technopolis group

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SHDF Wave 1 Thematic Case Study

Installing Measures in Hard-to-Treat Properties

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1 Introduction

1.1 Defining hard-to-treat properties

Understanding complex properties that are difficult to decarbonise, often referred to as 'hard-to-treat', 'hard-to-decarbonise', 'hard-to-heat', and most recently 'complex to decarbonise' properties, is an area of significant interest in retrofit.[1] For this case study, a 'hard-to-treat property' was defined as a property that is difficult or costly to renovate or improve in terms of energy efficiency, because of specific features or conditions such as complex architectural designs or structural issues that make standard renovation methods less effective or impractical. The following types of properties were considered as potentially hard-to-treat:

- Properties with low EPC ratings (F or G).
- Archetypes such as bungalows, flats including high-rise, non-traditional houses, and Wimpey No-Fines properties.[2]
- Older properties, built before 1945.
- Properties in rural locations.
- Properties that are off the gas grid.

1.2 Case study content and sources

This case study brings together evidence from SHDF Wave 1 relating to:

- Decision-making of social housing landlords (SHLs) in terms of selecting hard-to-treat properties for retrofit, and relevant measures.
- The intended and actual upgrade of hard-to-treat properties within Wave 1 to EPC C.
- Enabling factors and challenges in delivering retrofit in hard-to-treat properties.

The data sources used for this case study include relevant scheme monitoring data, Social Housing Retrofit Accelerator (SHRA) masterclass videos, as well as data from a survey with residents and from interviews and focus groups with SHLs, supply chain representatives, scheme delivery representatives, and residents.

2 SHL Decision Making Relating to Hard-to-Treat Properties

2.1 Property selection

In interviews, SHLs mentioned several reasons for selecting hard-to-treat properties for retrofit works:

- **Some hard-to-treat properties had been neglected in the past** due to technical and financial difficulties in upgrading them (reported by one SHL). Therefore, Wave 1 funding offered a good opportunity to treat them.

1 https://assets.publishing.service.gov.uk/media/65819bc3fc07f3000d8d44a5/complex-to-decarbonise-homes-report.pdf

2 Wimpey No-Fines are an archetype intended for mass production of temporary housing. More than 300,000 of these homes have been built in the UK since the 1940s. These properties tend to have higher propensity for condensation and mould and excessive heat loss.

> *"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

- **Properties selected to reduce fuel poverty often coincided with hard-to-treat properties**. For instance, one SHL decided to work on tower blocks following a resident engagement analysis that indicated a fuel poverty rate of fifty per cent in those buildings.
- **Some high-rise properties were expected to deliver the biggest economic and environmental benefits** through energy efficiency improvements. Following a "worst-first" approach as per scheme requirements, one SHL selected high-rise blocks with poor energy ratings in areas with high proportions of low-income households. The low energy efficiency of high-rise blocks was due to a historical preference for installing simpler, cost-effective measures in high-rise homes. **High-rise flats were also notoriously challenging in terms of damp and mould.** One SHL reported that these properties were the coldest in their stock and were having issues with heat loss and were therefore selected.

One SHL said it was important to check with their sales team which properties they were looking to sell as these were often the old, solid wall properties (and therefore hard-to-treat) that they would have selected for retrofit.

> *"So, we found a lot of the ones we were looking at doing retrofit to, they were also considering selling, and so keeping that communication open as well was important so we weren't going to do work to homes on their list."* – SHL focus group participant

One SHL reported that they did not intentionally select hard-to-treat properties but became aware some of their properties were hard-to-treat once they were assessed further.

2.2 Measure selection

One SHL said that **hard-to-treat properties often required more than one energy efficiency measure to raise their EPC to band C**, as per scheme requirements. Measure selection in hard-to-treat properties varied by archetype or specific property characteristics, some of which are listed below (data on measures installed in hard-to-treat properties are reported in section 3.4).

- **One SHL found that cavities had not been filled in some of the high-rise properties,** and therefore prioritised addressing this.
- **One SHL reported that External Wall Insulation (EWI) was the most appropriate measure to improve the fabric efficiency of high-rise properties, because their blocks used a system-built construction.**[3] Wave 1 funding made it possible for SHLs to install more expensive measures such as EWI in hard-to-treat properties.

