Department for
Energy Security
& Net Zero

Domestic Energy Efficiency Retrofit Supply Chain Final Report

DESNZ Report Number 079/2223

May 2025

Completed by Eunomia Research & Consulting Ltd for the Department for Energy Security and Net Zero prior to the recent general election in the United Kingdom in July 2024.

As such, any references to government policies, commitments, or initiatives may reflect the stance of the previous administration and were accurate at the time of fieldwork and writing.

Contents

Glossary

Terminology	Description
Carbon budget	The Carbon Budget is a government target that restricts the total amount of greenhouse gases that can be emitted over a 5-year period. The UK's 6th carbon budget was released in 2020.
Clean Growth Strategy	Clean growth means continued economic growth whilst reducing greenhouse gas emissions. The UK Government published the Clean Growth Strategy in 2017, which outlined the steps to accelerate the delivery of increased economic growth and decreased emissions.
Energy Efficiency	Energy efficiency is the process of reducing the amount of energy required to provide necessary services, eliminating energy waste by fully utilising the energy expended. In buildings, energy efficiency can be achieved by reducing losses and heating only when necessary.
Energy Performance Contract	A contractual arrangement for the implementation of energy efficiency measures (such as heating, lighting, or ventilation products, amongst others), with payment only required after the delivery of an agreed level of energy efficiency improvement, often measured in energy or financial savings.
Net zero	The UK's target for net zero emissions by 2050 refers to achieving an overall balance between emissions produced and emissions taken out of the atmosphere.
Domestic	All building stock that is used for residential purposes.
Retrofit	Retrofitting a building involves changing its systems or structure after its initial construction and occupation, to improve the building's performance.
Thomson Code	A global industry classification system [otherwise known as the Refinitiv Business Classification] based on the primary economic activity of a business.
Web-harvesting Approach	Applying web data extraction or scraping to extract data from websites, to assess their suitability and relevance to this project.
Installer	Business or individual that physically installs one or more types of energy efficiency measure in domestic properties. For example, insulation, energy efficient lighting, and home energy management systems.

Key Professional	Business or individual that is involved in the installation of energy efficiency retrofit measures but is not an installer. For example, designer, project manager, consultant.
Construction Business	Business or individual that installs one or more types of energy efficiency measures in domestic properties and also provides general construction services (e.g., extensions, repairs and refurbishment).
Non-EE Installer	Businesses or individuals that physically install one or more types of measures in domestic properties unrelated to energy efficiency. For example, flooring installer, gutter installer, blinds and curtains installer.
Non-EE Construction Business	Business or individual that provides general construction services for domestic properties (e.g., extensions, repairs and refurbishment) but does not install energy efficiency measures
Skills Providers	Organisations that provide training, education or accreditation services to the installer, key professional or construction stakeholder groups.
Trade Bodies	Trade bodies are associations that represent the collective interests of businesses operating within the energy efficiency sector.
Net Zero Energy Hubs	Net zero energy hubs focus on helping the UK reach net-zero carbon emissions by 2050. They are regionally based and support local organisations to identify and develop local net zero and energy security strategies and projects.
Industry Experts	Industry experts are individuals who possess extensive, knowledge, skills and experience in the energy efficiency sector. They will likely have a comprehensive understanding of the sector, its principals, theories and emerging developments.
Small Medium-Sized Enterprises	According to the UK government definition, this encompasses micro (less than 10 employees and an annual turnover under €2 million), small (less than 50 employees and an annual turnover under €10 million) and medium-sized (less than 250 employees and an annual turnover under €50 million) businesses.[1]

[1] Department for International Trade (2020), Small and Medium-sized Enterprises Action Plan: https://www.gov.uk/government/publications/dit-small-and-medium-enterprises-sme-action-plan/department-for-international-trade-dit-small-and-medium-enterprises-sme-action-plan

Acronyms and Initialisms

Acronym / Initialism	Full Wording
BEIS	Department for Business, Energy & Industrial Strategy
CCC	Climate Change Committee
CITB	Construction Industry Training Board
ECO	Energy Company Obligation
EE	Energy Efficiency/Energy Efficient
DESNZ	Department for Energy Security & Net zero
DfE	Department for Education
DWP	Department for Work & Pensions
ESCO	Energy Service Company
EPC	Energy Performance Certificate
FENSA	Fenestration Self-Assessment
GHGVS	Green Homes Green Voucher Scheme
LCREE	Low Carbon and Renewable Energy Economy
MEES	Minimum Energy Efficiency Standard
PAS	Publicly Available Specification (e.g., PAS 2035)
RICS	Royal Institute of Chartered Surveyors
RMI	Repairs, Maintenance, and Improvement Work
RQ	Research Question
SME	Small and Medium-sized Enterprises

Executive Summary

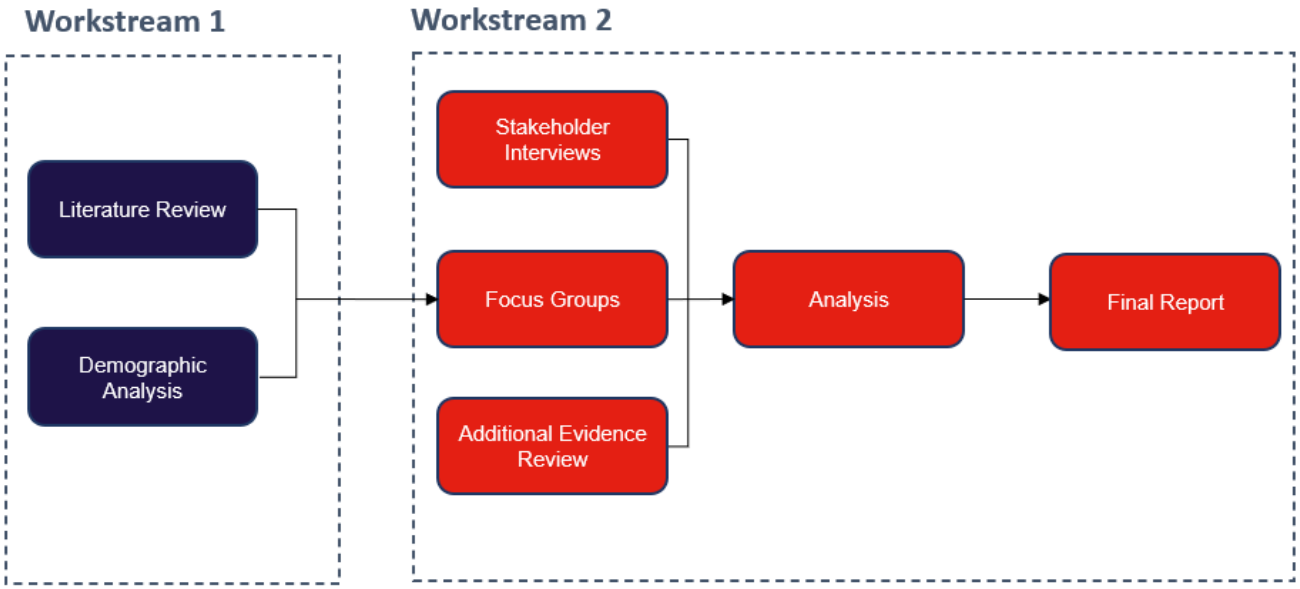
Introduction

The domestic building sector contributes 13 per cent of annual carbon emissions in the UK. Retrofitting homes to install energy efficiency (EE) measures will therefore play a vital role in meeting the government's net zero targets. However, there is a significant knowledge gap in the current retrofit supply chain's capacity and capabilities, as well as what may be required for the future. This report considers this issue by investigating the retrofit industry and the demand for EE services, taking inventory of the existing skills, exploring ways to incentivise workers to move into retrofit work, and understanding the role of the government.

Methodology

The method was split into two distinct phases as shown in Figure 1.

Figure 1: Schematic representation of research methodology



A total of 78 interviews were carried out with EE and non-EE professionals. This included installers, key professionals, construction businesses and skills providers. Two one-hour focus groups were undertaken with trade bodies and industry experts, with between six to nine participants in each focus group. Two in-depth interviews were also carried out with a Net Zero Energy Hub representative and an industry expert.

About the Industry - Supply Chain Profiles

The results of the literature review demonstrated that there were between 12,000 – 87,000 businesses carrying out domestic EE retrofit work in England. This was supported by the demographic analysis that found between 40,000 – 46,500 businesses carrying out EE work within the in-scope areas of this research (see Project Scope section). Different sources tend to include different measures within EE retrofit which results in the large range for the number of businesses.

The retrofit supply chain is fragmented with many small and medium sized businesses (SME) operating in the market. This research has illustrated that the sector is adaptable and fluid, with many installers and construction businesses working in both the domestic and non-domestic sectors. Overall, it was found that the industry needs more integration within and between installers, EE professionals and skills providers, as well as standardisation and a holistic approach to retrofitting.

About the Industry – Business Models

How Work is Found

All businesses interviewed working on private residential properties primarily found work through word-of-mouth, recommendations, and referrals. Referrals more commonly came from customers or alternatively from repeat work with, and recommendations from other businesses they had been contracted by. These could be either key professionals, such as architects, or main contractors. Generally, installers did not find work using business registers or frameworks, while some key professionals and larger construction businesses did. Interviewees suggested contracts are more geared towards larger businesses and less accessible to SMEs. Businesses have used advertising to grow, although it was found that often they had no need to market their services, as they were working at full capacity.

Approach to Subcontracting

Large contractors tended to use subcontractors on the majority of projects for cost efficiency and avoiding the financial and employment responsibility for full-time workers. SMEs used subcontracting on a variable basis depending on the capacity and capability of the business to take on a project. Subcontracting could increase the capacity to deliver a project and also the skills capability if a specialist or alternative skill or profession was needed.

Similarity to non-EE Services

The research indicated that business models for businesses providing EE services were broadly similar to those providing non-EE services, such as plastering, rendering and damp proofing.

Demand for EE Services

The main customers for the installation of retrofit measures were identified to be housing associations, local authorities, and wealthier homeowners, who owned large or historic properties. The interviews illustrated that most homeowners could be potential EE retrofit customers and thus there was deemed to be some demand for this. This was driven by the incentive to reduce energy bills, but for the most part, EE retrofit was not a priority. It was also reported by participants that consumer knowledge was limited and therefore homeowners require support from skilled tradespeople to carry out retrofit work.

Skills Assessment

There is a significant skills shortage in the domestic EE retrofit sector. Although installers indicated that existing construction trade skills are transferrable to retrofit activity, they did identify some exceptions including for older, listed buildings and those in conservation areas. It was also easier for installers and builders to move from non-domestic to domestic work rather than the other way round. EE professionals, skills providers and the literature highlighted that there is a strong need for more in-depth technical retrofit knowledge and skills. This includes a good understanding of regulations, as well as a whole house approach that mitigates against the risk of unforeseen interactions between other contextual components or measures installed in the home. The results of the qualitative research showed that workers currently undertaking retrofit work often do not possess specific retrofit accreditations or qualifications, in part because these qualifications are not mandated outside specific government funded schemes. They were also sceptical about their quality and the longevity of demand for work that requires those skills. The longevity of the value of the accreditations was also highlighted and key professionals were concerned that accreditations may be replaced and become out of date.

The employment and skills shortages in this sector are exacerbated by the lack of investment, instances of poor standards of work, and limited options of EE retrofit measures that homeowners can conceivably commit to implementing within constrained budgets. Interviewees indicated that existing workers and new younger workers are prime targets to retrain, ensuring that they can develop the holistic mindset, knowledge and skills that are currently missing in this sector.

