

RETROFIT: THE WORKFORCE WE NEED

WHO SHOULD LEAD THE GREEN REVOLUTION?

March 2023



Autonomy

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Autonomy

Autonomy is an independent research organisation which creates data-driven tools and research for sustainable economic planning. Our research focuses on issues such as the future of work, sustainable jobs and just green transitions. Our team of policy experts, economists, physicists and machine learning specialists means that we can produce data-driven, analytically sharp research that can influence policy, intervene in public debate and augment movements for sustainable change.

Published 2023 by © Autonomy

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This project is supported by Subak and the Alex Ferry Foundation



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EXECUTIVE SUMMARY

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- » This report considers the nature of residential and domestic retrofit work - the skills, tools and tasks of the jobs involved - and provides key data points to design an appropriate industrial strategy.
- » It uses an unprecedented dataset (ASPECTT), developed in-house by Autonomy, to map international databases onto ONS occupation codes, to put important detail onto job transition plans.
- » This allows us to identify the skills, tasks and tools used in retrofit work, and therefore which workers in adjacent occupations could transition to this crucial line of work.
- » **The study shows that the North of England is a fertile area for mass retrofit roll outs:**
 - » This is partly due to large demand, however, these areas also contain many workers in low-wage, so-called 'Elementary Occupations' - those with more common-denominator skill requirements - who could be doing useful retrofit work.
 - » **In total, there are over 3.8 million workers across the UK that could move into retrofit work relatively quickly.**

- » Potential retrofit workers are clustered most acutely in Northern regions such as Sheffield, places in the Midlands such as the Black Country, and Cornwall in the South West.
- » The study identifies wage differences between occupations that represent potential opportunities and/or challenges to incentivising workers to transition to this line of work.
 - » Some retrofit occupations - such as solar photovoltaic installers or heating, ventilation, air conditioning, and refrigeration mechanics - offer higher typical salaries than adjacent, 'pre-transition' jobs, and would represent a potentially attractive 'step-up' for workers..
 - » Other occupations, e.g. domestic energy assessors, sometimes often offer less remuneration than similar 'pre-transition' occupations, potentially holding up recruitment from one job to the other.
- » If such a large-scale transition is to succeed it will require a UK government-led industrial strategy.
 - » This will include job creation but also robust training programmes that need to be underway as soon as possible.
 - » It will also require collaboration with trade unions to make sure that this transition is sustainable and equitable from a worker perspective.



INTRODUCTION

INTRODUCTION

Buildings are the second largest source of emissions in the UK,¹ which currently has the least energy efficient housing stock in Europe.² While there have been gradual improvements in efficiency over the last decade, change has not come quickly enough.³

To meet its current climate targets, the UK government aims to retrofit all homes to the 'EPC Band C' standard by 2035. However, only 29% of current homes meet this standard.⁴ As such, they have been left with the task of retrofitting an ambitious 71% of all housing stock over the next 13 years - a serious challenge given current trajectories.⁵

In the 2022 Autumn Statement, the UK government announced its target to reduce energy consumption from industry and buildings by 15% by 2030, alongside the creation of a new Energy Efficiency Taskforce (EET) to oversee delivery of the policy.⁶ In an effort to reduce energy costs and drive up energy efficiency, however, the EET - along with £6 billion of new funding - has been promised for the period 2025-2028 only.

1 HM Government (2020). 'White Paper: Powering Our Net Zero Future'. Available at: <https://www.gov.uk/government/publications/energy-white-paper-powering-our-net-zero-future>

2 Green Alliance (2021). 'Reinventing Retrofit: how to scale up home energy efficiency in the UK'. Available at: <https://green-alliance.org.uk/publication/reinventing-retrofit-how-to-scale-up-home-energy-efficiency-in-the-uk/>

3 Department for Levelling Up, Housing and Communities (2020-21). 'English Housing Survey: Energy Report 2020-2021'. Available at: <https://www.gov.uk/government/statistics/english-housing-survey-2020-to-2021-headline-report>

4 *ibid.*

5 *ibid.*

6 HM Treasury (2022). 'Autumn Statement'. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1118417/CCS1022065440-001_SECURE_HMT_Autumn_Statement_November_2022_Web_accessible_-_1_.pdf

Previous policy efforts to improve the energy efficiency of buildings since 2010 have largely ended in failure, with the Green Homes Grant, Green Deal and Energy Company Obligation (ECO) falling far short of their predecessors in terms of making meaningful gains in energy efficiency and carbon emissions reductions.⁷ These programmes represented a meaningful opportunity to move toward the UK's retrofit target. Instead, they were squandered by poor design, organisation and, ultimately, low public uptake.

Such failures seem all the more egregious given the proportion of the UK population currently living in fuel poverty. Since October 2022, an estimated 7 million UK households have fallen into fuel poverty - a number which could rise to 8.6 million by April 2023 unless immediate policy measures are taken.⁸ Significantly, many of these households are living in a property with an energy efficiency rating of band D or below.⁹

Meeting targets will entail a significant increase in the number of workers performing retrofit related tasks such as domestic energy assessment, retrofit advice, retrofit coordination, as well as the installation of energy efficiency measures in existing dwellings such as insulation and windows, in addition to renewable energy sources such as heat pumps and solar photovoltaic systems. Currently, only around 200,000 people work on fitting and maintaining existing housing stock.¹⁰ It is estimated that the retrofit workforce needs to double the number of workers - to around 400,000 - to meet the UK government's target.¹¹ Meeting this could therefore provide sustainable and decent employment at a time when such work is in short supply. The TUC predict that over 260,000 jobs could be created by retrofitting social housing alone.¹²

7 National Audit Office (2016). 'Green Deal and Energy Company Obligation'. Available at: <https://www.nao.org.uk/reports/green-deal-and-energy-company-obligation/>; House of Commons Library (2021). 'Green Homes Grant'. Available at: <https://commonslibrary.parliament.uk/research-briefings/cbp-9235/>

8 End Fuel Poverty (2022). 'About Fuel Poverty'. Available at: <https://www.endfuelpoverty.org.uk/about-fuel-poverty/>

9 *ibid.*

10 Ashden (2022). 'Retrofit: solving the skills crisis'. Available at: https://ashden.org/sustainable-towns-cities/retrofit-solving-the-skills-crisis/?utm_source=press_release&utm_medium=referral&utm_campaign=retrofit_policy_brief_2_2022

11 *ibid.*

12 TUC (2020). 'Can an infrastructure stimulus replace UK jobs wiped out by COVID19 crisis?' Available at: https://www.tuc.org.uk/sites/default/files/TUC%20Jobs%20Recovery%20Plan_2020-06-17_proofed.pdf

Decades of underinvestment in industrial manufacturing and infrastructure works in the UK has resulted in a workforce generally lacking in technical skills. Workers who do gain such skills primarily find employment in the construction sector, which in recent years has seen high staff turnover, with some estimates placing the figure at 21.4%, well above the UK average of 15%.¹³ A number of other factors, including Brexit and the pandemic, have led to a severe shortage of construction workers. Some estimates suggest that the industry will require as many as 250,000 new workers by 2026.¹⁴

In this study, we use Autonomy's ASPECTT tool to analyse the characteristics of various retrofit occupations which are expected to grow rapidly in the UK over coming years. In order to facilitate accelerated recruitment into these occupations, it is necessary to focus on recruiting workers who require minimal retraining and upskilling: i.e., those whose current jobs or recent work histories indicate similar skills and knowledge profiles, as well as similar work activities, and the use of similar tools and technologies. In order to make these transitions attractive to workers, these new jobs will also have to offer competitive pay and conditions commensurate with their skills and the vital nature of their work.

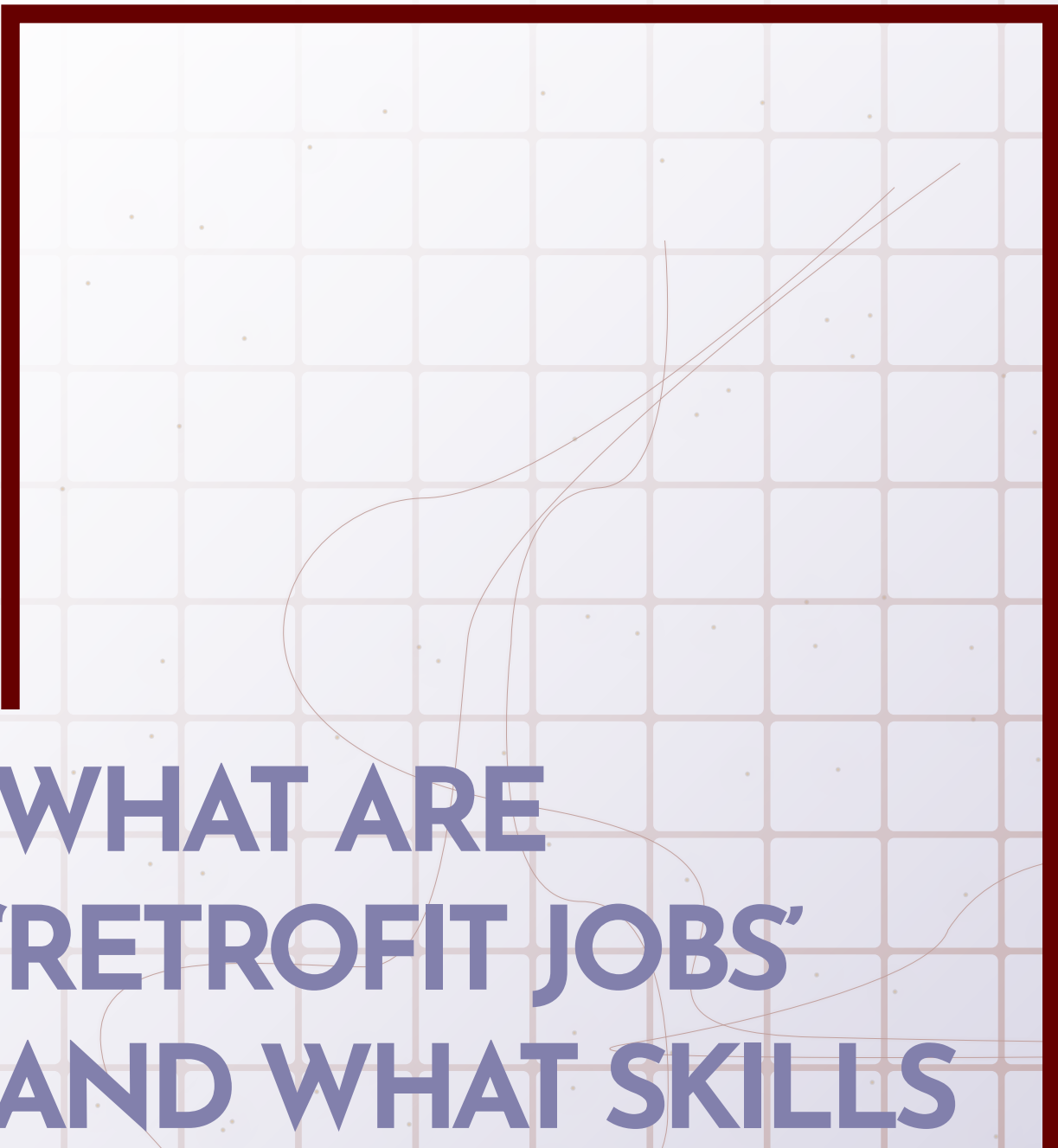
ASPECTT is a unique database, produced in-house by Autonomy, that allows for a much more fine-grained analysis of the UK labour market.¹⁵ It does this by mapping O*NET, ONS and other international occupation codes in order to build richer portraits of every single occupation in the labour market. Such work has been long called for by the Department for Business, Energy and Industrial Strategy and key actors in the field.¹⁶