> *"Because it is such a big project [to install EWI], we maybe wouldn't have considered it so much if we didn't have the funding available just because of the cost. So obviously the funding did mean it was more viable for us."* - SHL focus group participant

[3] A system-built construction refers to a method of building structures using pre-fabricated components that are manufactured in a controlled factory environment and then assembled on-site. This approach contrasts with traditional construction methods where buildings are primarily constructed on-site from raw materials.

- **Bungalows or terraced properties that were heated through mains gas had a high space heating demand**. To reduce space heating demand to the target level of 90 kwh/m2/year as per scheme requirements, these properties **required renewable methods such as solar thermal heating** in addition to insulation measures.

2.3 Timing of installations

There was little evidence to suggest that the timing of treatment of hard-to-treat properties differed to that of other properties within projects. Two SHLs stated that hard-to-treat properties were not grouped at the start or the end of their projects but were staggered throughout the project duration. For one SHLs, this was because some of the properties were identified as hard-to-treat as the project progressed and hence there was no specific timing associated with treating them.

Another SHL reported that work on flats could not be undertaken all at once within the Wave 1 delivery timeframe as it would have caused significant disruption for residents. Therefore, further measures had to be installed after Wave 1.

> *"We've got some external works on window replacements to do, but we couldn't have done it all at once in three tower blocks, as there are 273 units, and within the time frames of SHDF it just wasn't possible."* – SHL focus group participant

3 Upgrade of Hard-to-Treat Properties

3.1 Number of hard-to-treat properties retrofitted

The following figures are taken from project applications and from scheme monitoring data returned by projects from January 2022 up to the end of February 2024[4]:

- In bids, a small proportion of properties planned to be retrofitted had EPC ratings of G (46 properties, 0.3% of all properties) and F (726 properties, 4%) (Figure 1). About half of properties with starting EPC of G and F had received measures by the end of February 2024 (26 and 244 properties, or 0.15% and 2% of all properties, respectively) (Figure 1).
- In bids, almost a third of all properties planned to be retrofitted were flats (31%) and over one in ten were bungalows (13%). Fewer flats, but more bungalows, had received measures by the end of February 2024 than originally planned (20% and 16% respectively) (Figure 1).
- In bids, just under a quarter (24%) of all properties planned to be treated were reported to rely on fuel other than gas, suggesting they were off the gas grid. Of properties that had received measures by the end of February 2024, 24% were reported to be off the gas grid. Although these may have not been exactly the same properties, this suggests the proportion of off the gas grid properties planned to be treated at bid stage and delivered as of February 2024 had remained constant.

