OXFORD INDUSTRIAL DECARBONISATION PROJECT

Skills and Supply Chain

AN ERM REPORT FOR THE ZERO CARBON OXFORD PARTNERSHIP

FEBRUARY 2025

ZERO CARBON OXFORD

Introduction to this report, authors, and disclaimer

ABOUT ERM

Sustainability is our business. As the largest global pure play sustainability consultancy, ERM partners with the world's leading organizations, creating innovative solutions to sustainability challenges and unlocking commercial opportunities that meet the needs of today while preserving opportunity for future generations.

ERM's diverse team of 8,000+ world-class experts in over 150 offices in 40 countries and territories combine strategic transformation and technical delivery to help clients operationalize sustainability at pace and scale. ERM calls this capability its "boots to boardroom" approach - a comprehensive service model that helps organizations to accelerate the integration of sustainability into their strategy and operations.

ERM acquired Element Energy and E4tech in 2021, which are now fully integrated in ERM's Sustainable Energy Solutions (SES) team. The team consists of over 150 specialists bringing deep expertise in the development, commercialisation, and implementation of emerging low-carbon technologies across a wide range of sectors, including industrial decarbonisation (hydrogen, carbon capture utilisation and storage, electrification), low carbon fuels and chemicals, the built environment, smart energy systems, electricity and gas networks, low carbon transport and funded project management.

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About this document

This document reports the findings from WP5.1 of the ZCOP Local Industrial Decarbonisation Roadmap (LIDP) project, investigating barriers and enablers related to the skills and supply chain needed to decarbonise the Oxford Industrial Cluster.

Link to other work

The report builds upon the findings of the Oxford's Industrial Landscape & Baseline (WP1) report alongside the Scenario Modelling (WP4) report. The analysis was also informed through several stakeholder engagement activities (WP2).

The recommendations in this report inform the actions identified in Oxford's Industrial Decarbonisation Roadmap and Action Plan (WP6).

Funded by DESNZ through the Local Industrial Decarbonisation Plans (LIDP) grant

Department for Energy Security & Net Zero

Contents

Executive Summary

Achieving Oxford City Council's ambition of net zero by 2040 will require major uptake of low-carbon technologies

- The rollout of low-carbon technologies in Oxford is heavily reliant on local skills and supply chains. This analysis sought to understand the key gaps in existing capabilities and provide actionable recommendations to enable the net zero transition through a mixture of stakeholder engagement and literature review.
- To meet the increasing demand for low-carbon solutions, on time and at scale, it is crucial to **train a new workforce of certified installers and invest in the scalability of existing supply chains**.
- By showcasing local demand, stimulating interest, and attracting new entrants to the sector, the Oxford Industrial Cluster can enhance workforce capabilities and strengthen the supply chain for the transition:
    - Without **clear customer demand**, SME installers remain reluctant to invest time and resources into offering low-carbon services given a lack of capacity to train, certify, and expand into new technologies.
    - Fragmented demand from small-scale projects also limits **Oxford's visibility and attractiveness to suppliers**, who tend to prioritize large-scale, aggregated projects so the Oxford Industrial Cluster should work to aggregate attractive supply portfolios for the supply chain.
    - **Attracting new talent** to the sector is essential to bridge the transition skills gap and can be achieved by **highlighting success stories and developing a local apprenticeship network**, with competitive incentives for both young entrants and mid-career re-trainers.
- The Oxford Industrial Cluster has an opportunity to drive and scale the net zero transition, but success will rely on the ability to foster a **collaborative ecosystem of stakeholders -** including industrial leaders, installers, suppliers, training providers, and apprentices. The Oxford Industrial Cluster should also collaborate with other sectors where similar technologies, namely solar PV and heat pumps, will also be crucial in decarbonising the residential, commercial, and institutional building stock.

To deliver Oxford's ambitions for 2040 Net Zero:

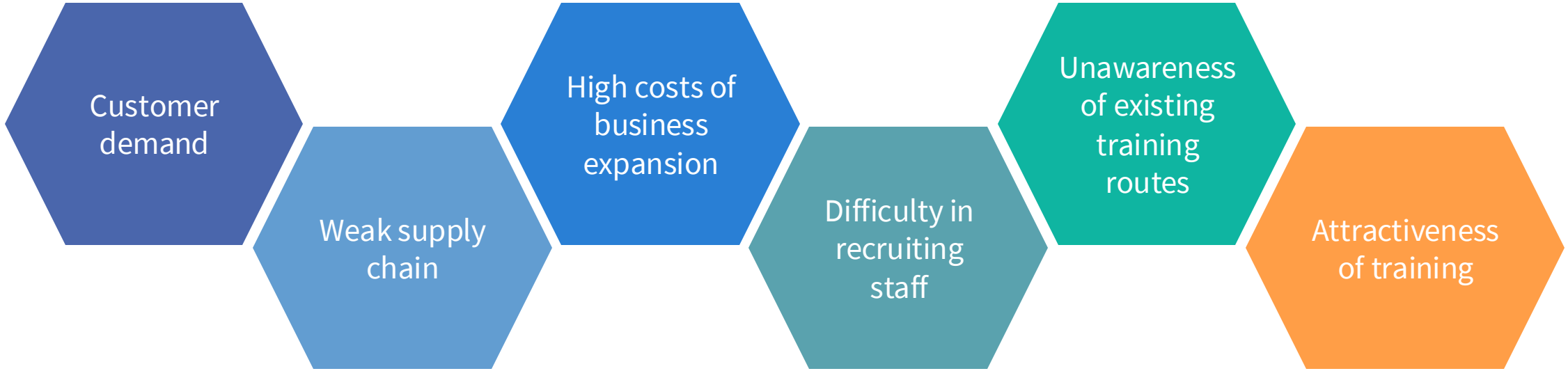
1. Make **consumer demand and future growth** more visible to the supply chain
2. **Develop local skills** to install and maintain these technologies
3. Expand the **local installer base** to a sufficient scale
4. Ensure the timely **availability of necessary low carbon technologies**

The Oxford Industrial Cluster faces a series of significant barriers preventing development of skills and supply in low-carbon technologies

Low demand from customers originates from the high upfront costs, low technical awareness, a perceived risk that this technology has not yet been vigorously tested, and a lack of carbon reduction targets within SMEs. Potential installers need to see an increase in customer interest before they would consider offering these services.

The training and certification required for low-carbon technologies represents a substantial investment for local tradespeople and installers, many of whom are sole traders or SMEs with limited time, resources, and motivation to expand their services into new areas.

Many potential new entrants into the low-carbon technologies field are unaware of the existing courses and training programs offered by colleges and training providers.



Both PV systems and heat pumps rely on technology and materials that are largely produced outside of the UK. The availability of components can fluctuate, and manufacturers can deprioritise demand from Oxford.

Installers are struggling to recruit new workers with the necessary training. Many of the existing engineers have established careers and may not see the urgency in transitioning to low-carbon technologies.

Training programs for low-carbon tech installation are not perceived as attractive, especially for mid-career entrants who may already have established careers. The demand for low-carbon technologies is not clearly demonstrated.

