



ade

ace
research



THE MCS
FOUNDATION

PROJECT REPORT | NOVEMBER 2023

UPSKILLING FOR LOW-CARBON HEATING IN THE PRIVATE RENTED SECTOR

1 Executive Summary

This report completed by ACE Research (ACE-R) at the Association for Decentralised Energy (ADE) details the Upskilling for Low-carbon Heating evaluation in the Private Rented Sector project. It describes the work to train local authority officers (LAOs) and landlords on private rented sector (PRS) regulations, energy efficiency measures, and low-carbon heating options. This report's findings are relevant to future initiatives and projects to support local authority officers and landlords in their knowledge of low-carbon heating solutions.

1.1 Introduction

This project was undertaken by ACE-R and was funded by the MCS Charitable Foundation. This project aligned closely with the mission of the MCS Charitable Foundation to accelerate the adoption of renewable energy and low-carbon technologies. By building capacity amongst critical actors in local government and the PRS, this project supported the accelerated roll-out of low-carbon heating solutions in the PRS, therefore benefiting tenants whilst offering more comprehensive economic and societal benefits to the UK; including a reduction in building-related emissions, helping to meet net-zero targets and sustained supply chain growth. Further, this project recognised that low-carbon heating solutions must be rooted in understanding issues related to fuel poverty to ensure that efforts to decarbonise domestic heating are part of the solution and not the problem expressly. Specifically, the project set out to upskill and train LAOs and landlords on the following focus areas: Minimum Energy Efficiency Standards (MEES) regulations, energy efficiency options, and low-carbon heating options. This project also aimed to understand

how councils enforce MEES regulations and what barriers they face to enforcement. PRS MEES are devolved matters and the specific regulations considered in this project were those for England and Wales.

ACE-R delivered 11 Continuing Professional Development (CPD) accredited training sessions to upskill and train local authority officers in these areas. The training was delivered online and nationally, free of charge. Evaluations were then undertaken to assess the effectiveness of this training for LAOs and how LAOs are enforcing MEES regulations within their councils. This report outlines the project context, methodology, overall project findings, future needs and opportunities, and conclusions from the project.

1.2 Project Context

The proposed project aimed to remove barriers to domestic low-carbon heating solutions in England and Wales through the engagement and training of local authority enforcement officers and PRS landlords as part of the transition to net zero through MEES.

With low levels of awareness around low carbon heating solutions, upskilling across both groups will be essential to decarbonising heating. With greater knowledge and understanding of low-carbon heating solutions, local authority officers can support landlords who want to take action to improve their properties and enforce regulations where required. Landlords will be able to begin to understand the pathways that they could take to ensure that their property meets standards, giving them the confidence to invest in their property using quality supply chain actors and enabling access to grant funding and finance.

1.3 The issue

Current MEES regulation states that it is unlawful for all existing leases in England and Wales to grant a tenancy to new or existing tenants if their property has an EPC rating of band F or G¹. According to government legislation², local authorities are required to enforce MEES regulations, however, as it has not been made a statutory duty, local authorities are not allocated the necessary funds to enforce MEES.

Moreover, findings from ACE-R's groundbreaking research into implementing MEES in the PRS, the Warm Arm of the Law³, showed that local government enforcement officers lack the skills and understanding to implement standards effectively.

National Energy Action's experience and key learnings from their Technical Innovation Fund Programme⁴ likewise identified skills gaps across the energy efficiency and low-carbon technology sectors. Specifically, this programme identified knowledge gaps for frontline workers around the efficacy of different consumer solutions, including vulnerable households, and effective consumer engagement.

While energy retrofit has received substantial attention recently, awareness remains low, particularly around low-carbon heating solutions. For many years under the Housing

Health and Safety Rating System (HHSRS), enforcement officers have specified that landlords install gas central heating systems to move away from electric storage heaters. This narrative needs to change, with local council officers specifying low-carbon heating technologies instead.

Moreover, ACE-R has engaged with various PRS stakeholders as part of the current consultation on MEES, including Rent Smart Wales, the National Residential Landlords Association (NRLA) and a range of fuel poverty and climate change organisations. We heard evidence that landlords need more awareness of the MEES regulations and need to adequately understand how to start the retrofit journey for their properties, what technologies can be installed or how to finance these improvements.

Due to the reasons outlined, a lack of enforcement of MEES is taking place. Our pre-workshop survey further supplemented this finding, which indicated that 25% of surveyed respondents do not enforce MEES regulations, and 9% were unsure of their council's involvement with MEES regulations. Landlords also lack an understanding of what they can do to their properties and how they make changes.

Thus, upskilling and further support across local authorities and landlords is essential to improve the energy efficiency of the PRS building stock to comply with MEES regulations in order to meet net zero targets.

¹ <https://www.gov.uk/guidance/domestic-private-rented-property-minimum-energy-efficiency-standard-landlord-guidance>

² The Energy Efficiency (Private Rented Property) (England and Wales) Regulations 2015, *The National Archives* [Online] Available at: [The Energy Efficiency \(Private Rented Property\) \(England and Wales\) Regulations 2015 \(legislation.gov.uk\)](https://www.legislation.gov.uk/2015/legislation/2015/legislation.gov.uk)

³ The Warm Arm of the Law., 2019, ACE-R [Online] Available at: [The Warm Arm of the Law: Tackling fuel poverty in the private rented sector | Publications | The Association for Decentralised Energy \(theade.co.uk\)](https://theade.co.uk/publications/the-warm-arm-of-the-law-tackling-fuel-poverty-in-the-private-rented-sector/)

⁴ Technical Innovation Fund., 2017, National Energy Action [Online] Available at: [TIF_Report_2017-FINAL-FOR-PRINT.pdf \(nea.org.uk\)](https://www.nea.org.uk/TIF_Report_2017-FINAL-FOR-PRINT.pdf)

1.4 Outputs

To achieve this overarching objective, the ACR-R team engaged and supported local government enforcement officers, PRS landlords, and the energy retrofit and low-carbon heating sectors in a three-phase project, as set out below.

Phase 1: Evidence compilation, stakeholder engagement & development of training and webinar materials

The main objectives of phase 1 were:

- To compile the evidence to demonstrate the benefits and feasibility of low-carbon heating solutions in different types of properties.
- To produce training programmes and training materials for upskilling local authority enforcement officers and PRS landlords around low-carbon heating solutions.

Phase 2: Delivery of training and webinar programmes

The main objective of phase 2 were:

- To empower key PRS stakeholders to drive decarbonisation in the private rented sector.
- To upskill 200 local authority enforcement officers in low carbon heating solutions, delivering 10 online CPD-certified training sessions across England and Wales.
- To raise awareness of low-carbon heating solutions with 100 PRS landlords through online webinars.

Phase 3: Evaluation and next steps

The objectives of phase 3 were:

- To evaluate the impact of the project.
- To identify lessons for future skills development activities.
- To assess what future activities, such as further guidance and live technical support, may be needed to advance heat decarbonisation in the private rented sector and to identify opportunities to pursue further action.

1.5 Key findings

In order to understand the challenges faced by LAOs and identify recommendations, we conducted a detailed analysis of the different regions LAOs came from, characteristics of PRS properties in their area, MEES enforcement types within the surveyed councils, and a quantitative analysis of LAOs knowledge pre- and post-training.

Enforcement types

We also analysed the different enforcement types across councils. 39% of surveyed respondents reported proactive MEES or EPC regulations enforcement. This is made up of 70 LAOs from 41 councils across 11 regions⁵. Proactive enforcement for most councils took the form of seeking out non-compliant properties, engaging the landlord and making them aware, and then enforcing if no action was taken. Given that this process was cited by most councils who undertook a proactive approach, it could form the basis of a best practice approach for other councils to implement.

A key reason for councils' ability to undertake proactive enforcement was the successful use of funded pilot projects within the council. This enabled staff to be given dedicated resources (time, full-time staff, and allocated funding) to start identifying non-compliant properties, begin engaging landlords, and subsequently issue fines to those who had not rectified the breach in regulation. Once such pilot projects

had ended, the practice was integrated into business as usual.

21% of survey respondents reported reactive enforcement methods within their councils. This includes 37 LAOs from 24 councils across 11 regions⁶. Reactive councils tended to only enforce in response to complaints, enforce when they became aware of properties with non-compliant EPCs, or act in accordance with HHSRS. Reasons cited for taking a reactive approach included a need for more financial resources, inadequate staffing, and other work commitments. This demonstrates the reliance on tenants to be aware of the EPC of the property they are renting, MEES regulations, and if the property is non-compliant. Tenants must then feel empowered to report it. Research conducted by Shelter demonstrates that a quarter of private renters (25%) have yet to ask their landlord for repairs to be carried out or conditions improved for fear of being evicted⁷. Therefore, reliance on complaints is ineffective in identifying non-compliance in a council locality.

6% of survey respondents reported that they were in the process of enforcing MEES or EPC regulations. This includes 11 LAOs from eight councils across six regions⁸. Regionally, Greater London had the highest proportion of councils in enforcing MEES and EPC regulations (3). This took the form of examining EPC registers to identify F and G-rated properties to start contacting landlords to inform them of the regulatory breach. Transitioning councils

⁵ East Anglia, East Midlands, Greater London, North Wales, North West, South East, South West, South Wales and Yorkshire and the Humber.

⁶ South West, West Wales, East Anglia, North West, North Wales, East Midlands, North East, South East, Yorkshire and Humber, Greater London, and South Wales

⁷https://england.shelter.org.uk/media/press_release/private_renters_who_complain_about_disrepair_more_than_twice_as_likely_to_be_slapped_with_an_eviction_notice

⁸ Yorkshire and Humber, Greater London, East Midlands, North East, West Midlands, and South Wales

could benefit from the successes and lessons learned from those involved in proactive enforcement.

Interestingly, 9% of survey respondents reported that they were unsure if their council enforced regulations, which provides insights on the levels of awareness of within councils regarding MEES and EPC enforcement and who is responsible. This was because they either did not know, were new to the team, or believed it was the responsibility of a different department. The latter insight suggested that some officers believed it was the responsibility of Trading Standards and others that of Environmental Health officers. The Department for Energy Security and Net Zero (DESNZ) does not specify which department within a council is responsible for enforcing MEES regulation, stating only that, "The MEES Regulations are enforced by local authorities, who have a range of powers to check and ensure compliance."⁹ Given the ambiguity of the communication from the government over which departments are

responsible for enforcement, it is understandable that LAOs reflect this uncertainty.