4 Wave 1 had not yet completed at the time of reporting and therefore these figures should not be considered final.

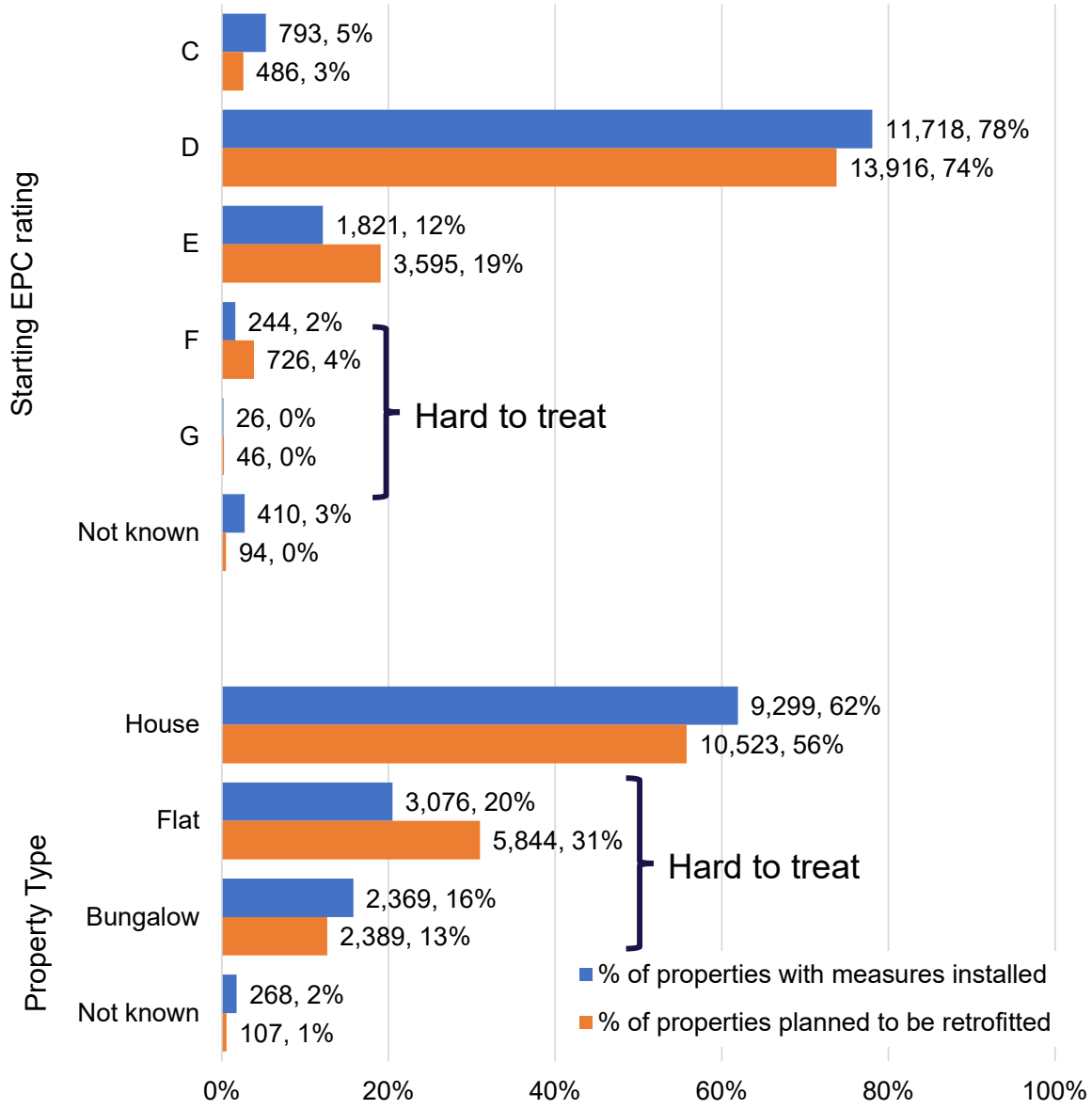

Figure 1: Number and proportion of properties retrofitted as of end of February 2024, and properties planned to be retrofitted (from post-bid data), by starting EPC rating and property type.

Base sizes: properties retrofitted as reported by projects in scheme monitoring data (15,012); all properties planned to be retrofitted from post-bid baseline (18,863). Six projects not submitting valid scheme monitoring data through the DMS were excluded from this analysis. Baseline includes four projects that dropped out of Wave 1.

3.2 Measures installed in hard-to-treat properties

Scheme monitoring data as of February 2024 shows that, on average, bungalows received 5 measures, compared to an average of 4 measures installed in houses and flats. [5] Most measure

[5] Data is not available on which measures were originally intended to be installed in hard-to-treat properties.

types (excluding heat) were more commonly installed in bungalows than in flats and houses. Specific findings included:

- Cavity wall insulation and flat roof insulation were more common in bungalows (48% and 17% respectively) compared to flats (28% and 6% respectively) and houses (35% and 4% respectively). External wall insulation was more common in bungalows (42%) compared to flats (28%), whereas internal wall insulation was more common in flats (10%) compared to houses and bungalows (4% and 4% respectively). Loft insulation was most common in houses (79%) overall.
- Ventilation was more common in bungalows (47%) compared to flats (27%) and houses (38%).
- Ground source heat pumps, storage heaters, and controls for heating systems, were more common in flats (14%, 34%, and 29% respectively) than in bungalows (0%, 11%, and 17% respectively) and houses (0%, 3%, and 17% respectively). Air source heat pumps were more common in bungalows (5%) than flats (1%) or houses (3%).
- Solar panels and energy efficient lighting were more common in bungalows (29% and 40% respectively) compared to flats (5% and 19% respectively) and houses (22% and 27% respectively).