The Oxford Industrial Cluster can undertake enabling activities to engage the supply chain and fill the skill gap in low-carbon technologies

Building local networks

A clear pathway from training and qualification into the labour market must be established. The Oxford Industrial Cluster could facilitate **regular industry roundtables,** including installers, wholesale suppliers, and educational institutions, enabling dialogue on the challenges faced by installers.

Partnerships between colleges and local industry can support targeted training, creating a skilled labour pool.

These networks would **streamline procurement, enable group purchasing**, and build a cohesive community of stakeholders attracting suppliers and investors.

The Oxford Industrial Cluster should create an **online platform to link employers and apprentices/re-trainers.**

Targeted training and support

The Oxford Industrial Cluster should collaborate with technical schools, industry associations, and training providers to **establish clear routes into the industry, including hands-on training programs**.

A particular focus could be on creating **hands-on retraining/upskilling programmes and short-term stipends to boost the salary for mid-career professionals** who may not be able to live on an apprenticeship wage.

To boost attractiveness of the sector for students, the Oxford Industrial Cluster can **launch campaigns to highlight career opportunities and showcase success stories**. Emphasis should be placed on **the long-term job security** of renewables installation, and the profitability of the associated businesses.

Increase public awareness to drive demand

Unawareness and perceived complexity of low-carbon technologies are key barriers to customer demand.

The Oxford Industrial Cluster can gather and share information on anticipated installations resulting from **the carbon reduction commitments of local businesses and strengthened planning requirements** for new construction. This will increase confidence on the growth of the sector in the coming years.

To build confidence in low-carbon technology, the Oxford Industrial Cluster could invest **in educational and showcase projects on their own buildings**. This would provide experience to local, newly trained installers, and allow other businesses to better understand the systems and benefits.

Financial incentives for SME installers

Financial incentives such as **grants or low interest loans** would make it more financially viable for existing installation SMEs to grow in size and expand their offerings.

Installers could receive support to cover the costs of certification, staff training or salary support for new starters, ensuring they have the resources and confidence to move forward with expanding their activities.

Large industrials/corporates are beginning to prioritise suppliers based on full ESG performance and standard of secondary/tertiary suppliers. In the 5-10 year time frame, the Oxford Industrial Cluster should tailor any incentives to **support installers that source materials locally,** and/or **with transparent supply chains.**

Recommendations

- To achieve significant decarbonisation by 2040, the Oxford Industrial Cluster must address critical barriers in skills and supply, ensuring the city builds a robust workforce and resilient supply chain for the transition.
    - Without **clear customer demand**, many installers remain reluctant to invest time and resources into offering low-carbon services. This challenge is especially pronounced for Oxford's SMEs. Those companies, predominant in Oxfordshire, are small, resource-constrained businesses that often lack the capacity to train, certify, and expand into new technologies.
    - **Attracting new talent** to the sector is essential to bridge the skills gap in the transition. Establishing a local apprenticeship network, highlighting success stories, and promoting demand in the low-carbon sector could strengthen the talent pool. It is crucial to make training programs attractive, with competitive incentives for both young entrants and mid-career re-trainers.
    - The transition also depends on **ensuring the availability of equipment**. Currently, fragmented demand from small-scale projects limits Oxford's visibility and attractiveness to suppliers, who tend to prioritize large-scale, aggregated projects.
- In light of these barriers, the Oxford Industrial Cluster has an opportunity to drive and scale the net zero transition. Success will rely on Oxford's ability to foster a **collaborative ecosystem of stakeholders**—including industrial leaders, installers, suppliers, training providers, and apprentices.
- By showcasing local demand, stimulating interest, and attracting new entrants to the sector, the Oxford Industrial Cluster can enhance workforce capabilities and strengthen the supply chain needed for the transition

Introduction

Investing in skills and supply chains is key to accelerating low-carbon technology deployment in Oxford

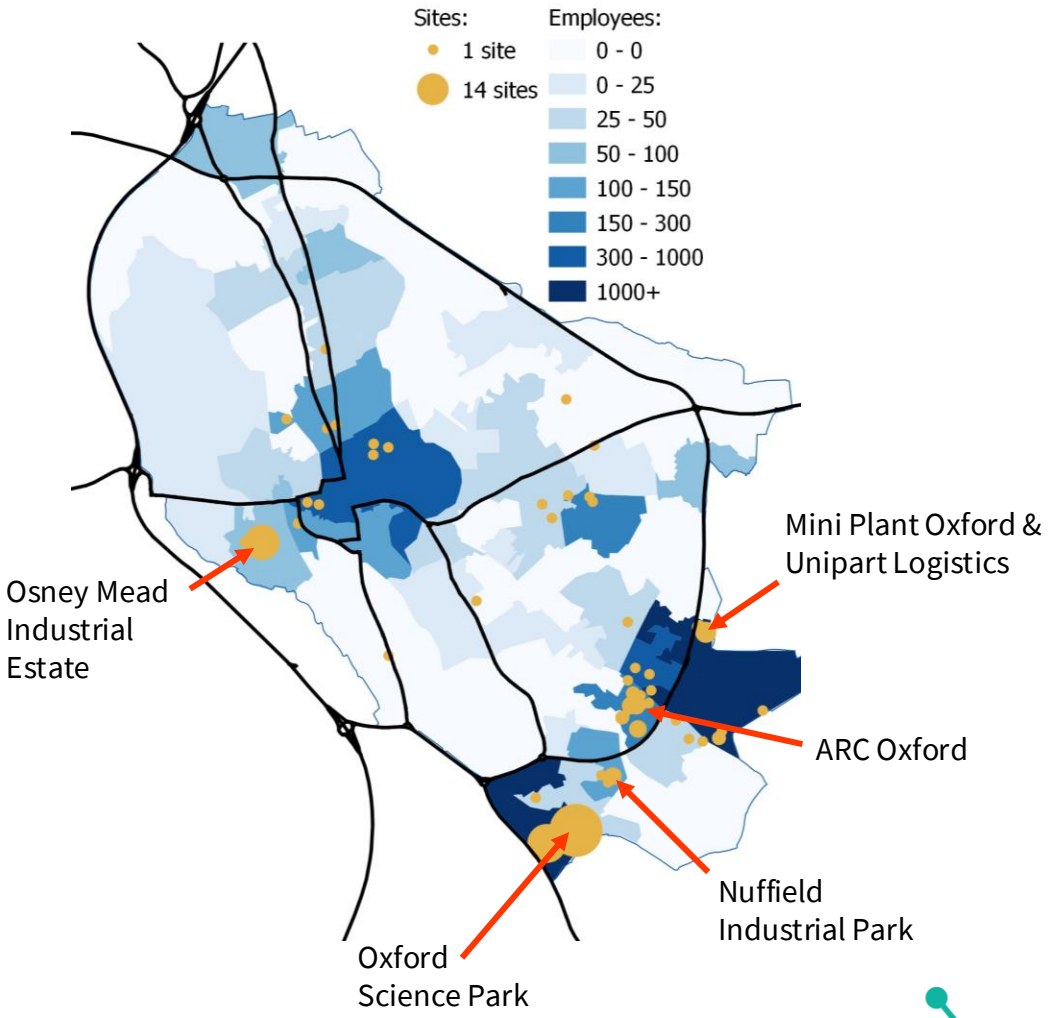
The rollout of low-carbon technologies in Oxford is largely dependent on the ability to scale up the skills and supply chains required for the transition. To accelerate this deployment, four key pillars have been identified:

- **Increasing consumer demand** for low-carbon technologies.
- **Developing local skills** to install and maintain these technologies.
- Expanding the **local installer base** to a sufficient scale.
- Ensuring the **availability of necessary equipment**.