Therefore, local authorities could benefit from clear guidance from the government on which department is responsible in addition to training (either in their induction or during their post) on their council's enforcement approach. If MEES and EPC regulation training were included in a LAO's regular training induction, it could improve the enforcement level within that council and lead to more proactive enforcement.

Finally, 25% of survey respondents from 25 councils across 11 regions¹⁰ reported that their council did not enforce MEES or EPC regulations¹¹. According to government legislation¹², local authorities are required to enforce MEES regulations, however lack of funding limits their ability to do so. Little reasoning was given over the lack of enforcement, with only a few expressing that they will make this a priority shortly.

⁹ Domestic private rented property: minimum energy efficiency standard - landlord guidance, 2023, *Department for Energy Security and Net Zero* [Online] Available at: [Domestic private rented property: minimum energy efficiency standard - landlord guidance - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/publications/domestic-private-rented-property-minimum-energy-efficiency-standard-landlord-guidance)

¹⁰ South Wales, Greater London, South West, East Anglia, West Midlands, South East, North Wales, North East, East Wales, West Wales, and East Midlands

¹¹ It is important to note that there were 11 cases where a LAO reported that their council did not

enforce MEES or EPC regulations, however another LAO from the same council reported that their council proactively enforced regulations. This indicates a clear lack of communication within councils regarding their level of enforcement.

¹² The Energy Efficiency (Private Rented Property) (England and Wales) Regulations 2015, *The National Archives* [Online] Available at: [The Energy Efficiency \(Private Rented Property\) \(England and Wales\) Regulations 2015 \(legislation.gov.uk\)](https://www.legislation.gov.uk/2015/1030/the-energy-efficiency-private-rented-property-england-and-wales-regulations-2015/contents.html)

Regional distribution

We noted regional differences across those who responded to our pre-workshop survey, 204 of the 207 respondents gave the name of the council they represented. Of the 204, there were 74 different councils¹³. Of these responses, we observed varying levels of engagement across different regions, with the highest response rate recorded in Greater London (51 respondents) followed by North Wales (27 respondents). Other regions such as West Midlands (20 respondents), Southwest (20 respondents) and West Wales (17 respondents) also had notable participation. The North of England was the lowest represented with Yorkshire and the Humber (9), North West (8), North East (6). Nonetheless, given the limitations of the dataset's size, it is important to approach any potential geographical implications with caution and further research may be needed to establish any significant patterns.

PRS characteristics

The survey asked respondents to describe the PRS in their area. There were 190 responses to this question. Based on this analysis, the following key themes can be identified:

- **Property Types:** The survey responses mentioned various property types, including terraced houses, flats, HMOs (House in Multiple Occupation), rural properties, listed buildings, conservation areas, traditional builds, semi-detached houses, and detached homes. Older properties, such as those built in the 1920s to 1950s, pre-1919 terraces, and Victorian terraces, were prevalent.
- **Rural and Urban Mix:** The responses stated a mix of urban and rural areas, with rural properties often being off the gas network and solid walls constructed. There were references to rural estate-owned properties and national park conservation areas.
- **Conservation Areas and Listed Buildings:** Some areas had conservation areas and a high concentration of historic/listed buildings. Respondents mentioned the need to preserve and manage these properties within the private rented sector. In rural areas, there were properties such as listed and historic buildings, including some off-grid properties reliant on oil.
- **Energy Efficiency:** Solid brick or stone wall construction was prevalent in many areas, and respondents mentioned that this hinders energy efficiency improvements. Some properties are off the gas network and rely on alternative heating sources such as oil, Liquefied Petroleum Gas (LPG), or solid fuel. The average EPC rating for properties in the area is around band D. However, there is still a significant number of properties with lower ratings (E to G).

LAO knowledge pre- and post-training

Furthermore, our quantitative analysis of LAOs' understanding of MEES regulations, energy efficiency measures, and low-carbon heating solutions demonstrated interesting results. Participants were asked to rate their knowledge on these three areas, both prior to the training and after the training. Responses were rated on a 1 to 5 scale, with 1 being "I understand the basics", and 5 being "I am an

¹³ Please note that respondents referred to local authorities using abbreviations or shortened names. We have grouped as accurately as possible each council and put them under one heading however, variations in the naming format of the local authorities may still exist.

expert". Of the 54 respondents¹⁴ who completed both the pre- and post-workshop survey, there was an observed average knowledge increase across these three focus areas:

- Knowledge of MEES regulations had an average of 2.22 pre-workshop, which increased to 3.50 post-workshop.
- Knowledge of energy efficiency options had an average knowledge of 2.35 pre-workshop and increased to average of 3.74 post-workshop.
- Knowledge of low-carbon heating options had the greatest overall increase in knowledge, with an average of 1.70 pre-workshop and an average of 3.46 post-workshop.

As shown by the data, LAOs tend to have low awareness on MEES regulations, energy efficiency options, and low-carbon heating solutions. Offering training on these three focus areas should be made accessible for all LAOs for them to improve their overall knowledge and optimally support landlords regarding regulations and energy efficiency/low-carbon heating solutions. Furthermore, upskilling their knowledge in these focus areas will also allow them to enforce and advise effectively, should their council begin enforcing.



¹⁴ It is important to note that these findings came from only 54 participants, as our post-workshop survey received low engagement and therefore these findings may not be representative of all LAOs

Recommendations

Government

The government should implement the following recommendations:

- Ensure that MEES can be assigned the necessary resources (funding, time, and training) within the council.
- Provide clarity on which departments are responsible for enforcing MEES within the council.

Local authorities

Local authorities should implement the following recommendations:

- Adequately fund a dedicated team to train to staff enforce MEES with it being their main duty and responsibility.
- Share resources and case studies of best practice approaches towards MEES compliance and enforcement activities by other councils. These include the lessons learned and best practices from the councils undertaking a proactive approach to enforcement, notably:
 - The success of pilot projects,
 - Adequate funding and staffing,
 - Clear roles and responsibilities
- Train and upskill officers during induction for new staff or in post for existing staff to ensure they understand:
 - MEES regulations, legislation, and enforcement within the council
 - Low-carbon heating options, insulation measures, and improvements in energy efficiency.

Landlords

Landlords should implement the following recommendations:

- Landlords need to ensure they are informed on MEES and EPC regulations and that their properties are compliant, as is their legal duty.
- Examine EPC reports to understand how they can improve the energy efficiency of their properties and undertake any suitable measures.
- Understand what grant funding is available to support the necessary retrofit measures.

Contents

1 Executive Summary.....	2
1.1 Introduction	2
1.2 Project Context	2
1.3 The issue	3
1.4 Outputs	4
1.5 Key findings.....	5
Recommendations.....	9
2 Project Context	11
3 Methodology	12
3.1 CPD-accredited training series for local authority officers	12
3.2 Private rented sector landlord online training series.....	15
3.3 Limitations and evidence gaps	16
4 Overall Project Findings.....	18
4.1 Local authority officer training	18
4.2 Pre- and post-workshop survey.....	25
4.3 What are the current issues and gaps?	28
5 Future needs and opportunities.....	31
5.1 Local Authorities	31
5.2 Recommendations.....	32
5.3 Landlords in the domestic private-rented sector	33
6 Conclusion.....	37

2 Project Context

The proposed project aimed to remove barriers to domestic low-carbon heating solutions and MEES enforcement in England and Wales through the engagement and training of local authority enforcement officers and PRS landlords as part of the transition to net zero.

With low levels of awareness around low carbon heating solutions, energy efficiency and the associated regulation, upskilling across both groups will be essential to decarbonising heating. With greater knowledge and understanding of low-carbon heating solutions, local authority officers can support landlords who want to take action to improve their properties and enforce regulations where required. Landlords will be able to begin to understand the pathways that they could take to ensure that their property meets standards, giving them the confidence to invest in their property using quality supply chain actors and enabling access to grant funding and finance.



3 Methodology

3.1 CPD-accredited training series for local authority officers

3.1.1 Recruitment

As we planned to deliver training to 200 local authority officers, we divided the training into 10 online courses, aiming to host circa 18-23 officers in each course. The team scheduled and prepared up to 12 sessions in case some officers could not attend last minute, thus securing 'backup slots'.

The ADE contacted partners, local authority groups, and known associates of the MCS Charitable Trust via email, informing them that we would be conducting CPD-accredited sessions that would provide valuable resources and educational material to LAOs that worked

in departments related to MEES and HHSRS related enforcement and compliance.

Once notified of training sessions in spring of 2023, LAOs were assigned a training day by the ACE-R team according to their preferred time slots and days.

Before assigning a training day to each LAO, ACE-R collected details on a Microsoft Forms pre-workshop survey. LAOs were asked questions about their level of previous experience with MEES, energy efficiency options, and low-carbon heating technologies before the sessions took place. Understanding prior knowledge of LAOs was used in the project to assess evidence of upskilling by comparing it to post-training knowledge in the final survey results. The survey also allowed LAOs to express how their council enforced EPC and MEES regulations, why they were interested in partaking in the training, and what type of knowledge they would be interested in learning during the training.

3.1.2 Training Material

The project team received CPD accreditation for the training courses. The CPD accreditation was an essential factor for LAOs as it legitimised their training, and they would receive an official certificate that they could show to their employer.

To develop the training material, we:

- Undertook desk-based research to determine what MEES are and who delivers them.
- Undertook desk-based research to define energy efficiency in the built environment.
- Engaged with local authority officers to understand their level of understanding on energy efficiency in the private rented sector and their capacity to upskill.
- Engaged with local authority officers to understand what they needed to enforce MEES.

The training agenda was as follows:

Section 1: Policy overview.

- Housing Act 2004:
 - Housing Health and Safety Rating System (HHSRS)
 - House of Multiple Occupation (HMO) Licensing
 - Selective Licensing
- Minimum Energy Efficiency Standard (MEES) Regulations
- Energy Performance Certificate (EPC) Regulations

Section 2: Improving the energy performance of a property: fabric first.

- Heat loss
- Loft and roof insulation
- Cavity wall insulation
- Solid wall insulation
- Floor insulation
- Windows
- Small measures
- Important: Ventilation

Section 3: Improving the energy performance of a property: heat generation.

- Traditional heating systems
- Low carbon heating: heat pumps
- Heat pumps
- Air Source Heat Pumps
- Ground source heat pumps
- Hybrid heat pumps
- Air to Air source heat pumps
- Solar panels – photovoltaics (PV)
- Low carbon heating: heat networks
- Low carbon heating: hydrogen

Section 4: Tools to support you and landlords and demos.

