Clean Heat and Energy Efficiency Workforce Assessment

Zoltan Karpathy[1], Tessa Clark[1], Isabella Impesi[2], Megan Lancaster[2] and Stephen Strachan[2]
[1]Delta-EE and [2]Changeworks
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1 Executive summary

Introduction

To meet the Scottish Government's ambitious climate change targets, there will need to be a significant increase in the deployment of energy efficiency and low carbon heat measures in domestic and non-domestic buildings in the next decade. To deliver this, the supply chain in Scotland needs to be fit-for-purpose in terms of having the capacity and skills to deliver this scale of technology deployment.

On behalf of the Scottish Government, ClimateXChange commissioned Delta-EE and Changeworks to undertake research to understand current and future workforce capabilities around energy efficiency and low carbon heat technologies. This report reviews the current capabilities and skills along the supply chain of the energy efficiency and low carbon heating technologies in Scotland, identifies the skills gaps and analyses the potential options to fill these gaps to meet the targets set out in the Heat in Buildings Strategy [1].

Future workforce requirements

To meet the Scottish Government's statutory climate change targets, we estimate that the peak full-time equivalent[1] workforce required for energy efficiency and low carbon technologies by 2030 would be between 4,500 to 5,400 installers of **thermal insulation**, assuming a linear growth in the number of installations.

The study explored three scenarios of **heat network uptake**, alongside **heat pumps** and **direct electric** installations. The middle scenario requires 4,600 – 11,400 heat pump installers, 320 – 4,000 heat network installers and 530 - 1,100 direct electric installers. In the future low carbon heat installer workforce, heat pump installers are expected to have the highest share, even in the scenario of higher heat network uptake. This is primarily due to the volume of planned heat pump installations, but also due to the length of the installation time for heat pumps.

[1] The future workforce numbers presented in the report are full time equivalent (FTE) jobs required in a particular year; the number of people employed in these roles could be higher if they do not work exclusively on the energy efficiency measures / low carbon heating technologies analysed in the report

The numbers provided only account for the workforce to *install* low carbon heat and energy efficiency measures, and there would be additional requirements for wider workforce for different parts of the supply chain such as EPC assessors and project managers. Jobs related to maintenance of low carbon technologies are outside of the current project's scope, however these will be an important future aspect of this sector and further research could be carried out to explore this segment.

Estimating the exact future workforce numbers required is difficult at this time for several reasons and further research would be needed to provide more precise estimations. The mix of technologies considered in this study are of strategic focus for the Scottish Government, however the absolute scale of deployment of each technology is indicative only and is still to be determined. These indicative figures show the magnitude of the changes required in the workforce in a relatively short time frame. This growth is both due to the increase in the rate of heating replacements in this period to meet climate change targets, and due to many clean heat measures taking longer to install than current heating systems – predominantly gas boilers. We would, however, anticipate that many people currently working in the gas boiler industry – and the wider construction industry – could move into or contribute to, the low carbon heat workforce.

Other key findings

The view of the respondents was that there are current shortages in the energy efficiency and low carbon heat workforce, which adds to the challenge of attracting the required future workforce numbers.

Respondents considered the landscape of different funding sources to support upskilling / re-skilling in the energy efficiency area very complex to apply for. Smaller businesses reported finding it a considerable challenge to find the most appropriate funding for their needs and to pursue with the application process. Tied in very closely to this is the fact that for businesses to invest in the skills development of their workforce, they need certainty of revenue to make the investment worthwhile. For example, interviewees reported wanting to see a project procurement pipeline which stretches several years ahead (ideally at least five years), alongside the committed public funding which supports it.

Employers will need to have the confidence to invest in their future workforce as they will need to play an important part by bringing in new workforce to this field. For certain roles the route in is to take on apprentices and offer them employment after completing their apprenticeships. Apprenticeships in the construction sector currently do not have a shortage of applicants, but the numbers are still lower than required for the anticipated future demand. If demand for apprenticeships grows in the future, increasing training capacity will need to be considered.

There is also a need to attract and upskill new entrants for roles which do not have an apprenticeship route. Ways to bring in more new entrants will need to be looked at and companies need to be prepared to invest in training up these new entrants.

There are current challenges related to training that will need to be overcome to upskill a larger workforce. There is a need to build stronger partnerships between colleges and industry experts who are actively involved in projects (e.g., installers). This would ensure that the courses are delivered by skilled trainers, with up-to-date training curriculum and workshop facilities, including a practical[2] aspect.

Companies located in the Highlands & Islands and the Scottish Borders struggle to attract the required number of skilled workforce; training opportunities are also scarcer in

[2] Practical aspect refers to technical practice and real-life application (e.g. by building type)

the more remote areas of the country. Projects sometimes are carried out by companies not located locally, which face higher costs due to logistical challenges.

In addition, the research also highlighted a lack of diversity of employees in the low carbon sector. For example, the construction sector has a long-standing reputation of being white male dominated, where women and people from other ethnic backgrounds are under-represented.

2 Glossary

ASHP	Air-source heat pump
CWI	Cavity wall insulation
Direct electric heating	Direct electric heating refers to devices where one unit of electrical input results in a single unit of heat output. There are largely two forms of direct electric heating: storage heaters and direct acting electric heaters.
Direct jobs	Direct jobs are defined as roles associated to a respective technology along the elements of the supply chain: project design & consultancy, manufacturing, installation, operation and maintenance as well as related to client management / business models.
EPC	Energy Performance Certificate
EWI	External wall insulation
GSHP	Ground source heat pump
Heat network	A heat network (also referred to as district heating) is a distribution system of insulated pipes that takes heat from a central source and delivers it to a number of domestic or non-domestic buildings.
Heat pump	A heat pump is a device which can provide heating, cooling and hot water for residential, commercial and industrial applications. Heat pumps transform energy from the air, ground and water to useful heat via a refrigerant cycle.
Indirect jobs	Jobs existing in the broader industry sector because of the uptake of a certain low carbon heating sector.
Installer skills matrix	The installer skills matrix outlines the recommended minimum qualifications for the various trades, with Recognition of Prior Learning (RPL), broken down by energy efficiency measure. The Scottish Government proposes to integrate the Scottish installer skills matrix into the British Standards Institution (BSI) Publicly Available Specification (PAS) 2030 installer retrofit standards and Microgeneration Certification Scheme (MCS) standards.
MCS	Microgeneration Certification Scheme
RSL	Registered social landlord
SWI	Solid wall insulation
VRF	Variable Refrigerant Flow air conditioning

Contents

3 Introduction

3.1 Introduction

This report presents research carried out by Delta-EE and Changeworks around the current and future capabilities of the supply chain workforce in Scotland around clean heat technologies and energy efficiency. The research was commissioned by ClimateXChange on behalf of the Scottish Government and carried out late 2021 - early 2022.

3.2 Policy Context

The Scottish Government's statutory climate change targets to reduce carbon emissions by 75% by 2030 and reach net-zero emissions by 2045 will require major changes to how buildings in Scotland are heated. The scale of improvements required is significant with around half of homes – or a million homes – needing to convert to a clean energy system by 2030. In addition, 50,000 non-domestic buildings in Scotland will need to be fitted with a low carbon heat source by this date. Energy efficiency levels will also need vast improvements, for example by improving all domestic properties to at least EPC band C by 2033 (and the majority by 2030).

These targets are ambitious in terms of their scale and the timescales in which to meet them. It will require a significant step-change from current deployment levels. The Scottish Government has set out various policy actions to encourage consumer uptake of these decarbonisation measures, and regulations to drive this, for example through the recently published 'Heat in Buildings' strategy.

To meet these challenging targets, the supply chains for clean heat and energy efficiency measures needs to be fit for purpose in Scotland. This applies to every measure likely to play a part in meeting targets, and every segment of the supply chain – from manufacturing of technologies, to surveying buildings, to installing and maintaining the equipment. Insufficient capacity or a lack of skills in any of these areas could seriously impede the ability of Scotland to meet its Net Zero ambitions. At the same time, this presents economic opportunities for Scotland to upskill and employ people in this sector, and to attract expansion or new entrants for businesses, such as manufacturing, into Scotland.

The research here seeks to present a more detailed picture of the workforce requirements in Scotland to meet decarbonisation targets around heating buildings and energy efficiency. It provides Scottish Government with an understanding of gaps in the current skills base, the workforce requirements over the next decade in terms of capacity and skills, and how initiatives to upskill the workforce are currently working and will need to adapt. The project builds upon a previous unpublished piece of research carried out by Delta-EE for Scottish Enterprise [2]. The methodology for new research in this project is described in section 9.1.

4 Background and future uptake of energy efficiency and low carbon heat technologies

To assess the uptake of the selected low carbon technologies by 2030 in Scotland, we worked closely with the Scottish Government to establish various indicative forecast scenarios for each technology up until 2030. Increasing the number of heat network connections is a high priority for the Scottish Government, but there are a significant number of properties for which this is not possible. In these cases, individual heat pump installation will be the preferred option, followed by direct electric.

It should be noted that the forecast scenarios of low carbon heating technologies presented in this report are not expectations/projections of future demand, but rather indicative to aid the calculations of the future workforce needed. The aim of these indicative forecast scenarios is that they each meet the overall ambitions of Scotland's 'Heat in Buildings Strategy' [1], to decarbonise the heating in 1 million homes by 2030 and improve their energy efficiency.

The scenarios related to the low carbon heat technologies are interlinked in the following manner (in all cases direct electric is installed in domestic properties unable to be connected to heat networks or unsuitable for heat pumps):

- Scenario 1: high uptake of heat pumps and low uptake of heat networks
- Scenario 2: medium uptake of heat pumps and heat networks
- Scenario 3: low uptake of heat pumps and high uptake of heat networks.

This section explains the various uptake scenarios used within this report. More information on these technologies and related figures can be found in the Appendix in Section 9.2.

4.1 Thermal insulation

A high proportion of energy consumed by buildings is lost through their fabric [3]. It is important to improve the energy performance of buildings prior to the deployment of low carbon heating technologies and to improve the majority of Scotland's buildings to at least equivalent to an EPC band C by 2030, where cost-effective and technically feasible.

This report considers loft and wall (cavity and solid wall) insulation. Other energy efficiency measures, such as double glazing or draught proofing, are excluded from this report, as they were not well-evidenced by the interviews carried out.

4.1.1 Current status

Currently around 1.3 million properties are ranked below EPC band C, with 51% of homes (of the occupied 2.5 million) achieving EPC C or better [4].

Scotland's non-domestic properties are hugely diverse, and analysis of energy efficiency levels shows that almost 75% of all non-domestic premises have a current EPC of E or worse (which may be due to space heating using old, inefficient direct electric equipment) with only 5% EPC B or better. [5] Note that Scottish non-domestic EPCs are derived on a different basis to domestic EPCs (and English non-domestic EPCs).

4.1.2 Future scenarios

The 'Heat in Buildings Strategy' states that energy efficiency remains at the core of its heat in buildings policies and programmes, adopting a 'fabric first' approach. In line with this, all residential buildings in Scotland will need to be improved to EPC band C by 2033, with the majority improved to this level by 2030.

The following three scenarios were considered for the uptake of thermal insulation measures by 2030 (for more details please see Section 9.2):

- Scenario 1: Linear growth until meeting target
- Scenario 2: Slow increase until 2026/2027, then accelerate to meet the target
- Scenario 3: Fast increase until 2026/2027, then ramp down to meet the target

As loft insulation already has a higher level of penetration in the current building stock than wall insulation, fewer retrofit installations are needed for loft than for wall insulation to reach the 2033 target. Therefore, the rate of retrofit (and total) installations, and variation across scenarios, is accordingly lower for loft insulation.

*Table 1: Insulation uptake scenarios: total number of properties (retrofit and new) to be insulated by 2030**

	Scenario 1	Scenario 2	Scenario 3
Loft insulation	326,000	300,000	331,000
CWI	564,000	411,000	726,000
SWI	340,000	182,000	515,000

**For ease of analysis, the number of properties to be insulated listed in the table above are rounded.*

Source: Delta-EE calculations

4.2 District heating / heat networks

Heat networks are regarded as a 'no / low regret strategic technology' in the Heat in Buildings Strategy and are expected to play a key role in decarbonising heat in Scotland. Developments have taken place mainly in more densely populated areas, though there are also some small-scale rural schemes. District heating is generally easier to connect and more cost effective to deploy in new build houses rather than retrofit.

Most heat networks currently powered by renewable energy sources are biomass schemes, due to the previously available Renewable Heat Incentive (RHI) scheme. Low carbon technologies such as large-scale heat pumps and energy from waste supplying heat are still at an early stage of deployment, however there is an increasing trend to move towards these technologies and away from gas boilers, CHP, and biomass.

4.2.1 Current status

There are around 830 heat networks operating in Scotland [6], which supplied around 34,000 households in 2019. [4] Around 94% of these networks are in urban areas, (where population density makes it a viable solution) and just over 82% supply heat to social housing.

4.2.2 Future scenarios

The Heat Networks (Scotland) Act 2021 regulates the sector and will accelerate the use of networks across Scotland. With aspects such as network zoning, creating clear investment pipelines and opportunities for local supply chains, and measures to de-risk investment, the new Act could significantly help to stimulate the creation of new heat networks across Scotland.

The statutory targets within the act for heat to be supplied by heat networks are 2.6 TWh of output by 2027 (3% of current heat supply) and 6 TWh of output by 2030 (8% of current heat supply). To put this into perspective, this would be equivalent to a heat supply to approximately 650,000 domestic properties in 2030[3], although in reality there will be heat supplied to commercial and industrial buildings as well (which tend to have significantly higher heat demand) and the number of domestic connections will be lower.

The indicative future scenarios considered for uptake to 2030 (for more details please see Section 9.2):

- Scenario 1: achieving statutory targets (2.6TWh in 2027 and 6TWh in 2030)
- Scenario 2: exceeding statutory target (10 TWh in 2030)
- Scenario 3: exceeding targets (12TWh in 2030).

Table 2: Number (indicative) of cumulative district heating connections in 2030

	Scenario 1	Scenario 2	Scenario 3
Domestic	52,000	117,000	200,000
Non-domestic	33,000	29,900	25,600
Total	85,000	146,900	225,600

**For ease of analysis, the number of future cumulative district heating connections listed in the table above are rounded.*

Source: Delta-EE calculations

4.3 Heat pumps

Heat pumps are also regarded a key ‘no / low regret strategic technology’ for decarbonisation of heat. They tend to provide heat at lower temperatures than conventional fossil fuel boilers and as such operate optimally within energy efficient buildings, adapted to provide low temperature heat (e.g., with larger radiators or underfloor heating). Their capital cost tends to be higher compared to conventional heating systems, but their running costs can be competitive with conventional fossil fuel systems when appropriately specified and installed.

The main types of heat pumps commercialised are air source heat pumps (ASHPs) and ground source heat pumps (GSHPs); there is also a small but increasing market of hybrid heat pumps (a combination of a heat pump and a boiler, which operate together enabled by a level of automated, intelligent controller between the appliances). Multi-split air-air and Variable Refrigerant Flow (VRF) air conditioning systems are still primarily installed in the commercial sector (although these are emerging in some larger,

[3] https://www.gov.scot/news/new-measures-to-accelerate-greener-cheaper-heating/

high-end, and multi-family homes), and are often used for both cooling and heating purposes.

Heat pumps are not commonly used at present in Scotland; however, they are established technologies with well-developed supply chains in some other countries, which have regions with a similar climate to Scotland.

4.3.1 Current status

There were around 2,400 Microgeneration Certification Scheme (MCS) accredited heat pump installations in Scotland in 2019 (air source and ground source heat pumps), which increased to almost 2,900 units in 2020. Also, a further annual 1,800 – 2,200 heat pumps were installed in new build in the 2019 - 2020 period.