Enablers and Barriers to Moving into EE Retrofit

There were many factors that act as enablers and barriers to move into EE retrofit. There was a general preference for workers in the construction industry to continue to work within what they are familiar with and refrain from developing new skills or take on EE retrofit work. An actual or perceived lack of demand in retrofit work may also disincentivise some. Age was another factor as many construction workers are close to retirement and were often found to be resistant to moving into a new sector or to undertake the necessary upskilling.

Negative perceptions of the construction sector as a whole presented a further barrier for some to move into it. Perceptions included inflexible hours, amount of travel and not enough focus on new science and energy efficient technologies or roles not being identified as 'green' jobs. Construction businesses interviewed and the wider literature highlighted that the sector is often regarded as unwelcoming, hierarchical and patriarchal with a lack of diversity. The perceived absence of a clear plan from government for how net zero will be achieved was regarded as another key barrier to the development of the industry.

Training was also outlined by all participant groups as a key barrier to workers moving into the sector. Skills providers highlighted that the quality of qualifications or training programmes requires improvement to increase enrolment in retrofit courses. This included ensuring new trainees and course providers understand the wider context of EE and getting the balance of practice and theory right. It was also suggested that teaching around a whole house approach was necessary, providing knowledge of the way the different EE measures used for retrofitting buildings can work together. Stakeholders highlighted that time and cost constraints within existing workloads also limited their capacity to undertake training.

Role of Government

Government messaging aims to encourage businesses and installers to support net zero targets, by ensuring all homes meet EE standards. Participants were all aware of government messaging around EE retrofit to a degree. Some were only aware of general messaging around net zero, while others were aware of standards or regulations to abide by such as Energy Performance Certificates (EPC), or changes to building regulations. Interviewees and focus group participants often agreed that much of the messaging was confusing, inconsistent and that homeowners are fearful over the complexity of the retrofit process and have minimal confidence in the stability of funding schemes that help reduce the cost of EE retrofit.

Government schemes offering financial support to implement EE retrofit measures were consistently described as poorly promoted, short-term, improperly structured and unnecessarily complex. Participants gave the example of schemes such as the Green Deal being stopped as evidence for the need for consistent, long-term funding. In particular, meeting the eligibility criteria for funding was seen as unachievable for many consumers hoping to improve the EE of their home. Interviews indicated that applying for government schemes to provide retrofit to homeowners is perceived to be inaccessible to businesses without the capacity to dedicate resources to lengthy, bureaucratic application processes. Skills providers tended to have more involvement with government schemes and funding than other participant groups. They asserted that these short-term initiatives meant they were constantly looking for more funding to fill the skills gaps in the industry. Interview and focus group participants highlighted that increased investment and clear signalling are necessary to provide confidence, as currently the sector is seen as unattractive to potential new entrants, trainees, and customers.

Conclusion

Overall, the findings from the qualitative interviews and focus groups suggest that instilling confidence in the sector by providing long-term scheme funding for all sized businesses, along with guidance on retrofitting to homeowners is crucial to restore trust and stability. To ensure that the domestic retrofit supply chain has sufficient capacity and capability for contributing to net zero, key stakeholders and the government must collaborate to address the skills shortage raised in this report by providing access to funding for training and to invest in building a workforce that embodies a holistic, effective, and long-term approach to housing retrofit.

Introduction

The UK housing stock currently represents 13 per cent of annual carbon emissions. Installing energy efficiency (EE) measures will help meet net zero targets whilst generating green growth and skilled jobs, reducing energy bills, and making the energy system more resilient to future price shocks.[2] So far, much of the research in this area has focused on how the supply chains engage with government schemes that offer financial support (e.g. The Green Homes Grant Voucher Scheme (GHGVS) or grants (e.g. Energy Obligation Company Scheme) to implement EE retrofit measures. There are still gaps in knowledge on understanding the characteristics and size of the current retrofit supply chain that is needed in the future. Thus, this study sought to assess the current and future capacity and capabilities of businesses, installers, and the workforce involved in delivering domestic EE measures.

Project Aims and Research Questions

This project aimed to explore the issue of future capacity and capability across the domestic EE supply chain. The main research questions are listed below and a full list can be found in the Technical Annex accompanying this report.

1. What are the characteristics of businesses, installers, and key professionals involved in energy efficiency retrofit work?

2. What business models (including subcontracting) are used by businesses that deliver the installation of domestic energy efficiency retrofit measures?

3. What has been the role of government in business-related decisions in the retrofitting market?

4. What can we learn from wider stakeholders (such as trade bodies, skills providers, net zero energy hubs, etc.) about the skilled roles and trades required to undertake different energy efficiency retrofit projects?

5. What skills, specialisms, accreditation, and qualifications do installers and other energy efficiency retrofit professions have? How might these change in future?

Project Scope

The project focused on the domestic sector in England and included existing and newly built domestic properties (owner-occupied, private rented sector, social housing), small terrace, medium/large terrace, semi-detached, detached, bungalow, converted flat, purpose build flat

[2] HM Government (2021), Heat and Buildings Strategy: https://www.gov.uk/government/publications/heat-and-buildings-strategy

(low rise), purpose build flat (high rise), and on and off gas grid properties. The supply chain segments in scope were design and construction management (advice to customers on the design of retrofit measures and activities, and the management of retrofit processes), and the installation of measures in properties. Skills providers were also included. Table 1 shows measures in scope.

Table 1: EE Measures within Scope

Category and Measure	Jobs / Other Considerations
Insulation: Loft/roof, Flat roof, Cavity wall, Internal solid wall, Underfloor, External high rise, External low-rise	Installers, Construction businesses
Lighting: Energy-efficient lighting	Electricians, Lighting consultants, Installers, Construction businesses
Airtightness: Draught-stripping	Surveyors, Installers, Construction businesses
Doors and windows: Replacement glazing and doors, Secondary glazing, Airtightness testing, Draught-proofing, Conservatory conversion	Installers, Repairers, Construction businesses
Energy management: Heating controls, Home energy management system (HEMs), Building energy management system (BEMs) for multiple property developments/ retrofits	Installers, Energy suppliers
Design and management: Retrofit design/coordination, Building surveying	Project managers, Architects, Retrofit surveyors, Retrofit assessors, Retrofit designers, Retrofit coordinators, Principal contractors, Engineers, Energy specialists, Energy Service Companies (ESCOs) – for multiple property developments/ retrofits

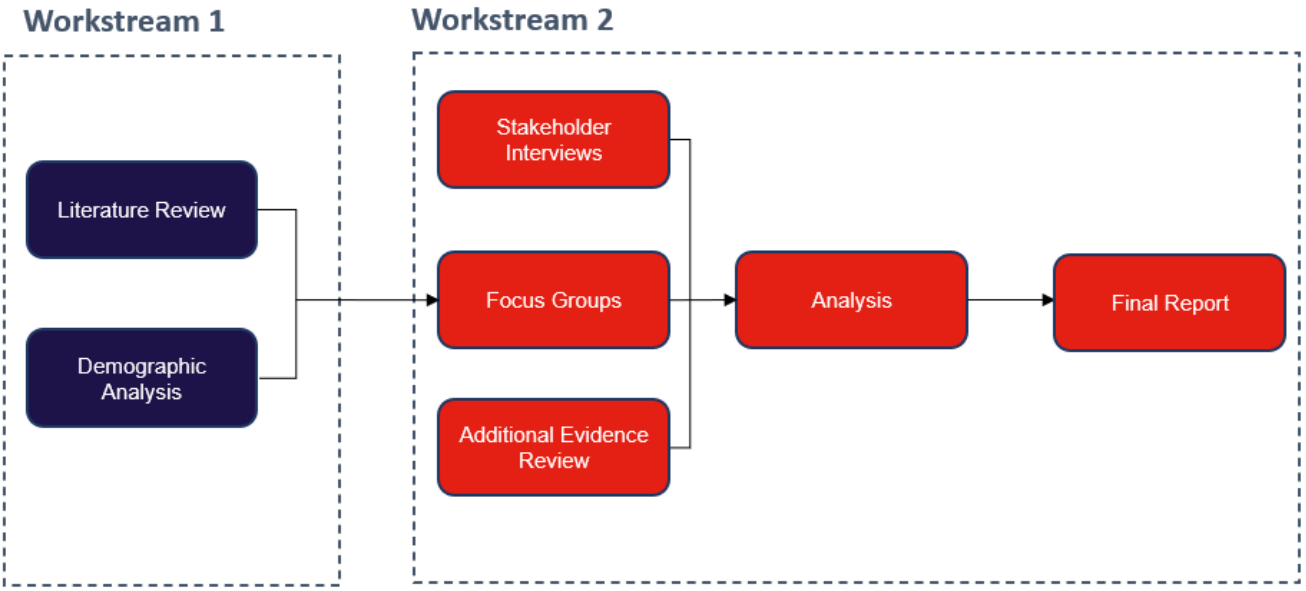
The scope excluded the following technologies: heating, ventilation, and cooling (i.e. heat pumps, condensing gas boilers, biomass boilers, combined heat and power, building work on transitioning to heat networks, or air conditioning), solar, or other micro-renewables, electric vehicles charging, batteries and Smart Meters. It also excluded the supply chain for EE products including manufacturing of EE products, supply and distribution (to the market) of EE products, post-installation maintenance and management of EE products, and decoration and refurbishment (e.g. painting). However, the research included businesses and tradespeople

involved in the refurbishment activity that could be needed after retrofit works. This included roles such as plastering, rendering, and cladding.

Methodology

The method was split into two distinct workstreams as shown in Figure 2. A total of 78 interviews were carried out with EE and non-EE professionals. This included installers, key professionals, construction businesses and skills providers. Two one-hour focus groups were conducted with trade bodies and industry experts, with between six to nine participants in each focus group. Two in-depth interviews were also carried out with a Net Zero Energy Hub representative and an industry expert. The details on the methodologies are in a Technical Annex accompanying the report.

Figure 2: Schematic representation of research methodology



Research Challenges & Limitations

Workstream 1

Sector challenges had a bearing on the project including the lack of available granular quantitative data on domestic installers meaning it was difficult to identify the supply chain and understand demographic, regional, or other variations. The EE retrofit sector is also diverse with installers working across multiple sectors including domestic and non-domestic properties, making it difficult to ascertain key services and core skills. This created challenges for identifying the size of the supply chain.

Workstream 2

There were some challenges associated with the primary research:

- Some installers mentioned research fatigue in the sector due to a large number of requests for research in this topic.
- Many non-EE stakeholders did not see how their opinion would be valid for research on EE when they did not work in EE.
- It was also difficult to recruit skills providers for the interviews as it was hard to find those who were suitable and offered EE-specific training. This meant there were proportionally fewer candidates with whom to engage, although those recruited did provide some very useful insights. In total about a fifth of skills providers contacted agreed to do an interview. The remaining were either not interested in engaging in the research, were not available, or could not be contacted.
- It was easier to engage key professionals such as architects, surveyors and those involved in energy management but difficult to involve construction businesses and installers. The reasons for this are discussed in the Technical Annex that accompanies this report.
- For the focus groups, the target number of Net Zero Hub participants was not met. The aim of the research initially was to carry out 120 interviews, which was later reduced to 102, and to conduct focus groups with 30 attendees. However, due to reasons discussed above, only 78 interviews were carried out, including very few non-EE stakeholders. Focus groups only had 15 attendees complemented with two in depth interviews. In total around 3,500 potential participants were contacted. The number of refusals were tracked and in total 22 per cent of those called refused, 26 per cent were not in the target sector and 37 per cent were ‘open’ meaning they said to call another day but did not engage when followed up. Analysis of the data collected showed similar themes across interviews and focus groups, with no new information being picked up. As a result of this, there was a high level of confidence that data saturation was achieved and that no further recruitment was required.