13 PPR (2022). 'What is the best practice for internal recruitment in construction?' Available at: <https://www.ppronline.co.uk/blog/2022/02/what-is-the-best-practice-for-internal-recruitment-in-construction>

14 CITB (2022). 'The Skills Construction Needs'. Construction Skills Network'.

15 Autonomy (2022) 'The ASPECTT Database'. Available at: <https://autonomy.work/wp-content/uploads/2022/01/Aspectt-occupational-tool.pdf>

16 Institute for Employment Studies (2015) 'Exploring the value of an O*NET resource for the UK'. Available at: <https://www.employment-studies.co.uk/resource/exploring-value-onet-resource-uk>



**WHAT ARE
'RETROFIT JOBS'
AND WHAT SKILLS
DO THEY REQUIRE?**

WHAT ARE 'RETROFIT JOBS' AND WHAT SKILLS DO THEY REQUIRE?

What does a 'retrofit job' mean? What are the skills, knowledge and abilities needed to carry out the tasks and use the tools required? And how do these overlap with the existing capacities of the UK workforce?

In this section, we draw on bespoke Autonomy tools such as ASPECTT to flesh out further detail on common retrofit jobs and the extent to which their skill sets overlap with those of the existing UK workforce.

Having first offered a taste of the standard tasks that common retrofit jobs entail, we then take a deeper dive into the skills, knowledge and abilities that underpin them, as well as the extent to which these overlap with the existing capacities of the UK workforce, looking at from where the new retrofit workers of the green transition might be drawn.

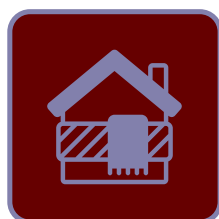
As a specific case study, we also focus in more detail on Solar Photovoltaic Installers - a core component of the future retrofit workforce.

WHAT DAY-TO-DAY TASKS DO RETROFIT JOBS ENTAIL?

What day-to-day tasks do key jobs in retrofit involve? Here, we offer an initial sense of the roles central to the retrofit transition.



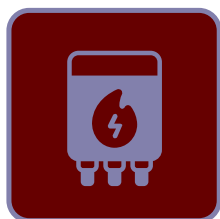
Solar Photovoltaic (PV) Installers install and integrate solar PV systems into pre-existing domestic electrical systems in accordance with codes and safety standards, using drawings, schematics, and instructions. PV Installers are also required to work safely on rooftops and perform minor repair and finishing tasks to roofing and tiles.



Insulation Installers must identify insulation needs of buildings, select and handle different insulating materials and install them in appropriate parts of buildings, by hand or using specialist tools. 'Fabric first' retrofit is an approach which prioritises improving airtightness and reducing heat loss from the building envelope, prioritising areas of high loss such as roofs, windows and doors. Insulation technicians perform important roles in this work by installing cladding and upgrading insulation, performing structural and other repair work, ensuring good airflow and proper ventilation and moisture-proofing. They may also be employed in insulating floors, ceilings and internal walls, and areas around hot water tanks and pipes. They must also undertake cosmetic repair and finishing tasks such as plastering, sealing and painting to restore function and aesthetics.

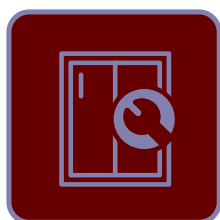


Energy Auditors primarily identify opportunities for energy efficiency improvements to buildings. They conduct investigations into heating and insulation systems, perform energy efficiency tests, analyse energy usage patterns and issue recommendations on possible measures that can be installed. They may also draw up specifications for measures to be implemented, oversee the work of installing upgrades, and undertake further tests to assess and certify improved energy performance of buildings

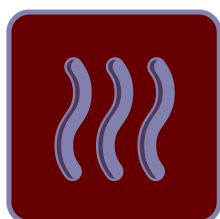


Heating, Ventilation, Air Conditioning, and Refrigeration Mechanics

work in a variety of industrial and domestic contexts, but their role in retrofitting domestic buildings specifically involves installing, servicing and repairing climate control and ventilation systems and their components such as boilers, heat pumps, air conditioners, mechanical ventilation heat recovery systems, pipes and ducting. They are also required to perform checks to ensure that these systems comply with safety and energy efficiency standards.



Glaziers prepare and install windows and glass doors to buildings. Since a large number of domestic retrofit projects are expected to include upgrading windows from single glazing to double and triple glazing, we expect retrofit projects to employ glaziers to install and finish upgraded windows, including their mouldings, frames, panes and accessories.



Geothermal Technicians install, service and maintain ground based heating systems. Even though ground source heat pumps are not as widely deployed as other heating systems, and are mainly installed in newer buildings, we foresee in the coming decade a rise in demand for technicians with this specialised skill set.

HOW DO RETROFITTER SKILLS OVERLAP WITH THE EXISTING UK WORKFORCE?

With an initial sense of the tasks undertaken in retrofit jobs, in this next section we take a step deeper, drawing on our ASPECTT database to break these occupations down further into their composite knowledge areas, skills, abilities, and associated tools.

In so doing, we can assess the overlap - or lack of - between the knowledge, skills and abilities of existing sections of the UK workforce, with those required by new retrofit jobs.

In the following graphs, we therefore plot the average levels of abilities, knowledge and skills that are required from workers according to their Major Occupation Group. There are nine major occupation groups in the UK's Standard Occupational Classification. These are:

Major Group 1	MANAGERS, DIRECTORS AND SENIOR OFFICIALS
Major Group 2	PROFESSIONAL OCCUPATIONS
Major Group 3	ASSOCIATE PROFESSIONAL AND TECHNICAL OCCUPATIONS
Major Group 4	ADMINISTRATIVE AND SECRETARIAL OCCUPATIONS
Major Group 5	SKILLED TRADES OCCUPATIONS
Major Group 6	CARING, LEISURE AND OTHER SERVICE OCCUPATIONS
Major Group 7	SALES AND CUSTOMER SERVICE OCCUPATIONS
Major Group 8	PROCESS, PLANT AND MACHINE OPERATIVES
Major Group 9	ELEMENTARY OCCUPATIONS

We can think of retrofit jobs as falling into two broad categories.

First, there are ‘assessment’, ‘consulting’, ‘planning’ and ‘coordinating’ roles, which typically fall under ‘Group 2: Professional Occupations’ and ‘Group 3: Associate Professional and Technical Occupations’ of the UK Standard Occupational Classification (SOC). These jobs may require a degree or other specialist training.

Second, there are the majority of roles that form the bulk of retrofit installation, which fall under SOC ‘Group 5: Skilled Trades’ and ‘Group 9: Elementary Occupations’. Workers performing similar tasks at comparable levels of skills, abilities and knowledge can also be found in ‘Group 8: Process, Plant and Machine Operatives’. These workers are typically employed in industrial manufacturing sectors.

Below, we mainly focus on this second category of jobs, relating to **retrofit installation**. In turn, we highlight some of the key abilities, knowledge areas and skills required by retrofit installation jobs, and map which existing SOC ‘major groups’ most closely overlap with them - and therefore offer a potential base from which to source workers for transition.

In the following sections, we graph and compare the profiles of “the average worker” in each Major Occupational Group based on an ASPECTT analysis of the UK workforce, in terms of skills, knowledge domains and abilities. It must be noted that major occupational groups are themselves quite varied and that there can be broad variations in terms of these attributes within each group. But, nevertheless, the portraits suggested by these graphs point to some notable characteristics of the UK workforce. The scales along which the levels are assigned in the following graphs are based on the O*NET content model which also identifies the attribute categories we consider.¹⁷

¹⁷ National Center for O*NET Development. The O*NET® Content Model. O*NET Resource Center. <https://www.onetcenter.org/content.html>

ABILITIES

Abilities are enduring characteristics of individuals that influence their performance. They can be broadly classified as:

- » **Cognitive**
Abilities that influence the acquisition and application of knowledge in problem solving.
- » **Psychomotor**
Abilities that enable workers to manipulate and control objects, typically with their hands.
- » **Sensory**
Abilities that influence visual, auditory and speech perception.
- » **Physical**
Abilities that pertain to strength, endurance and control of gross bodily movements.

What abilities does **retrofit installation** work require?