4.3.2 Future scenarios

The indicative forecast scenarios for heat pump deployment in Scotland out to 2030 varies according to three scenarios (for more details please see Section 9.2):

- Scenario 1: high suitability[4]
- Scenarios 2: medium suitability
- Scenario 3: low suitability.

Sales of heat pumps will jump from 2024 as housebuilders respond to the change in regulations from the Scottish Government (from 2024, new buildings must use heating systems which produce zero direct emissions at the point of use).

Table 3: Number of cumulative heat pump installations in 2030

	Scenario 1	Scenario 2	Scenario 3
Domestic	1,364,000	1,025,000	679,000
Non-domestic	25,100	28,300	32,500
Total	1,389,100	1,053,300	711,500

**For ease of analysis, the number of future cumulative heat pump installations in the table above are rounded.*

Source: Delta-EE calculations

4.4 Direct electric

Direct electric heating refers to devices where one unit of electrical input results in a single unit of heat output. While heat pumps run on electricity, they are not direct electric heaters, and are more efficient than direct electric heating devices. Broadly speaking, there are two forms of direct electric heating: storage heaters and direct acting electric heaters. Direct acting electric heaters are often referred to as panel heaters and have an electric resistance element within a protective casing which is turned on or off as required. Storage heaters usually use cheap electricity rate (off-peak) to charge up

[4] The terminology used in these indicative scenarios of suitability was provided by Scottish Government

during off-peak periods and store the heat which then can be released when needed (during the day).

Direct electric heating can be installed in buildings where it is not possible to connect to district heating / heat network and which are not suitable for heat pump installation.

4.4.1 Current status

Direct electric heaters are often used as the main heating source in domestic buildings with low thermal demand (often new build flats with good thermal insulation), due to their low upfront cost. Some are also installed as supplementary heating in homes with other forms of heating.

Sales of storage heaters are heavily reliant on distress purchasing and like-for-like replacements. Unlike older heaters with low efficiency (due to leaking heat), newer dynamic storage heaters retain heat well and therefore can be significantly cheaper than using direct electric heating which uses peak time electricity tariffs. In recent years, storage heaters have been losing market share to other more advanced products, especially oil filled and dry electric radiators and electric convectors. Electric convectors are common in the first-time installation segment due to their low price and easy installation.

4.4.2 Future scenarios

To meet the Scottish Government's Net Zero ambitions, direct electric could complement the other two forms of low carbon heating technologies by 2030 as shown in these indicative scenarios (for more details please see Section 9.2):

- Scenario 1: complementing high uptake of heat pumps and low uptake of heat networks
- Scenario 2: complementing a medium uptake of heat pumps and heat networks
- Scenario 3: complementing a low uptake of heat pumps and high uptake of heat networks.

Table 4: Number of cumulative direct electric heating installations in 2030

	Scenario 1	Scenario 2	Scenario 3
Total	81,200	359,200	618,200

**For ease of analysis, the number of future cumulative direct electric heating installations listed in the table above are rounded.*

Source: Delta-EE calculations

5 Current workforce in Scotland

This section assesses the current low carbon heat and energy efficiency workforce in Scotland in terms of numbers, demographics, earnings, vacancies and shortages. It has been difficult to obtain quantitative data specifically on the energy efficiency and low carbon heating sector. Where relevant we have provided data from wider sectors – such as the construction industry – which is likely to provide some indication of trends in the energy efficiency and low carbon sector.

5.1 Elements of the supply chain

The elements of the supply chain considered by this study for the energy efficiency measures and low carbon heating technologies have been characterised as follows:

- Project design & consultancy
- Equipment manufacture
- Installation
- Operation and maintenance
- Client management / Business model.

By defining the elements of the supply chain, we ensured that we interviewed companies across the entire supply chain, however the majority of data presented in the report relates to the installation and operation & maintenance phases.

The detailed supply chain elements for thermal insulation and the selected low carbon heating technologies are presented in Section 9.3.

5.2 Current size of workforce

The uptake of low carbon heat and energy efficiency measures requires skilled trades people (insulating and thermal insulation engineers, glazers, heating and ventilation engineers, plumbing and heating engineers, electricians) as well as process, plant and machine operatives as defined by the Office for National Statistics in the Standard Occupational Classification (SOC). Specific measures, such as district heating networks, also require the work of certain professional occupations (architects, accountants, civil engineers, lawyers) to be effectively deployed.

It is estimated that in 2020 there were between 16,800 and 24,100 full time equivalent people employed in Scotland in the energy efficiency and low carbon/renewable heat sector in Scotland [7] with the sector generating an annual turnover of £5.5 billion.

Professional occupations are defined by requiring a degree or equivalent qualification with some occupations requiring postgraduate qualifications and/or a formal period of experience-related training. In 2020, professional occupations accounted for just over 23% of the Scottish workforce [8]. Employment per region for these occupation groups is summarised in *Table 11*, in the Appendix.

5.2.1 Thermal insulation

It was estimated that in 2013 around 1,700 people (direct and indirect jobs across the supply chain) were employed in the thermal insulation sector in Scotland [9]. It is very difficult to estimate the total number employed in this sector, as it encompasses several trades (e.g. plasterer / dry liner, bricklaying, carpentry / joinery, glazing) and the workforce does not only work on energy efficiency measures.

Shortages in this field were already identified in 2018 (before the effects of Covid-19 and UK's exit from the EU): a gap of over 4,000 building envelope specialists, over 2,000 painters and decorators, almost 2,000 plasterers and dry liners, over 1,000 glaziers and 300 scaffolders [10].

The latest available indication on employment numbers in this sector is from 2020 when there were 3,400 plasterers, 4,200 roofers, 2,100 glaziers, 5,600 bricklayers and 3,800 building envelope specialists employed in Scotland [11], but their activities are not limited only to energy efficiency measures.

Interviews with the supply chain in this sector agree that most of this workforce is built up by workers from Eastern Europe (mainly Romania).

5.2.2 District heating / heat networks

It is estimated that there were around 2,400 direct jobs along the heat network supply chain in 2018 [2]. Around 900 of these jobs were related to installation of district heating networks.

5.2.3 Heat pumps

Heat pump installers are also active in installation of other types of space and water heating appliances (e.g., gas boilers). It is therefore difficult to estimate the exact numbers of current installers.

There are no publicly available statistics available regarding the total number of heat pump installers in the UK and Scotland, but there are some estimates available from different sources which can provide an indication of the magnitude of the current workforce in this segment.

For example, the HPA estimated that in the UK in 2019 there were only 900 heat pump installers who had skills in heat system sizing, hydraulic balancing, heat loss and flow temperature calculations [12]. Nevertheless, the total number of UK heat pump installers is likely to be considerably higher, the HPA estimation focusing only on the installers who confidently possess the skills listed.

According to the latest data available from MCS there were 163 heat pump certified contractor companies[5] in Scotland at the end of 2021, mostly based in the Glasgow and Highland area. The size of companies varies a lot – with most being micro enterprises (fewer than 10 employees), but also a smaller number of large companies. According to the MCS, the certified companies typically have, on average, an estimated workforce of 3 installers, resulting in an estimated almost 500 heat pump installers currently in Scotland. Note that due to the lack of more accurate data, this number has to be treated as an indicative estimate and the real number could be lower or higher.

5.2.4 Direct electric

According to the respondents, direct electric heaters can be installed by an electrician without any specialist heating appliance knowledge.

A 2019 report by the Scottish Government titled 'Regulation of electricians in Scotland: research report' [13] estimated that there were 22,000 electricians operating within Scotland in 2018. A sizeable proportion of these electricians are estimated to exclusively work on large commercial and industrial projects. However, it was estimated that in 2018 there was a total of around 8,000 jobs (direct and indirect) across the supply chain of

[5] Over half of companies working in the ASHP and GSHP sector are estimated to be 'micro' enterprises, with fewer than 10 employees. Around a quarter are 'small' companies with 10 or more employees but fewer than 50. Around 10% are larger companies with over 100 employees. However, as with thermal insulation, many of these companies do not work exclusively on heat pumps and will also be installing other types of heating systems, such as gas boilers.

direct electric heating [2]. There are no specific data available for direct electric heating installers, but this total number includes installers and it is very likely that only very few of them work solely on electric heating installations and that many of them fit other electrical devices.

The Electrical Contractors Association for Scotland (SELECT) had 1,231 registered businesses in Scotland in 2020. Most businesses are very likely to be small or micro enterprises.

5.3 Demographics of current workforce in Scotland

There is no detailed data regarding demographics of the energy efficiency and low carbon heat technologies sector, but the following sections detail the demographics of similar sectors of the economy to identify indicative trends.

5.3.1 Employment by age

The majority of workforce in the electricity, gas and air-conditioning supply industry are in the 25 to 49 years old age group [14], as shown in *Table 12* in the Appendix.

- 2,900 people under 24 years old (11% in total in the electricity, gas and air conditioning sector, compared to 13% in the overall Scottish workforce).
- 18,000 were between 25 and 49 years old (67% in total in the electricity, gas and air conditioning sector, compared to 55% in the overall Scottish workforce).
- 5,000 were aged between 50 and 64 (19% in total in the electricity, gas and air-conditioning sector, compared to 29% in the overall Scottish workforce).
- Fewer than 900 people employed in this field were 65 and older (3% in total in the electricity, gas and air-conditioning sector, the same as in the overall Scottish workforce).

Supply of a suitable young workforce could be an issue in the future, given the declining number of people in the under 24 age group [15], also hindered by the fact that putting apprentices on the low National Minimum Wage had made construction apprenticeships less attractive for under 18s.

5.3.2 Employment by gender

The construction sector for a long time has had a reputation of being male dominated. Women are under-represented in this sector: in 2021, women only accounted for one in every four employees [16], as shown in *Table 13* in the Appendix.

The main barriers cited by interview respondents for this inequality are the (perceived or real) characteristics of construction-sector related jobs: culture, unsociable hours, long distance travel and working conditions These are also in line with the findings of Equate Scotland's 'Diversity in Construction' report. [17] Due to these reasons, the construction sector is regarded as an undesired career path for the majority of women, even from a young age.

5.3.3 Employment by other demographics

There is no data available on ethnicity or religion of those working in the low carbon sector in Scotland. *Table 14* contains overall employment levels by ethnicity and region in Scotland [18].

Respondents pointed out that employment in the construction sector is still not considered as an attractive career choice for many ethnic communities. This can be exacerbated by there being a lack of representation from these communities in the industry and therefore presents as a lack of role models to young people. There is also a perception that other professions are regarded as more prestigious and lucrative.

5.4 Other features of the current workforce

5.4.1 Earnings

There is no specific earnings data available related to low carbon heat technologies and energy efficiency measures segments, only for the overall construction sector.

In 2020, almost 87% of individuals employed in the construction sector in Scotland earned at least the Living Wage. [19] In the same year, skilled tradespeople earned a median hourly pay of £11.96 (*Table 15* in Appendix). People working in professional occupations have the highest median hourly pay and saw the most significant increase since 2019. [20]

The median real-time advertised annual salary in construction in 2020 was £32,400. [19]

5.4.2 Vacancies and current shortages

The thermal insulation sector has been heavily reliant in the past decade on an Eastern European workforce. The combined effect of UK's exit from the EU and Covid-19 has led a large proportion of this workforce to leave the country to seek better opportunities in the European Union, creating an immediate shortage. The respondents highlighted an acute need for plasterers, rough casters, roofers, glaziers, joiners, and insulation installers, pointing to an immediate need for around 1,000 people.

District heating / heat network installation is another segment, where respondents raised the current shortages of skilled labour, with an immediate need of metal and plastic welders (in fact welders are needed across the low carbon sector, with demand likely to rise due to the ScotWind projects).

Respondents along the supply chain also pointed out that there is a current need for more professionals skilled to carry out heat pump installations and electricians.

In 2020, 300 construction companies reported having skill-shortage vacancies across the entire construction industry in Scotland. [21] According to these reports the vacancies are hard to fill because of difficulties finding applicants with the required skills, knowledge or experience. Whilst we don't know if these reflect vacancies in the energy efficiency and low carbon heat sector specifically, the geographical variation is shown in *Table 16* in Appendix. The highest incidence of skill-shortage vacancies was reported in the West Lothian region, followed by the West (including East Renfrewshire, Inverclyde, Renfrewshire, and West Dunbartonshire) and Forth Valley. Large companies (100+ employees) reported the most skill-shortage vacancies (*Table 17* in the Appendix), followed by medium-size companies (25-99 employees).

There were 6,130 advertised construction-related job postings between 1st June 2020 and 31st May 2021. [19] Of these, around 14% were for plumbers and HVAC engineers and 5% for carpenters and joiners. Around 26% were in Glasgow, 14% in Edinburgh and 12% in Aberdeen.

Not all job adverts specify the skills required but based on around 60% of construction-related job postings, the most requested 'hard' skills were plumbing, budgeting and project management.

There are no statistics available for shortages in the construction sector by Scotland's regions but according to the stakeholders and the supply chain interviews, companies located in the Highlands, the islands and the regions around the Scottish borders struggle to attract the necessary number of skilled workforce.

6 Future workforce numbers in Scotland

6.1 Installer workforce required by 2030

The projected full-time equivalent (FTE) future installer workforce numbers are presented below. These have been calculated by multiplying the days required to install a measure (obtained from supply chain interviews) by estimated deployment rates of technologies in different scenarios (provided in Section 4). Table 5 shows the lowest and highest person days needed for installation, provided by the respondents.

*Table 5: Number of person days required to install energy efficiency measure / low carbon heating technology (from interviews with supply chain)**

	Low	High	Number of estimates per technology
Loft insulation	0.6	1	2
Cavity wall insulation	0.8	2	2
External wall insulation	18	20	2
Heat pump	6	15	6
Heat network – extra connection	2	25	2
Direct electric	2	4	2

**NB: the number of answers do not add up to the total number of interviews; the other respondents interviewed did not have a view on installation times*

The results below provide estimates of the number of people employed in installing these measures in future years, assuming the installers work full time on installing these measures. Nevertheless, it is worth noting that for example the heat pump installer numbers include not just heating engineers, but also apprentices and qualified electricians who need to make sure that the heat pump is correctly connected to the electrical board. There are several factors that will impact installation times of different measures – as outlined below. Given the complexity of this sector, the numbers presented in this section should be treated as indicative. For example, it is likely that individuals would work on multiple technologies. There may also be efficiency gains as the supply chain develops and economies of scale realised, but this is not considered in the calculations.

The full description of the methodology, assumptions and results of the various calculation methods are shown in the Appendix (Section 9.1).

The below sections provide detail on the installation times for the key technologies included in this research. They also provide a commentary around expected efficiencies, whereby increased uptake of technologies may lead to quicker installation times – and therefore fewer people required to install measures.

Heat pumps

Installation times of heat pumps can vary significantly, depending on a multitude of factors: the size and location of the property, number of people living at the property (influencing the domestic hot water demand), the type of the heat pump (air source / ground source, split or monobloc) and the heat distribution system. A very important aspect of a heat pump installation (with large impact on the specification and installation time and cost of the project), is the upgrade of heat emitters suitable for the lower flow temperature typical of heat pumps.

According to the respondents, installation times for heat pumps can vary between 2 days for 3 people and 5 days for 3 people (for a typical 2-bedroom semi-detached house the installation times are likely to be on the lower end of the scale). These estimated installation times include taking out the existing heat generator, installing the heat pump and calibrating/setting up the heating system, but do not include the additional time needed to survey the property, design the heating system, take out and replace the existing heat distribution system (such as radiators and pipework), and the follow-up visits to make sure the system operates as intended. A more detailed comparison of the heat pump installation process with gas boiler installation is included in Section 9.2.3.