These challenges and limitations have been discussed in more detail in the Technical Annex the accompanies this report.

Research Findings

Key outcomes from all research approaches specified in the introduction have been summarised below. The key findings are described per research question, covering the following topics: supply chain, business models, the role of government, skills, specialisms, accreditation and qualifications of installers and other EE retrofit professions.

About the Industry

Supply Chain Profiles

This section covers the characteristics of businesses and professionals involved in EE retrofit work, the measures they currently install and the current capacity of the workforce. It also discusses the results of the demographic analysis which illustrated the number of estimated businesses in the supply chain and the results of the literature review.

Business Characteristics

The demographic analysis and literature review illustrated that the EE retrofit supply chain is fragmented, with many small to medium sized enterprises (SMEs) operating in the market.[3] The recent evaluation of the Green Homes Grant Voucher Scheme (GHGVS) by BEIS also pointed out that approximately two-thirds of participating installers in the scheme were micro businesses and that 38 per cent were small enterprises.[4] The SMEs that dominate the retrofit supply chain typically operate within small-scale regional supply chains with services sold to private owners/occupiers. Businesses with over 250 employees only represented 32 per cent of the Low Carbon and Renewable Energy Economy (LCREE) employment in 2021.[5]

From the interviews it was apparent that installers and construction businesses tend to work on both domestic and non-domestic properties, with varying levels of work splits depending on the individual business. This split ranged from 40 per cent domestic work to 60 per cent non-domestic work to 90 per cent domestic work and 10 per cent non-domestic work. However, as businesses that focused on domestic work were targeted for this research this is not representative of all businesses. A survey from previous work on the non-domestic EE retrofit supply chain found that 86 per cent of respondents in non-domestic retrofit businesses also provided the same services to the domestic building sector. This assumes that the non-domestic sector is similar in size to the domestic sector, and this accurately represents an

[3] Energy Efficiency Infrastructure Group (2020), Rebuilding for Resilience: Energy efficiency's offer for a net zero compatible stimulus and recovery: https://www.theeeig.co.uk/media/1096/eeig_report_rebuilding_for_resilience_pages_01.pdf
[4] BEIS (2022), Evaluation of the green homes grant voucher scheme (GHGVS): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1131110/green-homes-grant-vouchers-phase-1-process-evaluation-report.pdf
[5] ONS (2023), Low carbon and renewable energy economy, UK: 2021: https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/finalestimates/2021

overlap between the two supply chains. In this study, 68 per cent of respondents felt that the retrofit services they provide for domestic could easily be switched to non-domestic.[6]

Energy Efficiency Measures

Businesses in the EE supply chain install a variety of measures. Examples of typical measures installed, found through the interviews and literature review, are shown in Table 2.[7]

Table 2: Examples of typical EE measures

Insulation	Lighting	Airtightness	Windows and Doors	Energy Management
External wall insulation Internal wall insulation Cavity wall insulation Underfloor insulation Loft insulation Pitched roof insulation Flat roof insulation	Energy efficient lighting Rewiring Light fittings for LED lighting Lighting controls Sun Tunnels	Draught-proofing Passivhaus standards	Double and secondary glazing Restoration of sash windows Window and door installation	HEMs BEMs

[6] Eunomia Research & Consulting, for BEIS (2021), Non-domestic energy efficiency optimisation and retrofit supply chain study.
[7] Amec Foster Wheeler Environment and Infrastructure UK Ltd (2017), Energy efficiency and low carbon market research; BEIS (2022),Supply Chain Mapping Project, unpublished ; Checkatrade, Checkatrade: Find a Tradesperson you can Trust: https://www.checkatrade.com/ (Accessed August 2023); Koh, S., Genovese, A., Rees, G. (2010), Regional supply chain for energy efficiency measures to retrofit to existing housing: Scoping study for the Yorkshire and Humberside Region; BEIS (2022), Supply Chain Mapping Project, unpublished; Qualitee (2018), Country report on the energy efficiency services market and quality.

Professions and Capacity

There are a number of different professions required along the EE retrofit supply chain and this is demonstrated in Table 3.[8]

Table 3: Types of professions in EE retrofit supply chain

Installers	Construction Businesses	Key Professionals
Installers	Construction Businesses Principal Contractors Tradespeople to support with implementation of measures General repair and maintenance workers	Retrofit Surveyors, Designers, Assessors and Coordinators EPC/ Energy Assessors Consultants, Surveyors Engineers, and Architects Project Managers for supervision ESCOs Energy specialists and suppliers Building performance evaluator to test and assure the performance of the retrofit

As an example, in the North East, the 2019/20 breakdown of employment within the sector by retrofit roles shows that 62 per cent of employment is for retrofit installers; 11 per cent for retrofit product manufacturers; 6 per cent for retrofit designers; 6 per cent for retrofit co-ordinators; 5 per cent retrofit advisors and 5 per cent retrofit ancillary services. Other retrofit roles comprise the remaining 5 per cent.[9]

Number of businesses in the supply chain

The findings from the literature review demonstrated that there were between 12,000 – 87,000 businesses carrying out domestic EE retrofit work in England. This is broadly in line with other

[8] CITB (2021), Industry insights and analysis: Building skills for net zero: https://www.citb.co.uk/about-citb/construction-industry-research-reports/search-our-construction-industry-research-reports/building-skills-for-net-zero/; Eunomia Research & Consulting, for BEIS (2021), Non-domestic energy efficiency optimisation and retrofit supply chain study: https://www.eunomia.co.uk/reports-tools/non-domestic-energy-efficiency-optimisation-and-retrofit-supply-chain-study/; Amec Foster Wheeler Environment and Infrastructure UK Ltd (2017), Energy efficiency and low carbon market research: https://energysavingtrust.org.uk/wp-content/uploads/2020/09/Energy-Efficiency-Low-Carbon-Research-Exec-Summary-Oct-2017.pdf

[9] North East Evidence Hub (2022), Understanding skills demand within domestic energy: https://evidencehub.northeastlep.co.uk/domestic-retrofit-skills-needs-assessment

sources, although figures vary regarding the number of businesses in the EE retrofit supply chain and depending which measures are included within the sources. Estimates for full time equivalent employees in the LCREE sector range from 114,000 to 154,748, with an average of 135,682 depending on the source.[10] In a project on the non-domestic supply chain, it was concluded that there are between 36,000 – 87,000 non-domestic retrofit businesses in the UK.[11]

To try and get a sense of the number of businesses in the supply chain, a demographic analysis was carried out, the methodology for which has been discussed in more detail in the Technical Annex accompanying this report. This research was also supplemented with secondary research on the supply chain and in particular used sources from Net Zero Energy Hubs and these findings have also been outlined in the Technical Annex. The outcomes of the demographic analysis are shown in Table 4.[12] The third column shows the confidence level (low, medium or high) of the range or number of businesses identified. This rating was based on how many different sources could be accessed, and how close these numbers were to the estimates found in the demographic analysis. In total, a range of 40,000 – 46,500 businesses were found to be involved in the in-scope areas of the EE retrofit supply chain.

Table 4: Overview of estimated number of businesses in the EE retrofit supply chain

EE Measure	Range or number of businesses identified	Confidence Level
Insulation	Total count range: 6,000 – 7,900 Made up of insulation installers, roofing services and render and cladding services.	Low
EE lighting	Total count: 17,232 Made up of electricians and electrical contractors.	Medium
Airtightness	Total count: 300 Made up of companies working in the air tightness sector.	Medium

[10] ONS (2023), Low carbon and renewable energy economy, UK: 2021: https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/finalestimates/2021; BEIS (2022), Supply Chain Mapping Project, unpublished.
[11] Eunomia Research & Consulting, for BEIS (2021), Non-domestic energy efficiency optimisation and retrofit supply chain study: https://www.eunomia.co.uk/reports-tools/non-domestic-energy-efficiency-optimisation-and-retrofit-supply-chain-study/
[12] The estimates in Table 4 are a result of the demographic analysis, verified and compared with various sources of information outlined in the Technical Annex, including Net Zero Hub studies and TrustMark data. These are separate to the estimates of 12,000-76,000 businesses, which came from the REA.

Doors and Windows	Total count range: 7,800 – 11,000 Made up of glass and glazing installers and repairers, door repairs and window repairs and replacement services.	Medium
Energy Management	Total count range: 330 – 410 Made up of energy management control systems.	Low
Design and Management	Total count range: 8,700 – 9,500 Made up of architects, architectural services and design consultants.	Medium

Current Capacity

Overall, the interviews illustrated that there was a mixed experience with relation to capacity. Participants in the EE supply chain reported varying levels of capacity from those with limited availability to take on new work, to those who felt the work was slowing. Others commented that demand for EE retrofit work has not really changed between 2019 and 2023. This was true across the different stakeholder groups with participants in every group with these viewpoints. The energy crisis and COVID-19 pandemic appeared to have mixed impacts on members of the supply chain. There were participants who reported becoming busier and put this down to the public becoming more aware of the environmental benefits and cost saving potential of retrofit work. While other participants reported experiencing less work and attributed this to the perception that the public have less money to spend due to the rise in energy bills and inflation.

Impact of Business Characteristics

Businesses indicated that the EE retrofit supply chain as a whole lacks coordination and a whole house perspective. Businesses focus on individual products rather than integrated solutions and tradespeople work in silos with little collaboration or trust in others' work or experience. This was reported to have caused inefficient workflows, as EE measures can be installed when other work is being carried out, poor quality outcomes, and missed opportunities to optimise building performance. EE measures are not often carried out in tandem with other works and this was seen as a missed opportunity. Misaligned incentives on EE training and measures for businesses and homeowners were also reported to prevent cooperation. Incentives for homeowners to have EE measures installed have limited effectiveness as businesses do not have the same incentives to invest in training new staff and therefore there are not enough workers to carry out the installs. Renovations also often focussed on specific interventions without broader systems improvements such as looking at other aspects of a property that could benefit from EE retrofit measures. Suppliers tend to promote partial solutions without considering the limitations, particularly of moisture, ventilation and heritage of

the building. Overall, the industry needs more integration, standardisation, and a holistic approach.[13]

Business Models

This section covers the business models that are used by installers of domestic EE retrofit measures. It focuses on how frequently sub-contracting is utilised, the procurement process for sub-contractors and the reasons behind their use.

Types of EE Business Models

From the interviews, it was apparent that businesses that work on private homes primarily source work through word of mouth, recommendations, and referrals. Businesses tend to place a high value on maintaining their local reputations and attribute their ability to find work to this, particularly with long-standing local businesses. This is the same across all stakeholder groups including installers, construction businesses and key professionals. Various installers also indicated that a lot of work came from repeat business from the same clients that had used their services previously. Additionally, installers indicated that work was commonly found through repeat work with architects who work on multiple projects. The architect will often recommend previous contractors they have worked with to the client. It was mentioned in the literature that SMEs are often not eligible for government schemes,[14] and that renovations of owner-occupied properties are often done by SMEs[15].

Installers and construction businesses did not distinguish sourcing EE retrofit work differently to other repair, maintenance and improvement (RMI) work. However, key professionals indicated that they usually found EE work via procurement frameworks and that they were more likely to use sub-contractors for EE retrofit work. This is to account for differing demand for these services or for when there is a high workload and a lack of capacity from in-house staff.