- » **Finger Dexterity**
- » **Rate Control**
- » **Control Precision**
- » **Arm-Hand Steadiness**
- » **Manual Dexterity**

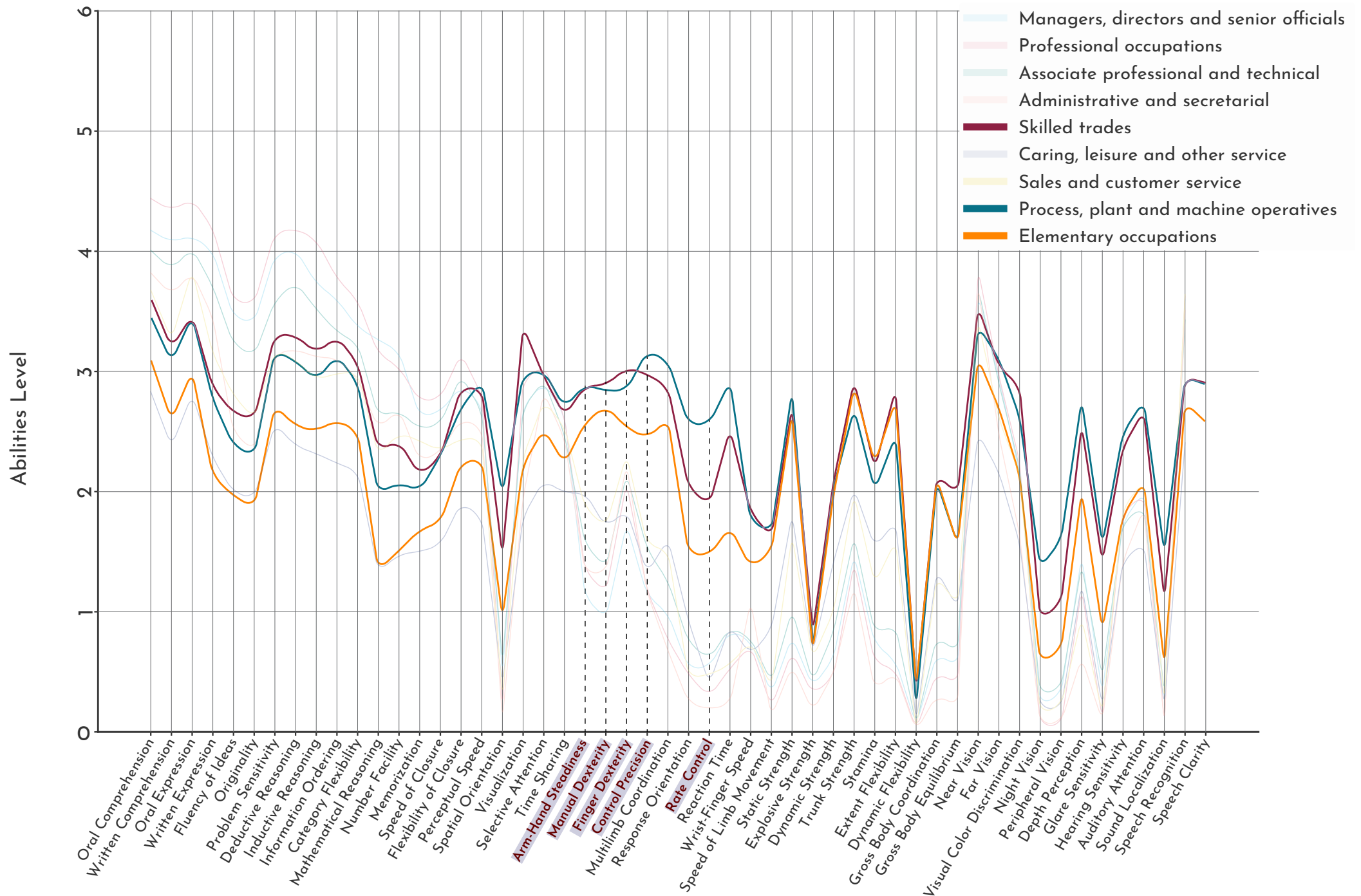


Figure 1: Average ability levels required by nine occupational groupings.
 Source: Autonomy analysis using ASPECTT (ONS x O*NET)

As Figure 1 shows, the occupations that most closely relate to retrofit installation work - with the highest levels in these specified abilities - are workers in the groups 'Skilled Trades', 'Process, Plant and Machine Operatives', and 'Elementary Occupations'.

These groups rely somewhat more heavily on physical and psychomotor abilities than other occupations, seeing higher scores for abilities such as 'Finger Dexterity', 'Control Precision' and 'Manual Dexterity' than those in other groups. However, while these stand out for their close fit, it should be emphasised that workers in other occupational groups may still possess these abilities even though their jobs may not require them to be actually used to the same extent.

KNOWLEDGE AREAS

'Knowledge areas' pertain to the acquired body of ideas, facts and methods that relate to a domain of information associated with a given occupation. Of the 33 domains of knowledge listed by O*NET, those that most closely relate to retrofit installation work include:

- » **Design**
- » **Building and construction**
- » **Engineering and Technology**
- » **Mechanical**

The O*NET model offers a very broad picture of these domains and, therefore, does not include the potential multiple strands of specialisation within each knowledge domain - i.e. we could break down wide areas like 'design' or 'mechanical' knowledge much further. However, these nevertheless offer a powerful initial picture of potential overlaps.

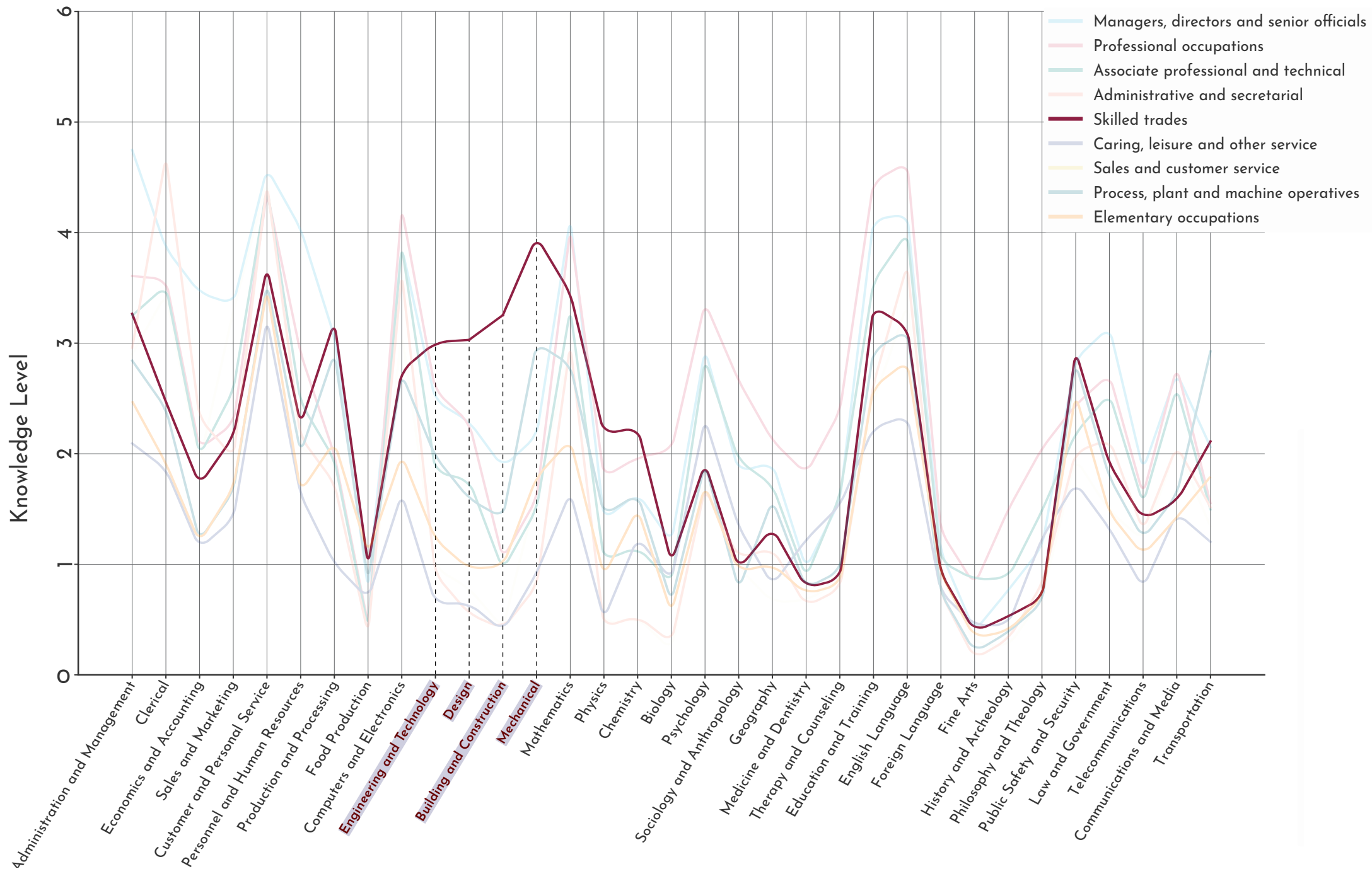


Figure 2: Average levels of knowledge required by nine major occupational groups.
 Source: Autonomy analysis using ASPECTT (ONS x O*NET)

Looking more closely at Figure 2, it appears that the occupations that have the greatest capacities in the above knowledge domains currently reside in the 'Skilled Trades' group. These knowledge domains include 'Engineering and Technology', 'Design', 'Building and Construction' and 'Mechanical', and the above disparity is readily explained by the fact that skilled trades in the UK are primarily employed in the construction sector.

Indeed, there is a substantial gap between knowledge profiles of the 'Skilled Trades' group of workers and the other occupational groups when it comes to the kinds of knowledge required for retrofit installation work. This presents a challenge to recruiting other groups of workers into retrofit work, and points to the importance of training programmes tailored to fill in these specific gaps.

SKILLS

Skills are the developed capabilities necessary to perform procedures associated with a given domain of knowledge. In the O*NET model, skills equate to what workers can do. Retrofit occupations require moderate levels of technical skill, including:

- » **Operations Analysis**
- » **Technology Design**
- » **Equipment Selection**
- » **Installation**
- » **Operations Monitoring**
- » **Operation and Control**
- » **Equipment Maintenance**
- » **Troubleshooting**
- » **Repairing**