Respondents interviewed for this study did not think that the time needed for the installation of heat pumps can be reduced significantly from the current levels, but there is a potential to reduce the time spent on design and specification.

Nevertheless, developments in product design and specification could potentially have an impact on time required for heat pump installation. Based on a recent study by Delta-EE, ('What is the potential for cutting the cost of an installed heat pump?') [22] a series of factors can influence the time required to install a heat pump. There is a trend towards a 'plug and play' approach (e.g., for heat pump controls), which can reduce the time required for installation. As the heat pump market evolves, it will increasingly become a replacement market. The implications are that a large stock of buildings will already have a heat pump system and heat emitters appropriately sized to a heat pump flow temperature, which will be easier to replace, compared to replacing a fossil fuel heating system with a heat pump. This will likely reduce the required time for heat pump installation in the future.

The evolution of the heat pump market will have a major impact on the time required for their installation. Split heat pumps face limitations in being developed into 'plug and play' systems. However, monobloc (with the refrigeration cycle contained within one unit which is then connected by piping to the heat distribution system) and hybrid heat pumps can be developed into more standardised solutions, reducing time needed for their installation. High temperature heat pumps can also have reduced installation times, as they can replace a gas boiler, eliminating the need to redesign and install a new heat distribution system.

Currently the installation time of a heat pump is significantly longer than that of gas boilers, but if the sector moves towards larger installation companies (with more in-house warehouse facilities and logistics, and more routine designing and dimensioning of heat pump systems), it will likely have an impact on reducing the time needed to design, specify, and install heat pump systems.

Thermal insulation

Loft insulation is typically carried out by two people (for Health & Safety reasons), who can install it in around half a day in a 50 sqm domestic loft area. Cavity wall insulation can also be applied by two people in approximately half a day on a 70 sqm semi-detached house. These do not include the time needed for preparation, finishing, and cleaning up after the application of thermal insulation.

An external wall insulation project typically takes around 4 weeks, of which applying the thermal insulation itself takes roughly 1 week, (for 2-4 people, depending on the size of the property) with the rest of the time needed to build up the scaffolding structure, the preparation process of the external wall, finishing the wall after the application of the insulation, cleaning up and dismantling the scaffolding. As the necessary activities must be carried out in a particular sequence, there is hardly any scope for improving efficiencies and to reduce installation times.

Heat networks

Time needed to build a new heat network depends on many factors. Geography, topography, services located under the ground, ground conditions, the size of the connection, weather, experience of installers, technology used (e.g., plastic, rigid, flexible pipes etc.) and road traffic requirements all influence the time needed to build a district heating system / heat network.

The estimates received from respondents vary significantly, although this is not unexpected given the wide range of heat networks available. Responses found that building an entire heat network can be between 50,000 and 400,000 people hours and it could last several months. In terms of time required for an extra connection to an existing district heating network, it can vary significantly, between 2 days to around 18-25 person days (depending on property size and location). These estimated installation times include taking out the existing heat generator, installation of the connecting pipework to the dwelling, connecting it to the internal pipework, installing the heat interface unit and sub-meter, calibrating/setting up the individual heating loop, but do not include the additional time needed to take out and replace the existing heat distribution system (such as radiators and the internal pipework),

According to the respondents, the time needed for the installation itself cannot be reduced significantly from the current levels, but there is potentially scope to optimise the length of time needed for the district heat network design and planning applications. There is also potential time saving to be gained when the heat network installation can be co-ordinated with connecting to other services (electricity, water etc.)

6.1.1 Energy efficiency measures

Installer requirements were calculated to install loft insulation, cavity wall insulation and solid wall insulation in both domestic and non-domestic buildings. These were calculated for the uptake scenarios provided in Section 4: in every scenario the Scottish Government's EPC target is met in 2033, but there are different annual deployment profiles between the scenarios.

Based on the three energy efficiency measures uptake scenarios, the estimated number of installers needed by 2030 are as follows:

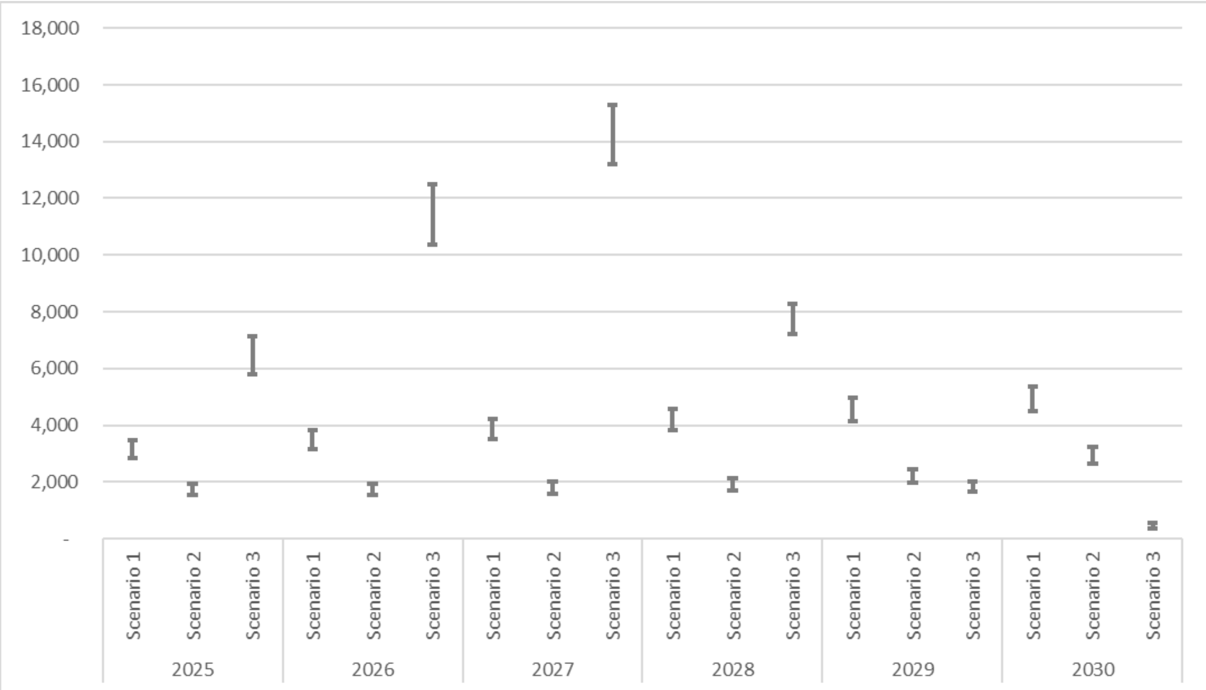
- **Scenario 1 (Linear growth until meeting target):** a gradual increase, with a peak installer requirement of c. 4,500 – 5,400 in 2030 (see *Figure 1*).
- **Scenario 2 (Slow increase until 2026/2027, then ramp up to meet the target):** a slower increase envisaged until 2026/2026 than in Scenario 1, then an accelerated growth afterwards to meet the target; by 2030 the required installer workforce is estimated to be in the region of 2,600 – 3,200.

- **Scenario 3 (Fast increase until 2026/2027, then ramp down to meet the target):** according to this scenario there will be a rapid ramp-up need for thermal insulation installation workforce of around 5,800 – 7,100 by 2025 and 13,200 – 15,300 by 2027.

These scenarios show that the energy efficiency installer workforce requirements will depend on the speed of deployment of these measures over the next decade. In some scenarios the installation of these measures' peaks mid-way through the decade, meaning that 2030 workforce requirements are lower than earlier in the decade. The highest number of installers required by 2030 is estimated to be 5,400 (Scenario 1). However, in a scenario where more deployment of measures is carried out earlier in the decade, the peak number of thermal insulation installers is estimated at 15,300 in 2027.

According to the latest available data, in 2020 there were 3,400 plasterers, 4,200 roofers, 2,100 glaziers, 5,600 bricklayers and 3,800 building envelope specialists employed in Scotland, but they are estimated to only spend a fraction of their time on these energy efficiency measures. Also, since 2020 several trades people left UK because of the effects of UK's exit from the EU and Covid-19, so the current number of employed workforce in this segment is likely to be lower. The existing workforce numbers are therefore not directly comparable with the number of FTE installers needed, but there is very likely to be a considerable gap between the current workforce and the future required workforce (between 4,500 – 5,400 in 2030 in the case of linear growth of installations).

Figure 1: Full-time equivalent (FTE) thermal insulation installer jobs needed in year (2025 – 2030). Tabulated values provided in section 9.1.3.



6.1.2 Low carbon heating technology

The scenarios presented in this section provide future estimates for the number of low carbon heating technology installers – including those to install heat pumps, heat networks and direct electric in domestic and non-domestic buildings. Estimates are based on the three scenarios outlined in Section 4 of differing uptake levels of these technologies. The heat network assumptions include connections to existing heat networks, not building new networks, as connecting an additional building / dwelling requires installers with similar skills to plumbing / heating engineers, whereas building a new district heating network also requires a wider range of professionals from the civil engineering sector.

- **Scenario 1 (high heat pump uptake, low heat network uptake):** in 2030 there will be a need of up to c. 15,500 heat pump installers, up to c. 2,250 installers to carry out heat network connections and up to c. 250 professionals installing direct electric heating to meet the 2030 targets (see *Figures 2, 3 and 4*). The highest installer workforce requirement is predicted to occur in 2026 (with up to 16,400 installers needed).
- **Scenario 2 (medium uptake of heat pumps and heat networks):** By 2030 there will be a need of up to c. 11,400 heat pump installers, up to c. 4,000 professionals qualified to install heat network connections and up to c. 1,100 trades people able to install direct electric heating. However, the largest growth in heat pump installer workforce requirement is estimated to occur in 2026, when c. 12,000 – 13,000 installers will be needed to ensure that the 2030 targets can be met.
- **Scenario 3 (low uptake of heat pumps and high uptake of heat networks):** Accordingly, the estimated required installer workforce for heat networks is the highest among all scenarios, up to c. 6,100 by 2030. The maximum number of required heat pump installers is estimated to reach c. 8,800 in 2026 and settle to around c. 7,500 between 2026 and 2030. The required number of electricians qualified to install direct electric heating is estimated to grow to a maximum of c. 2,100 in 2026 and stay at a level of around c. 1,800 by 2030.

Figure 2: Full-time equivalent (FTE) heat network installer jobs needed in year (2025 – 2030) Tabulated values provided in section 9.1.3.

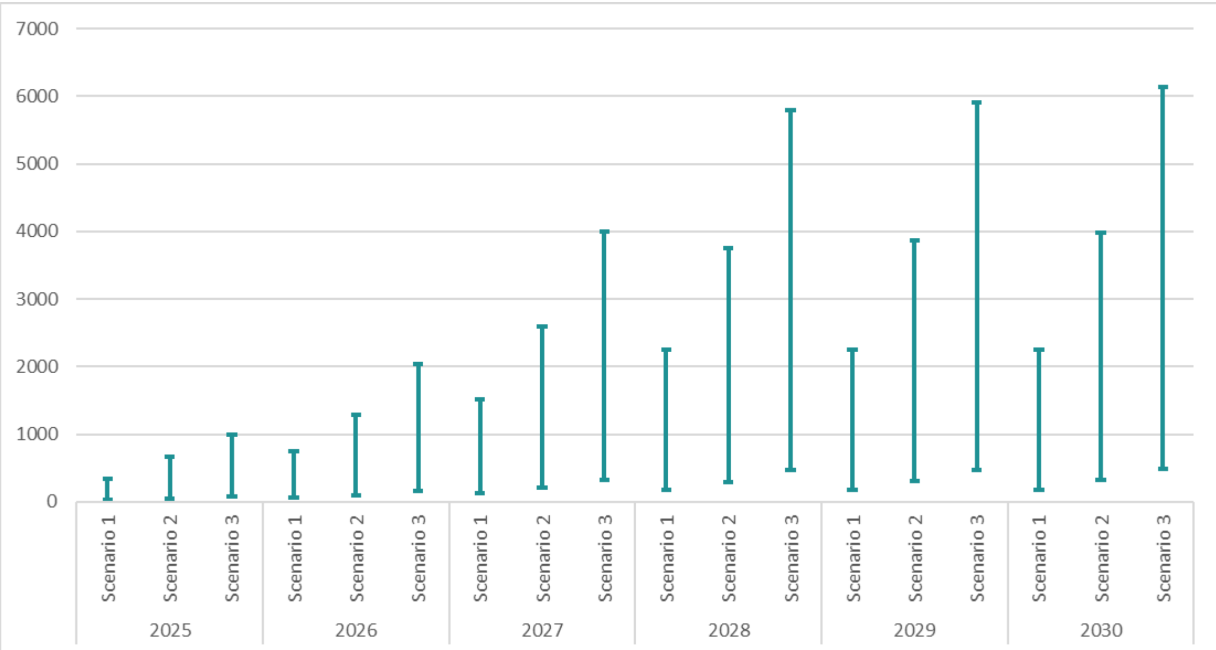


Figure 3: Full-time equivalent (FTE) heat pump installer jobs needed in year (2025 – 2030) Tabulated values provided in section 9.1.3.