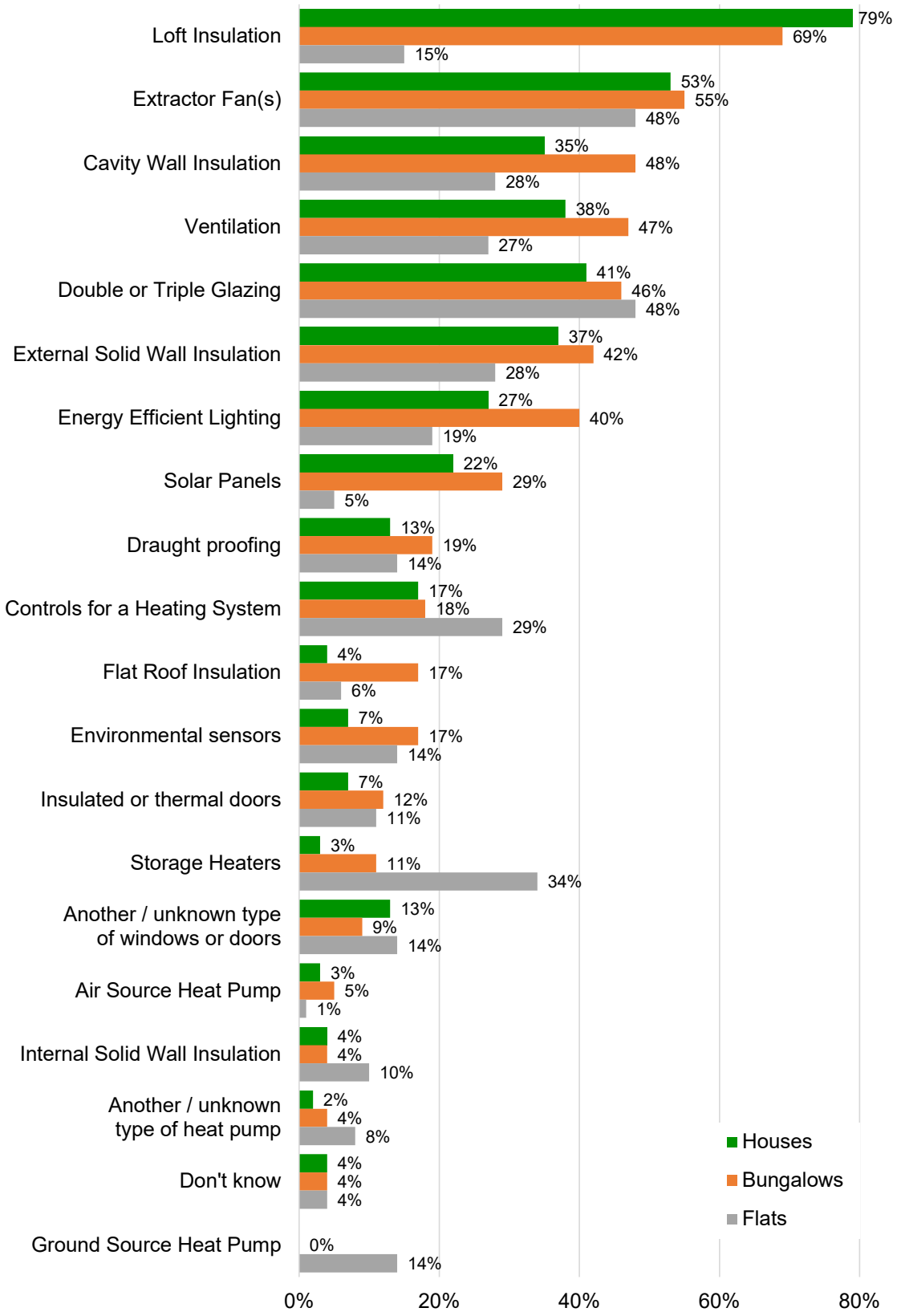

Figure 2: Proportion of measures installed by property type as reported by surveyed residents.

Base size: all residents with works ongoing and completed at the time of the survey, excluding those living in maisonettes due to small numbers (n=1,489).

3.3 EPC upgrade of hard-to-treat properties

As shown in Figure 2, the majority of properties with a starting EPC of F were improved to EPC C or above (82%). Nearly two thirds of properties with a starting EPC of G also reached EPC C or above (61%).