It was less common that installers and construction businesses utilised trade directories. Various trade directory platforms exist to provide reach to the private sector. These directories, such as Checkatrade, MyBuilder and Yell, usually require installers to receive approval from the directory and display reviews by homeowners.[16] However, there were some concerns over the quality of vetting by these platforms to potential members joining the directories. Installers did not want to risk damaging their reputation by being placed alongside businesses that were perceived to have poor quality standards by other customers.

[13] National Energy Foundation & Energy Efficiency partnership for Buildings (2013), Breaking Barriers: An industry review of the barriers to Whole House Energy Efficiency Retrofit and the creation of an industry action plan.
[14] Sustainable Energy Association (2022), What next for heat and building policy? What-next-for-heat-and-buildings-policy.pdf (sustainableenergyassociation.com)
[15] Energy Efficiency Infrastructure Group (2020), Energy efficiency's offer for a net zero compatible stimulus and recovery, eeig_report_rebuilding_for_resilience_pages_01.pdf (theeeig.co.uk)
[16] Checkatrade, Checkatrade: Find a Tradesperson You can Trust: https://www.checkatrade.com/ (Accessed August 2023); My Builder, My Builder: The Better Way to Find a Builder: https://www.mybuilder.com/ (Accessed August 2023); Yell, Yell: Your Marketplace for Local Services: https://www.yell.com/ (Accessed August 2023)

Social Housing

In order to undertake EE retrofit work on social housing properties, businesses are required to apply to be on a pre-approved supplier list or framework that local authorities use to procure services. A previous report prepared for BEIS identified the financially highest performing routes to market for contractors providing domestic retrofit services to local authorities. BEIS identified the most commonly used procurement frameworks for providing domestic retrofit services to local authorities under their schemes in progress during spring 2022 as, Fusion 21, Procure Plus, National Frameworks and Find a Tender. These are characterised by high levels of competition at the point of procurement.[17] Tier 1 contractors (general contractors, as opposed to the sub-contractors and specialist contractors that occupy Tiers 2 and 3) dominated these markets, which was attributed to the high barriers for smaller businesses to enter the public sector market (linked to its higher requirements for technical certification and insurance).[18] The administrative burden of getting onto these frameworks is also likely to have an impact.

Construction businesses stated that they were on local authority procurement frameworks but that these were mainly for new builds and new social housing, as opposed to retrofitting existing housing stock. On the other hand, smaller construction businesses claimed that some procurement frameworks are aimed at contractors that have the capacity to take on large projects, which creates a barrier to SMEs winning these types of contracts. Those that win the contracts can often be businesses that hold little expertise in retrofit or the types of homes being retrofitted under the contract, for example social housing.

Subcontracting

Large contractors generally used subcontractors as standard practice on all projects. The main reason for using subcontractors was cost efficiency. Contractors can employ trades as and when they are needed, as opposed to paying employees a full-time salary, holiday, and sick pay, even if they are not required on a particular project. A common theme throughout the research was the degree of trust needed both between contractors themselves, and between contractors and consumers. Proof of competence for installers tended to come through word-of-mouth, recommendations, and referrals. This was a driver for the business models employed in the sector, as most work was found through these sources which was perceived to provide the best proof of competence.

SME use of subcontracting tends to be more preference-based. Approaches ranged from avoiding it and keeping everything in-house, to utilising it regularly for various purposes. General contractors would commonly subcontract installers on every job they work on, these included electricians, plumbers, and heating technicians. The use of subcontracting depended on the nature of the project; often smaller firms brought in extra people to fulfil their capacity needs for a larger project. This is particularly relevant for specialist work such as traditionally constructed buildings and asbestos removal, which requires roofers with specific expertise.

[17] BEIS (2022), Supply Chain Mapping Project, unpublished
[18] BEIS (2022), Supply Chain Mapping Project, unpublished

This also applies when there is a need for a key professional such as an architect, structural engineer, or mechanical and electrical specialist.

The procurement process for subcontractors differs for SMEs who reported generally sourcing work via small local networks of known associates. Contractors tended to work with the same installers they had used in the past with a good reputation to eliminate any uncertainty over the quality of work. This was partly due to an impression that the accreditations do not necessarily guarantee quality. For example, participants stated that some accreditations were more concerned with health and safety than correct installation techniques which, while important, fail to certify that installers are using the proper methods. The use of subcontractors was also common with jobs where the demand does not have a steady enough flow to justify employing a member of staff full-time. More specialist contractors tend to be tier 3 subcontractors, however, participants reported that occasionally the client directly employs them. This direct employment from a client does not tend to occur in those installing EE measures due to a lack of demand for these measures in isolation. This is discussed in more detail in the section on 'Demand for Energy Efficiency Services'. It is not clear from the research how formal the sub-contracting arrangement with SMEs was and whether formal contracts and paperwork were utilised.

Non-EE Business Models

For businesses that provide non-EE retrofit services such as general maintenance or plastering, participants all indicated that they found work primarily through word of mouth or repeat business. This aligns with the business models utilised by the participant groups that do install EE measures. This continues to support the claims from participants that currently domestic EE retrofit work does not pose many significant differences to non-EE retrofit work. It was the view of stakeholders that EE work in owner-occupied properties often happens as a result of RMI more generally than being directly approached for EE work. It was also reported that there is more motivation from social housing providers to get housing up to standard.

Non-EE businesses mostly used subcontractors on their projects, similar to EE installers and EE construction businesses. There were also similar procurement processes, installers generally drawing on the same tradespeople for different projects.[19]

[19] As with all the interviews, the number of interviews carried out for non-EE businesses comprised a small number of installers. It is important to caveat the findings made by highlighting that the responses provided come from a small sample of participants.

Demand for Energy Efficiency Services

This section provides insights into the main customers of current domestic EE Retrofit services and the stakeholders' perceptions of existing demand. It examines the drivers and barriers behind the observed patterns and approaches to increase future demand.

Customers

Installers and key professionals identified the main customers for the installation of retrofit measures as housing associations and local authorities, or wealthier customers who owned large or historic properties. They thought that wealthier customers were more likely to need to have retrofit work done and to be able to pay for it. It was also mentioned that while demand came from owner-occupied homes, private landlords and housing associations, EE-retrofit work was not yet perceived to be a priority for owner-occupiers.

For the larger construction businesses interviewed as part of this research, EE work appeared to often be secondary to RMI work, such as renovations and conversions, and guided by health and safety or fire safety practices. These businesses tended to get a lot of work through local authorities, whereas individual installers and construction businesses appear to work more on owner-occupied properties. One large construction business interviewed had a subsidiary company that did most of their EE retrofit work. This work was mainly of a lower value and only made up 5% of businesses annual turnover.

Current demand

A recurring theme was that the environmental imperative of EE was not the main reason for an increase in owner-occupied demand and rather, it was incidental to the desire to make cost savings. This meant it was difficult to get customers to commit to further EE measures, even when they made a start on initial measures. However, in recent years where there has been an increase in demand for services from all types of homeowners, installers, construction businesses and professionals thought this was partly due to public awareness of climate change.

Construction businesses highlighted that demand was moderate and growing, but it was reported that the war in Ukraine and the COVID-19 pandemic had hampered the profit potential of some work. They suggested that this is due to the volatility of pricing for supply of materials and difficulty in finding an adequate, reliable supply of workforce.

Focus group participants also highlighted that demand may be influenced by a lack of knowledge about the benefits, costs, and approach to retrofit held by homeowners, owing to the perceived complexity of retrofit processes. Similarly, literature sources identified the lack of personalised advice as negatively affecting retrofit uptake, with over 1 in 3 homeowners feeling uncertain about the efficacy of retrofit. As a result, well-established measures such as double glazing are common, but less well-known and understood measures, such as solid wall and

floor insulation are less in demand.[20] An additional barrier for some consumers is the appearance of EE retrofit measures and how they may cover up traditional features of a house. For example, if a house with traditional brickwork gets external wall insulation, the new exterior wall must be rendered which obscures the brickwork and changes the look of the house.

Future demand

Participants held contrasting views around the perception of future demand. One view was that demand may soon increase drastically without significant government intervention due to increasing interest in EE and how EE can support net zero goals. Others were sceptical of change without government grants or incentives. The future demand was regarded as unpredictable and dependent on many external factors such as energy costs, the cost of living and the importance of climate change. Participants perceived that three key actions would be necessary to increase demand in the future: additional investment in the sector to help companies hire and train highly skilled professionals (see the section 'Training and Skills Funding'); grants for customers who would not otherwise be able to afford the work, and making these processes clear and simple; and changing energy standards and policy to encourage change. Further suggestions for how the government could increase demand are discussed in the section 'Factors Regarding Supply Chain Capacity'.

During focus groups, One Stop Shops (an integrated retrofit service provider covering everything from funding to implementation to evaluation), were also mentioned as a potential solution for homeowners to receive quality advice and support on installing retrofit measures more smoothly, reliably, and efficiently.[21] The One Stop Shops Service in Ireland were referenced by focus group participants, as a good example. This approach can also highlight and cover existing coordination gaps along the retrofit supply chain, facilitating a longer-term, complete retrofit renovation and present an opportunity to increase consumer demand.[22]

Skill providers said that the demand for future retrofit was still unclear, and the market was still potentially unstable. This has knock-on effects on the demand for training in EE retrofit skills and there was a hesitancy to take part in the training. Nonetheless, they were preparing to introduce new courses to adjust to the perceived increase in demand in the future (See 'Factors Regarding Training'). While there is government funding available for training schemes, it is possible that participants were not always aware of this. Other participants appeared to be aware that funding was available but were still concerned about the loss of income from putting staff through training schemes.

[20] Citizens Advice (2023), Demand: Net Zero – Tackling the barriers to increased homeowner demand for retrofit measures: https://www.citizensadvice.org.uk/Global/CitizensAdvice/Energy/Demand_%20Net%20Zero.pdf
[21] Sustainable Energy Association (2022), What next for heat & building policy? https://sustainableenergyassociation.com/publications/what-next-for-heat-buildings-policy/
[22] Turnkey Retrofit (2021), Underpinning the role of One-Stop Shops in the EU Renovation Wave: https://www.bpie.eu/wp-content/uploads/2021/11/Turnkey-Retrofit-report_OneStopShops_RenovationWave_Final.pdf

Skills Assessment

This section covers the existing supply of workers and skills in the retrofit supply chain across stakeholder groups. It explores their degree of specialisation, perceived transferability of skills, and any skills shortage. Additionally, this section explores the future of upskilling workers, including groups to retrain and their attitudes to retrofit.

Current Skills

Perception of Current Supply of Workers

Interviewees and focus group participants highlighted a skills shortage in the construction sector, which they saw as having been exacerbated by a loss of European workers due to the UK's exit from the European Union, older workers leaving after the COVID-19 pandemic, and underinvestment in training over many years. This supports the findings of a survey of installers conducted on behalf of BEIS in which 42 per cent of respondents reported a skills shortage in the sector.[23] This trend was also reflected in retrofit, with participants in this study and literature identifying a 'huge' or 'imminent' gap in tradespeople with the skills required to deliver retrofit at scale.[24] One installer stated *"Installers do not want to work in the EE industry due to the boom and bust nature of it. Many recruits are needed but again with the current short term funding programmes it is seen by many as not a long-term career"*.[25]

In the relatively few instances where installers and construction businesses interviewed thought there was not a problem with the supply of workers, this was in reference to only general building work because they did not yet see a demand for EE retrofit in their local area. Others, who were more optimistic, said that there would be a willingness to train or upskill in the sector if problems to do with engaging young people and accessing training while working could be overcome (see 'Enablers and Barriers to Moving into EE retrofit'). In a labour market intelligence report carried out in the electrical sector, it was suggested there was not a perceived skills gap in EE services in this sector covering lighting and lamp replacement.[26] A specific installer skill shortage identified by focus group participants was insulation installers.