- Energy Performance Certificates: <https://www.gov.uk/find-energy-certificate>
- Energy Performance of Buildings Data: <https://epc.opendatacommunities.org/>
- UK Gov – Help for households: <https://helpforhouseholds.campaign.gov.uk/>
- UK Gov – Simple Energy Advice: <https://www.gov.uk/improve-energy-efficiency>
- Halifax: Home Energy Saving Tool: <https://www.halifax.co.uk/mortgages/help-and-advice/green-living/home-energy-saving-tool.html>

Section 5: Supporting landlords.

- Engagement on policy/regulations and responsibilities
- Information on installers
- Information on grant funding and finance options
- Finance
- Q&A

The project team also developed a bank of valuable resources referred to within the training and other content to which the delegate could refer after the session ended. The content covered MEES, HHSRS, HMO and Selective Licensing, Homes (Fitness for Human Habitation) Act 2018, guidance for local councils, further guidance for landlords and tenants, retaliatory eviction, links on energy efficiency measures, and links to energy advice tools and past research. All this supplementary content was directed aligned to the training provided. It offered LAOs the opportunity to navigate through different content in more detail and receive contextual information regarding the discussion items.

3.1.3 Delivery of Training

The training ran from March to May 2023 to allow flexibility for local authority officers to attend and avoid clashes with annual leave and work commitments. When the initial methodology was set out, there was a suggestion of delivering training programmes for local authority officers on a regional basis. However, due to the overwhelming demand for interest in the scheme, we assigned delegates a session based on their date preferences selected on the survey.

We trained 194 local authority officers over 11 training sessions. The average number of officers booked into each session was 22, and the average attendance per training was 18. At the beginning of the project, 205 local authority officers registered for training, however we trained 194 in total.

3.1.4 Evaluation and further engagement

After delegates had attended the training session, they were sent an email containing:

- The slide deck in PDF format
- The PRS delegate resource pack
- The email address to access the BEIS PRS Toolkit¹⁵
- The recording of the session: Upskilling for low-carbon heating in the private rented sector (vimeo.com)
- The evaluation form: Following the training, LAOs were asked to send in evaluation forms to gain insights on the effectiveness of the training delivered by ACE-R. This information will be used for future sessions to determine the quality of our methodology and procedure for training, as well as areas our team can improve upon.
- A link to the post-workshop survey (see section 3.2)

In the email, we asked delegates to complete the evaluation form to receive their CPD certificate. We then logged their evaluation form and sent them the CPD certificate for proof of attendance.

3.1.5 Analysis of data

Following the training, we began a series of analyses on both the pre-training survey and the post-training survey, as well as collected evidence from landlords.

The pre-training survey involved a series of qualitative and quantitative questions. We assessed the qualitative answers pertaining to the type of PRS in respondents' council areas, as well as how their council enforces MEES regulations. Qualitative responses regarding what participants hoped to get out of the session were also analysed. We also collected data on the region their council came from,

¹⁵ The BEIS PRS Toolkit serves as a guide for LAOs when enforcing MEES regulations. It can be accessed by emailing BEIS and requesting access at PRSRegisterSupport@beis.gov.uk.

however we did not have enough data to properly extrapolate and summarise regional differences to a national level. Therefore, the regional analysis was limited to a total count of respondents by region and a total count of regions and their enforcement type.

While most qualitative answers were clear regarding their enforcement type, responses that were not clear required a secondary review. For example, one local authority officer stated that, “Action is taken in accordance with HHSRS” regarding what type of enforcement their council used. As this was not obvious whether their approach was proactive or reactive, we utilised the response of another member from the same council, which informed us that their enforcement approach was in fact reactive. We undertook this same approach for any other responses that were not straightforward. Responses that could be clearly grouped into a specific enforcement type did not require secondary reviews.

Quantitative answers from the pre-training survey were analysed against the post-training survey to assess a change in knowledge for MEES regulations, low carbon heating solutions, and energy efficiency solutions. On the post-training survey, we also asked participants further qualitative questions that allowed them to reiterate what they had hoped to get out of the session, as well as suggestions for content in future sessions.

Finally, we collected evidence of the barriers faced by landlords. When disseminating the training offered during the webinar for landlords, we received feedback from 200 landlords that the training was useful and informative, however we could not analyse the impact of our training. Therefore, we collected evidence through desk-based research and the ADE's energy efficiency policy knowledge. This informed our recommendations for supporting landlords to and educating them on opportunities for the energy efficiency of their properties.

3.2 Private rented sector landlord online training series

3.2.1 Recruitment

To promote the webinar series to landlords, the National Residential Landlords Association (NRLA) disseminated the training across their network, with a membership base of 100,000. Camden Council were particularly engaged with the training being done to support local authority officers and landlords and invited ACE-R to present a preview of the online modules at the Camden Landlords Forum, where 200 landlords were in attendance. The training was also disseminated across Camden's Landlords network via their newsletter, reaching 6,000 local landlords.

3.2.2 Training material

The ACE Research project team developed guidance on landlords' responsibilities about energy performance standards. We wanted to

highlight the benefits of taking action to improve energy performance standards, such as reduced voids, lower maintenance costs and enhanced asset value. Several property improvement scenarios were included within the guidance, showcasing how properties can be improved and at what cost, along with typical FAQs asked by landlords.

The content was then divided into 6 modules:

- Introduction
- 1. Policy
- 2. Fabric first – retrofit options.
- 3. Low carbon heating options
- 4. Tools
- 5. Funding and finance
- 6. Supporting your tenants

Each module had a slide deck accompanied by a recording of a project team member delivering the training in detail.

3.2.3 Delivery of training

As the training material was produced in the shape of a recording and a slide deck, the project team uploaded the slide deck to an open online drive where landlords could access the link, open the PowerPoint slide deck, and the video would immediately commence. Landlords could move across the training as they saw fit and re-watch any recording if necessary. The link to the online drive was available during the project duration until the time of project reporting (June/July 2023).

3.3 Limitations and evidence gaps

As we engaged landlords through the NRLA and the Camden Landlords Association, we were unable to interact with them directly. Consequently, we could not monitor landlords as closely as we monitored LAOs. Therefore, many of the landlords' insights have been understood from desk-based research rather than primary data collection.

The small sample size of the dataset overall and skew in the dataset limited significant regional analysis. For example, the greatest number of respondents across each enforcement type came from councils within Greater London, and this is shown within our analysis. Greater London had the highest number of councils¹⁶ reporting proactive enforcement (10), reactive enforcement (5), transitioning enforcement (3), no enforcement (8), and uncertainty about enforcement (4). Therefore, we have only calculated the total counts of councils from each region with their reported enforcement type. Furthermore, though this study was advertised nationally, it is a limitation that there

are many more councils across England and Wales than those that registered for the workshop and received training. This limits our ability to generalise the data across regions.

Local authority officers who participated in the training alongside fellow members from their respective councils offered varying responses concerning the nature of enforcement undertaken by their council. As a result, it often needed to be clarified how a council was enforcing MEES and led to data discrepancies.

Our review of how local authority officers enforced MEES regulations within their council also revealed limitations. As the survey invited participants to write in their responses regarding how they enforced MEES regulations, responses were not always clear or straightforward. For example, one local authority officer stated that, "Action is taken in accordance with HHSRS" regarding what type of enforcement their council used. As this was not clear whether their approach was proactive or reactive, we utilised the response of another member from the same council, which informed us that their enforcement approach was in fact reactive.

The pre- and post-survey for local authority officers was self-selecting, therefore, it is likely that respondents are already engaged somewhat in PRS MEES and have a keenness to upskill. Moreover, the survey was also self-reported, therefore respondents may have had a subjective perspective of their own knowledge.

Only 57 out of 207 local authority officers responded to the post-workshop survey, and only 54 completed both the pre- and post-workshop surveys. We can only analyse data

¹⁶ Please note that due to local authority officers from the same councils reporting varying types of

enforcement than their colleagues, this skews the total count.

from these 54 participants, limiting our ability to evaluate the training effectiveness for all 194 attendees. It is important to note that this was a small dataset to analyse, so responses may not be generalisable.

Furthermore, as we did not ask LAOs to rate their confidence working with landlords and enforcing regulations such as MEES before the workshop, we cannot expressly determine if our training affected LAOs' confidence as we do not have the pre-training data to compare; however, LAOs still reported that they were moderately enforcing MEES, with an average of 3.65 ($s = 1.09$, $n = 57$) on a scale of 1 to 5.



4 Overall Project Findings

4.1 Local authority officer training

4.1.1 Pre-training survey

Before the local authority officer attended the training, they completed a survey which addressed their current knowledge on MEES regulations, energy efficiency options, and low-carbon heating options. Delegates were also invited to describe the PRS in their area, how their council has enforced against MEES EPC regulations, and anything they hoped to get out of the session. This survey had 207 responses from 74 different localities.

4.1.1.1 Regional distribution of survey responders

204 of the 207 respondents gave the name of the council they represented. Of the 204, there were 74 different councils¹⁷. See Appendix A for the complete list of councils and the number of survey respondents from each council.

This map of England and Wales (Figure 1), based on the number of respondents to the preliminary survey, provides some insight into the distribution of respondents self-reported knowledge on energy efficiency MEES and low carbon heating solutions prior to attending any training. The numbers show varying levels of engagement across different regions, with the highest response rate recorded in Greater London (51 respondents) followed by North Wales (27 respondents). Other regions such as West Midlands (20 respondents), Southwest

(20 respondents) and West Wales (17 respondents) also had notable participation. The North of England was the lowest represented with Yorkshire and the Humber (9), North West (8), North East (6). Nonetheless, given the limitations of the dataset's size, it is important to approach any potential geographical implications with caution and further research may be needed to establish any significant patterns.