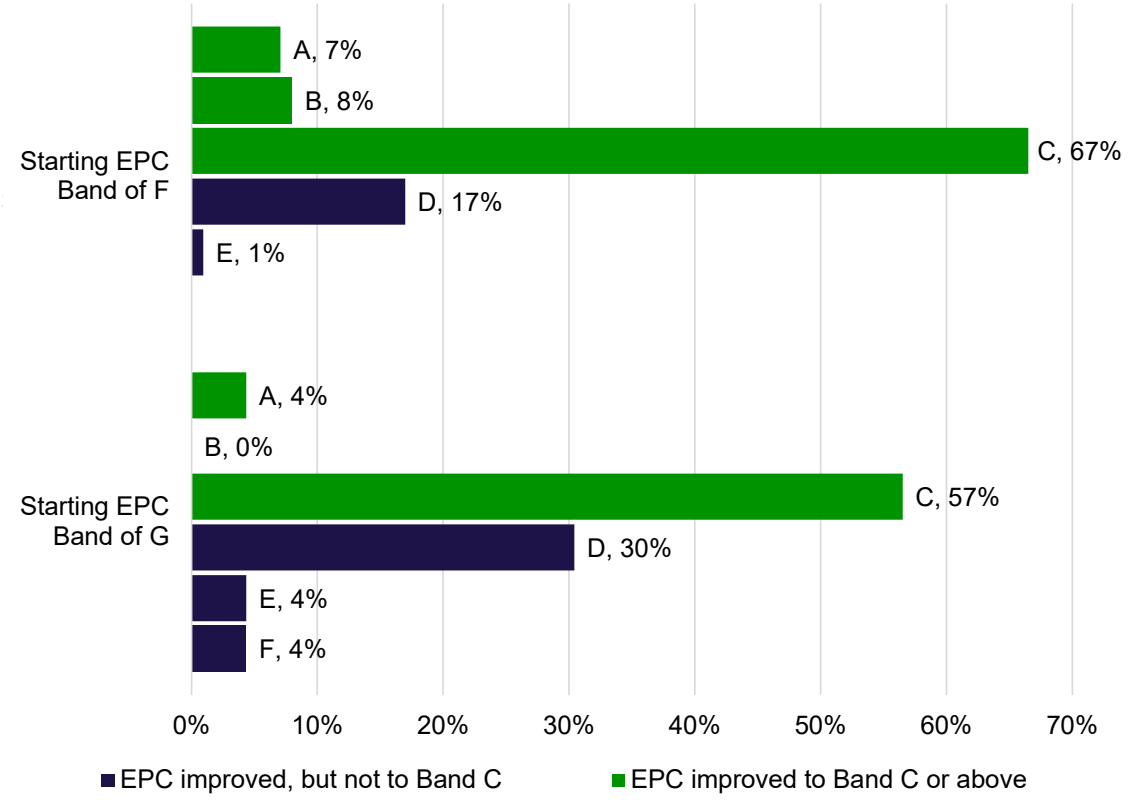

Figure 3: Proportion of properties with starting EPC Bands of F and G, retrofitted as of end of February 2024, by EPC achieved post-installation.

Base sizes for Starting EPC Band of F: all properties retrofitted with starting EPC Band of F (276), 244 of which are properties for which the final EPC band is known, and 32 of which are properties for which the final EPC band is unknown.

Base sizes for Starting EPC Band of G: all properties retrofitted with starting EPC Band of G (29), 26 of which are properties for which the final EPC band is known, and three of which are properties where the final EPC band is unknown.

Six projects not submitting valid scheme monitoring data were excluded from this analysis.

3.4 Cost of installations in hard-to-treat properties

Scheme monitoring data as of end of February 2024 shows that:

- The average cost of installations was higher than estimated in bids by a small amount for properties with a starting EPC of F (2%), but by a much larger amount for properties with a starting EPC of G (23%, Figure 3).
- The average cost of installations for flats was 8% higher than estimated in bids, but 13% lower for bungalows (Figure 3).
- The average cost of installations was 5% lower than estimated in bids for properties off the gas grid, and 7% lower for those that were on the gas grid (Figure 3).