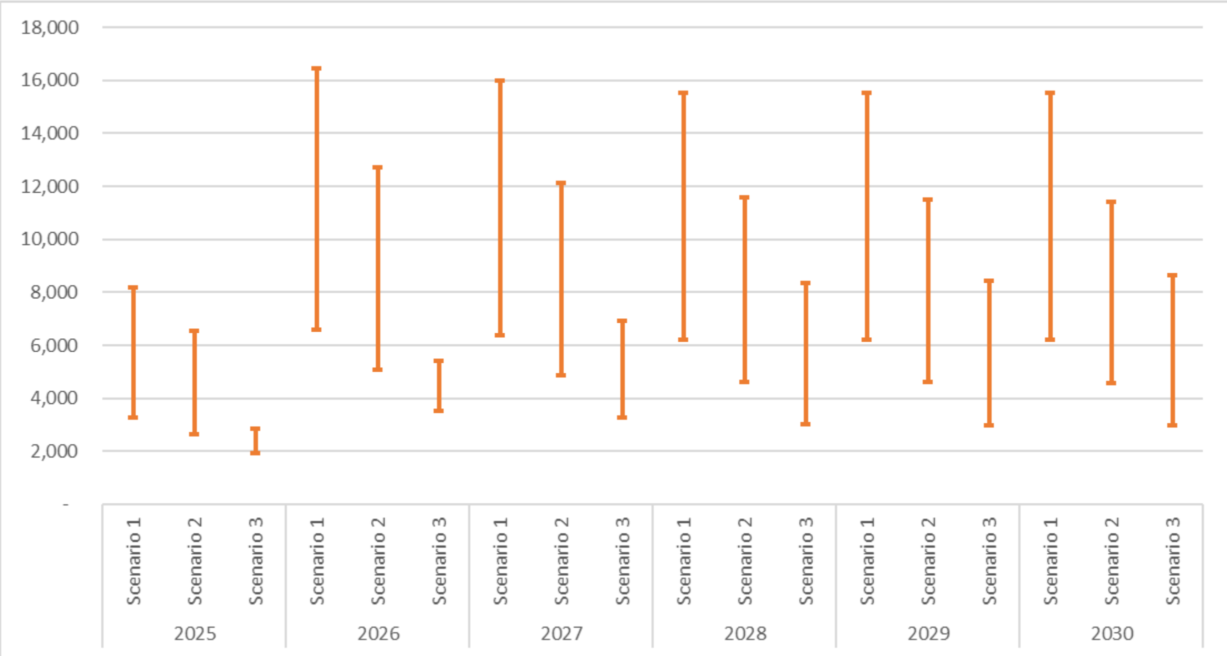
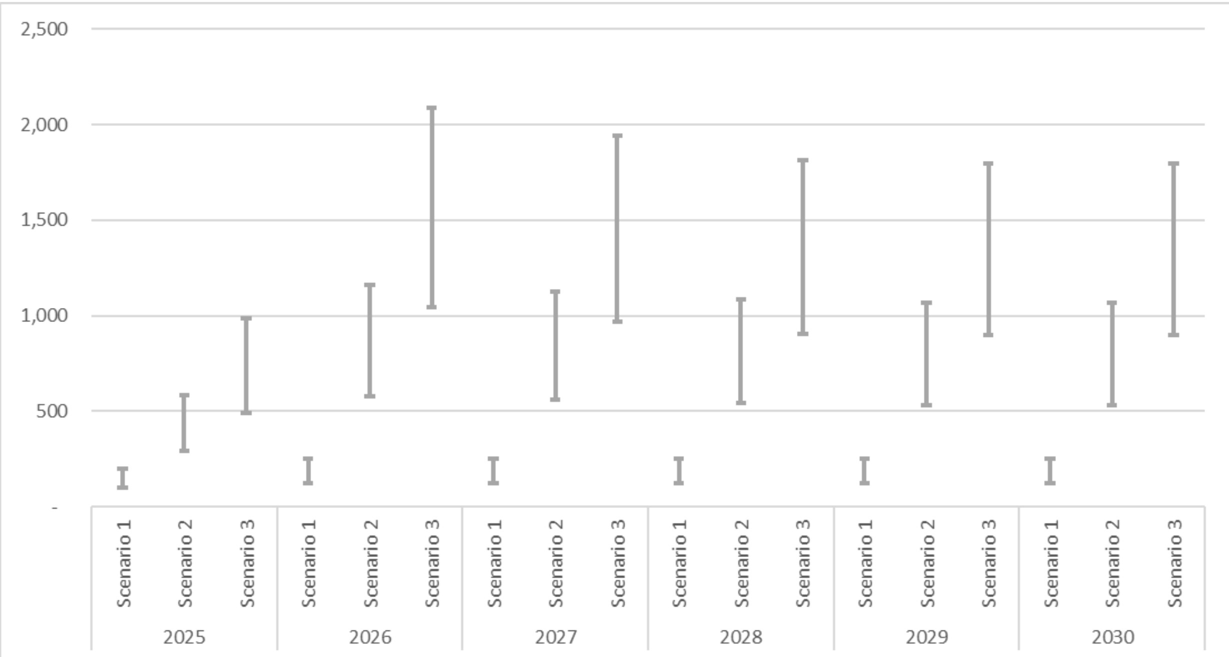


Figure 4: Full-time equivalent (FTE) direct electric installer jobs needed in year (2025 – 2030) Tabulated values provided in section 9.1.3.



The data above shows that estimated installer requirements differ based on the expected deployment rates of heat networks and heat pumps.

The number of required heat pump installers is the highest across the future low carbon heating installer workforce, driven primarily by the volume of planned heat pump installations, but also by the length of the installation time. Even under Scenario 3 (low uptake of heat pumps and high uptake of heat networks), the number of heat pump installers needed in 2030 is expected to outweigh that of installers of heat network connections.

- The required future workforce is considerably higher than the number of current jobs in the respective sectors. According to the middle scenario the number of required heat pump installer workforce is estimated to be between 5,100 – 12,700. Therefore, a significant number of installers need to be upskilled/reskilled compared to the current estimated direct workforce of 1,800 – 1,900 [9]. Installer jobs are included in these and account for around 30% of total direct jobs [23], or in the region of just below 600. It is worth noting that in 2018 there were 140,000 Gas Safe registered engineers in the UK [24]. Taking the number of heating engineers to be proportional to general population infers that there are currently approximately 11,000 heating engineers in Scotland [2]. As, in the future, low carbon heating technologies are expected to replace fossil fuel boiler installations, some of these gas heating engineers could be reskilled to carry out heat pumps installations.
- The heat networks installer requirement in the middle scenario is expected to be up to 4,000 in 2030, which requires a significant workforce ramp-up compared to the 900 installer jobs related to heat networks in Scotland in 2018. Considering the entire district heating segment, according to some industry estimates there is a future potential of around 14,000 – 23,000 new jobs (direct and indirect jobs across the supply chain, including installers) related to district heating installation in Scotland [10] to meet the decarbonisation targets.
- According to the middle scenario, around 1,200 direct electric heating installers will be needed. Although in 2018 there was a total of around 8,000 jobs (direct and indirect) across the supply chain of direct electric heating [2], only a fraction work solely on electric heating installations and most of them also fit other electrical devices. A shortage of electricians was reported by respondents, and more need to be reskilled/upskilled to enable the installation of the planned direct electric heating technologies between now and 2030.

6.2 Other future workforce requirements

6.2.1 Non-installer workforce requirements

Apart from the required installers, there will also be a need for professionals in other direct jobs as well, to help achieve the statutory climate change targets.

Direct jobs[6] account for around 58% of total heat network related and 60% of total heat pump jobs, according to the (previous) Department for Business Innovation and Skills [9]

These direct jobs consist of roles along the supply chain for the low carbon technologies and include:

- Project managers
- Domestic and non-domestic EPC assessors
- Administrative functions related to district heating / heat networks operation (e.g. financial administration, data management, account management)
- Other jobs within the installation companies that are not directly installers
- Manufacturing jobs to create the heating and energy efficiency products.

There are also wider jobs within the economy that would be needed because of this growing workforce and to enable the installation of these measures. For example, this

[6] Direct jobs are defined as roles associated to a respective technology along the elements of the supply chain: project design & consultancy, manufacturing, installation, operation and maintenance as well as related to client management / business models.

would include more trainers to upskill workers and more workers in electricity network operator companies to support the connection of heat pumps to electricity networks.

6.2.2 Manufacturing capacity

To meet the planned climate change targets, the supply chain needs to be able to cope with future demand. In this respect, there must be sufficient volume of low carbon heat technologies and thermal insulation material and product supply available. Scotland has two existing heat pump manufacturers, Mitsubishi Electric (in Livingston) and Star Renewable Energy (in Glasgow) [10]. As an innovation example, sustainable construction materials business IndiNature plans to open its new Borders manufacturing hub in summer 2022 (and grow its workforce to 30), producing a natural fibre insulation system called IndiBreathe using hemp grown in the UK, which can be fitted both in new and retrofit building projects. There is therefore an economic opportunity for Scotland to expand its manufacturing base for energy efficiency and low carbon products and increase employment in this sector. The numbers of potential employees have not been assessed as part of this research.

6.3 Factors influencing future workforce capacity

6.3.1 Lack of sufficient workforce

As Scotland's population ages, and UK's exit from the EU curbs immigration, the rate at which the country's population increases is projected to slow down over the next few decades and eventually to fall. [25] The effect of these trends is potentially a shrinking pool of workforce which can be attracted into the field of low carbon heat technologies and energy efficiency measures.

Young professionals

One of the key issues is that not enough young professionals are entering this employment segment. Several stakeholders mentioned that, currently, jobs in construction are not regarded a desirable career choice and in schools there is a push to send pupils towards university, while vocational courses are not encouraged.

The number of electricians leaving the workforce each year exceeds the numbers completing an apprenticeship. Respondents believe that although currently there is no shortage of applicants for apprenticeships in construction, the numbers of people entering the energy efficiency apprenticeships for electricians and plumbers are not increasing in line with the anticipated future demand. Modern apprenticeship numbers are relatively high in Scotland, but these are employed positions and rely on employers offering vacancies. Some respondents pointed out that employers will need to have visibility on future demand for energy efficiency measures and low carbon heating technologies to have the confidence to invest in new workforce.

Respondents pointed out that the issue of not having sufficient workforce is likely to be even more accentuated in the remote areas of Scotland, as the younger population tend to move to areas with more job opportunities and higher wages. These regions are often served by companies located in the central belt, but to carry out projects in the remote areas, they need to cope with higher costs (to ship materials and workforce to the remote locations).

Demographically diverse workforce

Poor working conditions and an unfavourable record on inclusion are considered as obstacles to hiring talent and increasing workforce. [26]

The industry currently is dominated by a male workforce and unless barriers (perceived or real) related to these jobs are not overcome (culture, unsociable hours, long distance travel, working conditions), they will likely keep preventing women from pursuing it as a career.

Until a career in the building industry is perceived as an attractive career choice, it will be unlikely to attract people from different ethnic and demographic backgrounds.

Effects of UK exit from the EU / Covid-19

Interviewees often quoted the UK's exit from the EU and Covid-19 as main reasons for decreasing workforce in recent years, which is expected to have ramifications in attracting workforce in the near future.

Eastern European workers (mainly from Romania), accounted for an estimated 70% of the workforce [27] delivering external wall insulation (EWI), which is a key element in several retrofit schemes. Although many of these workers have settled status in the UK, this represents a high exposure to a section of the workforce which may be strongly impacted by the consequences of the UK's exit from the EU. Those without settled status are unlikely to meet the earnings threshold set out in the UK Government's immigration proposals, potentially causing a wide gap in the required workforce to meet targets. Also, due to the restrictions triggered by Covid-19, a proportion of these workers moved home or closer to home.

6.3.2 Remote regions

A major challenge identified by respondents was related to the rural and island areas of Scotland. There is a need for shipping the necessary building materials and spare parts to the respective island, but there are limitations on freight weight on the ferries connecting the destination to the mainland. This currently requires shipments to be broken down into several transports, which has time and cost implications.

The logistical issues of shipping materials and workforce to the islands add to the complexity and cost of projects (it was estimated by respondents that this could add in the region of 7-10% to the total cost; projects located in remote areas need longer planning times, which also has implications on the timeline and overall cost).

In addition, businesses based on the islands find accessing training on the mainland prohibitively expensive and are discouraged from pursuing upskilling of their staff.

7 Future skills requirements in Scotland

7.1 Skills required across supply chain

7.1.1 Overview of skills requirements

High standards of skills are required for the safe and efficient installation of various energy efficiency measures and low carbon heating technologies. Therefore, there is an overarching need to ensure that the workers engaged in this activity are skilled up to the required levels and possess the required certifications. As technologies develop and improve, regular updating of skillsets will be required to maintain greater energy efficiency.

In early 2019, Energy Efficient Scotland (EES) noted the need to integrate the key processes of enhancing quality assurance, improving consumer protection, developing the business supply chains, and increasing the volumes of effectively skilled labour. [28] It highlighted that some measures are currently delivered by workers who do not have a trade in the conventional sense, and it was regarded as a potentially serious shortcoming (related particularly to external wall insulation). Also, it was acknowledged that there were no dedicated qualifications focusing on retrofit work on non-domestic buildings. As an outcome from these findings, a key recommendation by the Short Life Working Group (SLWG) was that, in the future, installations under EES must be based on skills and competencies, and a skills and qualifications matrix should be developed and clearly communicated to the supply chain. The Quality and Skills Working Group was set up by the Energy Skills Partnership (ESP) and developed the installer skills matrix. [29]

According to the respondents, certain skills can be trained in a relatively short time:

- Domestic EPC assessors
- Loft insulation (boarding)
- External wall insulation (boarding for semi-skilled workforce)
- Heat pump installation for experienced gas heating engineers
- Administrative functions related to district heating / heat networks operation.

Nevertheless, there are several crucial skills identified by the study, which are more difficult and time consuming to train people up to (depending on previous skill sets):

- Non- domestic EPC assessors
- Project management related to energy efficiency and low carbon heating technologies deployment
- External wall insulation (professions such as rough casters)
- Internal wall insulation (professions such as joiner and plasterer)
- Heat pump commissioning, understanding hydraulics, zone control strategies and wider energy system
- Heat network installation (professions such as welders, heating engineers with knowledge of larger heat distribution systems)
- Control and operation / maintenance of heat networks.

7.1.2 Overview of timescales required for upskilling

The following timescales were provided by interviewees to upskill people:

- **Less than 1 year:**
  - EPC domestic: 1 week training plus portfolio (around 2 months)

    - Retrofit coordinator[7]: 150 hours training in a year (applicable for professionals with building background);
    - Loft insulation: 6 months
    - Cavity wall insulation: 9 months
- **2 years:**
    - External wall insulation: 2 years (non-formal training; upskilling can take 1 week)
    - Internal wall insulation: 2 years (non-formal training)
- **Over 4 years:**
    - Electric heating: 4 years
    - Heat pumps: 4 years, then 3-5 days conversion course, plus on-the-job training
    - Consultancy: undergraduate degree plus learning on the job (minimum 4 years).

7.2 Skills gaps

According to the Scottish Employer Skills Survey 2020, 35% of skilled trades occupations in Scotland were in need of upskilling. [21] Process, plant and machine operatives reported a lower need for upskilling (15% of workforce in this sector). In addition to this, over 12% of skilled trades workers were identified by their employers as not fully proficient in their jobs. Focusing on the construction sector in Scotland in general, around 4,000 construction companies (of the 13,400 operating in Scotland) reported having one or more employee not considered to be fully proficient. There are no similar statistics specifically for the low carbon heat sector in Scotland, but we expect that many construction employees may move specifically into that sector in the future.

In addition to the lack of proficiency for a significant part of the workforce needed to meet Net Zero targets, over 5% of skilled trades occupations and almost 2% of plant, process and machine operatives in the construction sector have been identified as having a skills gap. Around 26% of the workforce with a skills gap was due to not having received appropriate training; in the case of 14% of the workforce, it was due to the introduction of a new technology. Another 40% resulted from the inability to recruit staff with the required skills.

This was echoed by the respondents along the supply chain and stakeholders, and it highlighted the shortages in skills for low carbon heating technologies and thermal insulation. Over-arching skill gaps to be addressed across all technologies and elements of the supply chain are project management and digital skills.

Respondents also mentioned an insufficient number of domestic and non-domestic EPC assessors who can carry out assessment to a high-quality level. One of the current challenges is the lack of consistency of assessment results. Non-domestic EPC assessors require a different skill set, than domestic assessors, as it requires a more technical background.

7.2.1 Energy efficiency measures

Across the supply chain of energy efficiency measures deployment, there is a current skill gap to be addressed: understanding of the building at the design and specification

[7] Research related to retrofit coordinator role is currently ongoing and is expected to be published later in 2022.

phase, to be able to assess what kind of impact a certain thermal insulation measure could have on the existing building fabric (e.g., fire retardation, moulding etc.).

In the installation phase of the supply chain, the professions in shortage are plasterers, rough casters, roofers, glaziers, joiners, and insulation installers. Generally, most of the current workforce needs to obtain formal qualifications to be certified according to the installer skills matrix.

7.2.2 Low carbon heating technologies

There is an increasing need for understanding what the implications of the Net Zero requirements are for design and planning, and to have holistic knowledge and awareness around various energy efficiency measures. This is mainly related to the relationship between the building fabric, the range of potential heating solutions and the importance of ventilation measures.

Heat networks

According to the Energy Saving Trust's Heat Network Skills in Scotland study, the main skills gaps identified related to heat networks were in the areas of project management of heat network delivery, design, installation, technical operation, optimisation, and maintenance of heat networks. [30] Where skills are not available in-house, typically specialist heat network contractors have been commissioned. Whereas this strategy proved suitable in the short-term in the past, the opportunity missed to build up the necessary in-house skills capacity could have unfavourable implications in the longer term for the ability to meet future increasing demand.

This echoes with the respondents' views, who also highlighted that there is a skill gap related to generally understanding the Net Zero requirements and with regard to professionals with experience in new technologies (e.g., heat pumps). In the installation element of the supply chain, there is a shortage in plastic and metal welders and heating engineers who can work on heat network projects.