The effectiveness of these pillars can be enhanced through targeted actions and investments by the Oxford Industrial Cluster. Given that Oxford's industrial sector is characterized by dispersed small and medium-sized enterprises (SMEs), it is crucial to develop a comprehensive roadmap that ensures all industrial players in Oxford can access the skills and supplies needed for the transition.

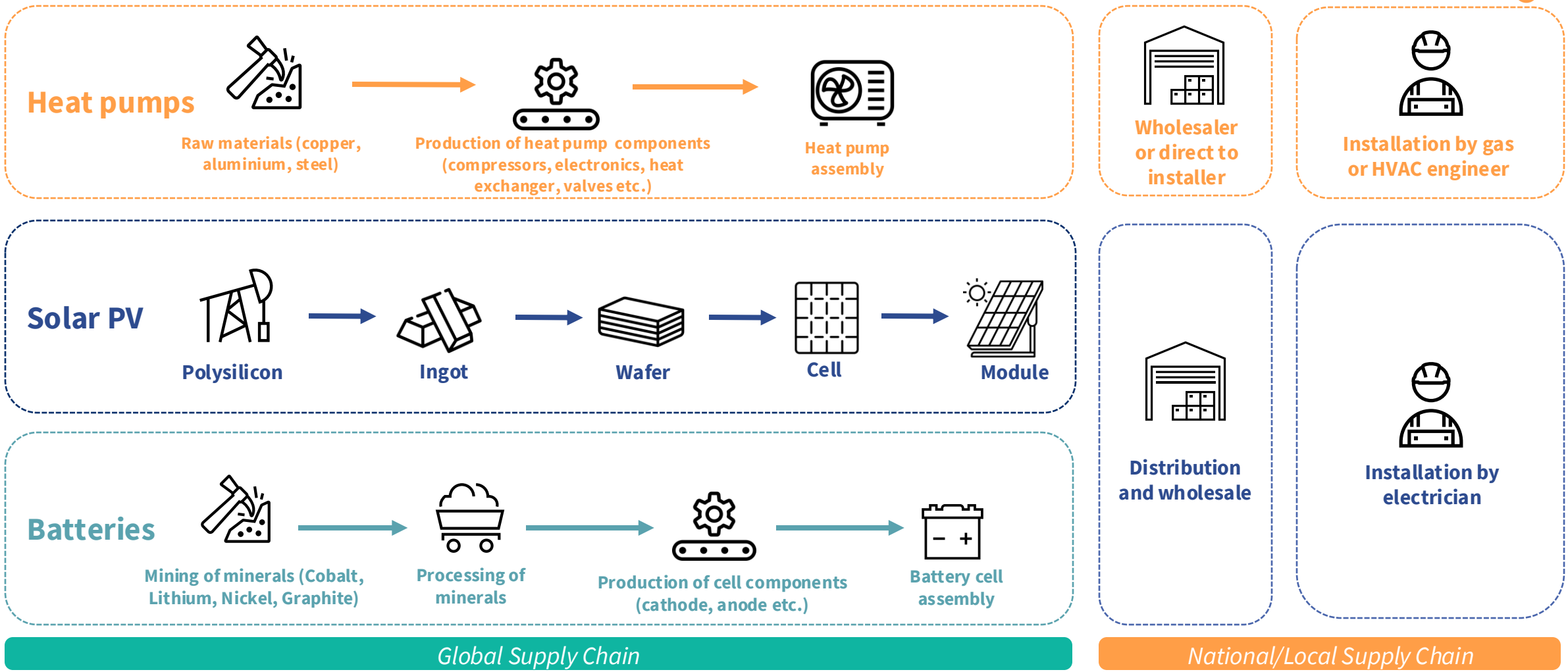
This report first outlines the barriers to deploying the necessary skills and supplies in Oxfordshire, and then examines the enablers and actions available to the industrial cluster. These initiatives will support the engagement of the supply chain and improve access to essential skills.

Map of industrial employment and sites in Oxford



The focus technologies of this report are heat pumps, solar PVs, and batteries

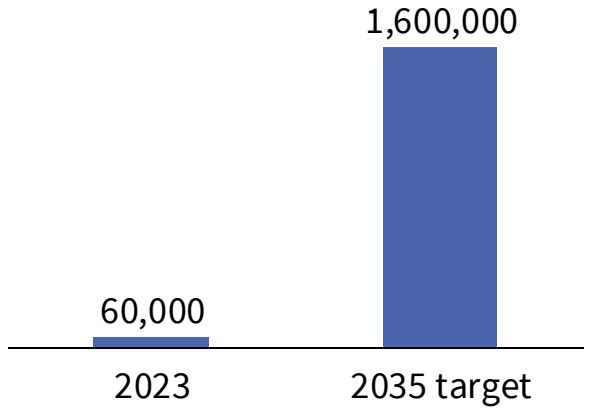
Overview of global and local supply chains of the focus technologies



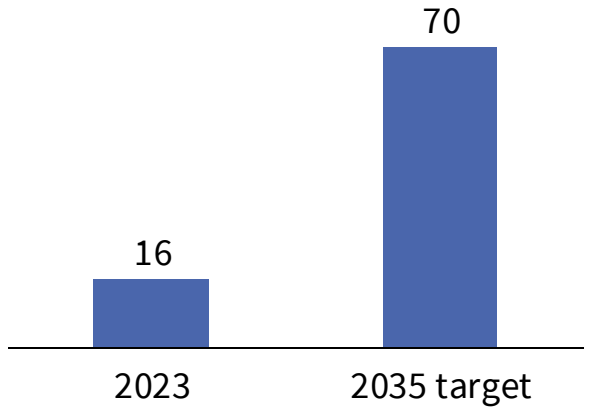
The UK has set ambitious targets for PV and heat pump installations that will require a major scale-up of the workforce

- The UK Government has set ambitious targets for the installation of heat-pumps and Solar PV :
  - **Heat Pumps**: As of August 2024, the UK achieved a significant milestone with 250,000 certified heat pump installations, largely supported by the Boiler Upgrade Scheme (BUS), which has made heat pumps more affordable and accessible. This achievement reflects the sector's dynamism; however, there remains a considerable distance to cover to meet the target of 600,000 *annual* heat pump installations by 2028, and 1.6m installations per year by 2035 [1].
  - **Photovoltaic Systems** : The installed solar capacity in the UK has reached 16 GW, according to data from the Department for Energy Security and Net Zero (DESNZ). To meet the target of 70 GW of installed solar capacity by 2035, a substantial increase in deployment is necessary [2].
- The current number of certified heat pump and photovoltaic installers is growing to meet the increasing demand for these technologies.
  - The Heat Pump Association reports a 166% increase in individuals completing training to become qualified heat pump installers, bringing the total to **11,000 certified heat pump installers (individuals) across the UK .** However, this figure falls significantly short of the projected need for **33,700 full-time heat pump installers required** to support the UK's transition to clean heating systems in alignment with government objectives. [3]
  - To meet these government targets, an estimated **80 individual heat pump installers will be required to service Oxford's population**, with a total of 360 installers to service Oxfordshire's population.