Skills and Specialisms

Installers

Installers tended to concentrate on one area of business according to their trade. There was no overall preference for a split between non-domestic and domestic work, with few businesses saying they specialised in domestic retrofit work only.

[23] BEIS (2022), Supply Chain Mapping Project, unpublished
[24] The Institution of Engineering and Technology & Nottingham Trent University (2020), Scaling up retrofit 2050: https://www.theiet.org/impact-society/factfiles/built-environment-factfiles/retrofit-2050/; Sustainable Traditional Buildings Alliance (2018), EPCs and the Whole House Approach – A scoping study: https://stbauk.org/wp-content/uploads/2020/08/EPCs-The-Whole-House-Approach.pdf
[25] Greater South East Net Zero Hub (2023), Supply Chain Market Intelligence Executive Summary: https://www.gsenetzerohub.org.uk/wp-content/uploads/2023/03/GSENZH-Executive-Summary.pdf
[26] The Electrotechnical Skills Partnership (2023), Labour Market Intelligence: Refresh – 2023, carried out by Pye Tait consulting: https://www.the-esp.org.uk/wp-content/uploads/2023/06/TESP-2023-LMI-Refresh-879.pdf.

Participants thought their trade skills were generally transferrable to EE retrofit within the envelope of their existing trade. However, there were some provisos to this including:

- The literature highlighted that greater expertise is needed for some older, listed buildings, and those in conservation areas. This is emphasised by the fact that this is a customer group with the biggest demand. Literature has also highlighted that traditional buildings require specific treatment and retrofit solutions, including the procedures, skills or materials adopted and engagement with occupants and owners.[27]
- Participants thought it was easier for installers and builders to move from non-domestic to domestic work rather than the other way around. This was because non-domestic buildings required more knowledge of materials, building at larger scales, and more licences and approvals than the domestic sector.
- They also believed retrofitting buildings had more similarities with maintenance and repair skills than working on new buildings.

Despite the perceived transferability of skills across EE and existing trades, literature sources and EE professionals (see below) stated that workers often lacked the deep expertise and holistic understanding required for effective retrofit.[28] Installers and construction businesses interviewed said they tended to rely on manufacturers' information about specific energy efficient materials or products installed or use social media (e.g., YouTube videos) to resolve retrofit related problems such as condensation in buildings.

EE Professionals

The EE professionals interviewed tended to focus on a mix of new build and retrofit work.

In contrast to installers, this group suggested that some skills were not transferrable between regular, and EE retrofit work. They believed that some smaller construction businesses or builders did not fully understand all relevant EE retrofit standards, meaning that they sometimes completed a job having misled consumers that their work was to the correct standard. They also said there needed to be a more whole house, tailored approach to retrofit because a standardised approach did not consider the differences between homes of different ages and designs. They emphasised that:

- Installers and builders need to work with EE advisers, architects, site managers, surveyors, and inspectors who could advise them or check their work meets the right standards and regulations.

[27] Sustainable Traditional Buildings Alliance (2012), Responsible Retrofit of Traditional Buildings: https://stbauk.org/wp-content/uploads/2020/08/STBA-RESPONSIBLE-RETROFIT.pdf

[28] National Energy Foundation & Energy Efficiency Partnership for Buildings (2014), Breaking Barriers: An industry review of the barriers to Whole House Energy Efficiency Retrofit and the creation of an industry action plan: https://www.saint-gobain.co.uk/sites/saint-gobain.co.uk/files/2018-12/EEPB%20%26%20NEF%20%27Breaking%20the%20Barriers%20to%20Whole%20House%20Retrofit%27.pdf ; North East Evidence Hub (2022), Understanding skills demand within domestic energy: https://evidencehub.northeastlep.co.uk/domestic-retrofit-skills-needs-assessment

- There was a need for more general training on EE retrofitting at apprenticeship level to address specific issues arising from retrofitting with materials (e.g., insulation) or to meet standards required for whole house retrofit such as PAS2035.

Supplementary coordination by EE professionals will become increasingly important, but stakeholders and literature sources stated that they are lacking. Examples of EE Professionals' skills shortages identified by participants of the focus groups and the literature included project management, retrofit surveyor, specialist consultant, contract governance, heat loss calculations, general skills (e.g., full driving license), retrofit evaluation skills, and providing retrofit advice to homeowners.[29] Examples of EE specialism shortages included working with pre-1919 traditional buildings, emergency lighting, recognition of asbestos, nature-based solutions and bio-based materials for breathable fabric for historic buildings, lime mortar understanding, thermal bridging, connected homes and HEMS.

Skills Providers

Skills providers thought that it made the most sense for installers and construction businesses to concentrate on upskilling their existing workforce on EE retrofit aspects of their current specialisations. However, skills providers stated that while installers and construction businesses had competencies relevant to their trades, they often did not understand how these related to domestic EE retrofit standards or regulations. This could have implications for the quality and compliance of EE retrofit measures implemented. They also noted that in the future, a less specialised, whole house approach would be needed, as well as more training programmes for new Energy Advisers or Energy Assessor roles. Several training providers have started offering dedicated courses for retrofit coordinators.

Accreditation and Qualifications

Qualifications and accreditations are generally expected to ensure good practices, high quality standard of work and consumer protection. They are often needed to work on government funded projects or gain manufacturer warranties. However, there are currently no legal requirements for both businesses and workers to hold them to do retrofit work.[30] Focus group participants highlighted that the lack of mandated accreditations and qualifications for retrofit, outside specific government funded projects, could lead to poor quality retrofitting outcomes. They believed that adoption of PAS 2035 outside of government schemes could mitigate against this. Interview participants undertaking EE retrofit work outside of government funded schemes tended not to be aware of PAS 2035. When discussing other accreditations, participants held the view that they tended to be associated with the safety of installations or building standards rather than ensuring quality of work.

[29] Qualitee (2018), Country report on the market and quality of energy efficiency services: https://qualitee.eu/wp-content/uploads/QualitEE_2-04_CountryReport_BE_2018.pdf; Killip, G et al. (2021), Building on our strengths: a market transformation approach to energy retrofit in UK homes: https://www.creds.ac.uk/publications/building-on-our-strengths-a-market-transformation-approach-to-energy-retrofit-in-uk-homes/; North East Evidence Hub (2022), Understanding skills demand within domestic energy: https://evidencehub.northeastlep.co.uk/domestic-retrofit-skills-needs-assessment

[30] Eunomia Research & Consulting, for BEIS (2021), Non-domestic energy efficiency optimisation and retrofit supply chain study.

Installers

Existing Retrofit Accreditations and Qualifications

There are several accreditations specific to retrofit work. For example, TrustMark License Plus certifies quality standards of fabric-first, whole house retrofit that works alongside some key principles of the PAS 2035 process for non-PAS 2030 certified businesses to engage in transitional adoption.[31] TrustMark is also the government's endorsed quality scheme. To become a TrustMark registered business, that business must be registered with at least one of TrustMark's scheme providers who conduct quality assurance inspections of the business. The United Kingdom Accreditation Service accredited certification bodies to ISO/IEC 17065 are also relevant for certifying retrofit products, processes, and services.[32]

PAS 2030 is a certification which demonstrates compliance of the installation of EE measures. This certification is relevant to installers of EE measures as it sets out the standards to which EE measures should be installed. This is to be used in conjunction with PAS 2035, which is an overall framework for preparing plans for domestic retrofit projects.

Other Accreditations, Experience and Qualifications

The installers interviewed had qualifications and accreditations demonstrating their competence and level of safety for the specific work they did (e.g., FENSA for window fitters, Construction Industry Trading Board (CITB) or Chartered Institute of Builders for builders, National Vocational Qualification Level 3 apprenticeships for electricians). They also learnt through experience and training on the job, with greater emphasis on competence in their trade and ability to work hard, than on formal qualifications. Installers had little interest in EE retrofit qualifications. Where this type of work was needed, they said that they contracted it out to Energy Performance Assessors or EE Advisors. While they had specific installation or building skills, they did not always understand how they related to domestic EE retrofit standards or regulations.

EE Professionals

Existing Retrofit Accreditations and Qualifications

The PAS 2035 guideline of Retrofitting Dwellings for Improved Energy Efficiency covers how to assess dwellings for retrofit, identify improvement opportunities, design, and specify EE measures and monitor retrofit projects.[33] PAS 2035 also requires designers involved with traditional building retrofits to have relevant qualifications. However, focus group participants mentioned that PAS 2035 is not mandated for projects that are not government funded, and therefore for other privately run projects including for owner-occupied properties, it is not generally taken into consideration. They also stated that PAS 2035 does not cover traditional

[31] TrustMark (2023), TrustMark's Licence Plus Scheme: https://www.trustmark.org.uk/business/information-and-guidance/licence-plus
[32] Qualitee (2018), Country report on the market and quality of energy efficiency services: https://qualitee.eu/wp-content/uploads/QualitEE_2-04_CountryReport_BE_2018.pdf.
[33] CITB (2021), Building skills for net zero: https://www.citb.co.uk/media/kkpkwc42/building_skills_net_zero_full_report.pdf.

building requirements sufficiently. Focus group attendees also mentioned that domestic energy assessors often do not have the expertise needed for traditional buildings.

Key Professionals were concerned that accreditations may be replaced with something new and end up out of date, such as the sustainable homes assessor accreditation. It was also felt skills associated with these accreditations may become less relevant as new energy efficient materials and technologies are developed. Skills providers highlighted a similar concern with training for PAS 2035 and Trustmark Plus.

Other EE related qualifications that were less common in the sample included qualifications from the Association of Environmentally Conscious Building, Passive House Trust, Energy Savings Opportunities Scheme among others.

Other Accreditations and Qualifications

The EE professionals interviewed included architects, building control surveyors, domestic engineers, design and management companies, development consultancies, energy advisors, energy assessors and energy consultants. Some of these had professional qualifications through organisations such as RIBA, RICS, and National Home Energy Rating, and gained new knowledge through continual professional development. Some held architectural degrees or postgraduate qualifications with EE components. However, like installers and construction businesses, they used specialists (e.g., retrofit assessors) when they needed retrofit advice.

Impacts of Lack of Skills or Accreditations and Employment Shortages

Focus group participants were concerned that a shortage of labour or skills may impact the future expansion of the domestic EE market in several ways. For example, financial lenders may be less likely to fund investment opportunities due to the capacity of the sector, which could hold back growth. Similarly, participants raised instances of poor-quality work where installers had to cover or improvise in areas they were not trained in, due to a shortage or high prices of skilled workers. Focus groups participants feared this could worsen with further shortages, as it could lead to measures being installed incorrectly that may have to be fixed or readjusted separately, which could be timely or costly for businesses and customers. It was also felt that employment shortages had an impact on consumers in the form of higher prices and lack of choice/options. A key step to overcoming these impacts would involve identifying the approaches necessary to upskill in the future, this is discussed more in the next section.

Future Skills

Deployment Trajectories for Upskilling the Labour Market

The literature review found that there are multiple trajectories for decarbonising UK homes, each with different impacts on the skills and labour market. The Climate Change Committee (CCC) has developed several scenarios for residential heat decarbonisation to help determine the trajectory most likely to impact skills and labour. These scenarios, known as pathways,

were explored in research carried out for the CCC with varying balances of efficiency and fuel switching.