Further skills gaps identified during this research are related to digital skills and network operations management (technical operation, optimisation, and maintenance of heat networks), which would improve the efficiency of heat network operation and maintenance in the future. As heat networks are regulated and client management / billing is a major part of operating the system, skill gaps related to several administrative roles have also been highlighted by the respondents: financial administration, data management, network operations management, account management, tax efficiency specialists, accounting (including procurement of energy).

The skills shortages identified are more prevalent in the rural and island areas of Scotland where access to specialist contractors is limited. With the expansion of heat networks having a key role in Scotland's Heat in Buildings Strategy, addressing the skills gaps related to the entire supply chain of heat networks is crucial.

Heat pumps

Respondents pointed out that the current number of heating engineers who can install heat pumps is not sufficient for the future uptake of this technology. Also, due to the low frequency and relatively long time needed for installing a heat pump (compared to a wall-hung gas boiler), the existing plumbing workforce needs to be upskilled to cope with the projected heat pumps installation leading up to 2030. According to respondents, most of the plumbing workforce lacks a general understanding of Net Zero requirements, experience with new and renewable technologies, understanding of heat loss and hydraulics, knowledge of zoning and control strategies and practical heat pump installation training. A major area of identified skill gap is related to skilled heating engineers (certified to handle refrigerant gases) who can take care of heat pump maintenance in the future (this is especially important considering the future substantial installed base of heat pumps).

On the manufacturing side, a challenge to attract enough skilled workforce has been highlighted. Despite the availability of the Employer Recruitment Incentives (ERIs), generally if suitably skilled workforce cannot be found in the manufacturer's local authority area, the incentive cannot be claimed by the employer. Wider issues on the manufacturing supply chain are the shortage of raw materials (e.g., copper, microchips, or refrigerant gases) and the insufficient number of industrial electricians. A further potential shortage highlighted along the supply chain is the availability of the required volume of heat pump products, considering that most manufacturers are located outside of the UK and also serve other European countries with similar Net Zero target ambitions (e.g., Germany and France).

Direct electric heating

According to the respondents, there is currently a general shortage of electricians, which needs to be addressed to enable meeting the decarbonisation targets by 2030. Respondents also highlighted the need to improve the quality of installations carried out by the electricians.

7.2.3 Wider issues

During the research, some stakeholders pointed out that an important skill required in the future is that of well trained and skilled individuals who can carry out an entire house or building assessment in relation to the set of measures needed to maximise its energy efficiency. This is envisaged to be covered by the role of retrofit coordinator. The Scottish Government is aware of this role's importance and has commissioned research which investigates competency related to risk. The research is currently ongoing and is expected to be published later this year.

Interviewees also drew attention to a skill gap at the local authority level, caused by the declining number of experienced staff charged with building standards and related issues. This is partly due to cuts in local authorities staffing with their posts being filled by existing employees with inadequate training and experience. Another skill gap mentioned is that environmental managers and related staff are not being sufficiently well equipped to make key decisions around the works needing to be done and how to ensure the most energy efficient and appropriate solutions were selected for the properties under their management. Interviewees reported that clerks of works are difficult to recruit with many local authorities reducing their numbers over the last decade.

7.3 Challenges to cover skills gaps

7.3.1 Training

The number of people commencing construction apprenticeships could have a major impact on future skills given the declining numbers in the age group over time. The situation is not helped by the fact that the low pay of apprenticeships is hindering older workers and higher paid professionals from other sectors to transition into the low carbon and energy efficiency sector.

There was also a strong feeling from respondents that apprenticeship training does not incorporate a suitably extensive element of low carbon processes and practices. The apprenticeship for electricians includes an energy efficiency pathway, but this is more focused on raising awareness of energy efficiency rather than practical installation in a real-life workplace setting. The plumbing apprenticeship has an 'emerging technologies' pathway element, but most apprentices still mainly chose 'gas' and only a relatively small number of apprentices pursued the 'emerging technologies' route as it does not fit with the mainstream business focus of their employers. Nevertheless, a new low carbon technology unit has become mandatory in the plumbing apprenticeship from 2021.

Training capacity can also be a major constraint in this area (e.g., only one college specialising in refrigeration and air conditioning). This can be seen as a barrier for the uptake of skilled heating engineers able to handle refrigerants and carry out maintenance work of heat pumps in the future.

One of the challenges mentioned by interviewees is the need for more funding to support the industry to train workers in low carbon / energy efficiency measures. There have also been cases when courses fail to be delivered due to insufficient number of attendees to achieve viability. Some colleges do not have sufficient resources for new workshop capacities and to recruit trainers skilled to an appropriate level. Currently, there is no strong partnership between the industry and colleges, which could ensure that those finishing training courses reach the level required on the job.

Location of colleges offering the courses can also constitute a barrier: the fewer the colleges involved, the greater the distance the workers must be sent for upskilling training, and the higher the unproductive time cost becomes for the employer.

Apprenticeships

The view of some respondents was that employers are willing to take on apprentices, and there are older candidates willing to switch sectors and take up construction apprenticeships but associated lower income levels represent a barrier for them as they are often not in a position of their life to accept lower income by switching careers.

Currently there are no apprenticeships related to heat networks, which, according to heat network developers/operators, would facilitate drawing in workforce into this sector.

Courses and training staff

Respondents pointed out that the recently published installer skills matrix is a very useful guide, but to truly facilitate upskilling of the necessary workforce in the future, it should be complemented by a simple overview of which courses are available for each low carbon measure and their cost.

One of the factors facilitating future jobs is the knowledge level of the lecturing staff and the lack of suitable equipment installed at colleges. Both need to be addressed to facilitate reaching the desired workforce numbers.

7.3.2 Market 'pull' of low carbon technologies

The respondents interviewed for the study felt that, especially with regards to heat pumps, one of the key challenges they are facing is the low level of consumer demand.

It was viewed that the current level of incentives is not enough to make low carbon heating and energy efficiency measures affordable and attractive for most homeowners. As a result, consumer awareness of these technologies remains low, and there is a general lack of clarity regarding the future funding available. Whilst consumer demand is not a topic explored in this research, it does impact the supply chain.

Therefore, companies active in the energy efficiency measures and low carbon heating technology space do not see enough evidence of a business case to hire more workforce and upskill/reskill them in anticipation of the potential future demand.

7.3.3 Quality

Respondents believed that the current level of quality assurance has led to lower quality of installations (especially in the case of air-source heat pumps), which has been hindering consumer confidence, and therefore demand for these low carbon technologies. As a consequence, installation companies do not see it as attractive to invest in staff upskilling/reskilling training.

7.3.4 Investment in the building sector

Several respondents pointed out that the lack of certainty and information regarding the longevity of project pipelines are factors which negatively influence the willingness of companies to employ people and to invest in their training.

This is posing a challenge especially for micro/small businesses, who currently often must take on the risk of 4-year apprenticeship based on a 1-year project contract.

Employers will need to have the confidence to invest in their future workforce in order to play an important part by bringing in new workforce to this field.

7.3.5 Regulations and policies

Without a clear roadmap of permitted heating technologies in the future, companies do not have the confidence to invest in upskilling of staff, as they are uncertain whether there will be potential projects in the future for which they can prepare for.

7.4 Initiatives to grow skills

7.4.1 Current initiatives

The Scottish Government, educational organisations and trade associations have developed schemes to upskill and grow the workforce related to renewables and energy efficiency. A short summary is presented below, with more details listed in Section 9.5:

- Apprenticeships in Scotland are coordinated by Skills Development Scotland (SDS), allowing people to work towards a qualification on the job. Apprentices work with experienced colleagues on real-life projects, while putting into practice what they learn at college or university.
- The Energy Skills Partnership (ESP) established an Energy Efficiency Training Network spanning nine colleges across Scotland. ESP supported these colleges in developing specialised renewables and energy efficiency training centres to ensure they had the capability and capacity to train future workforce that will ultimately help the Scottish Government reach its green targets. The training was offered until 31st July 2021, but the initiative could be a source of inspiration for future training programmes.
- On behalf of the Scottish Government, Skills Development Scotland (SDS) launched its Green Jobs Workforce Academy at the end of Summer 2021, aiming at building a fairer economy which delivers the skills, opportunities and jobs for the future.
- Climate Emergency Skills Action Plan Implementation Plan (CESAP) sets out the Scottish government’s plan to maximise the transition to net-zero, ensuring that Scotland’s workforce has the skills required to make the transition to net-zero successful

- The Flexible Workforce Development Fund is available to all Scottish employers, including small and medium enterprises (SMEs). It supports businesses in Scotland to upskill and reskill their employees to support inclusive economic growth in Scotland.
- The Employability Fund from Skills Development Scotland (SDS) provides flexible training support.

There are various schemes aimed at aiding business growth and the uptake of low carbon technologies:

- The Energy Saving Trust, in partnership with advice providers and energy companies, manages various energy efficiency incentive schemes on the Scottish Government's behalf through Home Energy Scotland (Home Energy Efficiency Programmes for Scotland, Home Energy Scotland Loan).
- Energy Efficient Scotland: Warmer Homes Scotland run by Warmworks
- Help to Grow scheme (the Scottish Growth Scheme is a package of financial support of up to £500 million for Scottish businesses).

Most small businesses interviewed had a low awareness of current funding available for training and upskilling/reskilling, only mentioning the Flexible Workforce Development Fund and the Skill Development funding. On the other hand, they are aware of training initiatives organised by the industry (heat pump training offered by manufacturers, open days for architects/developers, online learning on decarbonisation) and schemes aiding business growth (Home Energy Scotland and Help to Grow schemes).

Two building contractors formed partnerships with colleges (AC Whyte with West College Scotland and South Lanarkshire College, and Sears with West Lothian college) combining training and work experience related to external wall insulation (EWI), which can result in employment after one year of learning.

There is potential for attracting workers from other sectors as a means of meeting increases in demand for energy efficiency skills. Some sectors, such as oil and gas and manufacturing more generally are potentially facing decline due to UK's exit from the EU and the move towards a Net Zero economy. There are skilled electricians and engineers working in these sectors who could readily transfer into the energy efficiency and low carbon technology field with targeted upskilling and reskilling. Nevertheless, a potential barrier would be the currently lower income levels in the low carbon heating sector compared to oil & gas.

Covid-19 had a significant impact on sectors such as hospitality and some segments of these sectors may not recover to their previous employment levels on the short term [31]. As a result, a significant number of workers may look for a move into other employment sectors. Nevertheless, attracting, and reskilling workforce from other professions needs to consider the complexity of the roles and the time lag required to train up resources. Experienced workers from other sectors can go through the apprenticeship route, however barriers need to be overcome (such as lower income levels compared to the sectors they come from).

Ex-military personnel were also mentioned by respondents as having the core transferable skills and experience to fill in the gap in project management.

7.4.2 Recommendations for future initiatives

The respondents also suggested the following initiatives to be considered by Scottish Government to grow skills:

Training

- Consider allocating funding to enable relevant courses to grow and replicate in the future.
- Establish heat network training centres within colleges and universities to focus efforts to develop practical teaching content and meet the needs of the heat network industry in the future. The curriculum should contain a suitable mix of vocational and professional skills, for managing the entire supply chain of district heating / heat network system. There is also scope for enhancing training of non-technical practitioners working on project management, procurement, board governance, financial management and customer engagement related to heat networks.
- Ensure that training related to the installation of heat pumps and energy efficiency measures also includes practical installation in a real-life workplace setting.

Funding

- Subsidise the energy efficiency and low carbon heating companies to serve Scotland's remote areas. Workforce from the central belt could be re-allocated to carry out projects in the remote communities and to allow their employers to have access to grants.
- Subsidise the heat pump installer companies to cover the lost income while the installer companies' staff participate in training.

Regulatory / policies

- Procure the relevant future projects through framework agreements (placing increased weight on quality versus price, prior relevant experience, and good delivery record), which could give the confidence to the businesses that they can win a reasonable share of work. The demonstration of the capacity to deliver work of quality should include implicitly having a skilled, qualified, and certificated workforce. The industry can be stimulated to invest in upskilling/reskilling by awarding longer-term contracts (to ease the challenge currently faced by micro/small businesses).
- Enable development of strategic partnerships with local authorities, as there is a need for efficient procurement approach.
- Developing a regulatory framework with compulsory qualification requirements in low carbon heating technologies for installers (attesting competency) can have a key role in encouraging investment in upskilling/reskilling.

Other recommendations

- Create a joined-up strategy with a steering group together with industry and education representatives to assess the operational realities of achieving the Net Zero targets and develop a joint plan to solve the skill gaps.
- Improve the way inspections/quality assurance are carried out: this can consist of funding independent monitoring of installations, introducing random quality inspections and potentially using Home Energy Scotland to perform additional monitoring.
- Increase awareness of low carbon heat technologies, for example through communication campaigns (e.g., identifying which low carbon technologies will be allowed to be installed in the future and the funding available). This could

facilitate the market pull factor of these technologies, also helping businesses see real demand, in turn encouraging them to increase their workforce and upskill / reskill them.

It was suggested by the respondents that to cover the short-term shortage of skilled workforce, the UK Government should consider easing entry and settlement requirements for a European low carbon and energy efficiency workforce who possess the relevant skills in shortage.

8 Conclusions

8.1 Conclusions

About this research

Ambitious Scottish Government climate change targets require a significant uptake in the numbers of energy efficiency and low carbon heat measures installed in domestic and non-domestic buildings in Scotland by 2030. Meeting these targets will require the 2030 workforce to have the required capacity and skills along every element of the supply chain. This report has reviewed the current workforce in Scotland in this sector, in terms of size, demographics, vacancies and skills. It has then assessed the likely requirements of the workforce in 2030 including the scale of employment in this sector, skills required, and initiatives required to upskill the sector.

Assessing future workforce requirements is complex and uncertain in nature, and the findings should be interpreted in this context. For example, there is uncertainty around the technology mix likely to be installed by 2030 – such as the mix of heat pumps, heat networks and direct electric heat systems. There is a lack of available data on the jobs required along the supply chain for these measures. One challenge of estimating this is that employment in the sector is not usually solely in the low carbon heat and energy efficiency sector – for example, a heat pump installer is likely to also install gas boilers. Another challenge is the variability in installation times; for example, the time taken to install a heat pump can vary greatly depending on property size, location and existing heating system. This makes estimating the jobs required for a greater number of heat pump installations (for example) very challenging.

Future workforce capacity in 2030

Depending on the uptake scenarios of energy efficiency measures and low carbon heating technologies:

- The study considered three scenarios for future energy efficiency deployment; between 4,500 to 5,400 installers of thermal insulation will be required in 2030, assuming a linear a growth in number of installations.
- The study explored three scenarios of heat network uptake, alongside heat pumps and direct electric installations. According to the middle scenario a total of over 1 million heat pumps, almost 147,000 new heat network connections and almost 360,000 new direct electric installations will be installed by 2030. We estimate that this requires between 5,100 – 12,700 heat pump installers, between 320 – 4,000 heat network installers and 580 - 1,200 direct electric installers. This represents a significant increase in the number of employees currently in this sector in Scotland and there will be a need to upskill a large workforce – many of whom may transfer from other construction jobs. The large increase is due to the fact that a greater rate of heating replacement will be needed than currently, to enable higher deployment numbers. In addition, many measures take longer to install than currently common technologies.