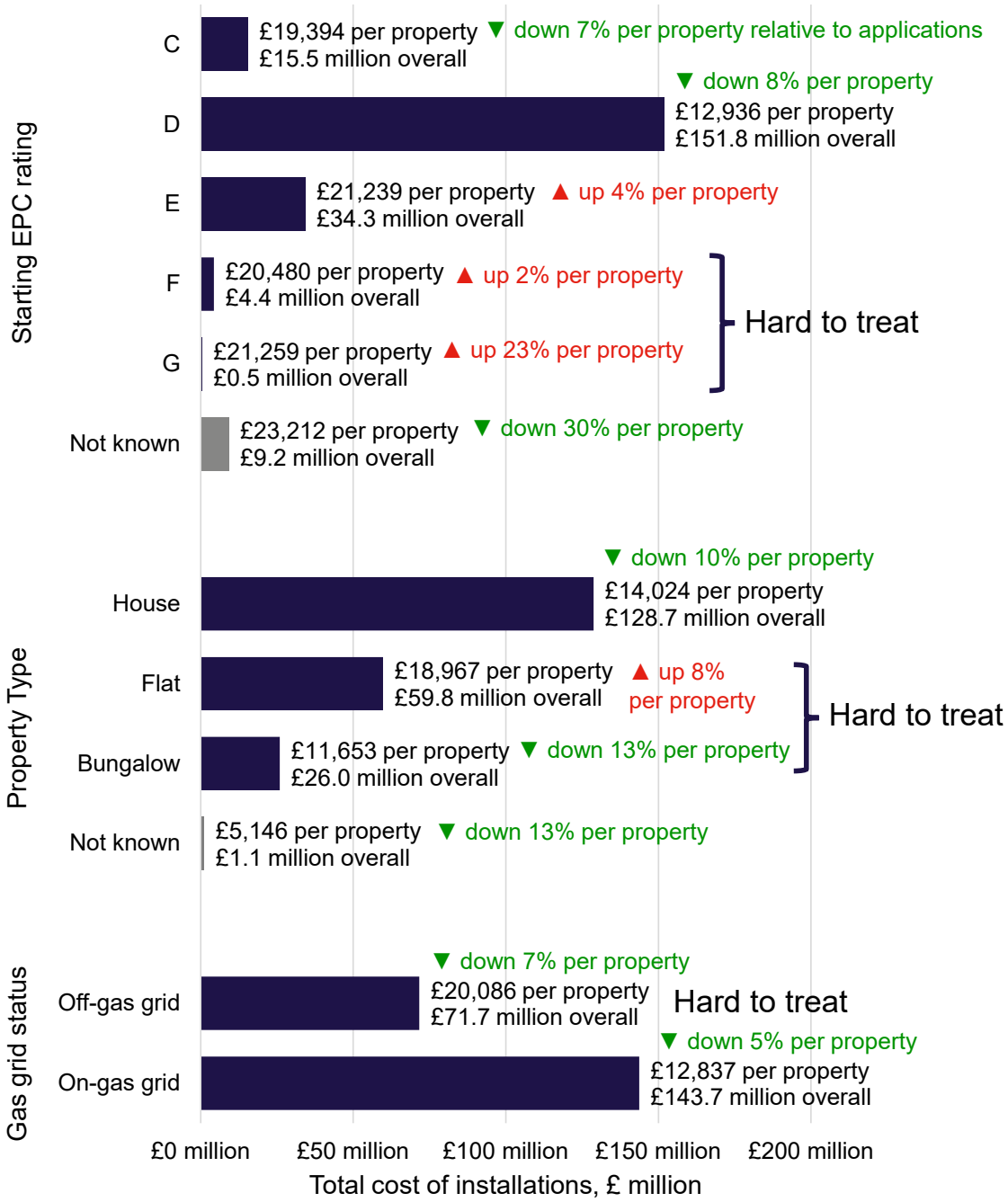

Figure 4: Average cost of retrofit by starting EPC rating, property type, and gas grid status, and percentage difference relative to costs estimated in applications.

Cost comparison data is based on scheme monitoring data from the DMS, filtered for properties with at least one completed measure on the DMS up to end of February 2024, and both application and actual costs given. Base sizes: EPC rating C (413), D (9,303), E (1,707), F (104), G (14), Not known (186); Bungalow (1,626), Flat (2,314), House (6,992), Property type not known (219); On-gas grid (8,676), Off-gas grid (2,420), Grid status not known (1, not shown).

Overall cost and per property cost data is based on scheme monitoring data from the DMS, filtered for properties with at least one completed measure on the DMS up to the end of February 2024, and actual costs given. Base sizes: EPC rating C (799), D (11,735), E (1,614), F (214), G (22), Not known (396); Bungalow (2,227), Flat (3,153), House (9,180), Property type not known (220); On-gas grid (11,194), Off-gas grid (3,568), Grid status not known (18, not shown).

4 Enablers and Barriers in Treating Hard-to-Treat Properties

4.1 Project planning and preparation

Some SHLs did not initially have data about which properties were hard-to-treat, which made it difficult to foresee challenges in treating those properties. They also reported that starting EPCs were often derived from very inaccurate data, or data collected by assessors that were out of date. One SHL reported that flats had all been given one EPC rating as a group of properties which was not necessarily accurate.