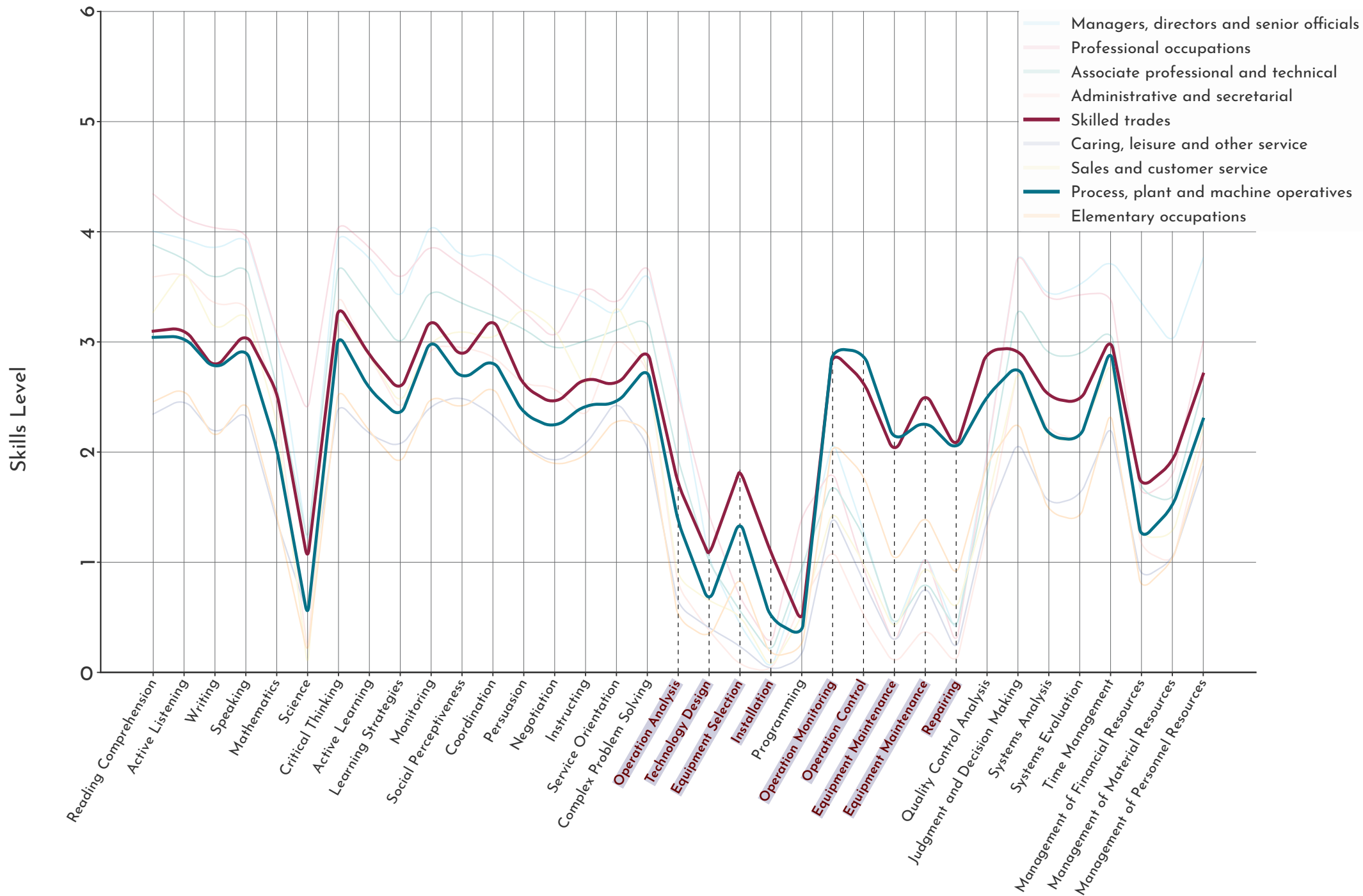


Figure 3: Average levels of skills required by nine occupational groups
 Source: Autonomy analysis using ASPECTT (ONS x O*NET)

Looking closely at Figure 3, we see those occupations most closely related to retrofit installation work in terms of skills are the groups 'Skilled trades' and 'Process Plant and Machine Operatives'. Both 'Skilled Trades' and 'Process Plant and Machine Operatives' entail skills such as 'Operations Monitoring', 'Operation and Control', 'Equipment Maintenance', 'Troubleshooting' and 'Repairing' which are not associated with the other occupational groups but are essential to retrofit work. As Figure 3 shows, there is a significant gap between these occupational groups and all of the others in terms of how closely they relate to these skills required by retrofit installation work.

CASE STUDY: SOLAR PHOTOVOLTAIC INSTALLERS

Here we focus on one particular retrofit job - Solar Photovoltaic Installers - and present their dominant abilities, knowledge areas and skills, as well as their most important tool types and tasks as suggested by an ASPECTT analysis.



The diagram features a central dark blue circle with the word 'ABILITIES' in white. A line extends from the top of this circle, branching out to connect to several stylized solar panels arranged in a row. The panels are depicted with a grid pattern and are tilted at an angle. The overall design is clean and modern, using a color palette of dark blue, light blue, and white.

ABILITIES

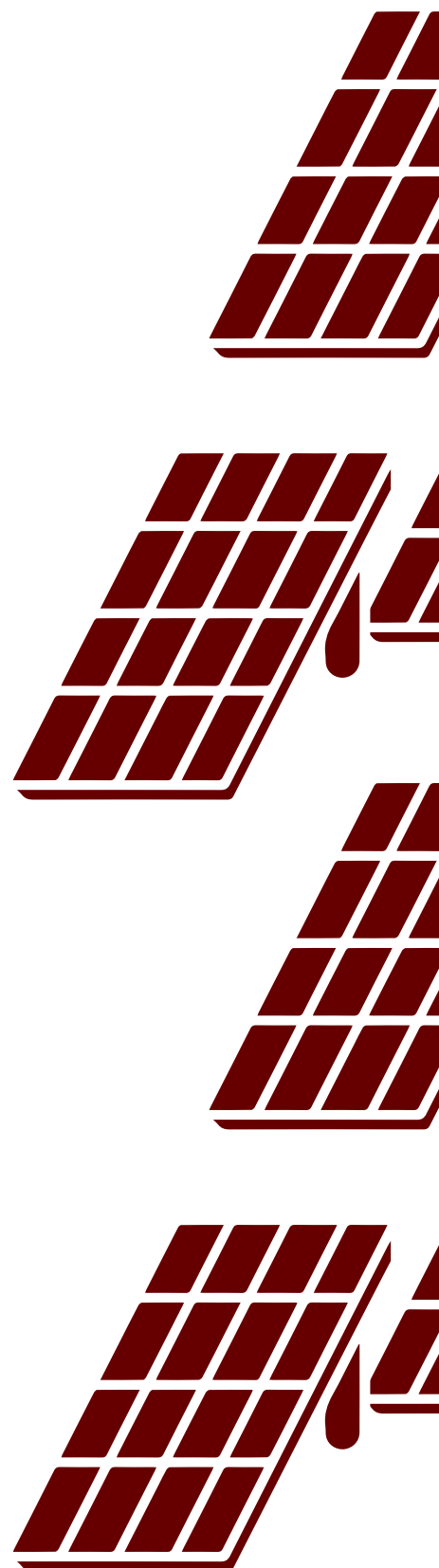
- » Visualization
- » Problem Sensitivity
- » Near Vision
- » Information Ordering
- » Oral Comprehension
- » Deductive Reasoning
- » Finger Dexterity

SKILLS

- » Installation
- » Critical Thinking
- » Troubleshooting
- » Coordination
- » Monitoring
- » Quality Control Analysis
- » Active Learning

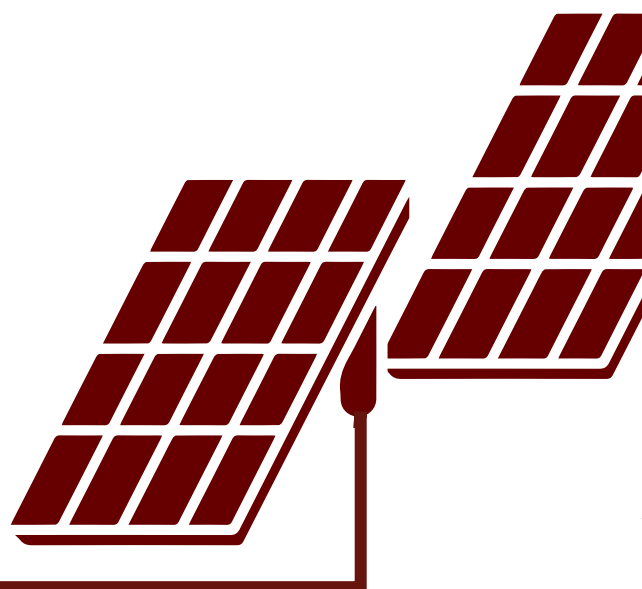
KNOWLEDGE

- » Mechanical
- » Building and Construction
- » Design
- » Engineering and Technology
- » Customer and Personal Service
- » Production and Processing
- » Mathematics



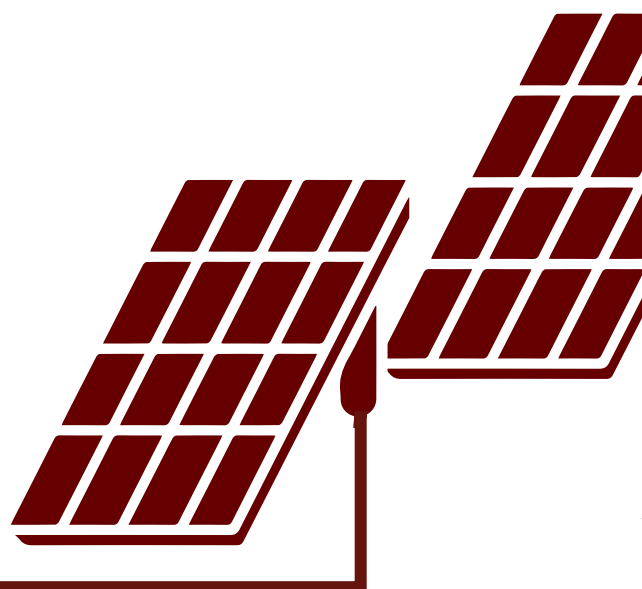
TASKS

- » Choose appropriate locations and materials
- » Assemble solar modules, install PV systems and batteries
- » Work on rooftops, refinish roofing
- » Work safely with existing electrical systems
- » Perform tests, assess performance, identify hazards
- » Demonstrate system functionality and performance
- » Perform maintenance and repairs to PV systems
- » Compile or maintain records



TOOLS

- » **Construction:** Blow torch, Power drills, Power Saws, Post hole diggers, Stripping tools, Wrenches (Adjustable, Pipe), Caulking guns, Screwdrivers, Sledge Hammers, Knives (Utility, Putty), Cutters (Wire, Pipe or Tube) etc.
- » **Measurement & Calibration:** Multimeters, Pitch measuring instruments, Solar radiation surface observing apparatus, Geological compasses, Levels, Tape Measures
- » **Information & Communication:** Computers (desktop, notebook), GPS receiver, Digital camcorders or video cameras, Portable data input terminals, Pocket calculator
- » **Safety:** Safety harnesses or belts, Masks, Protective gloves, Safety glasses
- » **Mobility & Transportation:** Ladders, Forklifts, Wheelbarrows, Trenching machines, Minivans or vans



TOOLS

Beyond abilities, knowledge areas and skills, ASPECTT also allows us to identify the most commonly used tools in retrofit installation work, which can then be grouped into four key technological categories. With this, we could then, for instance, map these against the kinds of current occupation groups that require workers to use the same or similar tools.

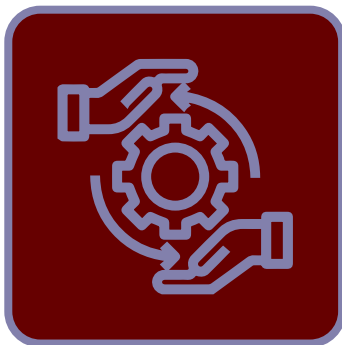
In so doing, we would add further detail to our developing portrait of those kinds of present occupations that could most readily transition to retrofit installation work, offering another criteria with which to judge potential close matches for transition. For now, through the list below, we offer an initial sample of some of the tools most regularly used in retrofit installation employment.