Yearly heat pump installations in the UK

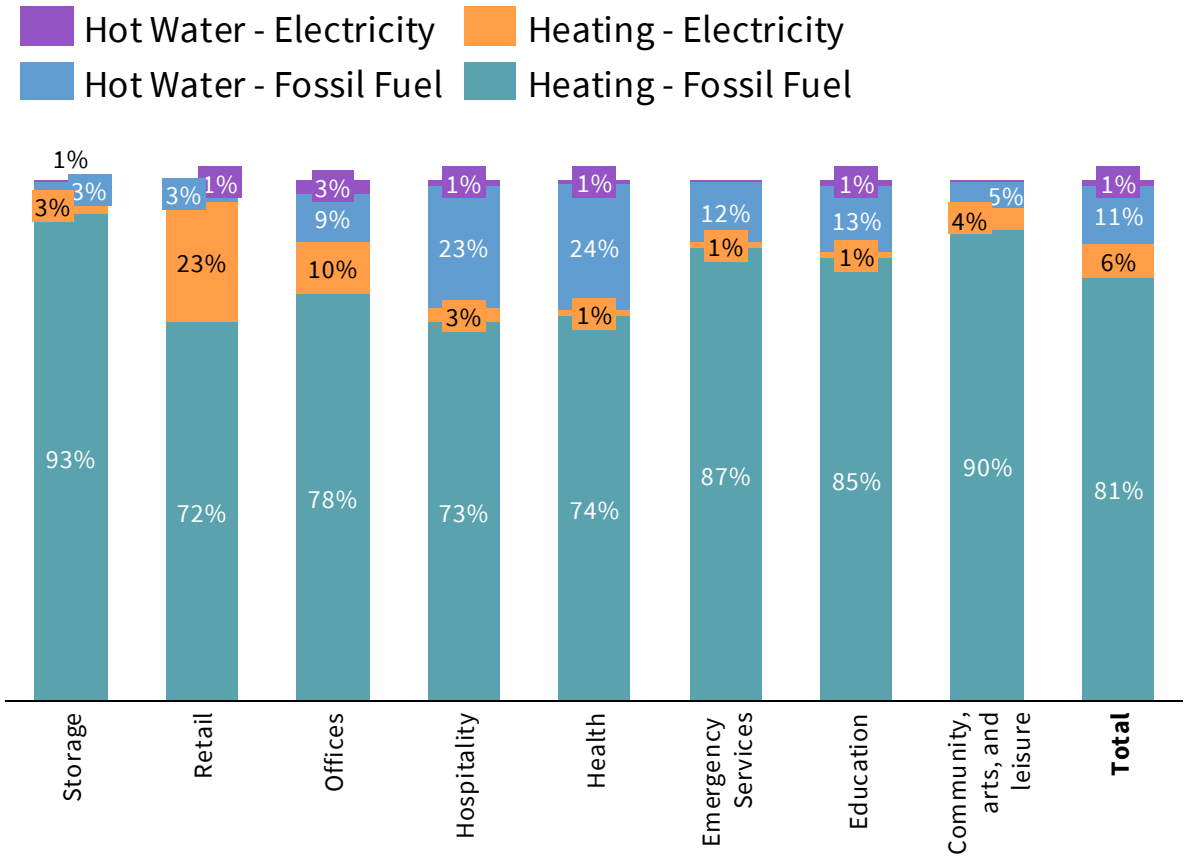


Solar capacity installed (GW) in the UK

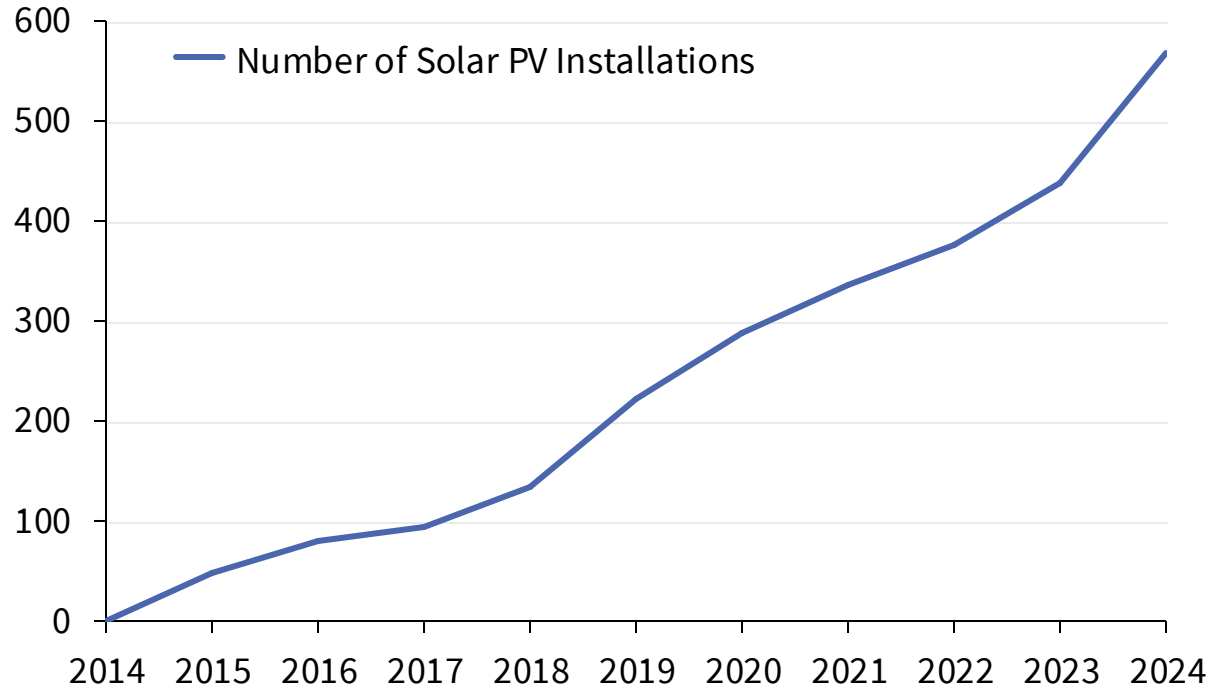


Current state of Low Carbon Technology in non-domestic properties

Proportion of electrification of heat by GWh in non-domestic buildings in GB[1], 2023



Number of non-domestic Solar PV installations in Oxford (Local Authority), MCS register, 2014-2024