Current shortages in the workforce

There are current shortages in the energy efficiency and low carbon heat workforce, which mean that meeting the above workforce increases will be challenging and there is a need for more initiatives to fill vacancies. Shortages include:

- In the district heating / heat network segment, there is a shortage of plastic and metal welders, heating engineers who can work on heat network projects, and people skilled in network operations management (technical operation, optimisation, and maintenance of heat networks).
- The current numbers of heating engineers are not sufficient, which makes it very challenging to increase the number of heat pump installations in the coming years. Due to the low frequency of current projects, they often lack routine and practical knowledge, so they also need to be upskilled.
- There is a shortage of plasterers, rough casters, roofers, glaziers, joiners, and insulation installers to carry out thermal insulation projects. Also, more electricians are needed to enable the planned future direct electric installations.
- Broadly, there is a growing need for professionals who understand what the implications of the Net Zero requirements are for design and planning and have a holistic knowledge and awareness regarding the relationship between the building fabric, the range of potential heating solutions and the importance of ventilation measures.

Skills required and challenges around upskilling

We interviewed a range of stakeholders and supply chain representatives to understand current challenges around training and upskilling in this sector. This highlighted the following challenges:

- There are challenges related to training, including lack of strong partnership between the industry and colleges (lack of practical aspects in some courses or potential trainees may fail to find work), unviable courses due to insufficient attendees, and insufficient number of courses led by skilled trainers and with up-to-date workshop capacities.
- The landscape of different funding sources to support upskilling / re-skilling in the energy efficiency area seems very complex and smaller businesses find it considerably challenging to find the most appropriate funding for their business needs and to pursue with the application process.
- Tied in very closely to this is the fact that for businesses to invest in the skills development of their workforce they need to see a project procurement pipeline which stretches several years ahead (ideally at least five years), alongside the committed public funding which supports it.
- Companies located in the Highlands, the islands and the regions around the Scottish border struggle to attract the required number of skilled workforce; training opportunities are also scarcer in the more remote areas of the country. Projects sometimes are carried out by companies not located locally, which face higher costs due to logistical challenges.

Demographics of the current energy efficiency and low carbon heat workforce in Scotland

Whilst we do not have specific data on the demographics of the energy efficiency and low carbon heat sector, we can look at the demographics of the construction sector as a whole to understand characteristics and trends likely to be applicable. The construction sector has a long-standing reputation of being white male dominated, where women and people from other ethnic backgrounds are seriously under-represented. Also, not enough young professionals are taking up employment in the energy efficiency and low carbon heating technologies segment in Scotland. This is partly due to the decreasing proportion of under 24-year-olds in the population, but also the insufficient number of people choosing these professions. Initiatives are required to make this sector more diverse in terms of gender, ethnicity and age.

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9 Appendix

9.1 Methodology and assumptions

Aims of this research were:

- Review the current clean heat and energy efficiency workforce in Scotland, including:
    - Current capacity and skills within the Scottish workforce in this sector
    - Identifying and analysing employability trends in the sector including demographics (age, gender), vacancies, regional differences, and wages
- Set out the future workforce requirements to meet the ambitions set out in the Scottish Government's Heat in Buildings Strategy and provide a range of scenarios to quantify future workforce requirements
- Identify gaps in the labour force to meet Scottish Government ambitions
- Analyse potential options and produce recommendations on how to fill these gaps, and related opportunities.

The scope of the research included:

- Supply chains for a range of clean heat and energy efficiency measures, as agreed with Scottish Government. The list of measures included and excluded is provided in Section 9.1.1
- Includes domestic and non-domestic
- Scenarios up to 2030
- Upstream and downstream elements of the supply chain.

9.1.1 Methodology

The methodology for this study was as follows:

1. **Development of sub-sectors and scenarios** for use within this research**.**
    a. **Decarbonisation technologies:** the main technologies considered by this study have been identified as those in line with the Scottish Government's Heat in Buildings Strategy: thermal insulation, district heating / heat networks, heat pumps and direct electric heating. Other technologies have been excluded from this research where they:
        - Have more 'niche' applications or are unlikely to see significant uptake, according to current Scottish Government policy (e.g. biomass, micro-CHP, hybrid heating systems)
        - Are not expected to be widely available for space/water heating applications in buildings in the timeframe of this study (e.g. hydrogen / biomethane, bio-LPG boilers)
        - Are 'secondary' systems which can contribute to reducing emissions, but are not able to operate without primary space and hot water production technologies (e.g. solar thermal, smart controls)

    b. **Key elements (sub-sectors) of the supply chain** were developed by Delta-EE and Changeworks based on their industry knowledge. This is presented in detail in Section 9.3.

c. **Growth scenarios for each technology** were identified for every year up to 2030. These were created using information from the Scottish Government on their 2030 targets and the likely combination and prioritisation of measures (e.g. heat networks or heat pumps). These are outlined in Sections 4 and 9.2.

2. **A literature review** to understand current employment trends in this sector in Scotland, workforce numbers, and required skills and qualifications. A search of available evidence sources took place and was further supplemented by literature provided by interviewees.
3. **Supply chain interviews** were undertaken with 30 organisations in Scotland, representing key elements of the supply chain for the technologies being researched. These were semi-structured 30-minute telephone interviews and were undertaken in December 2021 – January 2022. The interviews gathered data on current employability trends, qualifications, time to install technologies and skills gaps.
4. **Stakeholder interviews** were undertaken with 10 organisations in Scotland representing the construction industry and skills organisations, for example. These semi-structured interviews were around 60 minutes long and focused on employability trends, challenges and initiatives to upskill industry.
5. **Quantitative analysis to identify future workforce requirements** identified the number of human hours required to install decarbonisation measures using data gained from the supply chain interviews. The resulting data was multiplied by the technology deployment forecasts to arrive to the number of required installer workforce for each year.
   More details of the methodologies applied assumptions and limitations are presented in Section 9.1.2.
6. **Qualitative Analysis:** qualitative data from the literature review and interviews were analysed to identify key trends, skills requirements, upskilling challenges and understand the current landscape of support initiatives. Drawing on this and the workforce requirement numbers, enabled Delta-EE and Changeworks to identify key recommendations from this research.

The following approach was used to calculate the future required number of installer workforce:

- Total volume of technology installed per year is multiplied by the number of person days required for one installation (shown in section 6.1)
- The result is divided by the number of working days per year (assumed to be 220) to calculate the number of installer workforce required per year to install the planned volume
- The 'Low' calculation method uses the lower end of installation time estimates from interviews (number of people and number of days/hours required); it assumes that employees work full-time on installing the respective technology
- The 'High' calculation method uses the higher end of installation time estimates from interviews (number of people and number of days/hours required); it assumes that employees work full-time on installing the respective technology.

9.1.2 Assumptions

Forecasting of technology uptake was based on Scottish Government's indicative scenarios related to heat pumps, heat networks and direct electric heating deployment.

The baseline of the indicative forecast scenarios is that they each meet the overall ambitions of Scotland's 'Heat in Buildings Strategy' [1], including the proposed regulatory backstop dates for energy efficiency improvements, as well as the statutory targets for heat networks deployment.

The following assumption were considered for the calculations:

- Existing domestic conversions: c. 124,000 between 2021-2026 and 1.3 million by 2030 (all scenarios)
- Heat network supply (total i.e., domestic and non-domestic): Scenario 1 achieves statutory targets (2.6TWh in 2027 and 6TWh in 2030), Scenarios 2 & 3 exceed targets (10TWh and 12TWh in 2030 respectively)
- Heat networks' domestic penetration: medium in Scenarios 1 & 2, high in Scenario 3
- Heat pumps suitability: high, medium, and low in Scenarios 1, 2 and 3 respectively
- Energy efficiency in existing domestic properties assumes demand reduction in line with achieving EPC C across the building stock by 2033
- All scenarios assume green gas blending
- Displacement of non-electrical heat consumption in non-domestic buildings took into account the requirement to remain within the emissions envelope
- For non-domestic buildings no energy efficiency gains, or new build were assumed
- There is an assumption of 20,000 new build dwellings per year
- No building demolitions were assumed
- Totals may not sum due to rounding.

The outputs of the calculations were used as the basis of the Scottish technology uptake forecast and were adjusted to reflect the most up to date anticipated Scottish policy changes.

The following limitations need to be considered:

- The calculation method on future required workforce only gives an indication of the likely future installation jobs required (and does not refer to direct and indirect jobs)
- The future installation jobs estimated refer to Full Time Equivalent (FTE) jobs
- The data used for assumptions is not based on a representative sample of the businesses in Scotland and therefore, should be treated as indicative
- The heat network person days used in the calculations is for an additional heat network connection, as connecting an extra building / dwelling requires installers with similar skills to plumbing / heating engineers, whereas building a new district heating network also requires a wider range of professionals from the civil engineering sector
- The range of results is due to the wide range of responses regarding installation times (see section 6.1); it is very difficult to precisely estimate the time taken to install measures as there are a large number of variables that will impact this (e.g. travel, type and size of property, existing heat distribution system).

9.1.3 Future workforce numbers

The results of the various calculation methods are presented in the tables below:

Table 6: Total installer workforce required by thermal insulation uptake scenarios and calculation methods (2025 – 2030)*

	2025		2026		2027		2028		2029		2030	
	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
Scenario 1: Linear growth until meeting target	2,800	3,500	3,200	3,800	3,500	4,200	3,800	4,600	4,200	5,000	4,500	5,400
Scenario 2: Slow increase until 2026/2027, then ramp up	1,500	1,900	1,550	1,900	1,600	2,000	1,700	2,100	2,000	2,400	2,600	3,200
Scenario 3: Fast increase until 2026/2027, then ramp down	5,800	7,100	10,300	12,500	13,200	15,300	7,200	8,300	1,700	2,000	400	550

**For ease of analysis, the numbers listed in the table above are rounded.*

Source: Delta-EE calculations

Table 7: Total installer workforce required for ***low carbon heating technologies*** *by calculation methods - Scenario 1**

	2025		2026		2027		2028		2029		2030	
	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
Heat networks	30	350	60	750	120	1,500	200	2,200	200	2,250	200	2,250
Heat pumps	3,300	8,200	6,600	16,400	6,400	16,000	6,200	15,550	6,200	15,550	6,200	15,550
Direct electric	100	200	125	250	125	250	125	250	125	250	125	250

**For ease of analysis, the numbers listed in the table above are rounded.*
Source: Delta-EE calculations

Table 8: Total installer workforce required for ***low carbon heating technologies*** *by calculation methods - Scenario 2**

	2025		2026		2027		2028		2029		2030	
	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
Heat networks	50	670	100	1,300	200	2,600	300	3,800	310	3,900	320	4,000
Heat pumps	2,600	6,600	5,100	12,700	4,900	12,100	4,600	11,600	4,600	11,500	4,600	11,400
Direct electric	300	600	580	1,200	560	1,100	540	1,100	530	1,100	530	1,100

**For ease of analysis, the numbers listed in the table above are rounded.*
Source: Delta-EE calculations

*Table 9: Total installer workforce required for low carbon heating technologies by calculation methods - Scenario 3**

	2025		2026		2027		2028		2029		2030	
	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
Heat networks	80	1,000	160	2,050	320	4,000	500	5,800	500	5,900	500	6,100
Heat pumps	1,900	4,800	3,500	8,800	3,300	8,200	3,000	7,500	3,000	7,500	3,000	7,500
Direct electric	500	1,000	1,000	2,100	1,000	1,900	900	1,800	900	1,800	900	1,800

**For ease of analysis, the numbers listed in the table above are rounded.*

Source: Delta-EE calculations

9.2 Further information on energy efficiency measures and low carbon heating technologies

9.2.1 Thermal insulation

To install thermal insulation, tradespeople need to demonstrate understanding and comply with the Work at Height Regulations, competently erect and dismantle portable scaffold towers, apply insulation materials to cylindrical and flat surfaces, and fit pre-formed metal cladding and other finishes for insulation protection. All work must be completed reliably and safely using specific tools and equipment, sometimes without close supervision. [32]

Future scenarios

The following three scenarios were used in the calculations and are presented in the figures below:

- Linear growth until meeting EPC target
- Ramp up: slow increase until 2026/2027, then accelerate to meet the target
- Ramp down: fast increase until 2026/2027, then ramp down to meet the target

*Figure 9: Loft insulation uptake scenarios: number of properties (retrofit and new) to be insulated by 2030**

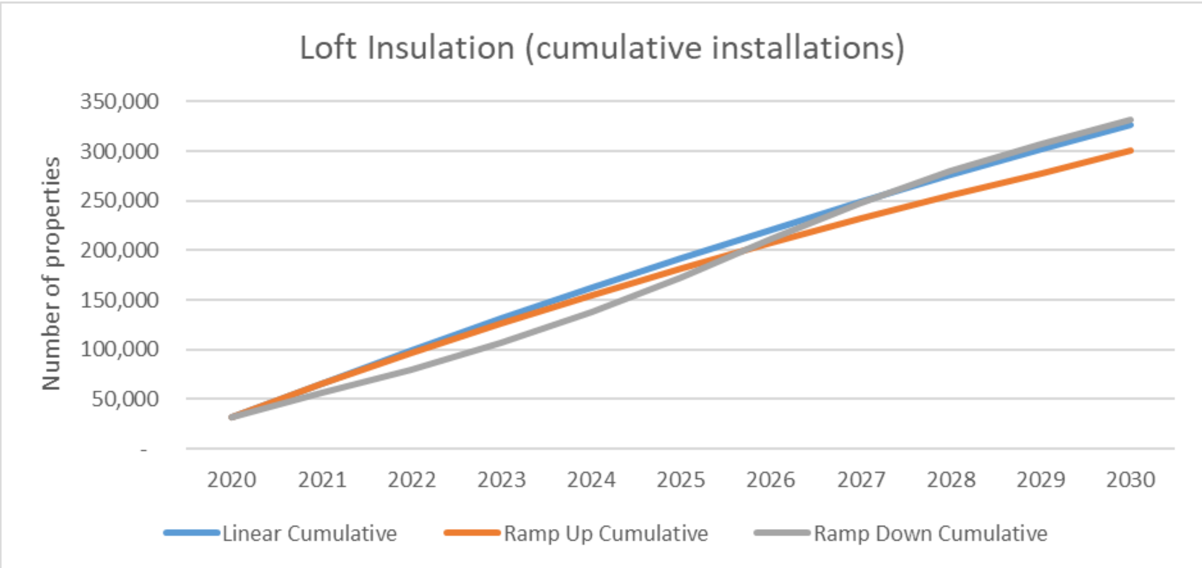


*Figure 10: Cavity wall insulation uptake scenarios: number of properties (retrofit and new) to be insulated by 2030**