The Balanced Pathway prioritises EE retrofits in fuel-poor homes. This would require rapidly training 12,000 people per year initially (first 1-4 years), rising to 30,000 people per year by 2028.[34] It focuses on improving homes of those in fuel poverty first.[35] An alternative is the widespread innovation scenario with faster technological advances and cost reductions. This would enable a more resource and energy efficient economy. Behaviour change would be high but EE uptake lower, needing fewer workers for retrofit supply chains. More optimistic scenarios like The Tailwinds Pathway envisage even greater innovation, behaviour change, and infrastructure advances, requiring more training and workers for EE retrofits.[36]

Groups to Retrain

Existing Construction Related Workers

The literature review found that a potential source of labour is the existing workforce within the construction sector. A report prepared for BEIS estimated that 7,506 TrustMark registered businesses, that engage in RMI work, could be incentivised to enter the domestic retrofit industry to boost the labour supply.[37] Evidence reviewed in the literature review also found that there was a decarbonisation skills gap and a clear appetite to retrain. In a survey of construction industry workers, 88 per cent reported that they would be willing to diversify and 90 per cent reported they would retrain if necessary. [38]

Young People

Evidence from the literature review and in-depth interview participants highlighted the opportunity to recruit and train younger people in retrofit work. According to interview participants, this group has proved to be challenging to recruit and improving working conditions in the sector and making the work more appealing to school and college leavers was also seen as essential to fill the skills gap in the longer term (see section Factors Regarding Routes to Entry for more detail).

New Entrants from Horizontal Sectors

Members of horizontal sectors, such as those in engineering or manufacturing (e.g. aerospace, automotive, shipbuilding and metal casting) have been identified as potential sources of people

[34] CITB (2021), Building skills for net zero: https://www.citb.co.uk/media/kkpkwc42/building_skills_net_zero_full_report.pdf.
[35] Element Energy for CCC (2020), Development of trajectories for residential heat decarbonisation to inform the Sixth Carbon Budget: https://www.theccc.org.uk/publication/development-of-trajectories-for-residential-heat-decarbonisation-to-inform-the-sixth-carbon-budget-element-energy/.
[36] Element Energy for CCC (2020), Development of trajectories for residential heat decarbonisation to inform the Sixth Carbon Budget: https://www.theccc.org.uk/publication/development-of-trajectories-for-residential-heat-decarbonisation-to-inform-the-sixth-carbon-budget-element-energy/.
[37] BEIS (2022), Supply Chain Mapping Project, unpublished.
[38] Eunomia & CITB (2021), Building skills for net zero: a summary report for the UK: https://www.eunomia.co.uk/reports-tools/building-skills-for-net-zero/#:~:text=The%20report%2C%20which%20was%20commissioned,how%20these%20can%20be%20developed.

who may require minimal upskilling.[39] Other potential sources for workers to fill the retrofit skills gap include returners (those who may return after having left the industry due to the UK's exit from the European Union or the inconsistent work demands) and those unemployed or underemployed.[40]

Skills Change in the Future

Focus group participants identified several ways by which skills may change in the future. For example, they highlighted the need for the maintenance of measures post-retrofit and educating homeowners on living in a retrofitted home. Installers will also need to have better knowledge of technology. One focus group participant also felt that *"smart technology was seen as complex to provide advice on"*. Participants suggested that increasing regulatory Minimum Energy Efficiency Standard (MEES) would encourage homeowners to invest in upgrades and installers would need to adapt to that additional demand.

Participants reiterated that a broader, whole house, holistic knowledge is needed, beyond what an installer's trade might be. It was also highlighted by participants that installers should build further knowledge and understanding of building fabric, performance, and materials. Specifically in the context of having to adapt to more extreme weather, flooding, overheating, health, well-being and safety. The need for homeowners to understand the impact of retrofit on energy security, property values and homes was also mentioned.

From Fragmented to Holistic

The literature review and qualitative research highlighted that the whole house approach to retrofitting homes mitigates ineffective and unintended consequences that may arise from the interaction between systems and retrofit components (e.g., building fabric, overheating, ventilation and air quality). [41] A whole house retrofit requires multiple skills/measures, and the likelihood is that this approach will require retrofit professionals, including retrofit assessors and retrofit coordinators. These professionals undertake training in accordance with the PAS 2035 standard. However, currently most trades are skilled in one measure and do not take a whole house approach.

According to literature, the current framing of some policy arrangements can encourage supply chains to deliver specific technology targets (e.g. heat pumps) rather than a systems approach. Subsequently, this informs the types of qualifications and training on offer, which are currently provided by manufacturers with a focus on specific installations or construction techniques.[42]

[39] North East Evidence Hub (2022), Understanding skills demand within domestic energy: https://evidencehub.northeastlep.co.uk/domestic-retrofit-skills-needs-assessment
[40] North East Evidence Hub (2022), Understanding skills demand within domestic energy: https://evidencehub.northeastlep.co.uk/domestic-retrofit-skills-needs-assessment
[41] Sustainable Energy Association (2022), What next for heat & building policy? https://sustainableenergyassociation.com/publications/what-next-for-heat-buildings-policy/; Sustainable Traditional Buildings Alliance (2012), Responsible Retrofit of Traditional Buildings: https://stbauk.org/wp-content/uploads/2020/08/STBA-RESPONSIBLE-RETROFIT.pdf.
[42] Greater South East Net Zero Hub (2022). Domestic Retrofit Market Intelligence & Skills Assessment: https://www.gsenetzerohub.org.uk/wp-content/uploads/2023/03/GSENZH-Skills-Assessment-Report_Summary.pdf.

For example, foundational training for retrofit installers exists, but there are limited training opportunities that go beyond single measures.[43]

There were three examples of the implementation of a whole house approach that were recognised in the stakeholder research, with ECO being identified by skills providers. The latest iteration of ECO is centered around a fabric-first approach, meaning that the focus is on improving the building itself before installing new heating systems. ECO mandates PAS 2035 compliance, meaning the installation of EE measures will look at the whole house when undergoing a retrofit assessment. One of the architects interviewed mentioned the extensive and successful adoption of a whole house approach in Wales, which was confirmed by literature that noted practices such as the Welsh Housing Quality Standard (2008). The whole house approach takes into consideration the wider context and condition of the home such as dampness, thermal comfort, and disrepair.[44] The Passivhaus fabric-first whole house approach to EE, which has been adopted internationally for over 30 years, was also mentioned across multiple sources.

Enablers and Barriers to Moving into EE Retrofit

This section focuses on factors incentivising workers to move into EE retrofit, including routes of entry, training and supply chain capacity. Enablers and barriers are considered within these sections.

Factors Impacting the Likelihood of Undertaking EE Retrofit Work

Conservatism within the industry: Interviews and evidence from the literature review pointed out that there was a general preference for workers in the construction industry, especially micro-businesses, to work within what they already know rather than take on new skills, materials, or project types,[45] presenting a barrier to moving into a new industry.

Availability of work: Actual or perceived lack of demand in retrofit work could discourage people from engaging in training for retrofit, and therefore disincentivise training providers from offering those courses.[46] During interviews, concerns were expressed by those in construction businesses about how much of this type of work would be available. This view was driven by uncertainty about when people would make changes to their homes, with this uncertainty creating a barrier to new businesses engaging in EE retrofit work. Additionally, installers often ended up opting for work that was more financially valuable, regardless of whether this will improve overall EE of a home (e.g., prioritising a new boiler installation instead of encouraging draughtproofing).

[43] North East Evidence Hub (2022), Understanding skills demand within domestic energy: https://evidencehub.northeastlep.co.uk/domestic-retrofit-skills-needs-assessment
[44] Sustainable Traditional Buildings Alliance (2018), EPCs and the Whole House Approach – A scoping study: https://stbauk.org/wp-content/uploads/2020/08/EPCs-The-Whole-House-Approach.pdf
[45] Brocklehurst et al. (2021), Domestic retrofit supply chain initiatives and business innovations: an international review: https://journal-buildingscities.org/articles/10.5334/bc.95
[46] South West Net Zero Hub (2023). South West Net Zero Hub Retrofit Skills Support: https://gemserv.com/wp-content/uploads/2023/05/SWNZH-retrofit-skills-report-FINAL.pdf

Lack of government support: From interviews, construction businesses and skills providers argued there was a need for more targeted funding and grants for EE retrofit and training, including incentivising workers to re-train and enabling more to move into the sector. Focus group participants also highlighted that the reluctance to pay for training was exacerbated by the fact that they already had enough paid work from non-EE RMI.

Age: During interviews, older workers in construction sometimes said, that while they may have considered the move into EE retrofit when they were younger, they were now too close to retirement to make it worthwhile to move into EE retrofit work. This is a significant barrier and one that is hard to overcome without training up a younger base of construction workers.

Factors Regarding Routes to Entry

Unclear path for new entrants: Skills providers said there was not yet a clear route into EE retrofitting for new entrants. They felt that this remained a significant gap in the supply chain for EE retrofit skills. While there are relevant courses at a variety of levels, there are some gaps in provision.

To fill this gap, Skills Providers recommended:

- Designing employability schemes to take raw talent through college, apprenticeships and traineeships and give them guaranteed jobs.
- Promoting a clear retrofit career pathway beyond the apprenticeships and traineeships which can start young people on a career.
- Attractive marketing and promotion of this type of work to young people via employment training schemes, skills boot camps and increasing awareness of roles.
- More, and more considered, funding for training in EE retrofit from the government would encourage businesses to recruit and train younger people (e.g., longer term EE capital schemes to enable business investment in training). Participants thought that this would provide more longevity and prospect of a career beyond training.

Engaging new talent/younger workforce: Interviewees thought that young people saw jobs in the construction sector as a last resort option for school leavers who could only do manual labour jobs, or that they avoided it because the sector as a whole was seen as unwelcoming, hierarchical, and patriarchal and with a lack of diversity. Other negative perceptions of the construction sector mentioned in the wider literature included inflexible hours, amount of travel, hard and dirty work, and not enough focus on new science and energy efficient technologies.[47] There are many opportunities for these candidates to find more lucrative jobs in other sectors, and retrofit roles were not necessarily identified as 'green' jobs.[48]

[47] Federation of Master Builders (2020), Trading Up: A blueprint for collaboration to boost construction apprenticeships: https://www.fmb.org.uk/resource/trading-up.html
[48] Greater South East Net Zero Hub (2022), Domestic Retrofit Market Intelligence & Skills Assessment: https://www.gsenetzerohub.org.uk/wp-content/uploads/2023/03/GSENZH-Skills-Assessment-Report_Summary.pdf

In addition, interviewees suggested that pay during training was a barrier, as financial incentives were described by key professionals and installers as insufficient to keep apprenticeship trainees in the sector. Sources have also cited the cost of employing and training an apprentice as the major reason SMEs are reluctant to take on apprentices in the construction sector.[49]

This is worsened by a lack of clear strategy in schools, colleges, and apprenticeships to engage young people early in the sector, and to give them the technical and scientific knowledge of retrofit work. There is currently no clear apprenticeship route for young people to gain a broad basic knowledge in EE retrofit work before specialising in a trade.