Figure 1 Map of number of Preliminary Survey Responses by Region



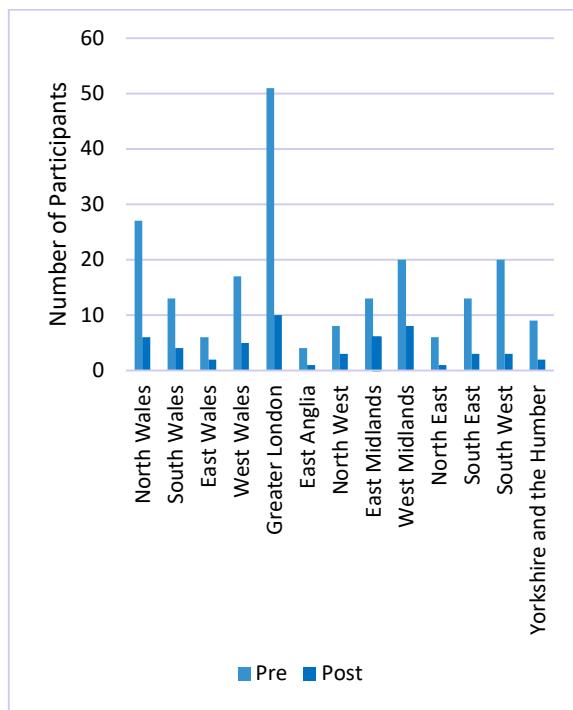
The bar chart (Figure 2) illustrates the number of local authority employees from each region who completed both the pre-survey and the training on MEES. The height of each bar

¹⁷ Please note that respondents referred to local authorities using abbreviations or shortened names. We have grouped as accurately as possible each council and

put them under one heading however, variations in the naming format of the local authorities may still exist.

represents the count of respondents, with the left side indicating the pre-survey figures, and the right side indicating the post-survey. Greater London exhibited the highest level of participation, with 51 employees initially responding to the survey and 10 of them successfully completing the training. Other regions, including North Wales, West Midlands, and West Wales, also demonstrated notable engagement. However, it is important to note that the dataset is relatively small, making it challenging to draw definitive conclusions about the relationship between region and training completion.

Figure 2 Number of Pre- and Post-Survey Respondents by Region



4.1.1.2 Characteristics of survey respondents'

PRS

The survey asked respondents to describe the PRS in their area. There were 190 responses to this question. Based on this analysis, the following key themes can be identified:

Property Types: The survey responses mentioned various property types, including terraced houses, flats, HMOs, rural properties,

listed buildings, conservation areas, traditional builds, semi-detached houses, and detached homes. Older properties, such as those built in the 1920s to 1950s, pre-1919 terraces, and Victorian terraces, were prevalent.

Rural and Urban Mix: The responses stated a mix of urban and rural areas, with rural properties often being off the gas network and solid walls constructed. There were references to rural estate-owned properties and national park conservation areas.

Conservation Areas and Listed Buildings: Some areas had conservation areas and a high concentration of historic/listed buildings. Respondents mentioned the need to preserve and manage these properties within the private rented sector. In rural areas, there were properties such as listed and historic buildings, including some off-grid properties reliant on oil.

Energy Efficiency: Solid brick or stone wall construction was prevalent in many areas, and respondents mentioned that this hinders energy efficiency improvements. Some properties are off the gas network and rely on alternative heating sources such as oil, Liquefied Petroleum Gas (LPG), or solid fuel. The average EPC rating for properties in the area is around band D. However, there is still a significant number of properties with lower ratings (E to G).

4.1.2 Levels of MEES and EPC Enforcement

Out of 207 survey responses to the pre-workshop survey, there were 178 responses to question "Please can you tell us if your council has enforced against Minimum Energy Efficiency Standards (MEES) or Energy Performance Certificate (EPC) regulations?". With this data, we conducted an analysis of the different enforcement types across councils. Enforcement types were grouped into the following categories: Proactive, reactive, transitioning, no enforcement, and uncertain

about enforcement. LAOs from 69 councils across 13 regions responded to this question.

It is also important to note that many councils had differing responses regarding their type of MEES or EPC regulations enforcement. Of the 69 councils, 33 had multiple members providing different answers on their council's enforcement type. This demonstrates that there is a lack of internal communication and awareness within councils of MEES and EPC regulation and their enforcement. There was also confusion within councils whose responsibility was to enforce MEES, with some suggesting it was Environmental Health Officers and others suggesting it was Trading Standards. Given that the responsibility lies with local authorities to enforce MEES and EPC regulations, there is a clear need to improve internal communication on the approach to enforcement and which department is responsible.

The survey found that 39% of surveyed respondents reported proactive MEES or EPC regulations enforcement; 21% of survey respondents reported reactive enforcement; 6% of survey respondents reported that they were in the process of starting to enforce; 9% of survey respondents reported that they were unsure and 25% of survey respondents reported that their council did not enforce MEES or EPC regulations.

The key themes from the survey responses regarding MEES enforcement are as follows.

4.1.2.1 Proactive approaches

39% of surveyed respondents reported proactive MEES or EPC regulations

enforcement. This is made up of 70 LAOs from 41 councils across 11 regions¹⁸. Greater London had the highest representative of councils (10) reporting proactive enforcement of MEES and EPCs closely followed by the South West at (7) with the North West and East Anglia at the lowest with only 1 council from each region reporting proactive enforcement.

When asked to expand on their proactive enforcement process, there were two key approaches¹⁹.

13 councils reported a similar approach consisting of seeking out non-compliant properties which were of an F and G rating, engaging these landlords and making them aware they are non-compliant. They offered advice to help the landlord rectify the issue and improve the property's energy efficiency to become compliant. Two councils noted that this was usually sufficient for the landlord to take action. However, those landlords who did not take action faced enforcement action in the form of a fine. Notably, three councils within this group incorporated responses to complaints, offered grant funding to the landlord or worked with schemes such as the Cold Homes Schemes to identify F and G rated properties as part of their approach.

Greater London (5), the East Midlands (2), and West Midlands (2) were prominent adopters of this strategy, suggesting a strong emphasis on this approach in different regions. Given that the English Housing Survey 2020 data estimates that 18.2% of privately rented English dwellings are in London, understandably, the greatest level of enforcement would also reside here²⁰.

¹⁸ East Anglia, East Midlands, Greater London, North Wales, North West, South East, South West, South Wales and Yorkshire and the Humber

¹⁹ 28 out of 41 councils expanded on their approach.

²⁰<https://www.ons.gov.uk/peoplepopulationandcommunity/housing/articles/changesinprivaterentalsectorbehaviourengland/february2022tofebruary2023#london-by-property-type-analysis>

6 councils across six regions²¹ noted a similar initial proactive approach (seeking out non-compliant properties, engaging the landlord and making them aware) but enforcement action still needs to be taken. Reasons for lack of enforcement action were cited as the previous stages being enough for the landlord to rectify the non-compliance and, therefore, enforcement was not necessary (2), they were under-resourced (2), they had not reached that part of the process (1), or they needed further training to understand who in the council was responsible for enforcing (1). There was no correlation between regions that undertook this approach.

Others (5) explained their approach to identifying non-compliant properties citing door-to-door knocking and inspections, sending out surveys to tenants, or through licensing schemes such as HMOs or selective licensing.

Out of 41 councils, 5 gave reasons as to why proactive enforcement had been possible, citing effective pilot projects that had run for an average six months had been effective in kickstarting the process and now the practice had become business as usual (3), or they had received funding for dedicated staff (ranging from a “small team” to 0.5 FTE staff) (2).

Overall, a key reason for councils' ability to undertake proactive enforcement was the successful use of funded pilot projects within the council. This enabled staff to be given dedicated resources (time, full-time staff, and allocated funding) to start identifying non-compliant properties, begin engaging landlords,

and subsequently issue fines to those who had not rectified the breach in regulation. Once such pilot projects had ended, the practice was integrated into business as usual.

4.1.2.2 Reactive approaches

21% of survey respondents reported reactive enforcement methods within their councils. This includes 37 LAOs from 24 councils across 11 regions²². Greater London (5) and North Wales (5) both had the highest proportion of councils indicating retroactive enforcement of MEES and EPCs, followed by South East (3) and South West (3). East Anglia, North West, East Midlands, North East, Yorkshire and Humber, and South Wales all had the lowest number of councils reporting reactive enforcement, with only 1 council from each region.

Councils have varied methods for reactive enforcement. Of the 15 respondents that provided detailed answers into their reactive strategy, we found that councils tend to only enforce in response to complaints (7), enforce when they become aware of properties with non-compliant EPCs (5), act in accordance with HHSRS (2), or act in an advisory capacity (1). This demonstrates the reliance on tenants to be aware of the EPC of the property they are renting, MEES regulations, and if the property is non-compliant. Tenants must then feel empowered to report it. Research conducted by Shelter demonstrates that a quarter of private renters (25%) have yet to ask their landlord for repairs to be carried out or conditions improved for fear of being evicted²³. Therefore, reliance on complaints is not an

²¹ Greater London, West Midlands, West Wales, South East, South West, North West

²² South West, West Wales, East Anglia, North West, North Wales, East Midlands, North East, South East, Yorkshire and Humber, Greater London, and South Wales

²³https://england.shelter.org.uk/media/press_release/private_renters_who_complain_about_disrepair_more_than_twice_as_likely_to_be_slapped_with_an_eviction_notice

effective way of identifying non-compliance in a council locality and could be significantly overlooking the scale of the problem.

Few councils gave a reason for taking a reactive approach (2) but those that did cited a need for more financial resources, specifically within the Trading Standards team. This was due to the investigation cost and resource issues. It was determined that it was not in their public interest to enforce, and that non-compliance should be handled informally. However, given that this further information came from one of the two respondents, conclusions cannot be deduced, and further evidence is needed.

Interestingly, the survey demonstrated that some councils had been proactive in their enforcement but now undertook a reactive approach. Seven councils across four regions²⁴ reported that they had previously engaged in proactive enforcement but were now reactive. Of the 6 councils that provided detailed feedback, lack of funding (4) appeared to be the most common reason for reverting back to reactive enforcement, followed by inadequate staffing (1) and other work commitments (1). This indicates that councils can enforce regulations proactively if they can access adequate funding alongside staff and capacity.

4.1.2.3 Transitioning

6% of survey respondents reported that they were in the process of enforcing MEES or EPC regulations. This includes 11 LAOs from eight councils across 6 regions²⁵. It was important to analyse the councils' responses in enforcing regulations that had yet to be enforced as it provided insights into their strategy for

enforcement and how they could transition into proactive enforcement.

Regionally, Greater London had the highest number of councils in the process of enforcing MEES and EPC regulations (3). Regions with the lowest number of councils transitioning to enforcement included Yorkshire and Humber, North East, East Midlands, West Midlands, and South Wales, with only 1 council per region.