1. GB level data based on ERM research.

Barriers

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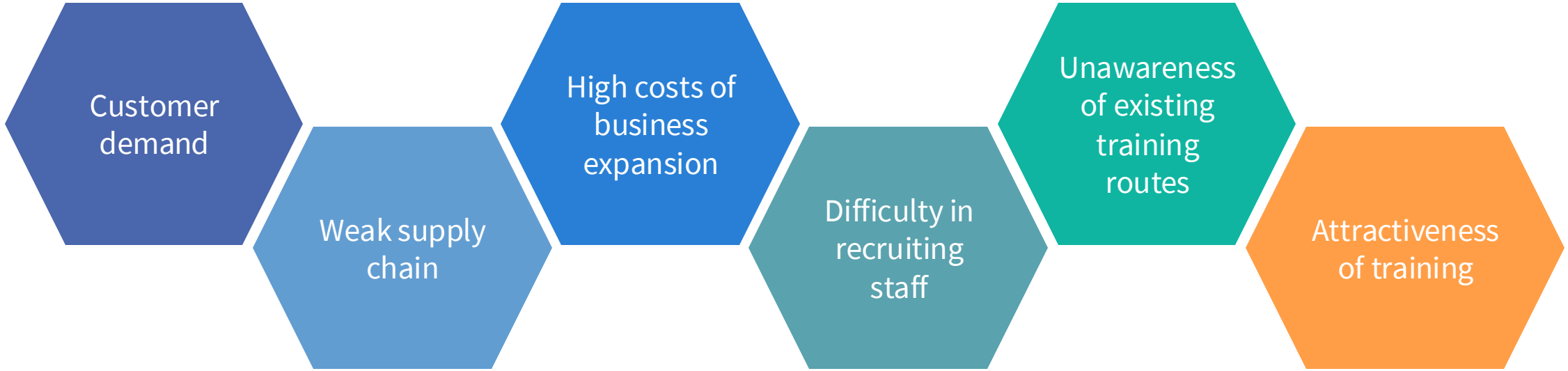

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Key barriers to developing skills and supply in Oxford

Customer perspective

General

- **General awareness:** While many non-domestic consumers are concerned about climate change, there is a mismatch between what consumers think they need to do to reduce the impacts of climate change, and the actual behavioral changes needed. Surveys indicate that while the majority are aware of options, they often lack detailed knowledge about their environmental impact and benefits.
- **Perception of Complexity:** The technologies involved are often perceived as complex and expensive, leading to hesitance in adoption. They doubt these technologies will actually save them money in the long run with reduced energy bills.
- **Government support:** Government policies can be inconsistent, which adds to the uncertainty for homeowners. Many are unaware of the financial incentives or funding available to help with the costs of installing technologies like PV systems, batteries, and heat pumps. Better communication and stable policies could help alleviate some of these concerns.

PV and energy storage focus

- **Quality of the installation:** There is no frame of reference for what makes a high-quality installation. Some installers may choose the cheap components without proper training or tools, compromising the system's performance and reliability.
- **High upfront cost:**The upfront costs associated with solar PV systems and batteries are often perceived as prohibitive for potential investors. This includes the price of panels, installation, and necessary infrastructure upgrades. A significant number of home- and business-owners are unaware of available funding schemes that could support them.
- **Common misconception that solar panels often need a battery** : This is not necessarily the case, as it depends on consumption profile. This could lead to unprofitable investments for customers.

Heat pumps focus

- **Heating and hot water are not seen as key areas for reducing emissions:** Consumers and businesses often see the transport and industry sectors as more contributing to reducing emissions and do not consider low carbon heating as a key lever.
- **High Initial Costs**: The upfront installation costs for heat pumps are high relative to gas boilers and depend on the type (air source vs. ground source) and additional necessary upgrades, such as insulation or hot water tanks. Many potential customers perceive these costs as prohibitive, especially when operational savings are uncertain.
- **Confidence in suitability of the solution:** Some gas installers will advise customers not to install heat pumps if because they are not confident in the technology or in their own ability to make the system work in the customer's premises.

Key barriers to developing skills and supply in Oxford

Installer perspective

General

- **Low demand from consumers:** A notable barrier is the insufficient demand from consumers for heat pumps and PV installations. Many installers report that they would need to see an increase in customer interest before they would consider offering these services.
- **Political support:** There is a perceived lack of clarity and support from the government regarding policies and incentives. Installers have called for better communication and incentives to stimulate consumer interest in low-carbon solutions.
- **Lack of awareness of benefits:** there is a lack of awareness amongst traditional installers of the profits available from green-tech, and the scale of future decarbonisation work. This is particularly acute for heat pumps, which have seen a slow uptake as compared to technologies like solar PV, and have faced successive policy roll-backs. There is not a strong sense amongst gas installers that their industry faces decline.

PV and energy storage focus

- **Dependence on Imported Solar Panels**: The majority of solar panels are imported from China, where forced labour is reportedly part of the supply chain. This overreliance on a single supplier poses significant risks, including potential ethical concerns and supply chain disruptions for installers.
- **Fragmented Installations:** fragmented installations—where multiple smaller sites are involved—can significantly increase the workload of installer (e.g. 10 MW to be installed on many roofs means more work for installers than a single installation of 10 MW).

Heat pumps focus

- **Administrative burden:** Many heat pump installers are sole traders or run small businesses. These installers often lack the time to manage the administrative tasks associated with heat pump installations, for example becoming MCS registered or engaging with public procurement frameworks.
- **Difficulty expanding and recruiting staff:** Installer struggle to recruit new apprentices or workers. It has been difficult to attract and retain skilled workers with hands-on training. For this reason, it's difficult for installers to expand their business and allocate a portion of their staff and time on low-carbon technology development.
- **Scalability of Supply Chain:** The UK's heat pump manufacturing supply chain is still in its early stages compared to more developed markets in mainland Europe and Asia. As a result, the majority of demand for heat pumps in the UK is currently met through imports from these regions. For countries with well established supply chains, scaling up production to meet demand can be quick. The UK is developing local production capacity (see section below on Developing Broader Supply Chains).

Key barriers to developing skills and supply in Oxford

Perspective of new entrants in the industry

General

- **Policy as a Driver for Demand**: Unlocking the full potential low-carbon solution will largely depend on policy interventions aimed at stimulating demand. If demand were to surge in the short term, many new intrants and retrainers will consider becoming installers and go through the necessary training and certifications.
- **Attractiveness of training path:** Training programs for low-carbon tech installation are not perceived as attractive, especially for middle-aged entrants who may already have established careers. They can be expensive and salaries during apprenticeship are not competitive.
- **Limited awareness:** Many potential new entrants into the low-carbon technologies field are unaware of existing courses and training programs offered by colleges and training providers. Enhanced marketing and outreach efforts are key to inform trainees about available opportunities.

PV and energy storage focus

- **Lack of proper training** : Proper training is crucial for solar PV installers to ensure safe and efficient installations. The increasing demand for solar installations may lead to new entrants on the market, who might not be qualified (e.g. mechanical and electrical contractors might underestimate the complexities involved).

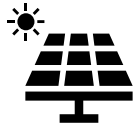
Heat pumps focus

- **Complex training pathways:** There is no single, clear route to becoming a heat pump engineer. Training programs are often fragmented and inconsistent, which can deter potential installers from pursuing a career in this field
- **Lack of new players in the industry:** Many of the existing engineers have built their careers around gas boilers and may not see the urgency in transitioning to heat pumps. Additionally, the average age of these engineers is high, and many will be retiring within the next decade. The industry must cast a wider net to attract new recruits.
- **Challenge for Small and Medium Enterprises (SMEs):** Many potential re-trainers are independent plumbers or operate small businesses. For them, dedicating time for training translates directly into lost income from jobs that could have been completed during that time. This financial burden can discourage SMEs from investing in retraining their workforce for heat pump installations.