Focus group discussions suggested some solutions to these barriers, including financial support to provide loan support to apprentices and raising awareness across schools to emphasise the environmental credentials of retrofit work and to highlight a clear career path.[50]

Absence of a clear plan: Interview participants perceived plans to achieve net zero to be insufficiently clear to enable development of the industry. Many businesses also see net zero as a future problem, viewing 2050 as a long way in the future and resulting in a lack of urgency to make changes.[51] In the evaluation of the GHGVS, a key point of consensus among installers was the need for long-term planning. Installers thought that schemes such as GHGVS should run for at least three years.[52]

Factors Regarding Training

Time and cost constraints with existing workload and limited capacity to train creating a barrier: Construction businesses said that the lack of sufficiently skilled installers and construction workers makes it hard for them to find enough workers to cover day-to-day work and release staff for additional retrofit training. They also mentioned that larger contractors did not allow for the cost of training to be included in the costs submitted by subcontractors. The lack of guaranteed steady work in retrofit further disincentivises involvement.[53] This sometimes led to an over-reliance on subcontracting workers, who were not suitably trained. This supports evidence from the literature review, where results from a survey indicated one of the main constraints installers were experiencing in the UK was the time lag associated with training,

[49] Federation of Master Builders (2020), Trading Up: A blueprint for collaboration to boost construction apprenticeships: https://www.fmb.org.uk/resource/trading-up.html
[50] Greater South East Net Zero Hub (2022), Domestic Retrofit Market Intelligence & Skills Assessment: https://www.gsenetzerohub.org.uk/wp-content/uploads/2023/03/GSENZH-Skills-Assessment-Report_Summary.pdf
[51] Eunomia Research & Consulting, for BEIS (2021), Non-domestic energy efficiency optimisation and retrofit supply chain study.
[52] BEIS (2022), Evaluation of the green homes grant voucher scheme (GHGVS): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1131110/green-homes-grant-vouchers-phase-1-process-evaluation-report.pdf.
[53] Greater South East Net Zero Hub (2023), Supply Chain Market Intelligence Executive Summary: https://www.gsenetzerohub.org.uk/wp-content/uploads/2023/03/GSENZH-Executive-Summary.pdf

which was one of the reasons for staff shortages, as well as the impacts of the UK exit from the European Union.[54]

Construction businesses also had limited capacity to train staff on a broad range of skills. Consequently, they looked for staff with basic competencies in a particular skill (e.g., insulation installation, window fitting, electrical installation), rather than for those with general EE retrofit knowledge or skills. Focus group participants suggested having well-recognised intense and short courses to increase expertise in retrofit, as these are currently lacking.

Improve the quality and assurance of qualification or training programmes to enable more participation: Participants highlighted the importance of getting the balance of practice and theory right: installers, construction businesses and key professionals felt that people have the skills necessary for their trade but do not understand the wider context of EE, retrofitting, products involved and how to achieve EE ratings or meet regulations. However, they noted that some courses could be too theory based and delivered online, which did not appeal to some in the industry.

In both interviews and literature, there was also evidence of installers lacking confidence in the quality and completeness of retrofit related qualifications which leads to hesitations in enrolling in retrofit courses.[55] The outcomes of training programmes have also been challenging to discern as there are no systematic retrofit evaluations in place. The literature suggested that there was a need to 'train the trainers' and improve the shortage of skilled tutors available.[56]

Fill in training gaps to stimulate demand: The main training gaps were (a) courses for existing installers and builders with job experience who want to go on to do designing or project management roles, (b) provision for young people wanting a broad basic understanding of EE-retrofit work before specialising in a particular trade, and (c) essential training for those looking to move into the sector. Skills providers stated that until training is made mandatory, the levels of training will not increase.

To date, there have been two main ways in which skills providers and funders have tried to fill these gaps. First, upskilling installers in EE retrofit aspects of their work after they have gained basic skills and experience. Consequently, most attendees on these sort of training courses were men in their forties who were looking to attend short courses online. However, this provision could also be an attractive part of continuing professional development for younger people coming into the sector. Second, providing new training and job opportunities for the medium to long-term unemployed, disadvantaged communities, or people seeking to retrain into a new career. Although this type of training was commercially available, the Departments for Education (DfE) and Work and Pensions (DWP) often funded it as 'skills bootcamps' so as

[54] Greater South East Net Zero Hub (2023), Supply Chain Market Intelligence Executive Summary: https://www.gsenetzerohub.org.uk/wp-content/uploads/2023/03/GSENZH-Executive-Summary.pdf
[55] South West Net Zero Hub (2023), South West Net Zero Hub Retrofit Skills Support: https://gemserv.com/wp-content/uploads/2023/05/SWNZH-retrofit-skills-report-FINAL.pdf
[56] Greater South East Net Zero Hub (2023), Domestic Retrofit Market Intelligence & Skills Assessment: https://www.gsenetzerohub.org.uk/wp-content/uploads/2023/03/GSEENZ-Skills-Assessment-Full-Report-FINAL.pdf

not to act as a barrier to joining the workforce. To date, the focus with these bootcamps has been on Energy Advisor or trade specific roles for example insulation installation for EE retrofit.

Factors Regarding Supply Chain Capacity

Government policies on retrofit: The fragmented, short-term nature of policies and its associated schemes that offer funding was consistently mentioned by research participants and cited in the literature reviewed.[57] This makes it challenging to establish a long-term market with a consistent supply and demand for retrofit (see The Role of Government Schemes in the Sector). In some cases, interview participants said that more funding for work, such as replacement windows and insulation, would build the market for EE retrofit work, especially where people were struggling with the cost of living. Where funding opportunities were acknowledged, the cost, time and 'red tape' were all seen as major barriers (see The Role of Government Schemes in the Sector).[58] Evidence from the literature review suggests that overcoming these challenges will require long-term guaranteed, consistent government commitment to funding and policymaking.[59] Participants suggested that greater consistency and stability of funding is likely to be more appealing to potential new entrants and trainees, and create a signal to the wider sector to move towards EE retrofitting work.

Regulations and policies: Interview participants stated that nationally stringent regulations and comprehensive guidance from the government would develop this market as well as the quality of work being done. Additionally, if planning law could be aligned with any future EE regulations, this would support the growth of EE retrofitting work. Interviewees also highlighted that there is zero VAT on new build materials but not on retrofit and that this is a current barrier to the expansion of EE retrofitting work.

Monitoring and enforcement of existing EE regulation: Focus group participants also mentioned mandating EE regulations such as the monitoring and enforcement of MEES for landlords, as it was suggested that breaches to the regulations were common or implementing minimum standards on mortgage providers to assist with this. The need to regulate the market was also stated, for example, as products that are banned under Eco-design principles such as tungsten halogen bulbs are still being sold on online markets.

New opportunities and positive encouragement around EE retrofitting: Key Professionals described the industry as growing. This included opportunities to work on Passivhaus projects and the feeling that workers are contributing to net zero. Participants indicated this could be a key source of encouragement for new entrants into the sector and that EE retrofit

[57] Greater South East Net Zero Hub (2023), Domestic Retrofit Market Intelligence & Skills Assessment: https://www.gsenetzerohub.org.uk/wp-content/uploads/2023/03/GSEENZ-Skills-Assessment-Full-Report-FINAL.pdf; Sustainable Energy Association (2022), Designing an effective Home Upgrade Grant Scheme: https://sustainableenergyassociation.com/wp-content/uploads/2022/05/Designing-an-effective-Home-Upgrade-Grant-Scheme.pdf

[58] Greater South East Net Zero Hub (2023), Supply Chain Market Intelligence Executive Summary: https://www.gsenetzerohub.org.uk/wp-content/uploads/2023/03/GSENZH-Executive-Summary.pdf

[59] Sustainable Energy Association (2022), What next for heat & building policy? https://sustainableenergyassociation.com/publications/what-next-for-heat-buildings-policy/

apprenticeships have the potential to be promoted in the same way as university degrees or STEM subjects, which could provide a boost to the capacity of the sector.

Boosts to the UK economy: Participants stated growth of the UK economy as being an important enabler of growth of the EE retrofit market. This would positively impact the supply chain via the increased demand for EE retrofit work, material costs and retrofit work costs. In line with this, public awareness of EE retrofitting needs to be improved. Key professionals and construction businesses also stated that, in their view, public misconceptions on the costs and benefits of EE create a reluctance from customers to retrofit their homes. It is difficult to provide an accurate idea of a payback period as this is variable for different properties and situations.

Lack of community approaches to retrofit: Focus group participants discussed the idea of community groups which could be used for retrofitting at scale on a local level. Attendees highlighted examples such as Retrofit Balsall Heath, HomeBaked CLT, People Powered Retrofit and LocoHome Retrofit. People Powered Retrofit is a co-operative based in Greater Manchester and the North West that focuses on promoting EE within homes. They collaborate with households, contractors, community energy organisations and others to support the delivery of more and better retrofit projects.[60] The group were established with government funding[61] and supported by community energy co-operative Carbon Co-op. The organisation has recently expanded their partnership network across the UK and expects to welcome more partners in 2024. Partnerships are based around the development of retrofit services and the provision of tools such as their Home Retrofit Planner.

Lack of consumer knowledge: It was clear from stakeholder engagement and in the literature that increasing public awareness of retrofitting would help to increase the demand for retrofit skills (see Demand for Energy Efficiency Services).[62] Additionally, community advocacy and local initiatives were suggested ways to increase homeowner engagement. Evidence from the stakeholder research suggests that businesses would be willing and able to respond to a demand signal like this, and that indications of a growing EE retrofit market would encourage more investment in training to increase the number of workers to deliver EE measures. Support for consumers from trained advisors was also suggested by some interview participants to support consumers in the process and help them make the right decisions, rather than relying on the advice of those carrying out the EE retrofit measures.

[60] People Powered Retrofit (2023), Homes for a Low Carbon Future: People Powered Retrofit
[61] BEIS (2020), Energy Efficiency Improvement Rates: Local Supply Chain Demonstration Projects: Selected demonstration projects: summaries - GOV.UK (www.gov.uk)
[62] Greater South East Net Zero Hub (2022), Domestic Retrofit Market Intelligence & Skills Assessment: https://www.gsenetzerohub.org.uk/wp-content/uploads/2023/03/GSEENZ-Skills-Assessment-Full-Report-FINAL.pdf

Role of Government

This section explores the government's role in the retrofitting market regarding funding, accreditation and training, and policy. This includes awareness of government messaging, the role of government schemes and funding for training.

Awareness of Government Messaging Around EE Retrofit

Across the participant groups, awareness of government policies was shown in two main ways. Greatest awareness was where new standards or regulations had been introduced that installers, construction workers and key professionals needed to abide by. For example, participants mentioned EPC rating standards changing for the expected standards of EE in different types of home and construction businesses and key professionals mentioned changes to building regulations. However, other participants were only aware of more general messaging. For example, around net zero or the need to save energy publicised on the news and in advertising. Construction businesses that were less involved in retrofitting homes were less aware of messaging and government initiatives for EE work, they perceived the demand for this type of work to be low and that it was not worth focussing their strategy on delivering EE retrofitting services.

However, despite interviewees all having some degree of awareness of messages, they felt much of this messaging was confusing and inconsistent, and did not effectively communicate how policies should be promoted, implemented, and achieved by the government.[63] Skills providers felt that although there was an identified need for more people to work in the industry, the funding available was sometimes piecemeal, hard to access and short term, with this inconsistency preventing the sector from evolving. Construction businesses said that the industry is trying to prepare for a shift into more EE retrofit work by changing construction methods, but the industry was not regarded as stable by some because policy and government schemes often changed. Participants of the interviews and focus groups indicated an example of this was the GHGVS, which closed in March 2021 after six months. One participant said that the GVGHS was *"short term and could not be deployed properly as there weren't the skilled people available to do the work".* Participants felt this did not align with the government's ambitious targets for energy reduction in the construction sector, a 15 per cent reduction by 2030.[64]

Focus group participants supported this view across all stakeholder groups. They agreed that homeowners are concerned over the complexity of retrofit in engaging and setting up the process (see 'Demand for Energy Efficiency Services' section) and that a sense of direction is required to drive demand. A suggested approach provided for mitigating against this concern was agreeing on common terminology across all government and local government channels.