Within the 8 councils that provided further detail, 3 councils indicated that their strategy involved using data resources to enforce properties. This included using EPC data sources from Rent Smart Wales (RSW), selecting a sample of over 100 properties with Band F and G to enforce MEES and EPC regulations, and creating a proactive desktop survey to take further action. Examining the data sources a council can use to identify non-compliance and enforce regulations is important as councils often have limited resources, and data sources can provide large amounts of information very quickly and often for free (for example, the Department for Levelling Up, Housing and Communities provides a free EPC data resource across England and Wales²⁶).

Detail on councils' future plans for enforcement was limited with only 2 councils providing a description. The approach was consistent to that described by most councils who were proactively enforcing MEES (seeking out non-compliant properties, engaging the landlord and making them aware, and then enforcing if no action is taken). Another council noted that they were in the process of developing an

²⁴ South West, East Midlands, South East, and West Wales

²⁵ Yorkshire and Humber, Greater London, East Midlands, North East, West Midlands, and South Wales

²⁶ Energy Performance of Buildings Data: England and Wales, Department for Levelling Up, Housing and Communities [Online] Available at: [Energy Performance of Buildings Data England and Wales \(opendatacommunities.org\)](https://opendatacommunities.org/)

enforcement team which they had been able to do with dedicated funding for MEES enforcement. Understanding the details of a council's action plan for enforcement is important as it can serve as a best practice example for other councils to implement.

4.1.2.4 No enforcement

According to government legislation²⁷, local authorities are required to enforce MEES regulations, however lack of funding limits their ability to do so. 25% of survey respondents reported that their council did not enforce MEES or EPC regulations²⁸. This includes 44 LAOs from 25 councils across 11 regions²⁹. Regionally, Greater London had the highest number of councils who reported they did not enforce MEES or EPC regulations (8). South Wales (3) and South West (3) followed closely behind. East Anglia, North East, East Wales, West Wales, and East Midlands all had the lowest proportion of councils that reported no enforcement, with only 1 council per region.

Most responses simply indicated that they did not enforce (21). Of those that provided some detail (4), we found that 3 councils reported an interest in enforcing these regulations in the future. A council from the West Midlands stated that it was a priority to begin enforcing MEES and EPC regulations for the next financial year, and another council from the East Midlands responded that they were keen to begin enforcing but had yet to enforce them. A Greater London Council indicated that it was an

area that needed further and better consideration. This shows that councils have the drive to begin enforcing even if they currently have no level of enforcement. 1 council reported that though they did not currently enforce, they were beginning to receive tenant enquiries. This was a trend reflected with councils enforcing reactively, wherein responding to tenant complaints was the most common way reactive councils handled enforcement. Therefore, examining the variables that push councils to begin enforcing could be worthwhile.

4.1.2.5 Uncertain about enforcement

Interestingly, 9% of survey respondents reported that they were unsure if their council enforced regulations, which provides insights on the levels of awareness of within councils regarding MEES and EPC enforcement and who is responsible. 16 respondents from 14 different councils, across eight regions³⁰, were either uncertain about their council's enforcement of MEES and EPC regulations (8), new to the team (5), or were from a different department that did not have oversight of regulation enforcement (3). Greater London had the highest proportion of councils who were uncertain (4), followed by North Wales (3). South West, West Wales, South East, East Wales, and South Wales all had the lowest proportion of councils that were uncertain, with only 1 council per region.

²⁷ The Energy Efficiency (Private Rented Property) (England and Wales) Regulations 2015, *The National Archives* [Online] Available at: [The Energy Efficiency \(Private Rented Property\) \(England and Wales\) Regulations 2015 \(legislation.gov.uk\)](http://www.legislation.gov.uk)

²⁸ It is important to note that there were 11 cases where a LAO reported that their council did not enforce MEES or EPC regulations, however another LAO from the same council reported that their council proactively enforced

regulations. This indicates a clear lack of communication within councils regarding their level of enforcement.

²⁹ South Wales, Greater London, South West, East Anglia, West Midlands, South East, North Wales, North East, East Wales, West Wales, and East Midlands

³⁰ South West, West Wales, West Midlands, North Wales, Greater London, South East, East Wales, and South Wales

Furthermore, there were different responses regarding which department was responsible for MEES and EPC enforcement (3). For example, one LAO from a council in the South West stated that they were an Environmental Health Officer and the responsibility sat with Trading Standards. However, a different respondent from a council in East Wales stated that the Environmental Health Officers handled MEES and EPC regulations in their council. DESNZ does not specify which department within a council is responsible for enforcing MEES regulation, stating only that, "The MEES Regulations are enforced by local authorities, who have a range of powers to check and ensure compliance."³¹ Given the ambiguity of the communication from the government over which departments are responsible for enforcement, it is understandable that LAOs reflects this uncertainty.

LAOs who were uncertain about whether their council enforces MEES and EPC regulation could benefit from training (either in their induction or during their post) as to their council's approach to enforcement and which department's responsibility it is. If MEES and EPC regulation training were included as part of a LAO's regular training induction, it could improve the enforcement level within that council and lead to more proactive enforcement.

4.1.3 Knowledge pre-workshop

We asked delegates to complete a survey before the training to describe the PRS in their area and identify any specific knowledge they hoped to receive from the training. This survey also assessed their current knowledge of regulations, energy efficiency options, and low-

carbon heating options. 207 delegates responded to this survey and provided key insights into these 3 questions:

1. How would you score your knowledge of MEES regulations? ($\bar{x} = 2.14$, $s = 1.08$, $n = 207$)³²
2. How would you score your knowledge of energy efficiency options? ($\bar{x} = 2.24$, $s = 1.03$, $n = 207$)
3. How would you score your knowledge of low-carbon heating options? ($\bar{x} = 1.71$, $s = 0.92$, $n = 207$)

Respondents were asked to rate their current knowledge on a scale of 1 to 5. The representation of 1 and 5 differed by question. For the first question regarding MEES regulations, 1 represented "I understand the basics", and 5 defined "I know the regulations inside and out".

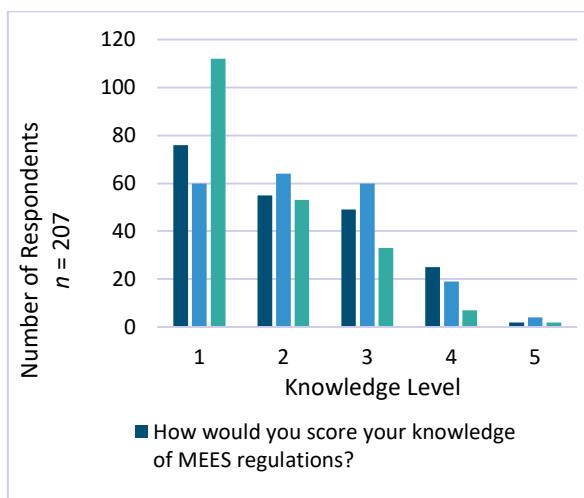
The first and second questions regarding energy efficiency options and low-carbon heating options were also rated on a 1 to 5 scale, with 1 being "I understand the basics", and 5 being "I am an expert" for both questions.

³¹ Domestic private rented property: minimum energy efficiency standard - landlord guidance, 2023, *Department for Energy Security and Net Zero* [Online] Available at: [Domestic private rented property:](https://www.gov.uk/government/publications/domestic-private-rented-property-minimum-energy-efficiency-standard-landlord-guidance)

[minimum energy efficiency standard - landlord guidance - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/publications/domestic-private-rented-property-minimum-energy-efficiency-standard-landlord-guidance)

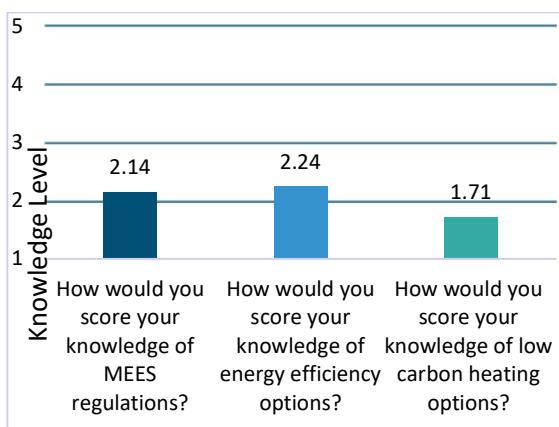
³² \bar{x} = mean, s = standard deviation, n = sample size

Figure 3 Pre-Workshop Score Count per Research Question



As shown in Figure 3, scores for delegates' knowledge level of MEES regulations, energy efficiency options, and low-carbon heating options before the workshop were relatively low. Out of the 207 delegates who responded to this survey, few participants rated their knowledge across the three focus areas as a 4 or 5, with the majority knowing very little about these topics prior to the workshop. This lack of knowledge was especially pronounced with low-carbon heating options, wherein most delegates rated their knowledge as a 1.

Figure 4 Average Knowledge Pre-Workshop per Research Question



Average knowledge of each research question before the workshop was also analysed.

Knowledge on MEES and energy efficiency options were similar and low for the 207 delegates, with delegates on average having the least amount of knowledge for low-carbon heating options.

4.2 Pre- and post-workshop survey

Following the training, delegates were also asked to complete a post-training survey to assess how their knowledge had changed. 57 delegates completed the post-training survey; however, only 54 delegates completed both the pre- and post-survey. Therefore, the data from the 54 respondents who completed pre- and post-survey are analysed below. Delegates were asked the following questions:

- How would you score your knowledge of MEES regulations post-training? ($\bar{x} = 3.50$, $s = 0.88$, $n = 54$)
- How would you score your knowledge of energy efficiency options post-training? ($\bar{x} = 3.74$, $s = 0.83$, $n = 54$)
- How would you score your knowledge of low-carbon heating options post-training? ($\bar{x} = 3.46$, $s = 0.97$, $n = 54$)
- How would you score your confidence working with landlords and enforcing

regulations such as MEES post-training? ($\bar{x} = 3.65$, $s = 1.09$, $n = 57$)³³

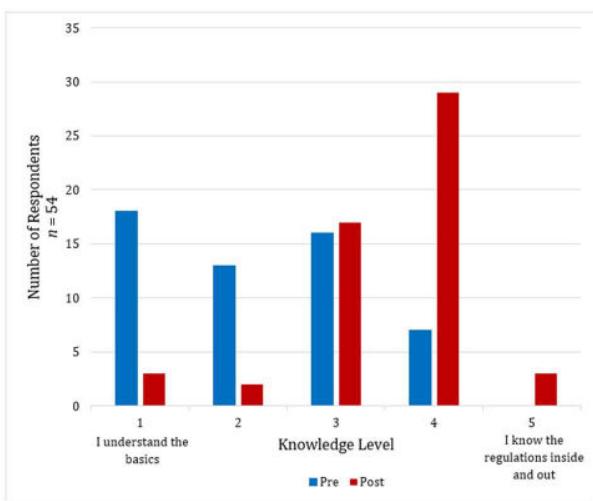
Similar to the pre-workshop survey, respondents were asked to rate their knowledge on a scale of 1 to 5 post-workshop. The representation of 1 and 5 differed by question.