Skills and Training

This section describes the current LCT installation workforce in Oxford, existing training routes, and issues surrounding these routes

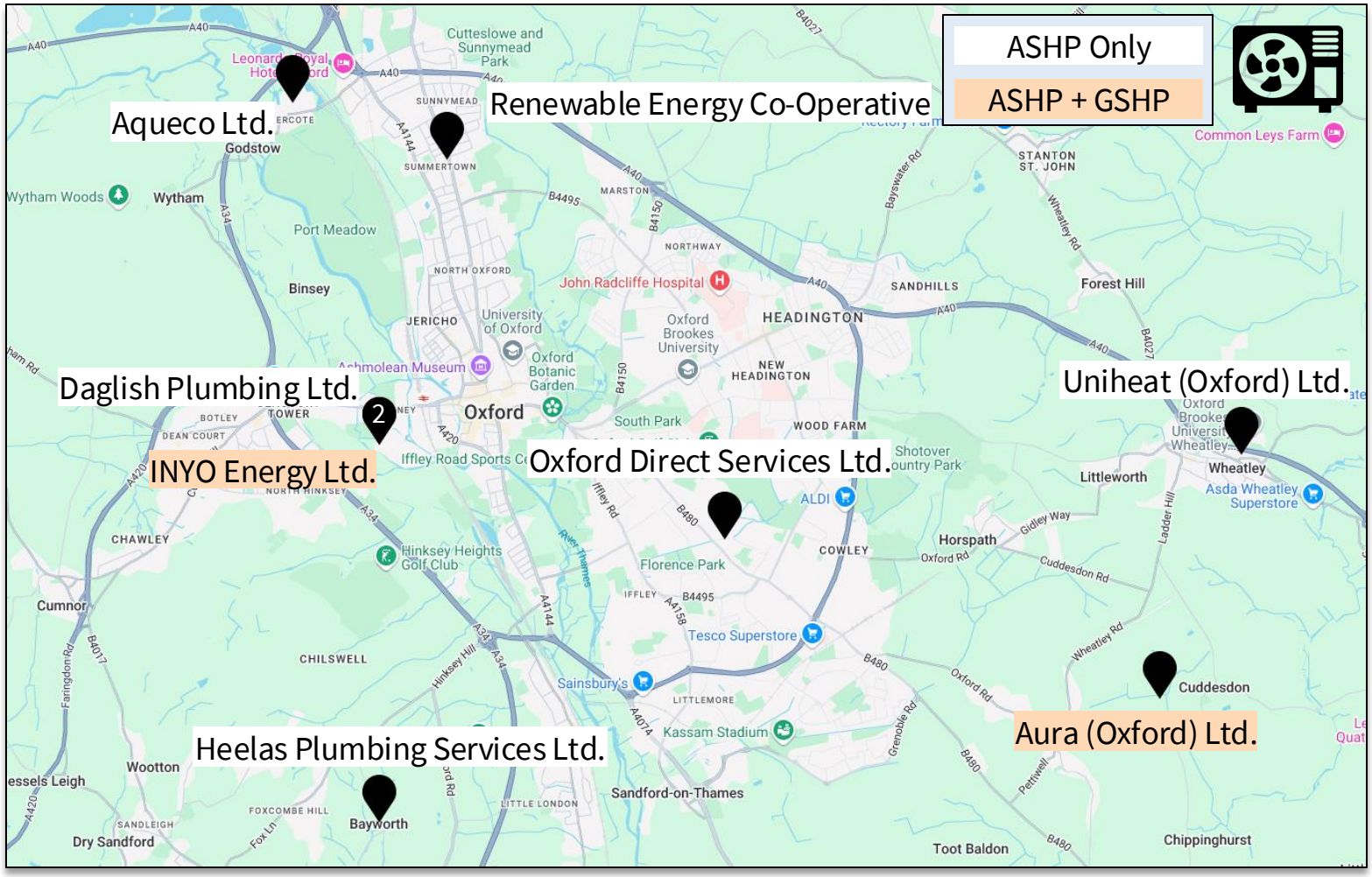
Introduction to LCT installation in Oxford

	 *Heat Pump Installation*	 *Solar PV & Battery Installation*
Current Landscape	There are **eight MCS registered heat-pump installation companies in Oxford** town and the immediate surroundings, and a total of 15 registered installation companies within 10 miles of Oxford. There is a large number of Gas Safe registered engineers, including 35 registered commercial-grade gas engineers within 5 miles of Oxford.	There are **ten solar installation companies** (eight of which install battery storage systems) in Oxford town and the immediate surroundings, and 33 solar PV installers within 10 miles of Oxford.
Requirements[1]	In order to meet national targets, Oxford will require an estimated **~80 full time heat pump installers** to service its population. Oxfordshire will require **~360 full time installers**.	Oxford will require an estimated ~**40 full time solar installers in 2025**, rising to **~50 by 2035**, to meet targets[2]. Oxfordshire will require an estimated **200 installers** by 2035 to service the population.
Training pathways	Most installers come into their role having retrained as an experience gas engineer. A small but growing number come in through specialised apprenticeships.	Installers must first train as an electrician, before completing specialised courses in PV and/or battery installation.

1. Installers do not need to be based in Oxford, and presently many are based in the surrounding areas. However, the installer base will need to scale across the country, and so these figures are indicative of the scale of increase required.
2. Targets refers to the solar generation targets detailed in the Oxfordshire Net Zero Route Map & Action Plan. We assume an average installation size of 4 kWp.

Oxford has eight MCS registered air-source heat pump installation companies, with a total of 93 companies within 30 miles of the city

Map of MCS registered heat pump installers in Oxford



There are **eight** air-source heat pump installers in **Oxford** and the immediate surroundings.