» **Construction**

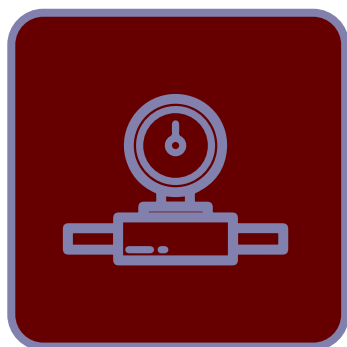


- » Blowtorch
- » Caulking guns
- » Screwdrivers
- » Locking pliers
- » Wirecutters
- » Power saws

» **Information and Communication**



- » Desktop computers
- » Tablet computers
- » Digital camcorders
- » Portable data input terminals
- » Walkie-talkies

» Measurement and calibration

- » Moisture metres
- » Multi gas monitors
- » Tape measures
- » Vibration testers
- » Power metres
- » Anemometres

» Safety

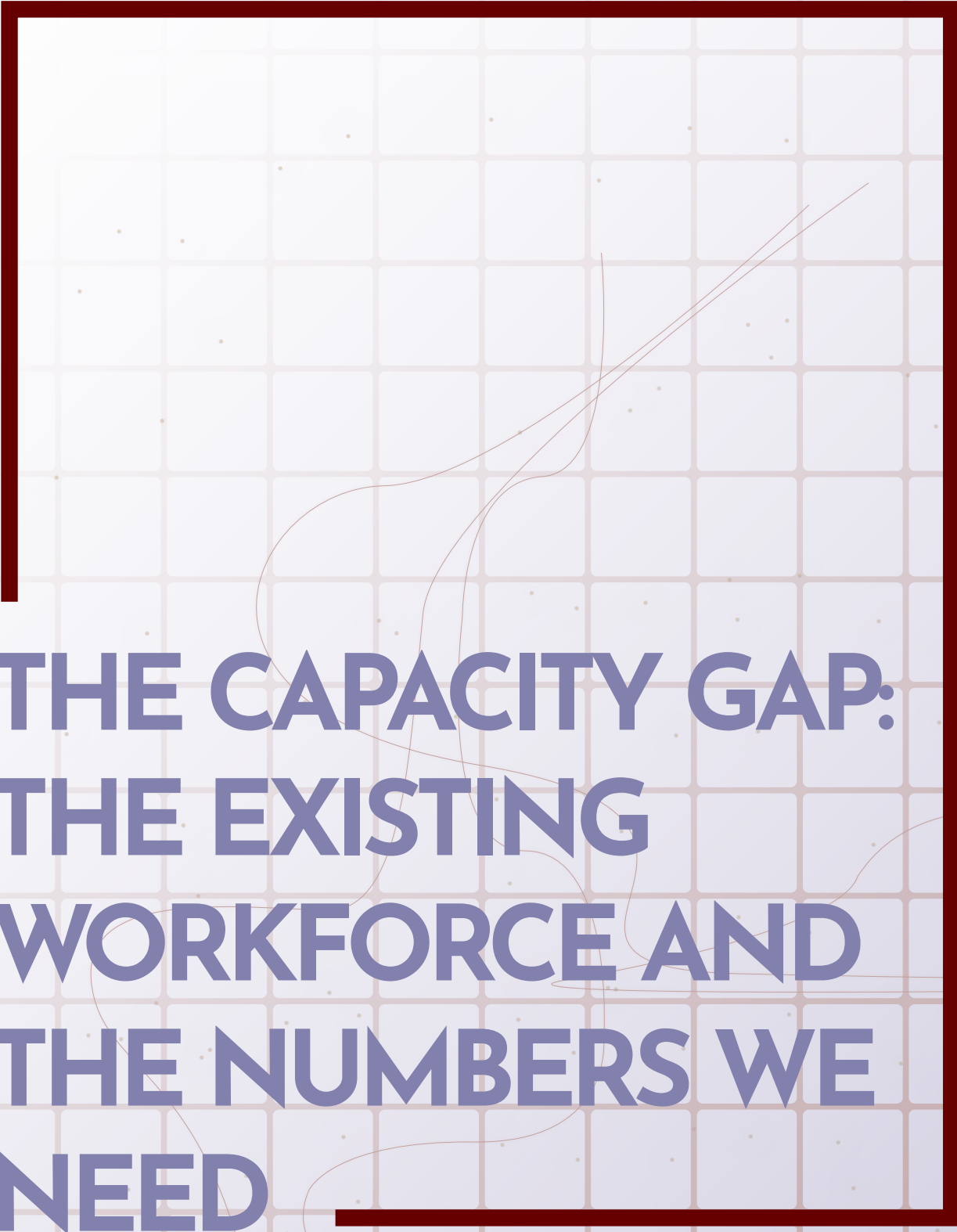
- » Combustible or hazardous gas detectors for power generators
- » Welding masks
- » Goggles
- » Safety glasses
- » Hardhats
- » Protective gloves

» Mobility

- » Forklifts
- » Cranes
- » Vans and Minivans

A FOUR-WHEELED BARRIER?

Vehicle ownership and full drivers licences are frequently listed as a requirement for retrofit jobs. It is worth investigating whether this acts a barrier to younger workers or those without the means to own and keep a vehicle and exploring what can be done to support them.



**THE CAPACITY GAP:
THE EXISTING
WORKFORCE AND
THE NUMBERS WE
NEED**

THE CAPACITY GAP: EXISTING WORKFORCE AND THE NUMBERS WE NEED

Though the UK government has an ambitious target to retrofit all houses by 2035, there remains a significant gap between the number of workers currently trained to retrofit buildings and the number of workers needed to meet this target.

Number of current retrofit workers in UK:	Number of retrofit workers required to meet target:
200,000	400,000

Table 1: The workforce gap in household retrofit

Source: Ashden (2022). 'Retrofit: solving the skills crisis'; Edie (2022). 'Government urged to promote localised retrofitting skills drive'.

Over the next few years, the UK will need to double the number of workers who are able to retrofit buildings. Only a fraction of these workers can emerge from generational upskilling - a process that is simply not rapid enough given the urgency of the situation. A large number of workers will need to be sourced from the existing workforce and will have to transition from occupations in construction. As we discuss later in Section 5, there are also ways to use procurement strategies to shift the priorities of specific sectors to reflect the urgency of the crisis.

In the table below we consider how many workers are currently employed in occupations that have skills profiles congruent with those required for retrofit work.

Number of Employees by Occupational Group and Industry Sector	Construction	Manufacturing	Transport & Communication
Skilled Trades	1,094,300	61,600	110,900
Process, Plant and Machine Operatives	183,200	495,600	691,900
Elementary occupations	165,500	252,700	335,800

Table 2: Number of employees by Occupational Group and Industry Sector

Source: Labour Force Survey, Jan - Dec 2019

As a preliminary method to estimate the feasibility of transitioning workers from other occupations into retrofit work, we have picked the three occupational groups with the skills profiles that most readily match those of retrofit occupations, employed in the three industrial sectors where they are most likely to employ these skills. The number of these jobs totals 3.95 million. The size of the retrofit workforce we need is just over 10% of this figure: 400,000 workers.

We also include the transport and communication sectors in the above classification for the following reasons:

- » **The transport sector must undergo drastic changes as a part of a green transition. For example, widespread adoption of electric vehicles will reduce the demand for skills in the manufacture, maintenance and repair of vehicles powered by internal combustion engines. As we identify in Section 3 below, workers in these areas possess skills which are easier to adapt to retrofit work.**
- » **In addition, energy efficient buildings in the future will extensively utilise smart systems to monitor and regulate energy use and climate control. This will increase the demand for workers with information and communication technology skills to install and maintain these systems.**

We can drill down further into the Standard Occupational Classification, and look at the most relevant sub-major groups (2-digit SOC 2010 codes), namely:

- » **31: Science, Engineering and Technology Associate Professionals**
- » **52: Skilled Metal, Electrical and Electronic Trades**
- » **53: Skilled Construction and Building Trades**
- » **81: Process, Plant and Machine Operatives**
- » **91: Elementary Trades and Related Occupations,**

Here, we see that there are a total of 4.2 million (over 3.8 million full time and 366,600 part-time) workers in these groups. Should any of the underemployment in these areas be involuntary, an increase in the amount of retrofit work available presents an opportunity for these workers to find more work.



**SOURCING
THE RETROFIT
WORKFORCE WE
NEED**

SOURCING THE RETROFIT WORKFORCE WE NEED

SOLAR PHOTOVOLTAIC (PV) INSTALLERS

This section considers the specific occupations that have skill profiles similar to common retrofit installation jobs, as well as their training levels, size of workforce, and salaries. This gives a clearer sense of which occupations could readily transition to retrofit work without having to shift to a lower salary, for instance. In some cases, the transition from an occupation with a similar skill profile into retrofit work would immediately offer a higher salary (see Solar Photovoltaic installers below). In these instances, we might expect the transition to retrofit work to be an attractive option.

Solar PV installers in the UK typically have a background as roofers or electricians. Starting salaries are between £600 to £2,000 per week.¹⁸

Other workers who have similar skills profiles in skilled trades occupations include:

» **Sheet metal workers**

(SOC 5213, 2021 figures: 10,900 employed, median pay: £499).¹⁹

» **Vehicle body builders and repairers**

(SOC 5233, 29,000 employed, median pay: £524)

» **IT engineers**

(SOC 5245, 38,500 employed, median pay £558).

¹⁸ The figures for the retrofit occupation are from a reviewed sample of actually existing job vacancies. The data was gathered from online sources. The figures for compatible occupations are gross weekly median pay (ONS, 2021)

¹⁹ All SOC codes used throughout the report are taken from the SOC 2010 classification.

Other workers who have similar skills profiles in the process, plant and machine operative group include:

» **Metal working machine operatives**

(SOC 8125, 38,600 employed, median pay £479)

» **Vehicles and metal goods assemblers**

(SOC 8132, 35,700 employed, median pay £551)

As the UK ramps up its transition to Net Zero, the size and employment profile of the automotive manufacture and maintenance industry is very likely to change. This will result in a large number of workers seeking employment in other industries, which presents an opportunity for the domestic solar sector²⁰

In terms of skills, many of the workers in the above occupations could transition to solar PV installation work. As we see above, this would also mean a significant raise in salary for many of these workers.

Occupation	Salary (per week)
Solar PV installer	£600-£2000
Sheet metal worker	£499
Vehicle body builder and repairer	£524
IT engineer	£558
Metal working machine operatives	£479
Vehicles and metal goods assembler	£551

Table 3: Comparison of starting salaries offered to solar PV installers with existing, transferable occupations.