For the first question regarding MEES regulations, 1 represented “I understand the basics”, and 5 represented “I know the regulations inside and out”.

The first and second questions regarding energy efficiency options and low-carbon heating options were rated on a 1 to 5 scale, with 1 being “I understand the basics” and 5 being “I am an expert” for both questions.

The final question regarding confidence in working with landlords was also rated on a scale of 1 to 5, with 1 being “I am not confident” and 5 being “I am extremely confident”.

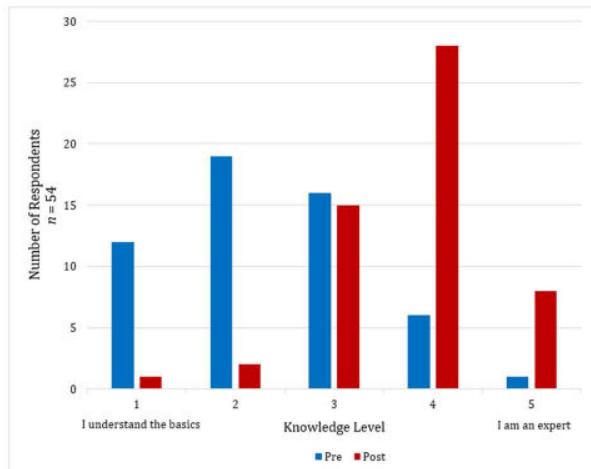
Figure 5 Pre- and Post-Workshop Score Count: “How would you score your knowledge of MEES regulations?”



³³ As this was not asked in the pre-survey, the data from all 57 post-survey respondents were analysed for this question.

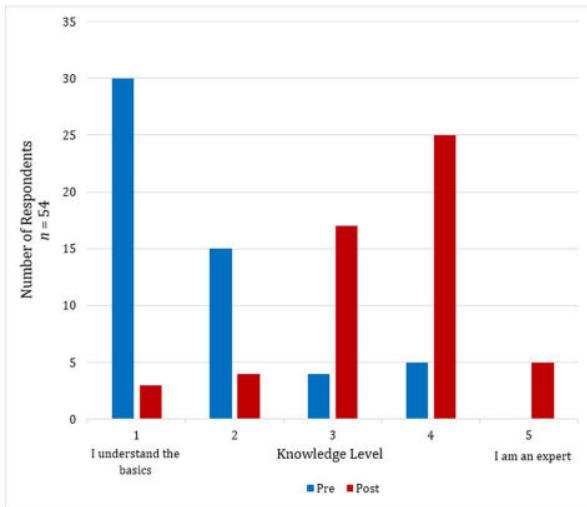
As shown in Figure 5, scores were compared between the pre- and post-workshop surveys. As only 54 respondents completed both the pre- and post-workshop survey, only their responses were analysed. This topic area saw moderate improvement, as the majority of delegates reported low knowledge prior to the workshop. Following the workshop, there was a noticeable increase in delegates reporting 4's and 5's for their knowledge on MEES regulations, with few delegates reporting 1 or 2.

Figure 6 Pre- and Post-Workshop Score Count: “How would you score your knowledge of energy efficiency options?”



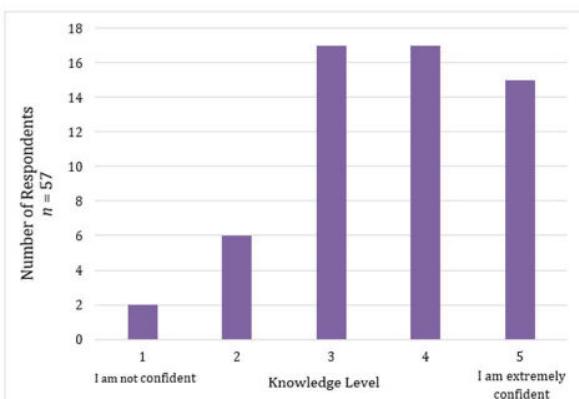
Next, we analysed the difference in knowledge level for energy efficiency options. This focus area also saw a noticeable increase. Prior to the workshop, many LAOs scored their knowledge as 1 or 2 for energy efficiency options. After the workshop, there was an increase in those reporting 4's and 5's. The training therefore improved knowledge of energy efficiency solutions for local authority officers.

Figure 7 Pre- and Post-Workshop Score Count: “How would you score your knowledge of low carbon heating options?”



The last focus area compared pre- and post-workshop was delegates knowledge on low-carbon heating options (Figure 7). This question had the greatest increase in knowledge between the pre- and post-workshop. The majority of LAOs rated their knowledge as 1 or 2 prior to the workshop, with many of them rating it as a 4 afterwards. Given the high increase in knowledge, this focus area had the greatest improvement for LAOs’ understanding of low-carbon heating options.

Figure 8 Post-Workshop Score Count: “How would you score your confidence working with landlords and enforcing regulations such as MEES post-training?”



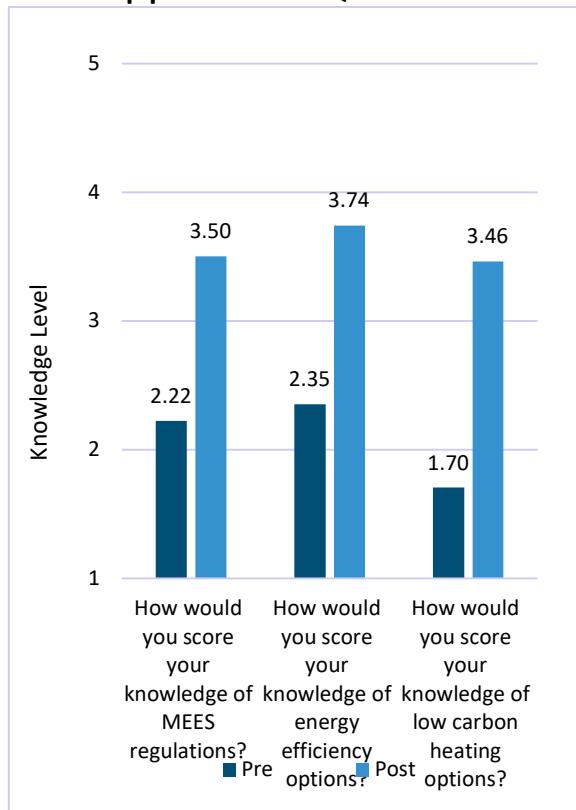
The last question on the post-workshop survey asked local authorities to rate their confidence in working with landlords and enforcing regulations such as MEES post-training. The data from 57 delegates who responded to this survey are considered here, as this question was not asked in the pre-survey. Similarly, as this question was not asked in the pre-survey, we are still determining if our training increased confidence when working with landlords and enforcing regulations such as MEES. The average confidence level was 3.65 ($s = 1.09$, $n = 57$). Therefore, delegates reported moderate levels of expected confidence when working with landlords.

4.2.1 Analysis

There was an observed average knowledge increase across the three focus areas (**Error! Reference source not found.**). Average knowledge is shown for both the pre-workshop and post-workshop of the 54 participants who completed both the pre-and post-workshop survey. Knowledge of MEES regulations had an average of 2.22 pre-workshop, which increased to 3.50 post-workshop. A similar increase was observed for energy efficiency options, which had an average knowledge of 2.35 pre-workshop and an average of 3.74 post-workshop. Knowledge of low-carbon heating options had the greatest overall increase in knowledge, with an average of 1.70 pre-workshop and an average of 3.46 post-workshop. Combining all three focus areas, the average was 2.09 pre-workshop ($s = 1.04$, $n = 54$) and increased to 3.57 post-workshop ($s = 0.90$, $n = 54$).

Overall, the average knowledge of MEES regulations and energy efficiency options increased by +1 following training, respectively. The focus area that saw the greatest increase in average knowledge was low-carbon heating options, with an overall average increase of +2.

Figure 9 Average Knowledge Pre- and Post-Workshop per Research Question



How would you score your knowledge of MEES regulations post-training?

Average knowledge on MEES regulation increased by +1 following training. One person reported a decrease of -2, three noted a decrease of -1, 11 respondents reported no change, 13 reported +1, 17 reported +2, and nine reported an increase of +3.

How would you score your knowledge of energy efficiency options post-training?

Similarly, average knowledge on energy efficiency options increased by +1 overall following training. Three respondents reported a decrease of -1, six said no change, 21 reported

an increase of +1, 16 reported +2, 7 reported +3. One reported an increase of +4 in their knowledge of energy efficiency options after training.

How would you score your knowledge of low-carbon heating options post-training?

The focus area that saw the greatest average knowledge increase was low-carbon heating options, which reported an average overall increase of +2 for delegates. One respondent reported a decrease of -1, nine reported no change, 10 reported an increase of +1, 17 reported +2, 15 reported +3, and two reported a rise of +4 in their knowledge of low-carbon heating options after training.

Based on the overall average knowledge increase for the three focus areas, we can confirm that the training had a meaningful impact on delegates' understanding of MEES regulations, energy efficiency options, and low-carbon heating options. Low-carbon heating options showed the greatest improvement, with an average knowledge increase of +2 for local authority officers³⁴.

4.3 What are the current issues and gaps?

Based on the feedback received from 194 attendees of the local authority training workshops, the pre-and post-training responses, and desk-based research, we have created a comprehensive list of the crucial issues facing PRS MEES.

There are a range of barriers to retrofit delivery in the PRS. This includes low awareness from landlords and LAOs regarding MEES and EPC

³⁴ Some delegates reported a decrease in the overall knowledge in the post-survey. To understand why would require further follow up with delegates.

regulation enforcement, and low understanding of energy efficiency and low-carbon heating solutions. There is also an overall lack of enforcement of MEES and EPC regulations and a lack of resourcing and political will from enforcement authorities. We also identified differences in proactive and reactive enforcement.

4.3.1 Lack of awareness over MEES and EPC regulations and their enforcement

There needs to be more awareness about low-carbon heating solutions, retrofit, MEES and EPCs and their enforcement from landlords and LAOs.