> *"So we had to undertake a sample across the three tower blocks as we have C ratings on properties with thermal bridging details prevalent and untreated cavities, even though the EPCs stated that it had EWI in some instances and boilers installed. So that was one of the biggest challenges that we faced in trying to get our bid together".* – SHL focus group participant

In interviews, scheme delivery representatives reported that properties were not properly assessed at bid stage, which meant budgets were often inaccurate. In a SHRA masterclass on Wimpey No-Fines flats, a project team representative noted the importance of doing an accurate survey of properties before works, including assessing factors such as gates, fencing, uneven existing finishes, drains, external pipe runs and grounds levels to ensure project success.

4.2 Project management

Good project management principles which may support any retrofit project were noted as particularly important for delivering retrofit of hard-to-treat properties.

- A scheme delivery representative reported that **having experienced project managers** enabled issues to be navigated more effectively.
- One SHL had the available internal resources to hire a retrofit coordinator and assessor to support the project. The same SHLs also noted the benefit of **having a good relationship with contractors.**
- In a SHRA masterclass, project team representatives stated that **a collaborative and transparent approach** was key for project success, specifically in relation to Wimpey No-Fines flats. Holding regular meetings with all stakeholders including clients, subcontractors, suppliers, and contractors was essential for achieving goals and tackling problems associated with retrofitting flats.

> *"We're working with very experienced project managers who have worked in the Local Authority and worked in housing for decades […] some project teams are really well set up and just have the knowledge, maybe not even the bodies, but they just have the knowledge and that really can help."* – Scheme delivery interviewee

4.3 Enablers in resident engagement

The following factors were reported to support positive resident engagement in hard-to-treat properties:

- Project representatives in a SHRA masterclass reported the positive outcomes of **being on the ground and talking to residents living in Wimpey No-Fines properties.** For example, residents provided valuable information relating to previous window replacements they had done, which helped SHLs understand how best to proceed.

- Another SHL working with densely populated flats highlighted that **having an in-house resident liaison function was key for project success.** This enabled collaboration and ongoing engagement with residents as they faced disruptions from the works.

> *"To be able to tell them [residents] the benefits that it was going to deliver and then for them to start witnessing that quite early on when we started getting the connections in. I think that was really, really helpful."* – SHL focus group participant

The resident survey shows a significantly lower level of dissatisfaction with communications from the SHL (10%) and from installers (12%) among residents living in flats compared to the total sample (21% and 20% respectively).[6]

4.4 Challenges in resident engagement

Two SHLs indicated that residents living in hard-to-treat properties were less willing to accept measures. One SHL suggested this may explain why some hard-to-treat properties had not received retrofit works before Wave 1. Two specific issues were cited in relation to resident refusals to receive the works:

- Two SHLs reported that some residents were reluctant to accept heat pumps as a new approach to heating, particularly following the increase in energy prices. These were often residents living in homes with lower EPC ratings and with solid walls. SHLs were able to find replacement properties where residents refused to receive measures, however this required additional time.
- One SHL also reported that some residents whose families worked in the mines were getting coal for free or were getting free logs from farms and therefore refused works.

> *"So they don't want to give up their free solid fuel appliance and take on something that even though it might be low carbon and cheap to run, it's not cheaper than free."* – SHL focus group participant

Disruption for residents during works was also reported to be an issue. One installation supply chain representative stated that residents in flats raised concerns about the amount of materials stored around the blocks for months. One SHL stated that resident disruption was a particular issue when installing ground source heat pumps in densely populated flats as substantial external infrastructure work was required, including over 110 boreholes (each down to 300 metres) within car parks at the site. One resident interviewee living in a flat reported losing many of their parking spaces while works were ongoing.

> *"Parking has been a big problem. We were given covers to put over our cars to prevent dust…there are also security issues as people can climb the masts outside […] It's gone on long enough now and we're all just fed up with it."* - Resident interviewee.

[6] There were no significant differences in satisfaction with communication from SHLs or installers amongst residents of other property types that could be considered hard-to-treat (bungalows, built pre-1945 and off the gas grid).

However, there were no significant differences in satisfaction rates of surveyed residents living in flats in relation to disruption to the wider area during installation (69%), compared to the average across all surveyed residents (65%). Satisfaction in relation to disruption to the household was significantly higher amongst surveyed residents living in flats (75%), compared to the average across all surveyed residents (65%).

In contrast, surveyed residents living in bungalows reported greater dissatisfaction (26%) in relation to general disruption to the household, compared to the average across all surveyed residents (20%).

Key learnings:

- Residents in hard-to-treat properties may be particularly challenging to engage with and may also face higher incidences of disruption, specifically in relation to work on flats.
- Dedicated, in person engagement with residents may be supportive of successful delivery.