Source: Review of recent online job postings and median weekly pay for a selection of occupations with similar skills profiles identified using ASPECTT and ONS.)²¹

²⁰ Green Jobs Taskforce (2021). 'Report to Government, Industry and Skills Sector'. Available at: <https://www.gov.uk/government/publications/green-jobs-taskforce-report>

²¹ ONS, Annual Survey of Hours and Earnings, 2021. [Earnings and hours worked, region by occupation by four-digit SOC: ASHE Table 15 - Office for National Statistics \(ons.gov.uk\)](https://www.ons.gov.uk/employment-and-hours-worked)

INSULATION INSTALLERS

Insulation work plays a crucial part preventing heat loss from buildings and ensuring the effectiveness of energy efficiency measures. Insulation installers tend to have starting salaries in the range of £400 to over £1200 per week, depending on location and expertise.

The retrofit industry champions the fabric first approach for its cost-effectiveness as well as its indispensable role in ensuring that all other upgrades deliver on their promise. Insulation workers operate at a range of skill levels. Their skills match a broad range of occupations within skilled trades, operatives and elementary occupations. Workers with more relevant experience in the construction industry may find employment repairing and upgrading building fabric, while newer entrants gain experience by assisting in these tasks. A retraining and employment program in Manchester for theatre workers unemployed in the Covid pandemic provides a recent example of how this work can attract workers with varied backgrounds.

Some insulation work offers full training to workers who have elementary construction skills and driving licences. This presents a significant opportunity for many workers in the construct

Occupation	Salary (per week)
Insulation Installers	£400-£1200
Welding trades	£559
Metal machining setters and setter-operators	£560
Electricians and electrical fitters	£646
IT engineers	£558
Roofers, roof tilers and slaters	£463
Plumbers and heating and ventilating engineers	£606
Carpenters and joiners	£537
Plasterers	£516
Floorers and wall tilers	£471
Electroplaters	£536

Occupation	Salary (per week)
Coal mine operatives	£468
Quarry workers and related operatives	£635
Metal working machine operatives	£479
Assemblers (vehicles and metal goods)	£551
Scaffolders, staggers and riggers	£700
Air transport operatives	£465
Elementary construction occupations	£449
Industrial cleaning process occupations	£362
Elementary storage occupations	£426

Table 4: Adjacent occupations for Insulation Installers

Source: Autonomy analysis using ASPECTT (ONS x O*NET)

DOMESTIC ENERGY ASSESSORS

Domestic energy assessors in the UK are associate professionals with NVQ Level 3 qualifications in Domestic Energy Assessment. Starting salaries are between £400 to £700 per week.²²

Similar jobs with respect to skills include some professional occupations like engineers and quantity surveyors, but these tend to require higher qualifications and salaries.

However, workers in associate technical occupations and domestic energy assessors tend to have comparable qualification and salary profiles and, for this reason, offer a more suitable match:

» **Associate professional within the construction and engineering fields**

(SOC 31, over 100,000 employed, median pay £520)

» **Health and safety officers**

(SOC 3567, 58800 employed, median pay £663)

Still, there remains a discrepancy in salary levels. Domestic energy assessors receive starting salaries of £400 to £700 per week for qualified personnel, which, in some cases, will be lower than the median pay for associate technical occupations. As an incentive to draw workers out of jobs in associate technical occupations, domestic energy assessors should be paid starting salaries that equate to or are higher than those of associate technical occupations.

An additional benefit in terms of career progression is that domestic energy assessors also have the background and opportunity to upskill and move into managerial roles such as retrofit coordinators and advisors. However, as these workers progress into more senior roles there will need to be strategies in place to make sure that sufficient numbers of workers are given the training required to take their place.

²² These figures are from a reviewed sample of actually existing job vacancies. The data is gathered from online sources.

HEATING, VENTILATION, AIR CONDITIONING, AND REFRIGERATION MECHANICS

Plumbers and heating and ventilating engineers and similar tradespeople are in high demand in the UK and their shortage has been exacerbated since Brexit. HVAC mechanics and those with equivalent qualifications can seek specialised training and become qualified heat pump installers - occupations that are in high demand in both the retrofit and new build sectors. Gas heating engineers and qualified heat pump technicians fetch similar weekly starting salaries of £600 to £1000 per week.²³ There is also flexible work available which is paid per installation and may suit the needs of some workers.

In order to ramp up recruitment in these occupations we need to look outside the construction industry and into sectors employing workers with similar skill profiles such as industrial manufacturing and maintenance, as they can be retrained most easily. There are almost 400,000 skilled mechanical tradespeople in metal working, automotives including boats, ships and rail, as well as precision instruments (SOC: 5223, 5224, 5231, 5232, 5236, 5237) in the UK. Depending on industry, their median weekly pay ranges from £500 to £700.

Other skilled engineering trades such as electricians and electrical fitters, and those currently working in TV, video, audio, and IT engineering (SOC: 5241, 5244, 5245, 5249) also have similar skill profiles. There are over 330,000 such workers in the UK, and their median pay ranges from £450 to £700 per week. However, given the high demand for skilled electrical occupations, this is unlikely to be a sector with a large outflow of workers.

Operatives in semi-skilled trades in construction and industrial manufacturing have an opportunity to upskill relatively easily into these occupations as the pay is significantly higher. For example there are 74,000 construction operatives in the UK (excluding those specialised workers in scaffolding and rigging, road and rail construction) whose median weekly pay is £494. Upskilling can increase their earnings by at least 20%.

GLAZIERS

There are around 19,000 glaziers and window fitters in the UK, and their median weekly pay is £454. The shortage of materials and supply chain issues are a more urgent challenge to this sector than labour shortages, but operatives in the automotive industry and sectors where many workers earn less money such as glass and ceramics (median weekly pay £444) and electrical goods assembly (median weekly pay £400) as well as elementary construction workers (median weekly pay £449) can be recruited and retrained to fill any shortages in this area.

²³ These figures are based on a reviewed sample of actually existing job vacancies. The data was gathered from online sources.



THE GEOGRAPHY OF RETROFIT SUPPLY AND DEMAND

THE GEOGRAPHY OF RETROFIT SUPPLY AND DEMAND

Demand for retrofit jobs - and the distribution of suitable skills and transferable occupations among the working population - is far from uniformly distributed across the UK.

As a preliminary step towards investigating the geographical constraints on expanding the retrofit workforce, we used the latest available ONS data (2019) to look at the number of workers in each SOC 3-digit occupational group at the English Local Enterprise Partnership level and aggregate them into three relevant major occupational groups, allowing us to calculate the percentage of the workforce in each. Their geographic distribution across England only is shown below in Figures 5, 6 and 7.

Figure 8, meanwhile, looks at uneven geographic demand for retrofit, by displaying the proportion of poorly insulated homes according to local authority area across England and Wales.

SKILLED TRADES

Percentage of Skilled Trades in local workforces

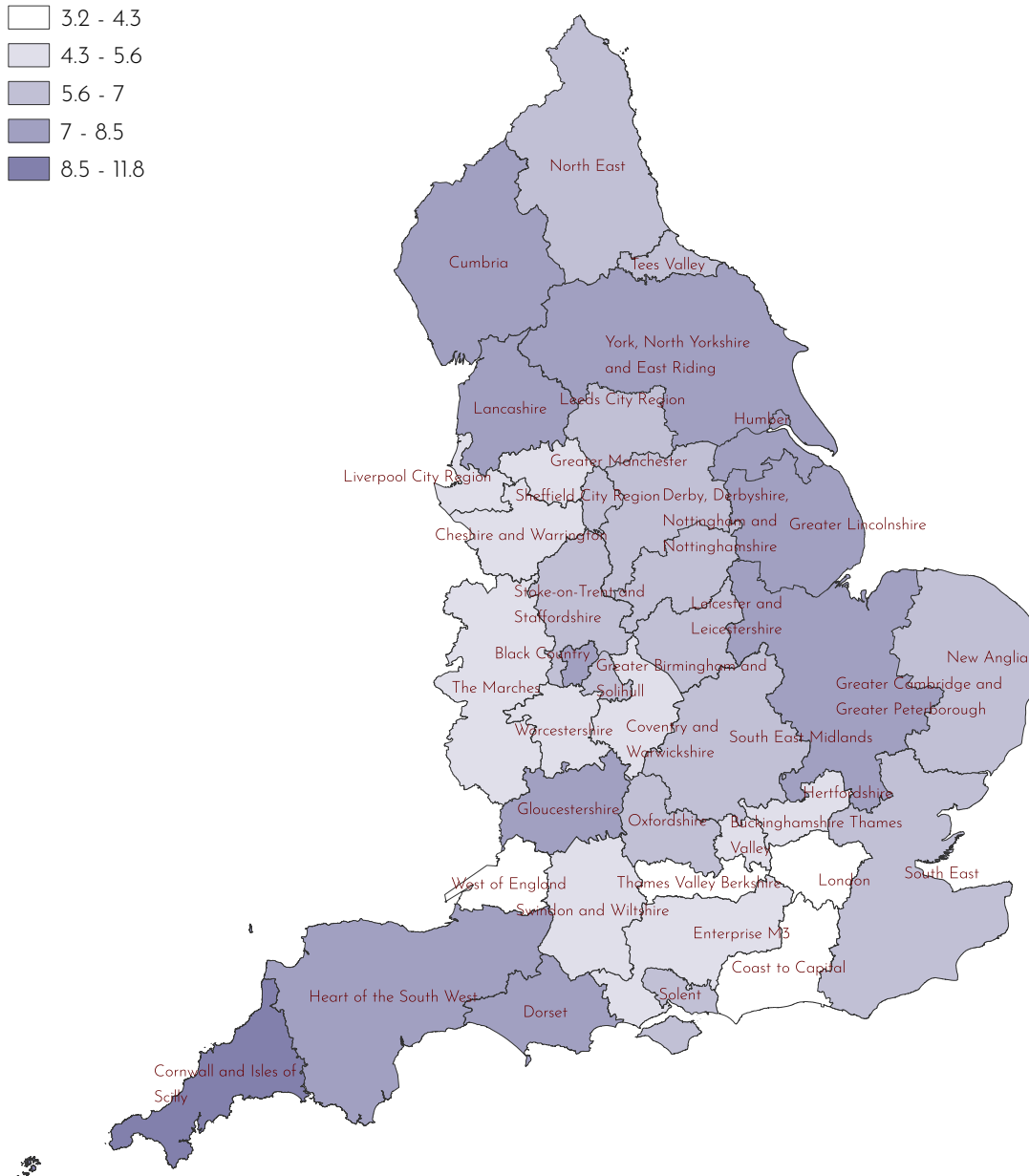


Figure 5: Where are the skilled trades workforce? The distribution of skilled trades workers as a percentage of overall employment in that region (by Local Enterprise Partnership)

Source: Annual Population Survey, January-December 2021,

Figure 5 shows which regions have the highest density of skilled trade occupations among their workforces. The South-West and North include a relatively high proportion of skilled tradespeople. This makes it easier for retrofitting projects in these places to recruit workers for more advanced tasks such as installing and upgrading gas boilers, solar photovoltaic systems, or heat pumps.

