The evaluation also evidenced benefits to residents in terms of the energy they used and its affordability. Over four in 10 residents with completed installations thought they had reduced their gas or electricity use post installation (rising to six in 10 among those who received heat pumps), while a similar proportion reported they were less worried about being able to pay their energy bills. These figures are subject to change given the relatively high volume of surveyed residents who had not experienced a Winter season between the installation of measures and the survey.

Barriers to successful design and delivery

While the Wave 1 design drew on learnings from the SHDF(D), the evaluation identified some aspects of scheme design that negatively impacted the application process and delivery. These included:

- Several SHLs felt that application data and modelling requirements (such as housing stock modelling) for bidding were onerous and, given the short bid timescales, that the process favoured more experienced or larger applicants with experience and capacity.
- Consistent with this, smaller social housing providers were under-represented in Wave 1. While around half of providers in England with 10,000 to 24,999 units were involved in successful bids, this fell to about one quarter of those with 5,000 to 9,999 units and even lower among the smallest SHLs with fewer than 5,000 units.
- Some SHLs felt that a lack of technical expertise among some MDOs from the DP reduced efficiencies and over-burdened DESNZ staff.
- Project monitoring was a burden for some SHLs, who considered it disproportionate to the size of funding allocated.

The scheme experienced considerable delays to delivery, while a number of projects had to re-scope their work. Key barriers affecting delivery are noted below, while the Wave 1 Impact Evaluation report will explore the implications of these delays on scheme outcomes:

- Labour shortages in the retrofit industry, particularly installers trained in PAS 2035 standards.
- Unanticipated rising costs due to above expected inflation levels affecting both labour and materials.
- A broader lack of knowledge regarding retrofit standards and accreditation requirements, among both supply chain stakeholders and SHLs.
- Residents refusing access to their properties.

The resident survey showed that half of residents participating in the scheme did not think they had a choice whether the works went ahead in their home. The evaluation did not determine whether this was due to a lack of communication from the SHL or the residents not engaging with SHL communications.

While the installation process was typically a positive experience for residents, there were pockets of discontent. One in five were dissatisfied with the communication they received from their SHL and installers, and a similar proportion was dissatisfied with the installation process itself. Those living in a house, younger residents, those with a long-term health condition, and those having windows and doors installed were typically less satisfied. Key factors contributing to dissatisfaction included poor communication from the installers, mess and dust, limited access to the property during installation, and damage to property. The installation of multiple measures tended to exacerbate resident dissatisfaction.

A minority of residents reported that they encountered certain issues such as new patches of damp or condensation, due to poorly completed installations. This suggests that the PAS 2035 standards may not have always been rigorously upheld in installations, as these should in theory prevent the occurrence of such problems.

Close to half of residents with ongoing or completed installations reported receiving no support or guidance about the measures installed in their home. This affected the maximisation of

benefits of measures, with only around half of residents feeling confident about cleaning their new equipment or checking for signs of wear and tear.

Despite challenges with delivery, evidence from this evaluation shows that Wave 1 of the SHDF was of value to both SHLs, who would have otherwise delivered retrofit at a smaller scale and possibly lower quality, and to residents, who were overall satisfied with the installation of measures and reported improvements to issues experienced in their home.

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