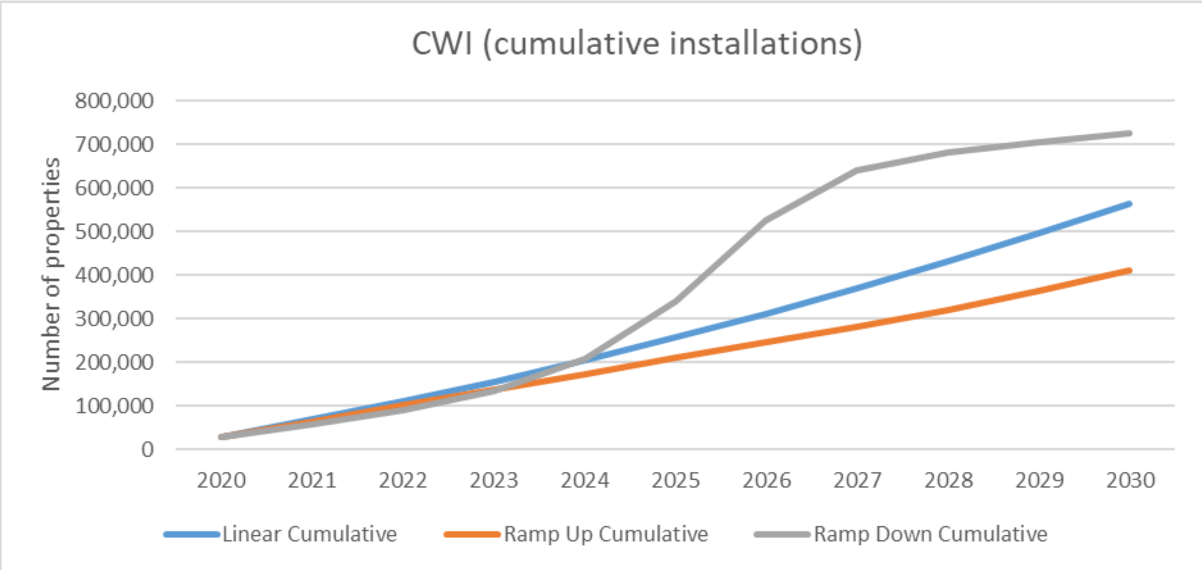
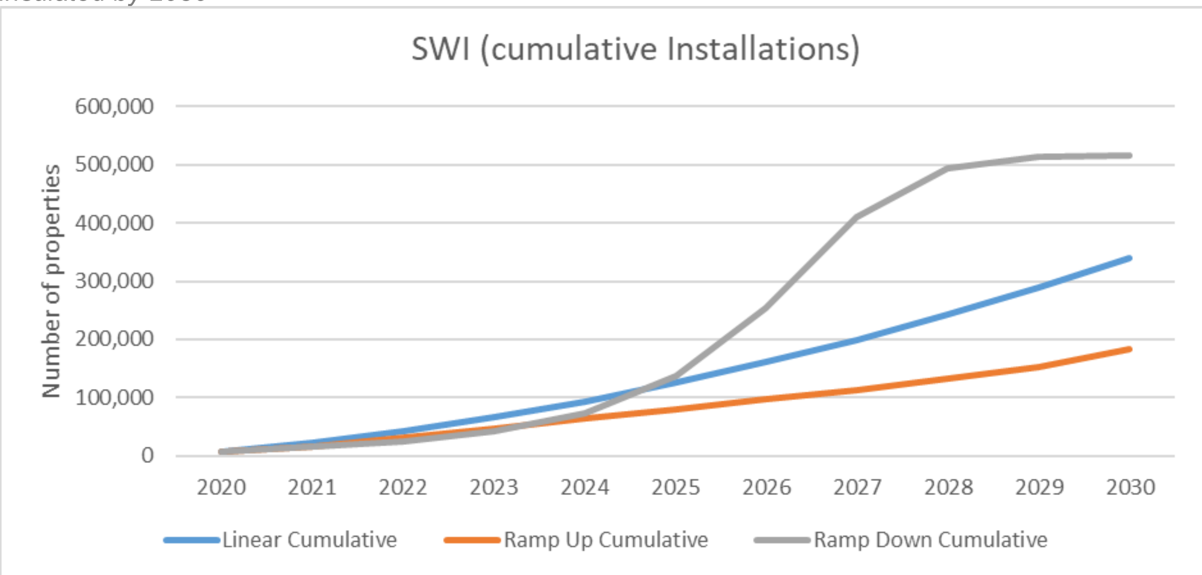


*Figure 11: Solid wall insulation uptake scenarios: number of properties (retrofit and new) to be insulated by 2030**



9.2.2 District heating / heat networks

Regarding the low carbon heating appliances, plumbing and heating technicians are responsible for planning, selecting, installing, and maintaining plumbing and heating systems. They need to demonstrate the ability to safely install and service electrical components and control systems on heating systems, to cut, bend and joint metallic and non-metallic pipework, and understand the principles of fuel combustion, heating, ventilation, and domestic mechanical, environmental technology systems. [33]

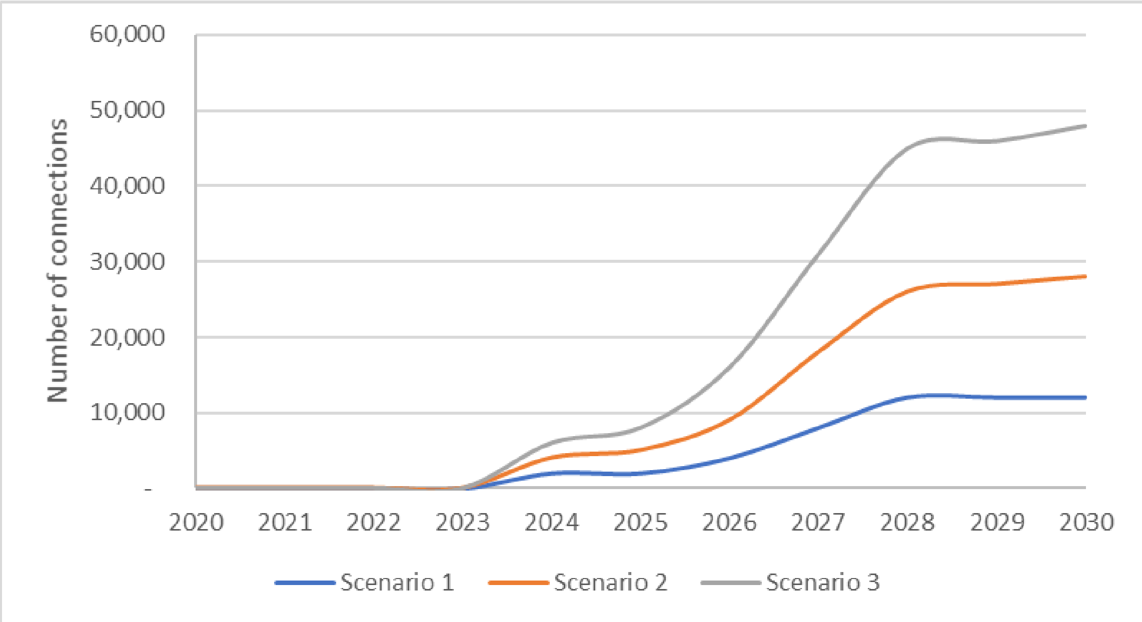
Future scenarios

The following three scenarios are presented in the figures below:

- Scenario 1: achieves statutory targets (2.6TWh in 2027 and 6TWh in 2030)
- Scenario 2: exceeds statutory target (10 TWh in 2030)

- Scenario 3 exceed targets (12TWh in 2030).

Figure 12: Forecast total heat network connections per year until 2030



In terms of what kind of heating technologies will be installed in these networks in future, we expect heat pumps to see the most significant increase as they gradually challenge the incumbent heating technologies due to decarbonisation targets. Hybrid combinations of gas boilers, gas CHPs and heat pumps used to be rare but are expected to become more common. Biomass schemes are expected to decline due to an uncertain incentive rate future.

9.2.3 Heat pumps

Regarding the low carbon heating appliances, plumbing and heating technicians are responsible for planning, selecting, installing, and maintaining plumbing and heating systems. They need to demonstrate the ability to safely install and service electrical components and control systems on heating systems, to cut, bend and join metallic and non-metallic pipework, and understand the principles of fuel combustion, heating, ventilation, and domestic mechanical, environmental technology systems

Comparison of heat pump installation with gas boiler installation

Currently installing a heat pump requires longer preparation, installation (around 3-7 times higher people hours to install than a gas boiler), and after-sales customer service time than a gas boiler.

The surveying time for installing a wall-hung gas boiler is minimal, as most gas boilers are like-for-like replacements and there is no noticeable efficiency loss by oversizing. Most homeowners are already aware of the technology and how to operate a gas boiler; they will usually choose whatever the heating engineer suggests.

For a gas boiler retrofit, typically the power supply, cold water feed, flow and return and domestic hot water pipework is already in place. This makes removal of the old boiler and installation of a new model a straightforward process. If a condensing boiler is installed to replace an older non-condensing model, then the condensate pipework may add a couple of hours to the time requirement depending on the proximity to the waste pipe. Gas boilers are also supplied with the necessary parts within the packaged unit (pumps, expansion vessel etc) which makes any additional installation works unnecessary. The electrical supply is 13A and so a heating engineer is qualified to install without additional approval from an electrician (as there is no work needed on the electricity distribution board). An additional feature of a gas boiler is its weight, making it possible for one person to lift and install it. So, a gas boiler installation is typically carried out by one installer over 2 days.

During the post installation phase there could be a short call back required to top up the pressure or balance the radiators which is estimated to take around an hour.

By contrast, a heat pump installation can take between 3 to 5 days for a team of 2-3 installers. This depends on various factors: the complexity of the installation, the current heating system, whether it is a low or high temperature heat pump, the size and type of the property and the number of people living at the property (which determines the domestic hot water demand) among the most important ones.

As heat pumps are generally not replacing existing heat pumps, the correct pre-installation specification is very important. To comply with MCS regulations a full house heat loss assessment must be undertaken which can take several hours. As the technology still is very new to most homeowners (and the CAPEX investment is currently a lot higher than that of a gas boiler) the sales process is much longer, potentially including several follow up calls or visits.

A heat pump installation in most cases is not a like-for-like replacement, therefore the flow and return pipes, the cold-water feed and domestic hot water pipework needs to be moved to the heat pump's location adding time to the installation. In addition, a new power supply needs to be installed from the electricity distribution board as the demand is higher than 13A. This also has an implication on the number of people involved in the installation, as the new power supply installation must be carried out by a qualified electrician. A heat pump unit requires at least two people to lift it and needs to be secured to a level base (which may need to be installed if none is already available) or to the wall. As the flow temperature is lower than a boiler (unless a high temperature model is installed) the heating distribution system (radiators) also needs to be replaced and a domestic hot water cylinder needs to be fitted (unless already present at the property).

As the operation of a heat pump is different to a gas boiler, the requirement for follow-up visits to educate householders is likely to be higher. Standard follow-ups for pressure drop/radiator balancing would also be required.

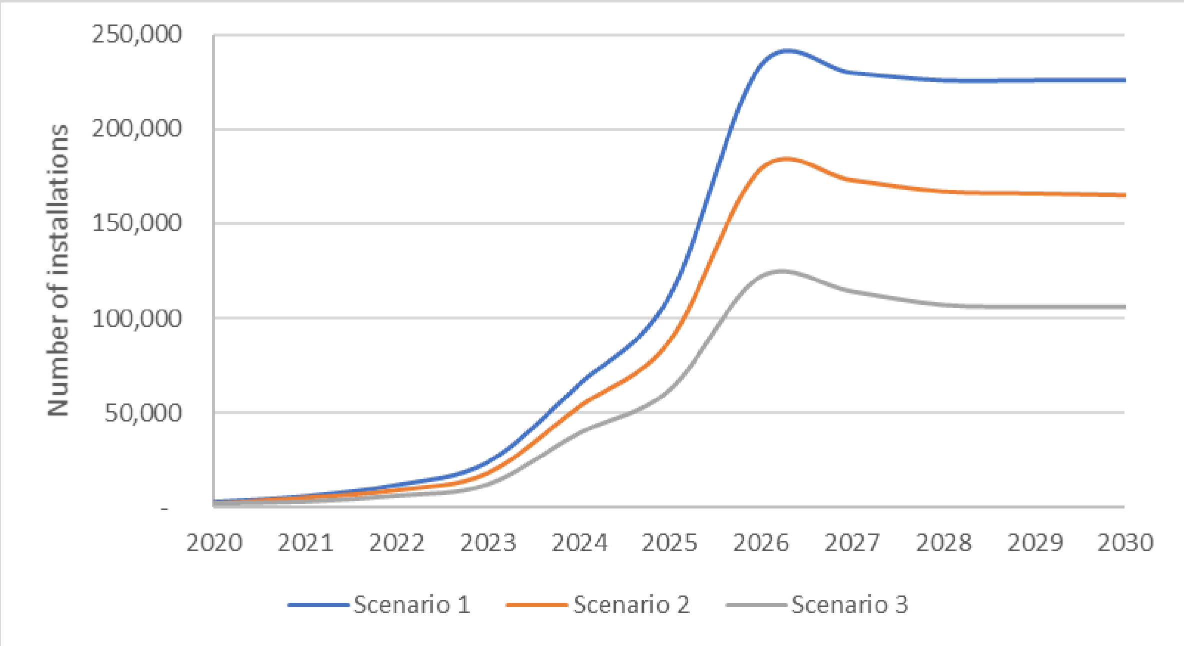
Future scenarios

The scenarios for heat pump deployment in Scotland out to 2030 is ambitious, fuelled by the intention to convert over 1 million dwellings to low carbon heating.

The following three scenarios are presented in the figure below:

- Scenario 1: high uptake
- Scenario 2: medium uptake
- Scenario 3: low uptake.

Figure 13: Forecast total heat pump installations per year until 2030



Sales will likely jump in 2024-2026 due to the proposed regulations for existing buildings and housebuilders responding to the change in regulations, strongly encouraging all new homes to install renewable or low carbon heating, as well as introducing new standards for home efficiency.

9.2.4 Direct electric

Direct acting electric heaters are mainly purchased as replacements, although some are used as supplementary heaters. Due to low installation costs and their simplicity of use, these devices are popular where thermal demand is low, such as in flats and new build homes. Currently around 70% of sales in the UK are for retrofit purposes in domestic properties.

The direct electric heating market (for homes solely heated by direct electric heaters) is dominated by:

- Radiant panel heaters
- Storage heaters
- Convectors.

Given the simple nature of direct electric systems, in most cases they are installed by electricians with little heating system design experience.

Future scenarios

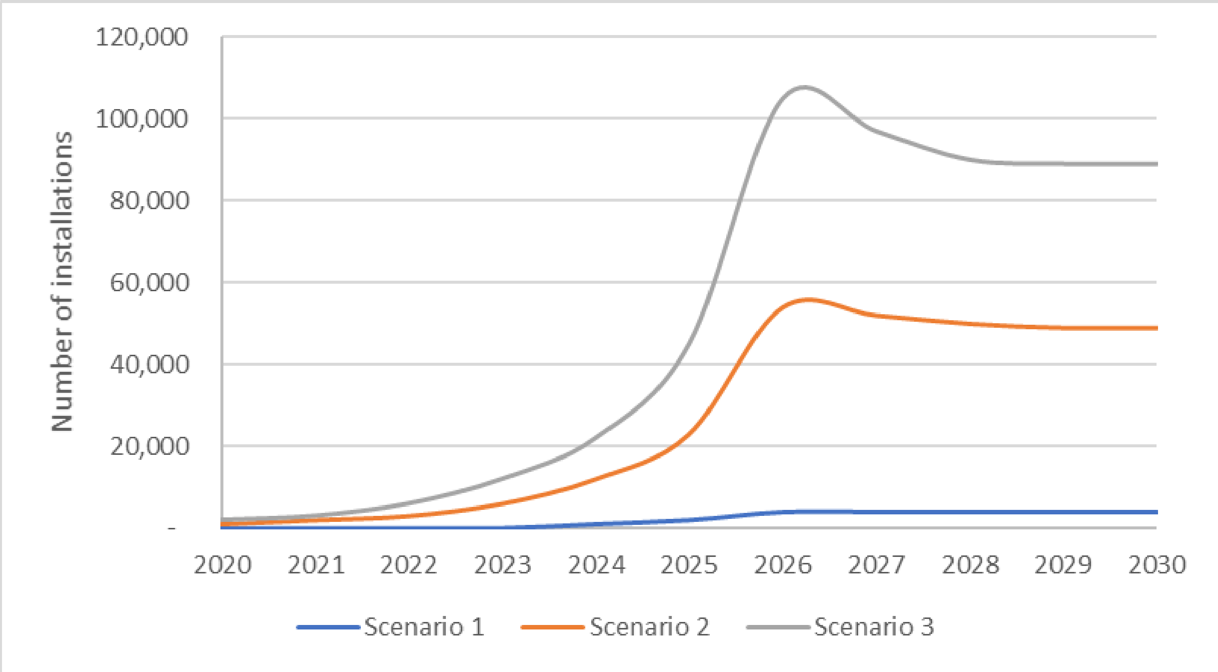
As a 'low-regret technology' domestic electric heating is expected to grow, especially as the requirement for zero direct emissions in new build comes into force. Proposed changes to fuel carbon factors in building regulations makes electric heating more competitive and will also likely boost direct electric sales.