PROCESS, PLANT AND MACHINE OPERATIVES

Percentage of Process Plant and Machine Operatives in local workforces

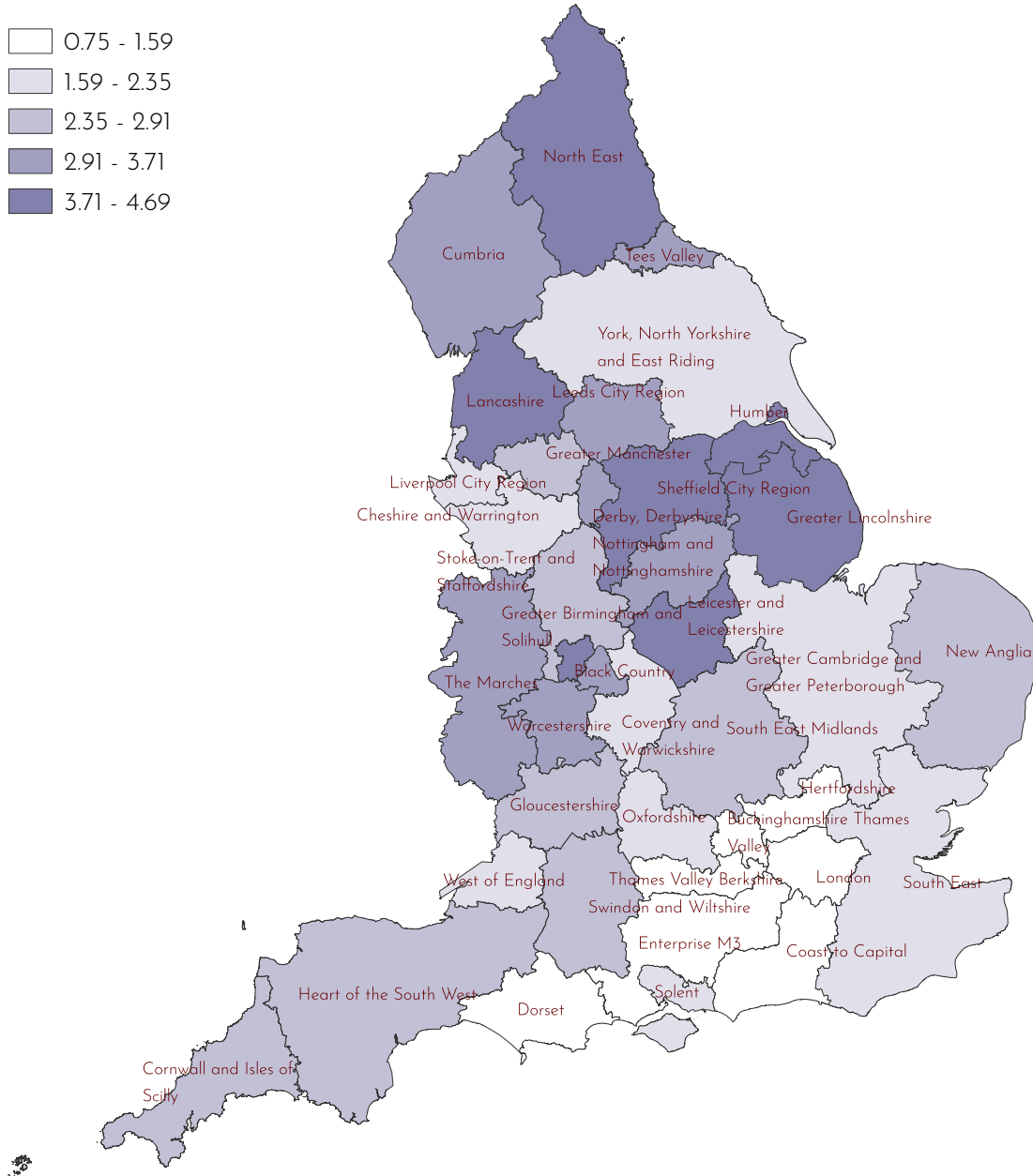


Figure 6: Where are the process, plant and machine operative workforce? The distribution of process, plant and machine operative workers as a percentage of overall employment in that region. (by Local Enterprise Partnership)

Source: Annual Population Survey, January-December 2021.

Figure 6 shows that in areas including the North East, Lancashire, Derbyshire, Lincolnshire, Leicestershire and the Black Country, there is a high density of process, plant and machine operatives among the workforce.

Process, plant and machine operative occupations are more likely to be employed outside the construction (and retrofit) sector, but many of them possess skills that are adaptable to retrofit work. In the North East, Lancashire, Derbyshire, Lincolnshire, Leicestershire and the Black Country, the retrofit industry can target and recruit workers wishing to transition from traditional sectors like industrial manufacturing to work in domestic retrofit projects. Another potential policy choice is to utilise this skills pool to invest in the production of equipment and materials used in improving the energy efficiency of buildings.

ELEMENTARY OCCUPATIONS

Percentage of Elementary Occupations in local workforces

- 1.25 - 2.34
- 2.34 - 3.29
- 3.29 - 4.21
- 4.21 - 5.37
- 5.37 - 6.81

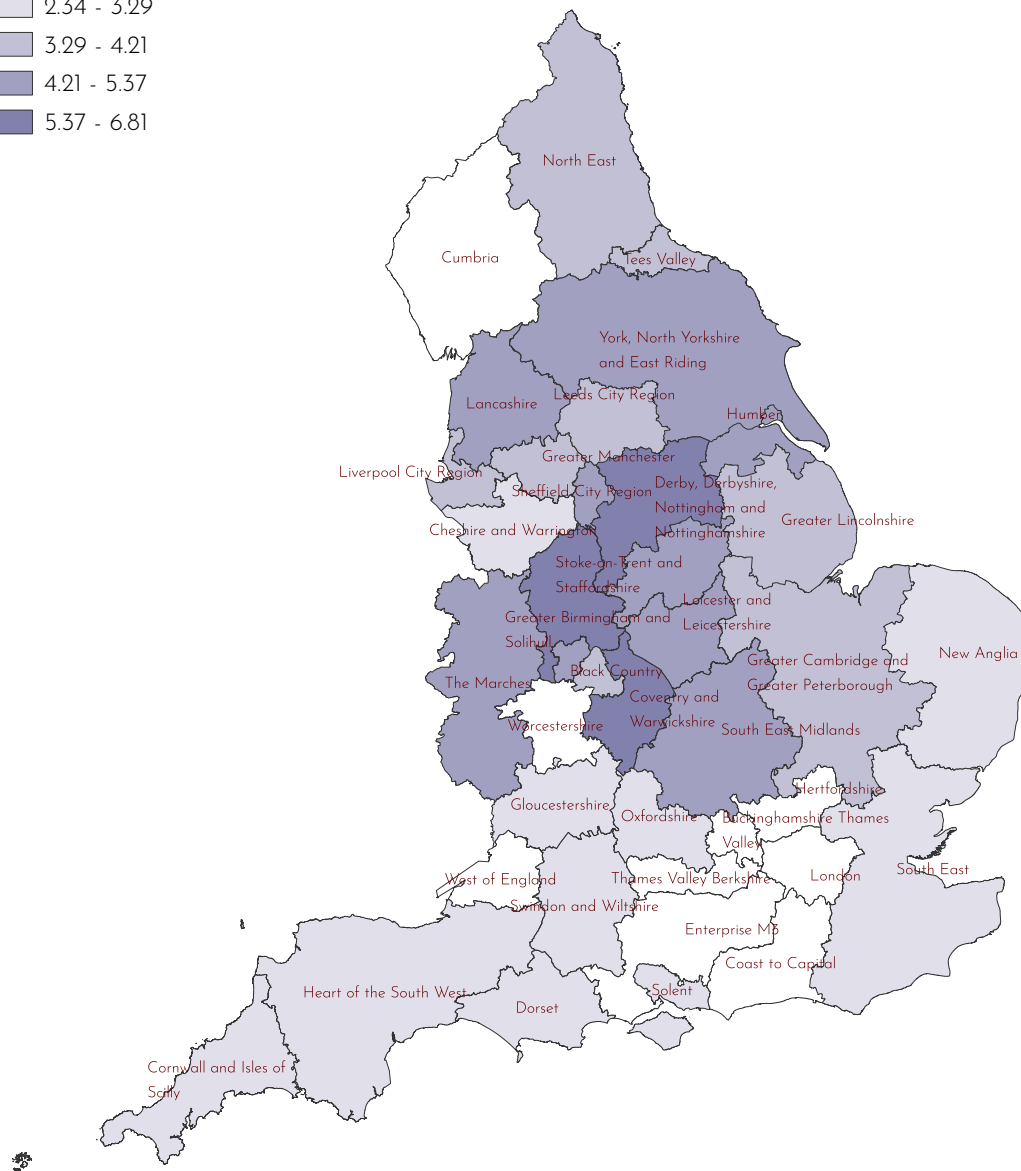


Figure 7: Where are the elementary occupations workforce? The distribution of elementary occupations workers as a percentage of overall employment in that region. (by Local Enterprise Partnership)

Source: Annual Population Survey, January-December 2021.

Figure 7 shows that in regions such as Lancashire, Stoke-on-Trent and Staffordshire, Coventry and Warwickshire and South East Midlands there is a high density of elementary occupations among the workforce. Some of these areas such as Lancashire also have a high density of process, plant and machine operatives, meaning they have a large local workforce that, with some training and education, could readily transition to retrofit work. Retrofit programmes could take into account the skill profiles of these workforces to design appropriate roles, for example within teams of workers of varying skill levels working together to install and upgrade insulation in local homes.

Elementary occupations are among the lowest paid occupations in the workforce. Even though the occupations themselves require lower levels of relevant skills than skilled trades or process plant and machine operative occupations, this does not necessarily mean that the workers currently employed in these occupations do not possess a higher level of these skills than their jobs require. Retrofit investment in areas where such workers are overrepresented could present a significant opportunity to underemployed workers to find better employment. These areas are also where investing in upskilling the current and future workforce may pay the largest dividend.