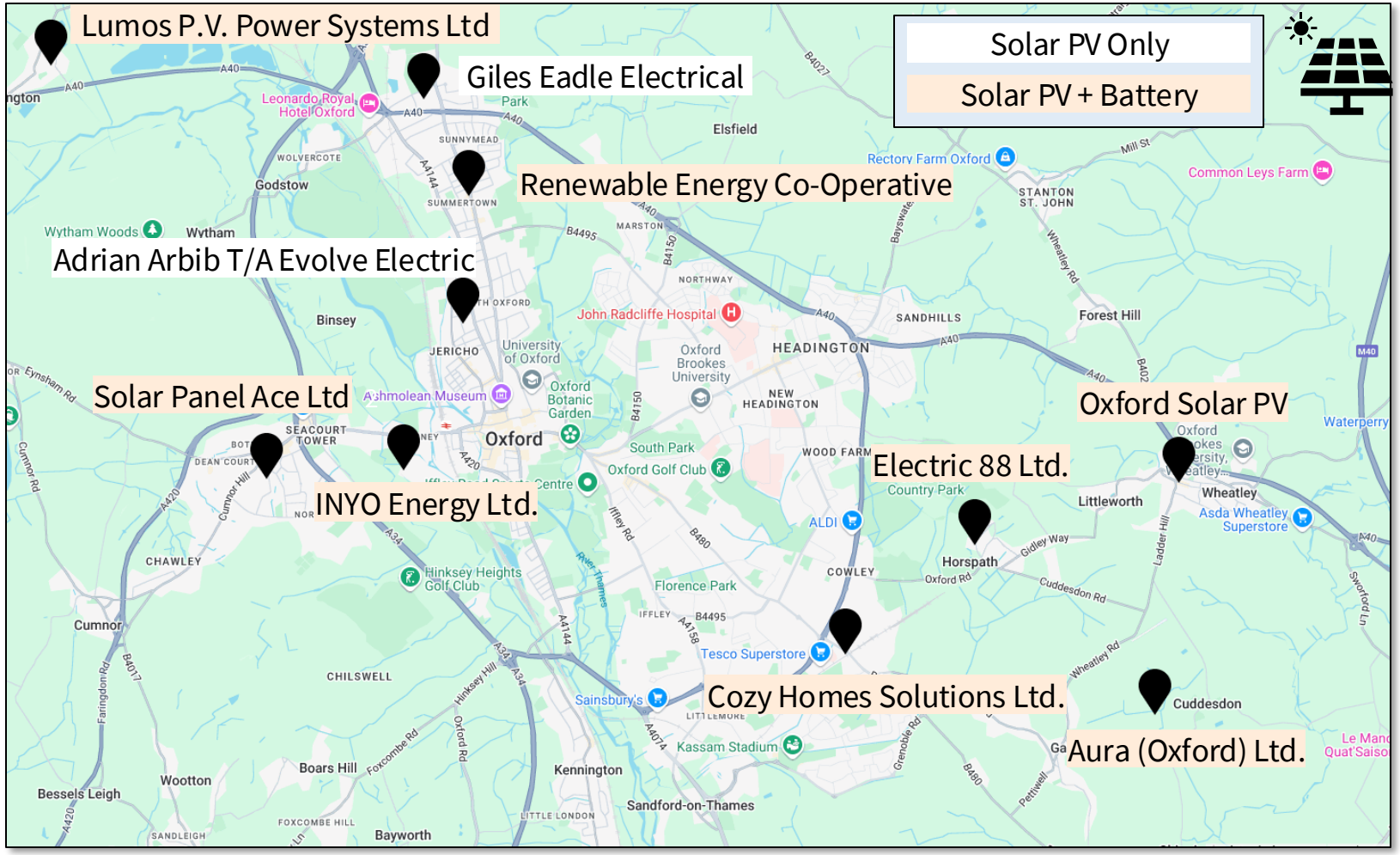
- Only **two** of these firms – Aura and INYO Energy– is MCS registered to install **ground-source heat pumps**
  - Aura and INYO are also the only firms to install Solar PV or battery storage as well as heat pumps
- There is minimal overlap between renewable technologies when it comes to installation companies
- Note that these firms do not necessarily deal with commercial or industrial installations

There are a total of **93** MCS registered HP installation firms **within 30 miles of Oxford.** To meet the 2028 target of 33.7k installers in the UK, there needs to be around **1,000 individual installers within this radius***.

*This is the national target scaled to the population within 30 miles of Oxford. Installers often serve a wide geographic area, making it difficult to establish local installer requirements. Therefore, this figure should be seen as an indication of the scale of increase required, rather than a target or requirement.

Oxford has ten MCS registered Solar PV installation firms, and 144 registered installers within 30 miles of the town

Map of MCS registered solar PV and battery storage installers in Oxford



There are **ten** solar PV installers in **Oxford** and the immediate surroundings.

- There are also installers based in Abingdon, Witney, and Swindon
- Most firms install both Solar PV and batteries
- Note that these firms do not necessarily deal with commercial or industrial installations

There are a total of 144 MCS registered Solar PV installation firms within 30 miles of Oxford.

Heat pump installers can train directly through apprenticeships, but commonly complete additional training as experienced gas engineers

Overview of Heat pump installation training

Retraining

- Most installers of heat pumps begin their careers as gas engineers and have gained additional qualifications to install heat pumps
- Typically, they will apply for an RQF qualification such as a Level 3 Installation and Maintenance of Heat Pump Systems
- These courses typically require you to already have:
  - A qualification in WRAS water regulations
  - Level 2/3 Award in installation and maintenance qualification in plumbing, heating and ventilation, gas or oil
- A basic ASHP installation course takes 3-4 days and costs £500-£1000**; Abingdon and Witney** College have started to offer some **free places to local residents** in relevant courses, such as the BPEC Domestic Air Source Heat Pump Installer, through their Net Zero Skills Hub.

Apprenticeships

- In recent years there has been a push towards getting people directly into the heat-pump installation industry through apprenticeships.
- School leavers can now apply to schemes such as the Refrigeration, air conditioning, and heat pump engineering technician (level 3) apprenticeship and the Low carbon heating technician (level 3) scheme.
- These courses take **3 years**, paying apprentices **up to £22,000** per year.
  - Due to the low pay and relatively long duration of these courses, these apprenticeships are typically pursued by school leavers
- At present there are **23** training providers for the Low Carbon Heating apprenticeships and **14** for the Refrigeration air conditioning and heat pump engineering technician course, nationally. **No training providers are local to Oxford**.

MCS Certification

Once installers have gained the necessary qualification, they are encouraged to achieve MCS certification. This is typically done on a company basis (unless they are a sole trader). This is not a legal requirement but is strongly encouraged; the MCS ensures that installers meet industry standards, and without MCS certification installers are not allowed to claim the UK's Boiler Upgrade Scheme (BUS) grant (or various other renewable grants). A company with 6 employees would typically pay a **£1,090 registration fee**.

To install solar PV and batteries you must first qualify as an electrician through traditional routes and then retrain

Overview of PV & Battery installation training

Routes to becoming an electrician

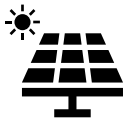
- To qualify to install solar PV in the UK **you must be a qualified electrician**
- This is achieved through traditional routes:
- A college degree, such as a Level 2/3 Diploma in Electrical Installations and an NVQ Diploma in Electrotechnical Technology
  - This typically takes 1-3 years and costs around £8,000 to £10,000
  - These courses are offered through **Abingdon and Witney College** and **Oxford City College**
- An apprenticeship, such as a Level 3 Domestic Electrician or Level 3 Installation and Maintenance Electrician (which covers businesses and construction sites as well as homes).
  - This typically takes 4 years and pays up to £20,000 / year.

Building the necessary skills to install Solar PV and batteries

- Qualified electricians can complete a short solar installation course, such as the Level 3 Solar PV Installers Course. This typically costs £500-£1,000 and takes 4-5 days; some courses cover battery installation. Standalone battery installation courses are also available, such as the BPEC Electrical Energy Storage Systems (Abingdon and Witney College have started to offer some free places for this course to local residents, through their Net Zero Skills Hub).
  - While these courses are not a strict requirement to install batteries and PV systems, they are a good route to ensuring standards are met and achieving MCS certification. MCS certification is a requirement for those looking to partake in the Smart Export Guarantee (SEG) with their Solar PV system.
- These courses are well established and offered in numerous locations across England.

Issues with existing training routes to low-carbon technology installation

Solar PV & Batteries



- There is **no direct route (e.g. apprenticeship)** through to PV or battery storage installation. You must first train as an electrician, taking 3+ years.
- **Electricians can find work in a range of sectors**. This makes completing further training (at expense) less appealing.
- Solar installation courses are **expensive** and require you to take **4-5 days** out of work .
- MCS registration is an added expense.
- After a short solar installation course, **electricians still lack practical experience of PV installation**. This makes it difficult for sole traders to enter the market.
- Further experience in roofing may be required to install rooftop solar.