[63] The Institution of Engineering and Technology & Nottingham Trent University (2020), Scaling up retrofit 2050: https://www.theiet.org/impact-society/factfiles/built-environment-factfiles/retrofit-2050/
[64] UKGBC (2023), Breaking the logjam on home retrofit policy: https://ukgbc.org/events/breaking-the-logjam-on-home-retrofit-policy-project-kick-off/; House of Commons Business, Energy and Industrial Strategy Committee (2019), Energy efficiency: building towards net zero Twenty-First Report of Session 2017–19: https://publications.parliament.uk/pa/cm201919/cmselect/cmbeis/124/12402.htm

They stated that the government have not played a sufficient role in guidance and awareness to drive demand and that the government should be the trusted voice for the industry. It was felt that greater support and green finance are needed to get people to engage with EE measures. Focus group participants also felt that the views of workers do not go past the consultation phase or studies like this due to fear of causing political disharmony.

The Role of Government Schemes in the Sector

Professionals and skills providers mentioned a range of schemes. These included current schemes like The Energy Company Obligation (ECO) and The Social Housing Decarbonisation Fund, and past schemes like the Green Deal, the Renewable Heat Incentive, and the GHGVS. Participants raised issues with schemes that broadly sit within three themes:

- **Poorly promoted schemes** meant that many professionals were not aware of their existence or were aware but had not taken part because they did not see them as worthwhile.
- **Short length or improper structuring** of schemes give businesses little time to mobilise and prepare for them.
- **Unachievable requirements** including ‘red tape’ and stringent eligibility criteria make it difficult for homeowners to improve the efficiency of their home even slightly.

Interview participants felt that taking part in government schemes was not worthwhile. In part, this was because they did not perceive them to be relevant, whereas others were aware of the schemes but had heard that they received a bad reception. Others argued that they already had enough installation or construction work and that they therefore did not need to get involved in any government initiatives or schemes. This also reflected the shortage of labour discussed elsewhere in the report, with demand outstripping supply being the reason they did not need to get involved in government schemes.

Participants also felt that funds were monopolised by larger businesses that they believed were consistently more likely to receive them. This was perceived to be due to larger businesses having the resources needed to deal with the application processes. Those applying also interpreted that large insurance costs were needed to access the funds and considered these to be a barrier for small businesses.

Most domestic retrofit installations rely on financial support from public schemes, which in England is provided principally through ECO, a government EE scheme covering Great Britain. Those who took part in ECO said the requirements kept changing, leaving them with work that was out of scope, and difficulties coordinating work with the requirements of other schemes including the Green Deal. This meant some interviewees were left feeling grateful that they had not taken part. Others said they were put off from becoming involved in similar schemes in the future.

Furthermore, there were remarks from the industry that aspects of the UK policy environment surrounding EE were confusing, and that a lack of long-term policy from the government

discouraged the implementation of EE measures.[65] The lack of confidence in policy support for domestic retrofit was further compounded by changes in the level of funding creating uncertainty. The short-term nature of schemes has also been a barrier, for example The Green Deal ended after only two years.[66] The GHGVS scheme supported the creation of jobs to some extent, but these were typically short-term and for roles such as quotation and administration.[67] The Sustainable Energy Association outlined that it will be a challenge, but necessary to reassure and re-engage installers after the GHGVS.[68]

Both focus group participants and interviewees felt that schemes were necessary and raise awareness. However, participants perceived them to be poorly designed, cause challenges, have 'red tape', inefficiencies, and overall have a poor reputation. Participants also described schemes as 'boom-bust' schemes, which they felt caused a lack of trust in the demand pipeline. This discouraged many businesses that were interviewed from even attempting to become involved in future schemes and gave them low confidence that any will be designed effectively.

Participants felt that the government were short-sighted to have schemes that run for two years or less. For these, short windows for engagement would not allow enough time to prepare and mobilise to take advantage of the grants available. The recent extension of ECO4, was highlighted as a rare example of an *"effective long-term retrofit scheme that mostly delivers on its targets".* That being said, participants also indicated that current schemes encourage new entrants into the market, as opposed to supporting the businesses that have experience in the sector; practices such as these often do not translate to high quality retrofits. To improve the structure of the schemes, and to give businesses and homeowners greater clarity, suggestions were made to split the structure into at least two phases. The first is the assessment phase, where homeowners can have retrofit assessors provide details on the measures that are suitable for their property and provide guidance on the grants that may apply to them, offering advice where needed. The second, distinct phase, is the installation of the measures themselves. With this clear structure, it gives homeowners and businesses time and knowledge to plan the delivery of retrofitting.

Training and Skills Funding

Skills providers tended to have more involvement with government schemes and funding than the other participant groups. This was because the courses they offered covered topics like building regulations and changes in policies and practices related to EE retrofit. Some of the providers received funding from BEIS, DfE and DWP and were working to fill skills gaps in the

[65] Eunomia Research & Consulting, for BEIS (2021), Non-domestic energy efficiency optimisation and retrofit supply chain study: https://www.eunomia.co.uk/reports-tools/non-domestic-energy-efficiency-optimisation-and-retrofit-supply-chain-study/
[66] Brocklehurst et al. (2021), Domestic retrofit supply chain initiatives and business innovations: An international review: https://journal-buildingscities.org/articles/10.5334/bc.95
[67] BEIS (2021), Evaluation of Green Homes Grant schemes (GHGVS): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1131110/green-homes-grant-vouchers-phase-1-process-evaluation-report.pdf
[68] Sustainable Energy Association (2022), Designing an effective Home Upgrade Grant Scheme: https://sustainableenergyassociation.com/wp-content/uploads/2022/05/Designing-an-effective-Home-Upgrade-Grant-Scheme.pdf

industry. Some providers were also working with regional authorities such as Greater Manchester Combined Authority to discuss their net zero strategies for housing, and the training needed to supply the right skills to ensure the policies were implemented. Other examples of government funding initiatives that participants had experience of included skills boot camps funded by DWP and DfE, BEIS Home Decarbonisation Skills Training funding to train suppliers needed to support the Social Housing Decarbonisation Fund, and from the European Social Fund.

However, despite this type of funding, the high cost of courses meant that they were only taken up where government funding was available, with fewer people able to take course's funding support. A further challenge was that initiatives and funding were regarded as short-term. This meant that skills providers were constantly looking for more funding, as certain funding streams came and went, and others were restricted to certain regions. Skills providers outlined how they have to invest time in finding different funding schemes and have waiting lists of clients who are waiting for the next funding to become available. Funding not being available all year round creates pressure for skills providers as they have to find trainees, sign them up and get them through the course before the funding ends. A specific example given was the Green Deal, which was said to have left a gap in funding streams when it was stopped.

This view was supported by the participants of the focus group discussions. Trade associations that provided training courses indicated a reluctance from potential trainees to pay for training, highlighting a need for financial incentives for new entrants, trainees, and payment support similar to student loan systems for university degrees.

DESNZ has funded training initiatives, such as the £6m investment in 2021 in its Skills and Training Competition, which resulted in 7,000 training opportunities in the EE, retrofit and low carbon heating sector.[69] They have also invested £9.2 million in the Home Decarbonisation Skills Training Competition in 2022, and a further £8.85 million for phase 2 of this in 2023.[70] However, the government's approach to addressing the skills and capacity shortage in the market has been criticised for focussing too heavily on the supply of skills.

There has also been a call for reforming the wider construction sector. For example, a report by the Centre for Research into Energy Demand Solutions argued that in the UK's construction industry, there is often a focus on training and the supply of skill, without addressing the lack of demand. Evidence from the literature suggested that a focus on training without confronting the lack of demand for retrofitting skills (which is largely attributable to insufficient investment in schemes supporting installation), will not give the required boost to rates of retrofitting.[71]

[69] BEIS (2022), Design of the Energy Company Obligation (ECO): https://www.gov.uk/government/consultations/design-of-the-energy-company-obligation-eco-2023-2026
[70] BEIS/DESNZ (2022), Home Decarbonisation Skills Training competition: Phase 1: Home Decarbonisation Skills Training competition: Phase 1 (closed to applications) - GOV.UK (www.gov.uk); DESNZ (2023), Home Decarbonisation Skills Training Competition: Phase 2: Home Decarbonisation Skills Training competition: Phase 2 (closed to applications) - GOV.UK (www.gov.uk)
[71] Killip, G. (2020), A reform agenda for UK construction education and practice: https://journal-buildingscities.org/articles/10.5334/bc.43

Conclusions

This research seeks to address gaps in understanding of the domestic EE retrofit supply chain. It focused on exploring the characteristics and capabilities of businesses, installers and the workforce that deliver retrofit work. This understanding is critical given the key role domestic buildings play in UK emissions, and the need to meet government decarbonisation and net zero targets.

Defining the Supply Chain and Business Models

The domestic EE retrofit supply chain is fragmented, comprised mainly of SMEs focused on specific trades. Installers rely on informal networks and recommendations to find work and generally avoid advertising due to working at full capacity. Subcontracting is common, especially amongst large contractors, to access specialist skills and manage fluctuating workloads. There were notable overlaps in the provision of services for both domestic and non-domestic markets.

Skills and Accreditations Assessment

There was a general understanding that the supply of domestic retrofit workers with adequate skills was lacking. Installers often felt their non-retrofit trade skills were transferrable to retrofit work, with exceptions such as the need for greater expertise in traditional building retrofit. However, in contrast to the opinions of installers, it was identified through literature, EE professionals and skills providers that installers tended to lack deep retrofit-specific expertise (for example how retrofit components may interact with other elements in the building) or knowledge of retrofit standards, often resulting in unintended consequences, such as moisture and condensation.

Whilst accreditations for retrofit exist, this study found that many of the businesses providing retrofit services did not have these; instead, they had accreditations specific to their trades and felt that retrofit specific accreditations were still nascent. There is a need to develop a common pathway into the sector through retrofit apprenticeships before young people specialise in a particular type of installation.

Increasing the Future Capabilities of Retrofit

Existing construction related workers (especially those doing RMI work) and young people were identified as target groups to (re)train for retrofit.

This study identified several factors that affect a worker's willingness to move into the retrofit market. For existing workers in the construction industry, this included: conservatism within the industry, perceived lack of consistent demand for retrofit work, lack of government funding to

support householders who were unable to afford the upfront costs of EE retrofit, and age (workers felt they were too old to move into a new area of work). It was also highlighted that the path to enter the retrofit market is often unclear, and engaging new talent is challenging given the negative image of work in construction and the lack of schools engaging students in apprenticeship opportunities. With regards to taking on retrofit training, time and cost constraints were a recurring barrier mentioned across stakeholders, along with the need to improve quality assurance of training programmes and mandating them for installers.

The government's role in supporting the expansion of the retrofit market was extensively discussed across stakeholders. A major factor that effected people's involvement in the EE retrofit market and any government schemes, was the short-term and inconsistent nature of past schemes and funding. In combination with a lack of clarity across government regulations and messaging, 'red tape', and stringent eligibility criteria, many in the sector showed disillusionment with the government's actions to boost this sector.

From the evidence gathered in this study, there appears to be a strong need for clear signalling by the government in terms of policy, and sustained investment to provide confidence for the market.

This publication is available from: www.gov.uk/government/publications/domestic-energy-efficiency-retrofit-supply-chain

If you need a version of this document in a more accessible format, please email alt.formats@energysecurity.gov.uk. Please tell us what format you need. It will help us if you say what assistive technology you use.