While our pre-workshop survey quantitatively revealed that the average knowledge of MEES regulations was low, the qualitative responses from the survey further indicated a lack of awareness over MEES and EPC regulations. 16 survey respondents noted they were unsure whether their council was enforcing MEES and EPC regulations. 9 respondents elaborated on this answer. The majority stated that they were unsure due to having recently joined the council (5) or felt that the role they worked in needed to be more responsible for enforcing regulations (3). It is also interesting to note that different departments across councils were responsible for enforcement. This difference in who is responsible for enforcing MEES further contributes to ambiguity and confusion surrounding enforcement. Furthermore, we noted that several members from 33 out of the 69 surveyed councils reported different types of MEES enforcement. For example, the survey showed that Isle of Anglesey County Council (Cyngor Sir Ynys Môn) had 3 LAOs attend the training. Of these 3 LAOs, 1 respondent stated that their approach was proactive, 1 respondent stated that their approach was reactive, and 1 respondent stated that they did not enforce. This demonstrates an internal lack of awareness regarding MEES enforcement and who is responsible for enforcement. Therefore,

despite the training conducted by ACE-R, more training is needed across a broader range of councils (not just for self-selecting officers) to ensure that officers are aware of their responsibility in enforcing regulation and the steps that can be taken to identify non-compliance and enforce against it.

During the workshops, delegates from the local authority observed that landlords often need more awareness of their obligations. This makes it challenging for LAOs to support landlords who wish to enhance their properties and enforce regulations when required. Unless a tenant complains about the absence of an EPC, an EPC rating that falls below the minimum threshold, or significant disrepair, the matter will unlikely be brought to the local authority's attention. Participants in the training session stated that tenants are often afraid to report regulation breaches due to fear of eviction or rental price increases.

4.3.2 Low understanding of energy efficiency measures and low-carbon heating solutions

In addition to a lack of awareness regarding MEES regulations within councils, there was also a low understanding of energy efficiency measures and low-carbon heating solutions. Based on the pre-workshop survey, awareness of low-carbon heating solutions and energy efficiency was very low amongst LAOs prior to training. Our training increased knowledge across both areas, indicating that with adequate training, LAOs can improve their understanding of energy efficiency measures and low-carbon heating solutions. Upskilling LAOs and landlords in these areas is of the utmost importance, as an LAO's knowledge can assist in advising landlords on measures to take to improve a property's EPC rating and provide the most optimal outcome for adhering to MEES regulations.

4.3.3 Lack of regulatory drivers and enforcement

Activity to improve the energy performance of homes in the PRS through MEES regulations has been marred by introducing a relatively low-cost cap, the plethora of exemptions available to landlords, and a need for more resources and political will to enforce the regulations by local government proactively³⁵. While national policies can support action, further long-term interventions to drive demand and support delivery are required.

In addition, there needs to be more enforcement of MEES regulations. Based on our survey, 25% of councils are not enforcing at all. The Mayor of London's response to the Department for Business, Energy and Industrial Strategy's 2019 consultation on the MEES regulations confirms that no MEES penalties had been imposed in London due to insufficient resources and prioritisation of energy issues³⁶. This was echoed by some LAOs who attended the training sessions and responded to the survey, which reported that they were yet to enforce a single MEES violation in their constituency. Reasons cited include lack of funding, inadequate staffing, resource constraints, and challenges engaging residents or landlords.

4.3.4 Lack of funding and pilot projects

Funding plays a significant role in a council's capability to enforce proactively. The key reason for councils' ability to undertake proactive enforcement was the success of the funded pilot projects within the council. This enabled staff to be given dedicated resources

(time, full-time staff, and allocated funding) to be able to start identifying non-compliant properties, begin engaging landlords, and subsequently issue fines to those who had not rectified the breach in regulation. This demonstrates a relationship between funded pilot projects and proactive enforcement.

As further evidence towards this, a key reason given for taking a reactive approach was the need for funding and, thus, the need for more dedicated resources. Moreover, 6 councils reported that they previously enforced proactively as part of a funded project but adopted reactive strategies once the funding ended. Those who had the funding sought out non-compliant properties and took appropriate action. Still, those who needed more funding in the reactive category tended to rely on complaints from tenants to identify non-compliance.

This demonstrates the importance of funded projects and the role it can play in adequate enforcement, and in cases where it is inadequate the approach to enforcement is affected.

³⁵ ACE-R (2019) The Warm Arm of the Law: <https://www.theade.co.uk/assets/docs/resources/Ebico-Policy-Report.pdf>

³⁶ RICS (2023) Why MEES are not enforced – and how they can be:

<https://ww3.rics.org/uk/en/journals/property-journal/mees-enforcement-penalties.html#:~:text=This%20is%20apparent%20from%20the,lack%20of%20prioritisation%20of%20energy>

5 Future needs and opportunities

5.1 Local Authorities

The key themes that emerge from the research are:

Financial support for councils: Resources are limited within the councils, which will likely stay the same. The role of the third sector in supporting councils with MEES compliance and enforcement activities is, therefore, paramount and must be addressed. Based on the survey, 21% of surveyed LAOs are enforcing reactively, with 25% not enforcing at all. Lack of funding and resources was found to be the most common reason why LAOs were unable to enforce proactively. Local authorities need funding to employ full time trained staff who are responsible for enforcing MEES. Additional resources are needed to support online and face-to-face activities with tenants and landlords, including house visits and community outreach events. Funding will also be needed for access to housing and energy data, like the CROHM software from Parity Projects, to aid the targeting of properties. Whilst the DLUHC EPC register is valid, coverage is less extensive. Funding from referrals into grant funding schemes (e.g., lead generation fees) and monies from charging landlords for enforcement cases (which must be ringfenced with council teams) can support activity.

Training and awareness: Many respondents expressed a need to broaden their understanding of various aspects of MEES including regulations, legislation, enforcement, low-carbon heating options, insulation measures, and energy efficiency improvements. The survey found that 9% of respondents were unsure of whether their council enforced MEES or not, and 6% were in

the process of transitioning to MEES enforcement. Furthermore, we identified several instances where LAOs from the same council reported different types of enforcement within their council. Training is therefore necessary to improve LAOs' understanding of MEES and increase awareness of enforcement responsibilities. Several respondents specifically mentioned the importance of understanding the enforcement process, including identifying breaches, taking appropriate action, and gathering evidence. They sought clarity on the protocols and procedures involved in enforcing MEES regulations.

Support for landlords and homeowners: Some respondents highlighted the importance of providing guidance and support to landlords, homeowners, and tenants in improving energy efficiency. They sought information on available funding, schemes, and practical options for upgrading properties. As 39% of surveyed respondents were proactive in their enforcement and are therefore actively involved with landlords, homeowners, and tenants, it is vital that LAOs feel they can adequately support these groups to ensure effective enforcement of MEES regulations.

Interest in low-carbon heating options: Many respondents wanted to learn about alternatives such as heat pumps and hybrid systems, including costs, installation, running expenses, and specific systems or appliances recommended for low-carbon heating. Respondents were interested in understanding calculation tools used by MEES assessors and determining the best combination and order of measures for optimal outcomes. They also wanted to understand the effectiveness and feasibility of these technologies, particularly in hard-to-insulate properties or listed buildings.

Awareness of more comprehensive environmental concerns: A few respondents

expressed interest in learning about broader environmental issues related to energy efficiencies, such as the impact of non-gas heating options on EPCs, renewable energy solutions like photovoltaic roof tiles, hydrogen boilers, and the latest innovations for low-energy products.

These key themes reflect a strong desire to acquire comprehensive knowledge and a practical understanding of MEES regulations,

enforcement processes, low-carbon heating options, and energy efficiency improvements. Respondents are motivated to effectively support landlords, tenants, and homeowners while staying informed about relevant legislation and future developments. Providing necessary financial support and resources to councils specific to MEES regulations and enforcement can allow councils to meet their goals and motivations effectively.

5.2 Recommendations

Based on the findings and feedback provided, here are recommendations to support local authority officers in enforcing MEES.

Resource Allocation and Funding:

1. Advocate for adequate resources and funding from the central government to effectively support MEES compliance and enforcement activities within local authorities. Those who were able to proactively enforce MEES regulations were often able to proactively enforce as part of a funded project. A lack of funding may lead to reactive enforcement, as proactive councils became reactive once funding ended.
2. Allocate dedicated resources for enforcement, data provision, and information sharing among different teams within the council. Based on the survey, LAOs involved in proactive enforcement had dedicated teams and staff members responsible for enforcement. The success of pilot projects also indicated a council's capacity to continue proactive enforcement.
3. Seek funding for access to housing and energy data tools to aid in targeting properties for interventions.
4. Explore funding opportunities from referrals into grant funding schemes and charging landlords for enforcement cases, with the requirement to ringfence these funds for council teams.
5. Consider the role of the third sector in supporting MEES compliance and enforcement activities and ensure funding is available for their involvement.

Knowledge Expansion and Understanding:

1. Build on the work started by ACE-R to provide comprehensive training programs and resources on MEES regulations, legislation, enforcement processes, low-carbon heating options, insulation measures, and energy efficiency improvements.
2. Organise workshops, seminars, and webinars to enhance officers' understanding and keep them updated with the latest developments in the field.
3. Encourage officers to pursue relevant certifications or qualifications to strengthen their expertise.

MEES Enforcement:

1. Develop clear protocols and procedures for identifying breaches, taking appropriate action, and gathering evidence during MEES enforcement. Based on the survey, clear roles and responsibilities played a role in a council's capability to proactively enforce.

2. Establish a benchmark for proactivity by identifying what constitutes proactive MEES enforcement and provide a guide on conducting inspections, issuing notices, and handling non-compliance cases. The most common process for councils engaging in proactive enforcement involved seeking out non-compliant F and G rated properties, engaging the landlord, raising awareness of the infringement, and then issuing fines if no action is taken.
3. Foster collaboration between LAOs and legal teams to ensure effective enforcement.

Low-Carbon Heating Options:

1. Offer specialised training and resources on low-carbon heating technologies like heat pumps and hybrid systems.
2. Provide information on these technologies' effectiveness, feasibility, and installation considerations, particularly for challenging properties like hard-to-insulate buildings or listed structures.
3. Collaborate with industry experts to offer demonstrations or pilot projects showcasing the benefits of low-carbon heating options.