4.5 Challenges in installing measures

SHLs reported some specific challenges in installing measures in hard-to-treat properties due to their structure, the quality of previous work undertaken, and planning requirements. These challenges often increased costs and timelines of projects. SHLs also generally reported the high costs of installations on hard-to-treat properties, some of which were unanticipated. This may partly explain why fewer hard-to-treat properties were retrofitted as of February 2024 compared to what was originally planned, as reported in section 3.

- **Issues with Finlock guttering[7] when trying to install EWI** led to significant additional costs. One SHL said they had not identified these at the time of application because they did not have the relevant information on these properties in advance.
- One SHL reported challenges with installing EWI in non-traditional properties where planning requirements led to an increase in costs:

> *"The LA had different rules they applied in relation to planning information for EWI […] So, the solution we came up with was to remove the external façade and then put a fire-retardant barrier on before we put the EWI on and that drastically increased costs."* – SHL focus group participant

- **Non-traditional homes that had cavity fill in the past** presented a challenge for one SHL as this had to be extracted before they could install EWI.
- Similarly, one installation stakeholder working on high-rise buildings reported issues with installing cavity wall insulation where **previous work was of poor quality and had to be rectified**.
- Another supply chain stakeholder reported that **bungalows did not have proper rafters** and had to be propped up from underneath with Acrow props.[8] The team had to use

7 A Finlock gutter is a concrete gutter commonly found in houses built between 1950 and 1970. It is built from two troughs that are horizontally positioned and sit at the head of a cavity wall. One of the troughs serves as the gutter while the other one distances the gap between the walls.

8 Acrow props are a temporary vertical support system to support overhead loads including ceilings.

scaffolding and Acrow props to ensure they did not cause any damage or go through the ceilings.

- Supply chain stakeholders reported **planning permissions to be stricter in rural areas.** For example, they needed to use rendering to make the wall finish look like stonework, in line with the local environment, which was also more expensive.

Key learnings:

- Costs are likely to be higher for hard-to-treat properties because they may have particular structural issues and previous work undertaken on them may be poor quality.

5 Data Sources

Data sources used to produce this case study	
Social housing landlord interviews and focus groups	1 focus group (Q 3, 2023) with: • 5 representatives from three Wave 1 projects which included hard-to-treat properties. Qualitative interviews with participating SHLs (Q 3 2023): • 14 Wave 1 representatives (from 6 projects selected to be case studies). • 15 Wave 1 representatives from 15 non-case study projects.
Scheme delivery representative interviews	Scheme delivery interviews and focus groups (Q 4 2023): • 1 focus group with DESNZ Integrated Delivery Team (IDT) representatives. • 2 focus groups with Delivery Partner representatives. • 4 interviews with DESNZ senior officials.
Supply chain stakeholder interviews	5 interviews (Q 3-4, 2023) with: • Two retrofit coordinators. • Two principal contractors. • One project administrator. Interviews were selected for inclusion through a key word search of all available interviews for the following terms: hard-to-treat, non-trad, EPC F/G, rural, off the gas grid, bungalow, flat/apartment/high-rise, Wimpey No-Fines), steel frame, timber frame.
Resident surveys and interviews	3 tranches of a survey (Q2-3 2023, Q1 2024) with residents for whom installation had started or had their works recently completed. Total base of 1,498 residents. Of these: off the gas grid (304), built pre-1945 (220), flat, apartment or bedsit (142), and bungalow (413).

	4 in-depth interviews with residents living in flats/apartments who also took part in the survey and consented to take part in a follow-up interview (Q3-4 2023, Q1, 2024).
Project closure reports	2 project closure reports delivered to DESNZ by Leicester City Council and Stafford (Q 4 2023), projects identified to include hard-to-treat properties.
Project applications	10 project applications for projects shortlisted for the SHL focus group (for including hard-to-treat properties) were reviewed.
Learnings documentation (SHRA videos)	3 masterclass videos created by SHRA on: • Retrofitting Blocks of Flats (main construction type was Wimpey No-Fines) • Wimpey No-Fines – Archetype Spotlight (covering a mixture of houses and flats) • Customisation of Insulation (Wimpey No-Fines houses)
Scheme monitoring data	Project reported data returns aggregated in the Data Management System (DMS) up to the end of February 2024 covering properties which had measures installed, cost of measures and EPC upgrades.

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