WHERE RETROFITTING IS NEEDED

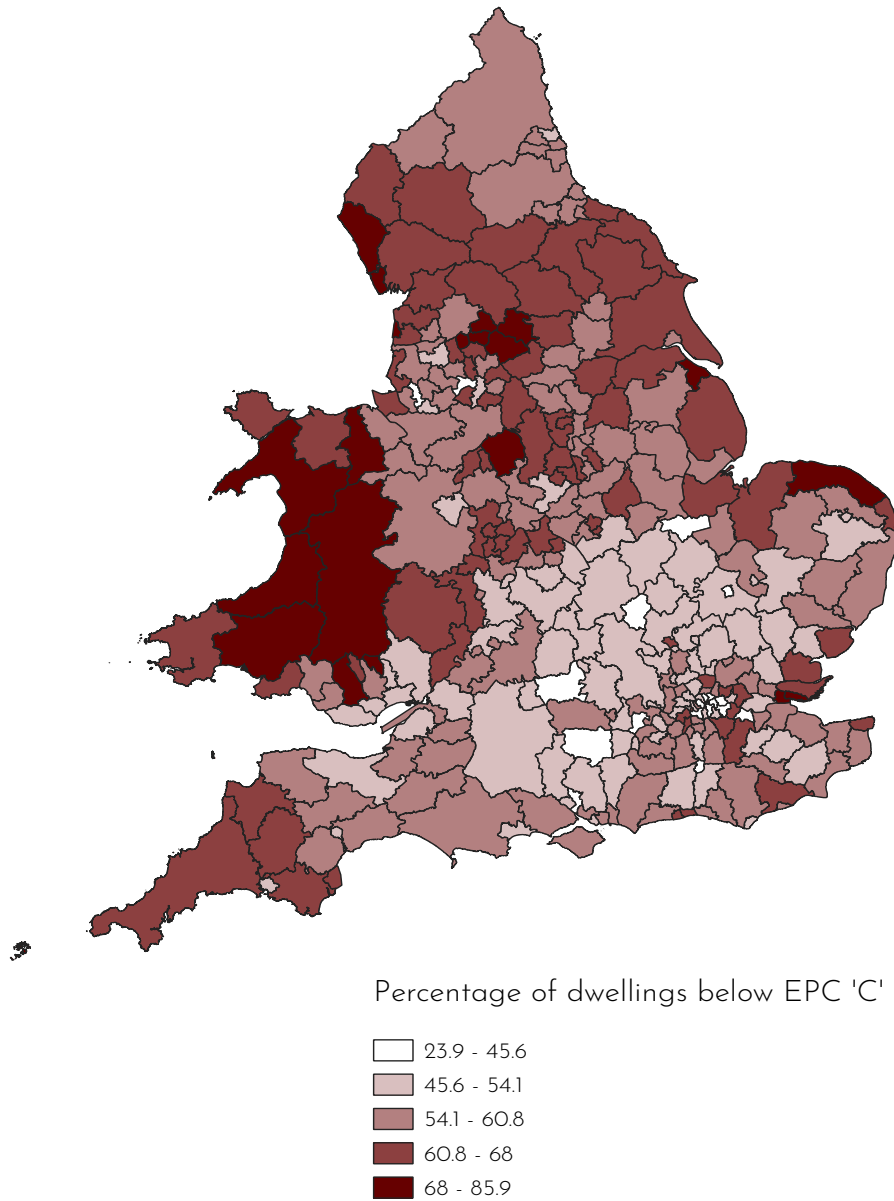



Figure 8: Where is retrofitting needed? Percentage of houses with Energy Performance Certificate ratings 'D' and below by Local Authority, England and Wales.

Source: ONS (2022) 'Energy Efficiency of Housing, England and Wales, local authority districts'.

Local authorities in Wales, the North, West and South-West of England have a larger proportion of dwellings that need retrofitting.²⁴ Our analysis for English Local Enterprise Partnerships shows that workforces in these areas are also relatively rich in the skills most suited to retrofit work. Targeted investment in these places can reap a double dividend, achieving climate targets while creating good jobs appropriate to the profile of the local workforce.

²⁴ ONS (2022). 'Energy Efficiency of Housing, England and Wales, local authority districts'. Available at: <https://www.ons.gov.uk/peoplepopulationandcommunity/housing/datasets/energyefficiencyofhousingenglandandwaleslocalauthoritydistricts>



INVESTMENT, TRAINING AND EDUCATION ROLLOUT

INVESTMENT, TRAINING AND EDUCATION ROLLOUT

What forms of policy-making will be required to push forward with a retrofit transition within the UK workforce? Here we offer two key recommendations - around public investment and training - to help meet the UK government's ambitious targets.

PUBLIC INVESTMENT

To meet its ambitious targets, the UK government will need to become mission-driven and assume an active role in repurposing industries to undertake large-scale retrofit projects. Rather than the piecemeal approach favoured at present, the UK government will have to steward certain sectors, such as construction, toward this goal.

The UK government's recently aborted Green Homes Grant gave homeowners vouchers to partially cover the cost of home improvements that would improve energy efficiency. Under the scheme, homeowners sourced a tradesperson's quote before applying for a voucher, but delays in response by the government meant the quote would expire before the work could be done. The scheme resulted in mismanagement, poorly performed jobs and homeowners reluctant to undertake the work. Unsurprisingly, it was widely criticised and was described by the Chair of the Public Accounts Committee as a "slam dunk fail".²⁵

²⁵ UK Parliament (2021). 'PAC Report: Green Homes Grant Scheme "underperformed badly". Available at: <https://committees.parliament.uk/committee/127/public-accounts-committee/news/159264/pac-report-green-homes-grant-scheme-underperformed-badly>

Future schemes will need to be less piecemeal. Rather than depending on homeowners to take the initiative to find suppliers, such projects will need a significantly greater degree of state oversight and will need to be performed by government accredited companies and organisations. This could be achieved through selective tender whereby the state awards lucrative contracts to construction firms capable of undertaking such large-scale projects. There is a solid argument for a progressive procurement strategy. Contracts would be given to firms that meet select criteria in terms of:

- » **Suitability to undertake the work**
- » **New employment opportunities**
- » **Decent conditions and pay for workers**

Some local authorities are already doing this, but they need significantly more cash to undertake projects at scale. Given that local authorities have jurisdiction over as much as a third of emissions in local areas, they should be treated by the central government - and devolved governments in Wales, Scotland and Northern Ireland - as influential and unique partners in delivering green infrastructure projects such as retrofitting existing housing stock.²⁶ This will require a bold investment strategy that recognises the role that local authorities have to play in reaching net zero.

Many of the occupations that could transition to retrofit work - such as those in the Skilled Trades occupational group - are associated with self-employment, while others - such as those in Elementary Occupations - are associated with low pay and poor working conditions. For this reason, the procurement strategy should be overseen by a committee composed of trade union leaders, government officials and retrofit experts. This would help to make sure that the projects prioritise good working conditions and the rights of workers.

²⁶ LGA (2021). 'Invest in councils to retrofit over a thousand homes a day'. Available at: <https://www.local.gov.uk/about/news/lga-climate-emergency-invest-councils-green-retrofit-over-1000-homes-day>

TRAINING AND EDUCATION PROGRAMMES

The Green Homes Grant Scheme sought to create 82,500 jobs in six months, but a hurried rollout and lack of training initiatives meant that it only created 5,600 in twelve months.²⁷ Heat Pump installations were encouraged as part of the six-month scheme, but the training alone required to do such work can take far longer than this timeframe.

The failures of the scheme demonstrate that the government must invest more directly in dedicated training and education programmes to give workers the requisite skills to do retrofit work. Some local authorities have spearheaded the drive for such programmes.

One exemplary case is Portsmouth City Council, which has ambitions to retrofit its existing housing stock but, like other local authorities in the UK, still lacks the skilled local supply chain to deliver on these ambitions. To deal with this problem, the council has supported the City of Portsmouth College in the creation and maintenance of the NetZero Training Hub, a local centre that 'aims to build the skills and knowledge needed locally to install new housing technology and meet the country's commitment to net zero'.²⁸ The hub is dedicated to closing the skills gap and dealing with labour shortages in sectors such as retrofitting.

Central UK government must support these efforts by giving local authorities across the UK the requisite financial resources to start or maintain these initiatives.

²⁷ House of Commons Committee of Public Accounts (2021). 'Green Homes Voucher Scheme'. House of Commons. Available at: <https://committees.parliament.uk/publications/8007/documents/82623/default/>

²⁸ For more information, see: <https://portsmouth.netzero-training.com/>

CONCLUSION

As it stands, the UK is not on target to meet its ambitious commitment to retrofit all homes to EPC band C standard by 2035. Missing this target would represent a serious blow to broader efforts to reach net-zero by 2050.

As the report shows, there are a number of interrelating problems that must be solved if the UK is to reach this target. There are some general problems, which are well documented but are worth reiterating:

- » **Insufficient investment in skills and training programmes.**
- » **Many of the industries that could transition to retrofit work have tended to rely on cheap migrant labour, a section of the labour market that has been in decline since Brexit.**

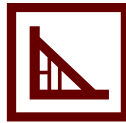
As we suggest in Section 5, one way to incentivise the growth of the retrofit workforce would be for the government to offer lucrative contracts to construction firms capable of undertaking long-term projects. Such stimulus would also help to support the creation of stable long term jobs, making retrofit work a more attractive employment option.

As this report demonstrates, there are significant skills matches between many retrofit occupations and those in the construction sector. Understandably, in many of the UK government and trade reports on retrofit work, there is significant emphasis on sourcing workers from construction occupations.

But, as we have also shown, training and transitioning more construction workers is not the only challenge. There is a shortage of skills in other areas of retrofit work, too. One specific domain is heat pump installation. There is a significant skills match between those required for this kind of work and those required by Plumbers and HVAC Technicians. Workers in these occupations are already in high demand - a problem exacerbated since Brexit and only heightening with an ageing workforce. It should be emphasised that training for these occupations is a slow and intensive process requiring lengthy apprenticeships. Cultivating such skills in a short time frame is simply not an option.

There are some easier challenges that have more immediate solutions. Government efforts in terms of investment and training can and should focus on fabric first retrofit over upgrading heating systems. This would create lots of opportunities for insulation work. Unlike heat pump installation, this work can attract workers at different skill levels from a variety of occupations (as we explored in Section 3). Additionally, the gains from installing these modern heating sources can only be fully locked in if the housing stock is upgraded to prevent avoidable heat loss. This is the thinking behind the “insulate, then generate” paradigm, embodied in the fabric first approach advocated by those working in the construction/retrofit industry, and encouraged by the UK’s Fabric Energy Efficiency Standard.²⁹

²⁹ Catherine Oxley (2022). ‘Insulate, then generate: energy strategy should put efficiency first, says NFRC’. Available at: <https://www.nfrc.co.uk/article/2022/04/26/insulate-then-generate-energy-strategy-should-put-efficiency-first-says-nfrc>



Autonomy

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Published 2023 by:

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GU51 5RU