Knowledge of Regulations and Future Developments:

1. 15. Further develop channels for officers to stay up to date with the latest regulations, legislation, and potential changes related to MEES.
2. 16. Share information on future minimum EPC standards, exemptions, and the relevance of EPCs in different scenarios.
3. 17. Facilitate regular communication and knowledge sharing between LAOs and relevant government agencies or industry bodies.

Practical and Technical Knowledge:

1. Develop comprehensive technical guides and resources on energy efficiency measures, including costs, installation processes, and running expenses.
2. Offer training on calculation tools MEES assessors use and provide recommendations on the optimal combination and order of measures for maximum energy efficiency.
3. Collaborate with industry experts and manufacturers to provide information on specific systems or appliances recommended for low-carbon heating.

Awareness of Comprehensive Environmental Concerns:

1. Include broader environmental issues related to energy efficiency in training programs and resources.
2. Provide information on the impact of non-gas heating options on EPC ratings, renewable energy solutions, and the latest innovations for low-energy products.
3. Encourage officers to stay informed about emerging technologies and environmental trends through continuous professional development.

5.3 Landlords in the domestic private-rented sector

The training for landlords comprised pre-recorded modules that could be accessed at any convenient time via a link disseminated to landlords via third-party organisations such as the National Residential Association for Landlords. Therefore, due to the training sessions' online nature and the untargeted engagement with landlords, we could not capture pre- and post-knowledge to measure the impact of the training sessions delivered. However, when disseminating the training offered at a webinar, the

feedback from the 200 landlords in attendance was that the guidance was very useful and informative though the impact cannot be further deduced. As this research piece lacked direct engagement with landlords, the following insights were developed through desk-based research and the ADE's energy efficiency policy knowledge.

In 2020 the government consulted on reform of PRS MEES, but the consultation³⁷ has yet to be published. Organisations such as the Chartered Institute of Environmental Health and consumer groups Warmer this Winter called for a deadline on the publication and to legislate for a new target of all privately rented homes to be EPC Band C by 2028³⁸. The delay in publication is creating risks with the iHowz Landlord Association stating that the delay in the consultation's publication has resulted in widespread uncertainty among landlords in the PRS regarding their obligations. Landlord Associations are calling for a timetable for landlords so they can organise materials and training for fitters and assessors.

Despite the rhetoric that landlords are reluctant to invest in the energy efficiency of their property, 2018 data from the ONS³⁹ on the UK private rented sector shows that the proportion of homes in the PRS in the most efficient EPC bands (A, B and C) has increased from less than 10% (8.2%) to over a quarter (27.4%) in the ten years up to 2017⁴⁰. Whilst in itself inconclusive, this may indicate that progress is being made and with further support, guidance, and regulation for landlords to invest in energy efficiency, further improvements to the EPC rating of the UK's PRS sector could be made.

5.3.1 Recommendations

The following is a list of recommendations that could be used to support the future needs of landlords and help them harness the opportunities for the energy efficiency of their properties.

Engaging Landlords

1. Undertake research to evidence the assertions that retrofit improvements benefit landlords, such as increased rental income to offset rising mortgage rates and improved tenant quality.
2. Conduct targeted outreach campaigns to communicate these benefits to landlords.
3. Highlight case studies and success stories showcasing how energy efficiency measures can increase the asset value of rental properties.

Landlord-Tenant Relationship:

1. Recognise the concerns of landlords regarding increasing costs and regulations.

³⁷ Improving the energy performance of privately rented homes., 2020, *Department for Energy Security and Net Zero and Department for Business, Energy & Industrial Strategy*, HM Government [Online] Available at: [Improving the energy performance of privately rented homes - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/publications/improving-the-energy-performance-of-privately-rented-homes)

³⁸ Chartered Institute of Housing joins calls for the government to tackle poor energy efficiency in the private rented sector., 2023, Chartered Institute of Housing [Online] Available at: [Chartered Institute of Housing joins calls for the government to tackle poor energy efficiency in the private rented sector \(cih.org\)](https://www.cih.org.uk/chartered-institute-of-housing-joins-calls-for-the-government-to-tackle-poor-energy-efficiency-in-the-private-rented-sector)

³⁹ UK private rented sector: 2018., 2019, Office for National Statistics [Online] Available at: [UK private rented sector - Office for National Statistics \(ons.gov.uk\)](https://www.ons.gov.uk/ons/rel/onsdts/uk-private-rented-sector/2018/uk-private-rented-sector-2018)

⁴⁰ Landlords shine brightly... but energy efficiently., 2019, National Residential Landlords Association [Online] Available at: [Landlords shine brightly... but energy efficiently | NRLA](https://www.nrla.org.uk/landlords-shine-brightly-but-energy-efficiently)

2. Foster dialogue and collaboration between landlords, tenants, and local authorities to find mutually beneficial solutions and address the issue of split incentives.
3. Provide information on financial support, grants, and incentives available to landlords for implementing energy efficiency measures.
4. Ensure that tenants are aware of their rights. As the survey indicated that reactive councils were reliant on tenant complaints to enforce MEES in non-compliant properties, it is important that tenants know their rights and take action, without fear of being evicted⁴¹.

Addressing Government Reforms

1. Keep landlords updated on government reforms, such as the Renters Reform Bill, and understand the implications of future publications on the PRS MEES and Lenders consultations.
2. Advocate to Government for a balanced approach that considers the interests of both landlords and tenants in energy efficiency regulations.
3. Highlight the potential for future regulation in the owner-occupier market, demonstrating that the PRS is not unfairly targeted.

Demonstrating Benefits:

1. Conduct research and analysis to quantify the financial benefits of energy efficiency improvements for landlords.
2. Provide evidence showing how retrofitting and improved energy performance can increase rental values and reduce vacancy rates.
3. Collaborate with industry experts and financial institutions to develop financial models and tools demonstrating energy-efficient properties' long-term financial advantages.

Communication and Consultation:

1. Engage landlords in consultations regarding PRS MEES and future regulations for the owner-occupier market.
2. Seek feedback from landlords on their concerns, challenges, and suggestions for improving the implementation of energy efficiency measures.
3. Ensure the consultation process is transparent, accessible, and inclusive of all stakeholders involved.

Industry Collaboration:

1. Foster partnerships with industry associations, landlord organisations, and property management companies to promote energy efficiency in the PRS.
2. Collaborate with these stakeholders to develop educational materials, training programs, and resources specifically tailored for landlords.
3. Encourage industry-led initiatives and certifications highlighting landlords' commitment to energy efficiency and providing recognition for their efforts.

⁴¹

https://england.shelter.org.uk/media/press_release/private_renters_who_complain_about_disrepair_more_than_twice_as_likely_to_be_slapped_with_an_eviction_notice

Financial Support:

1. Advocate for additional financial support from the government to assist landlords in implementing energy efficiency measures.
2. Explore options for grants, low-interest loans, and tax incentives that can alleviate the financial burden on landlords.
3. Provide clear information on available funding schemes and guide landlords through the application process.

Education and Training

1. Develop training programmes and workshops for landlords to increase their understanding of energy efficiency regulations, compliance requirements, and available support.
2. Collaborate with industry experts and energy assessors to deliver practical and technical knowledge on retrofitting options, low-carbon heating systems, and cost-effective energy efficiency measures.

Support for Landlords and Homeowners

1. Create guidance materials and resources to assist landlords, homeowners, and tenants in improving energy efficiency in their properties.
2. Provide information on available funding schemes, grants, and practical options for upgrading properties.
3. Establish dedicated support teams or helplines to address queries and provide personalised assistance.
4. Offer online resources, webinars, and guidance documents that landlords can access at their convenience to enhance their knowledge.

6 Conclusion

The training initiative aimed at educating local authority officers on MEES regulations, energy efficiency options, and low-carbon heating options was carried out from 17 March 2023 to 17 May 2023. Over 11 sessions, 194 local authority officers were successfully trained.

The survey highlighted various key themes related to the PRS, including the prevalence of different property types, the mix of urban and rural areas, the presence of conservation areas and listed buildings, challenges in energy efficiency due to building materials and off-grid properties, the role of licensing schemes, and how councils are enforcing MEES regulations.

Moreover, the survey responses revealed varying MEES and EPC enforcement levels across different localities. Local authorities are responsible for enforcement, however many lack the funds to adequately enforce MEES⁴². While many local authorities adopted both proactive and reactive approaches to enforce MEES regulations, the availability of funding and resources played a crucial role in shaping their enforcement efforts.

The pre-training and post-training surveys conducted among the delegates shed light on the impact of the training sessions on their knowledge and confidence levels. The analysis showed a positive shift in knowledge scores post-training for MEES regulations, energy efficiency options, and low-carbon heating options.

While the training initiative successfully enhanced the knowledge and confidence of the

local authority officers, it is essential to continue to seek ways to improve attendance rates and reach the targeted number of trained officers. Further efforts to secure ongoing funding and support for enforcement projects and proactive approaches are crucial in achieving better compliance with MEES regulations and improving energy efficiency in the PRS.

Overall, the training initiative was valuable for equipping local authority officers with the knowledge and tools to address energy efficiency challenges and effectively enforce MEES regulations. The insights gained from the pre-training survey regarding enforcement practices can aid in tailoring future training sessions to meet the needs of different localities better. With continued efforts and collaboration, the local authorities can make significant strides in improving the energy performance of properties and advancing sustainability in the private rented sector.

The report highlights a range of barriers to retrofit delivery in the PRS. These barriers encompass a lack of awareness of MEES, energy efficiency, and low-carbon heating; inadequate enforcement of MEES and EPC regulations; the prevalence of flats and solid-walled properties; conservation area restrictions; limited supply chain distribution areas; and insufficient resourcing and political will from enforcement authorities.

The need for more awareness among landlords and local authority officers regarding MEES, energy efficiency, and low-carbon heating options is a significant challenge. Training and education initiatives have been shown to improve knowledge in these areas, but there is

⁴² The Energy Efficiency (Private Rented Property) (England and Wales) Regulations 2015, *The National Archives* [Online] Available at: [The Energy Efficiency](https://www.legislation.gov.uk)

[\(Private Rented Property\) \(England and Wales\) Regulations 2015 \(legislation.gov.uk\)](https://www.legislation.gov.uk)

a need for widespread adoption of such programs across all councils. To achieve meaningful progress, it is essential for stakeholders at all levels, including local authorities, landlords, tenants, government agencies, and the private sector, to work together towards a common goal of improving energy efficiency in the PRS. By implementing the suggested recommendations and addressing the barriers identified, the PRS can make significant strides towards a more sustainable and energy-efficient future.