The future scenarios considered for the uptake to 2030:

- Scenario 1: complementing high uptake of heat pumps and low uptake of heat networks
- Scenario 2: complementing a medium update of heat pumps and heat networks

- Scenario 3[8]: complementing a low uptake of heat pumps and high uptake of heat networks.

Figure 14: Forecast direct electric installations per year until 2030



[8] In scenario 3, heat network uptake is high. It is assumed that most buildings which are not possible to connect to heat networks would be fitted with direct electric instead of heat pumps.

9.3 Elements of the supply chain

Table 10: Elements of the supply chain

	Project design & consultancy	Equipment manufacture	Installation	Operation and maintenance	Client management / Business model
Thermal insulation	Legal, financial and commercial advisory services System design Assessors (e.g., EPC surveyors)	External Wall Insulation Cavity Wall Insulation Loft insulation Double glazing Draught proofing	Installation of Cavity Wall Insulation (CWI) Installation of Solid Wall Insulation (SWI) Installation of Loft Insulation Installation of double glazing Draught proofing	N/A	Provision of financing Business case support
District heating / heat networks	Legal, financial and commercial System design Feasibility studies Academic research	Energy centre construction Heat generation assets Primary network (pipework) supply & installation Heat exchangers/substations Secondary network supply & installation	Installation (e.g. excavation and reinstate trenches) Installation of HUIs	Maintenance Operators Control software Metering and billing	Business case support Business model development Financing

	Project design & consultancy	Equipment manufacture	Installation	Operation and maintenance	Client management / Business model
		Network monitoring Heat interface units (HIUs) Heat metering equipment Heat pumps, valves, regulating equipment			
Heat pumps	Legal, financial and commercial System design Assessors (e.g. EPC surveyors)	Heat pump Refrigerants (excl. A/A) Pipes, fittings (excl. A/A) Underfloor heating (excl. A/A) Gas boilers (hybrids only) Ground loop (GSHP only)	HP installation Borehole drilling (GSHP only) Ground loop trench (GSHP only)	Maintenance	Business case support Business model development
Direct electric	System design Legal, financial and commercial	Subcomponents (wiring, mounting brackets, circuit breakers) Radiant panel heaters	Physical Installation (mounting of unit, ground works) Electric installation / connection	Maintenance Control software	Financing Business case support

	Project design & consultancy	Equipment manufacture	Installation	Operation and maintenance	Client management / Business model
		Oil filled radiators Infrared heaters Fixed fan heaters Electric underfloor heating Dynamic storage heaters Dry electric radiators Electric convectors Electric fireplaces Electric towel warmers			

9.4 Workforce statistics

Table 11: Level and proportion (per cent) of employment by occupation group by region in 2020

	Professional Occupations		Skilled Trades Occupations		Process, Plant and Machine Operatives		Other occupational groups	
	Level	Proportion (%)	Level	Proportion (%)	Level	Proportion (%)	Level	Proportion (%)
Scotland	609,100	23.3	246,500	9.4	157,200	6.0	1,597,700	61.2
Local Authority area:								
Aberdeen City	23,300	19.9	7,300	6.3	5,100	4.4	81,400	69.5
Aberdeen-shire	37,900	27.3	18,100	13.0	8,500	6.1	74,200	53.5
Angus	8,900	17.2	7,200	14.0	3,300	6.4	32,100	62.3
Argyll and Bute	6,400	16.3	4,800	12.3	2,000	5.1	26,100	66.2
Clackmannanshire	6,300	27.0	2,000	8.7	1,800	7.6	13,200	56.8
Dumfries and Galloway	9,900	16.1	10,300	16.8	3,100	5.1	38,000	62.0
Dundee City	15,400	22.3	6,100	8.9	4,600	6.6	42,900	62.2
East Ayrshire	10,000	18.5	5,400	10.0	2,300	4.1	36,500	67.5
East Dunbartonshire	15,000	29.8	4,300	8.6	1,000	2.0	30,000	59.6
East Lothian	13,200	26.4	6,300	12.6	2,600	5.1	27,700	55.8
East Renfrew-shire	12,600	28.6	2,600	5.8	900	2.1	28,000	63.4
Edinburgh, City of	94,500	34.7	12,800	4.7	10,300	3.8	154,900	56.9
Falkirk	19,900	25.3	7,600	9.7	6,700	8.5	44,600	56.4
Fife	40,200	24.5	18,800	11.5	6,700	4.1	98,000	59.9
Glasgow City	86,700	28.0	20,300	6.6	15,100	4.9	186,900	60.5
Highland	22,700	18.9	19,600	16.4	7,800	6.5	69,600	58.2
Inverclyde	7,200	21.7	2,900	8.7	1,900	5.9	21,100	63.9

	Professional Occupations		Skilled Trades Occupations		Process, Plant and Machine Operatives		Other occupational groups	
Midlothian	11,800	26.8	3,500	7.8	1,500	3.4	27,400	62.0
Moray	6,700	14.4	6,800	14.6	5,700	12.3	27,500	58.6
Na h-Eileanan Siar	2,200	17.0	2,300	17.7	1,000	8.0	7,500	57.3
North Ayrshire	8,500	15.4	4,500	8.0	5,400	9.7	37,300	67.1
North Lanarkshire	30,500	19.7	13,200	8.5	18,600	12.1	92,100	59.7
Orkney Islands	1,500	13.3	2,200	20.2	1,200	10.5	4,400	40.4
Perth and Kinross	14,700	20.4	7,300	10.1	5,100	7.1	45,000	62.4
Renfrew-shire	21,000	23.6	7,000	7.8	5,800	6.6	55,200	62.1
Scottish Borders	9,600	17.5	8,300	15.1	3,600	6.6	33,400	60.8
Shetland Islands	800	7.3	1,300	11.3	800	7.2	6,700	57.3
South Ayrshire	9,500	19.5	4,400	9.0	2,500	5.1	32,300	66.4
South Lanarkshire	24,700	15.8	14,300	9.2	9,900	6.3	107,000	68.7
Stirling	13,100	28.9	3,200	7.2	2,100	4.6	26,900	59.2
West Dunbartonshire	7,000	16.8	3,200	7.7	2,400	5.8		69.5
West Lothian	17,500	19.2	8,500	9.4	7,800	8.5		62.9

Source: Table 1.23A & B, People, Places and Regions. Scottish government dataset, 2020

Table 12: Scottish employment by age and industry, 2017

	Electricity, gas, air conditioning supply		Construction		All Sectors	
	Level	Proportion (%)	Level	Proportion (%)	Level	Proportion (%)
16-17	-	-	1,412	0.76	29,720	1.14

18-19	1,002	3.76	4,425	2.40	64,418	2.47
20-24	1,895	7.11	19,485	10.55	247,777	9.51
25-29	2,341	8.79	22,569	12.22	296,002	11.36
30-34	5,216	19.57	23,188	12.56	286,007	10.98
35-39	1,733	6.50	17,152	9.29	266,843	10.24
40-44	4,109	15.42	16,984	9.20	255,928	9.82
45-49	4,498	16.88	20,423	11.06	315,895	12.13
50-54	1,694	6.36	25,438	13.78	326,531	12.53
55-59	2,216	8.32	15,883	8.60	269,674	10.35
60-64	1,097	4.12	12,456	6.75	162,330	6.23
65-99	846	3.17	5,231	2.83	84,178	3.23
Total	26,647	100.0	184,646	100.0	2,605,303	100.0

Source: Scottish employment by occupation, age and industry (2010-2017), Office for National Statistics, 2019

Table 13: Employment by occupation by sex, Oct 2020-Sep 2021, Scotland

	All persons		Males		Females	
	Count	Rate	Count	Rate	Count	Rate
Engineering Professionals	52,800	2	47,700	3.6	5,000	0.4
Architects, Town Planners and Surveyors	23,900	0.9	21,000	1.6	3,000	0.2
Legal Professionals	16,800	0.7	7,500	0.6	9,400	0.7
Chartered and certified accountants	14,800	0.6	5,000	0.4	9,800	0.8
Electrical and Electronic Trades	35,700	1.4	35,200	2.7	#	!
Skilled construction and building trades	63,000	2.4	61,200	4.7	#	#
Construction Operatives	10,700	0.4	10,100	0.8	#	!

Source: Employment by Occupation by sex, Scotland, Oct 2020–Sep 2021. NOMIS. Query data here.
These figures are suppressed as statistically unreliable.
! Estimate and confidence interval not available since the group sample size is zero or disclosive (0-2).
Rate is the percentage (%) of employed people within each occupation.

Table 14: Employment levels by ethnicity and region, Scotland, 2020

	White	Minority Ethnic
Ayrshire and Arran	158,000	900
Edinburgh and Lothians	430,300	27,700
Glasgow City	270,500	39,200
Highlands and Islands	239,400	2,200
Lanarkshire	308,700	2,700
Mid-Scotland and Fife	374,900	9,200
South Scotland	114,300	1,800
North East Scotland	358,400	17,800
West Scotland	248,600	10,300

Source: Table 1.6 B & 1.7, People, Places and Regions. Scottish Government dataset, 2020

Table 15: Hourly pay excluding overtime for all employees and real terms change from 2019 by occupation, Scotland, 2020

	Median hourly pay (£)	Change from 2019 (%)
Skilled trades	11.96	- 8.5
Process, plant and machine operatives	11.05	- 0.4
Professional	20.92	3.7
Scotland	14.05	4.6

Source: [2020 Earnings in Scotland, Scottish Parliament, February 2021]

Table 16: Incidence of skill-shortage vacancies (SSV) per region, Scotland, 2020

	All establishments	Establishments that have an SSV	Rate (%)
Aberdeen and Aberdeenshire	17,100	500	3
Ayrshire	9,100	100	1
Borders	4,300	100	2
Dumfries and Galloway	5,900	200	3
Edinburgh and Lothians	20,300	600	3
Fife	8,600	300	3
Forth Valley	7,500	300	4
Glasgow	21,300	600	3
Highlands and Islands	19,200	600	3
Lanarkshire	16,700	200	1
Tayside	12,100	200	2
West	9,500	500	5
West Lothian	4,100	200	6
South of Scotland Enterprise	10,200	300	3

Source: [Background Tables, Scottish Employer Skills Survey 2020, 2021]

Table 17: Incidence of skill-shortage vacancies per size of establishment, Scotland, 2020

Number of employees	All establishments	Establishments that have an SSV	Rate (%)
2 to 4	76,200	700	1
5 to 24	58,900	1,800	3
25 to 49	8,700	800	9
50 to 99	4,500	300	6
5+	75,400	3,400	5
25+	16,500	1,600	10
100+	3,200	600	17

Source: Background Tables, Scottish Employer Skills Survey 2020, 2021

9.5 Training programmes and funding

Apprenticeships in Scotland are coordinated by Skills Development Scotland (SDS), allowing people to work towards a qualification on the job. Apprentices work with experienced colleagues on real-life projects, while putting into practice what they learn at college or university. The types of apprenticeships offered are Foundation Apprenticeship (for pupils in S3 to S6), Modern Apprenticeships (aimed at people aged 16 to 24 although there is no upper age limit. A modern apprentice is employed and works towards a qualification with a college or learning provider) and Graduate Apprenticeships (aged 16 and above, who are employed and work full-time while gaining an Honours or a Masters degree).

The Energy Skills Partnership (ESP) established an Energy Efficiency Training Network spanning nine colleges across Scotland (Ayrshire College, Borders College, Edinburgh College, Fife College, Forth Valley College, Glasgow Kelvin College, South Lanarkshire College, West College Scotland and West Lothian College). ESP supported these colleges in developing specialised renewables and energy efficiency training centres to ensure they have the capability and capacity to train future workforce that will ultimately help the Scottish Government reach its green targets. This initiative received £500,000 from Scottish Power Energy Networks' Green Economy Fund, and funding was used for curriculum development, staff training in current and emerging technologies, and the purchase of renewable and energy efficiency equipment, used in training. [34] During the Covid-19 pandemic, ESP also distributed funding through the National Transition Training Fund to allow colleges to upskill tradespeople over 25 years old and whose employment had suffered due to Covid-19. The funding helped reskill tradespeople in installing and maintaining renewable technology. Specifically created to face the first wave of Covid-19 -related furloughs and redundancy, the training was offered until 31st July 2021, but the initiative could be a source of inspiration for future training programmes. [35].

On behalf of the Scottish Government, Skills Development Scotland (SDS) launched its Green Jobs Workforce Academy at the end of Summer 2021. It aims at building a fairer economy that delivers the skills, opportunities and jobs for the future that will help secure Scotland's transition to net-zero and end its contribution to climate change. The academy offers information on the available opportunities, the skills needed to move into them, links to the required training and funding sources to successfully guide people of all ages through identifying the skills they have and the skills they need to find and secure green jobs. The academy will work in partnership with the Green Jobs Skills Hub which looks at the number and types of green jobs needed over the next 25 years. [36].

Climate Emergency Skills Action Plan Implementation Plan (CESAP) sets out the Scottish government’s plan to maximise the transition to net-zero, ensuring that Scotland’s workforce has the skills required to make the transition to net-zero successful. The CESAP acts as a driver towards Scotland’s ambition to be a world leader in decarbonisation, aiming to reduce reach zero greenhouse gases by 2045, with an interim reduction of 45% by 2030.

The Flexible Workforce Development Fund is available to all Scottish employers, including small and medium enterprises (SMEs). The Fund supports businesses in Scotland to up-skill and re-skill their employees to support inclusive economic growth in Scotland. The Fund is intended to help employers address priority skills gaps and training needs by providing funding to UK Apprenticeship levy-payers and SMEs in Scotland which they can use to access flexible workforce development training opportunities. The Flexible Workforce Development Fund is in addition to the apprenticeship support which is available to all employers in Scotland, and Individual

Training Accounts (ITAs) which support eligible individuals to take up learning opportunities to develop their skills for employment. Levy-paying employers can also use the funding to make improvements to the operation of their supply chain. They can either nominate up to two supply-chain companies to receive the funding instead of their own business or can include staff from supply-chain companies in a training opportunity. SMEs can apply for up to £5,000 to access training opportunities with colleges and the Open University in Scotland. The total fund for these opportunities is £5 million. Levy-paying employers have two options:

- Apply for up to £15,000 through Scottish Founding Council to access training opportunities with colleges (total fund for these opportunities is £13 million).
- If the training needed cannot be provided by a college, employers can apply for up to £15,000 through Skills Development Scotland (SDS) to access training delivered by independent training providers (£2 million funding available for this option).

The Employability Fund from Skills Development Scotland (SDS) provides flexible training support. It can help enhance employees' workforce and boost productivity by helping them to recruit through national employability support programmes. The Employability Fund is delivered in partnership with training providers and colleges. It brings together several national training programmes (Get Ready for Work and Training for Work) and provides training support which responds to the needs of employers and local labour markets.

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Scotland's centre of expertise connecting climate change research and policy

info@climatexchange.org.uk
+44(0)131 651 4783
@climatexchange_
www.climatexchange.org.uk

ClimateXChange, Edinburgh Climate Change Institute, High School Yard, Edinburgh EH1 1LZ