Heat Pumps

- While it is possible to complete an apprenticeship in heat pump installation, these apprenticeships are **poorly paid** (<£22k/year), which limits their attractiveness for older applicants.
  - These apprenticeships are offered at few locations (and **no locations in Oxford**).
- As with Solar PV, training courses and MCS registration pose an added cost
- **A 3-4 day training course does not prepare gas engineers** to undertake real-world heat pump installations. Significant **additional training "on the tools"** is needed before an engineer is competent and confident to bid for and execute a heat pump installation.

- Note that solar PV, battery, and heat pump installers may not necessarily have the skills or qualifications to work with larger industrial/commercial customers as courses and apprenticeships typically focus on domestic installations. In particular, large heat pumps (and high temperature air-source heat pumps) may require specialists. These skills are typically gained through an apprenticeship or on-the-job training.

There are 15 heat pump installers* within 10 miles of Oxford

Company	ASHP	GSHP
Inyo Energy Ltd	Yes	Yes
Daglish Plumbing Limited	Yes	Yes
Renewable Energy Co-Operative	Yes	
Oxford Direct Services Ltd	Yes	
Aqueco Ltd	Yes	
Aura (Oxford) Limited	Yes	Yes
Uniheat (Oxford) Ltd	Yes	
H and R Services (Oxford) Ltd.	Yes	Yes
Stocks Plumbing & Heating LLP.	Yes	
TGP Plumbing and Heating LTD	Yes	
Otmoor Electrical Limited	Yes	
Green Systems Engineering Ltd	Yes	Yes
EnergyMyWay (Oxford) Ltd	Yes	Yes
Renelec Chalgrove Limited	Yes	
EMW Franchising Ltd t/a EnergyMyWay	Yes	Yes

*note that some of these installers may only work on domestic installations

There are 33 MCS registered solar installers within 10 miles of Oxford

Company	Solar PV	Battery Storage
Inyo Energy Ltd	Yes	Yes
Adrian Arbib T/A Evolve Electric	Yes	
Renewable Energy Co-Operative	Yes	
Solar Panel Ace Ltd	Yes	Yes
Giles Eadle Electrical	Yes	
Cozy Home Solutions LTD	Yes	Yes
Electric 88 Ltd	Yes	Yes
A1 Contracting Ltd	Yes	
Seal Energy Group	Yes	Yes
Lumos P.V. Power Systems Ltd	Yes	Yes
Blackrock Electrical Ltd	Yes	
Oxford Solar PV	Yes	
The Oxford Electrical Company	Yes	
Aura (Oxford) Limited	Yes	Yes
+ 19 further installers within the local area		

*note that some of these installers may only work on domestic installations

Oxford City Council could support new entrants and re-trainers looking to become heat pump and solar PV installers

For new entrants

- **Awareness campaigns:** Launch campaigns to highlight career opportunities in the sector, targeting schools, colleges, and community centers, while showcasing success stories to inspire potential entrants.
- **Comprehensive training framework**: Establish a framework offering clear guidance on training routes with an emphasis on practical, hands-on experience.
- **Online platform development:** Create a platform to connect new entrants with SMEs looking to recruit skilled workers
- **Incentives for businesses:** Offer grants to local businesses that hire and train apprentices in low-carbon technologies.

For re-trainers

- **Demonstrate local demand:** Gather data on businesses planning to adopt heat pumps or solar PV and publicise local and national policies to showcase the business opportunities in the sector.
- **Salary support schemes:** Develop salary support schemes for older apprentices and re-trainers to make the sector more attractive.
- **Financial assistance:** Implement a bursary or low/zero-cost loan system to assist with training costs, MCS accreditation, and administrative tasks, encouraging existing plumbers to transition to the heat pump sector. Especially for SMEs, even a free course is not attractive as it is a lost a day of work.

Developing Broader Supply Chains

The leading companies in the heat pump industry primarily based in Asia and the USA have been in place for +50 years and sell globally

Daikin Industries Ltd: Global leader in the air conditioning market since 1924. Present in more that 160 countries. The company has installed 1.2 million heat pumps in Europe since 2006 and continues expanding its production capacity globally.

Carrier Global Corporation: Global leader in the HVAC industry for +100 years with more than 75 industry leading brand Carrier offers a wide selection of heat pumps and has released a new series this year that is compliant with the 2023 Department of Energy minimum efficiency requirements.

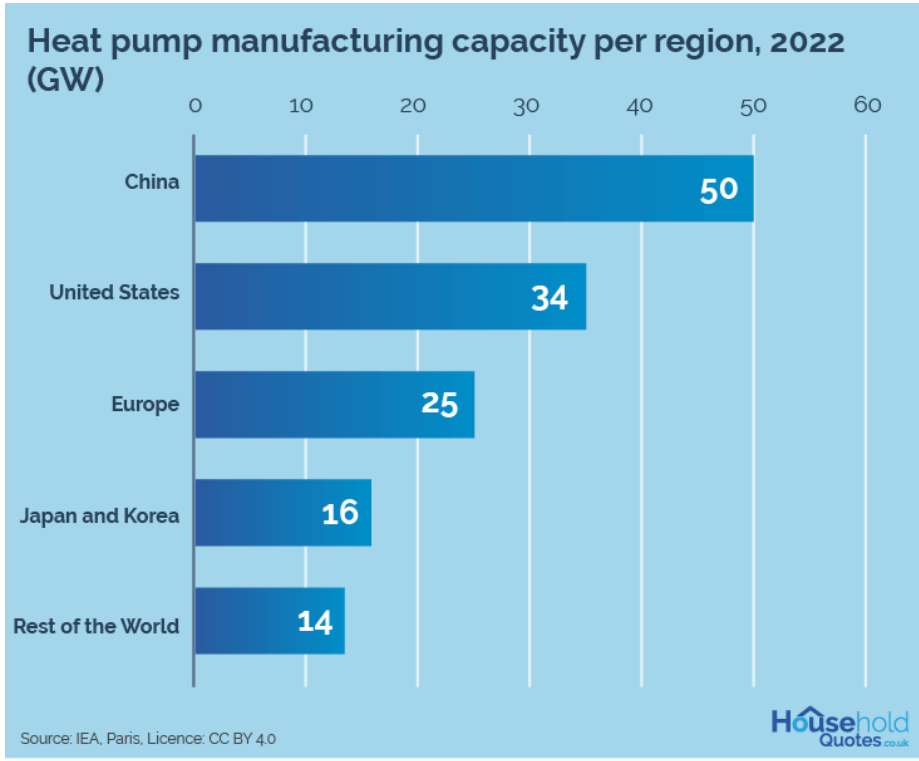
Mitsubishi Electric Corporation: Mitsubishi Electric, founded in 1921, is a world leader in the manufacture and sales of electrical and electronic products and systems, with heat pumps being one of them.

Midea Group : Midea is a leading manufacturer of heat pumps, with a strong market presence in China and expanding in Europe and North America. They are known for their innovative and energy-efficient heat pump solutions and have +30 production centers globally.

NIBE: NIBE is a prominent player in the European heat pump market, with a strong focus on energy-efficient and environmentally friendly solutions. They offer a wide range of heat pumps for residential and commercial use.

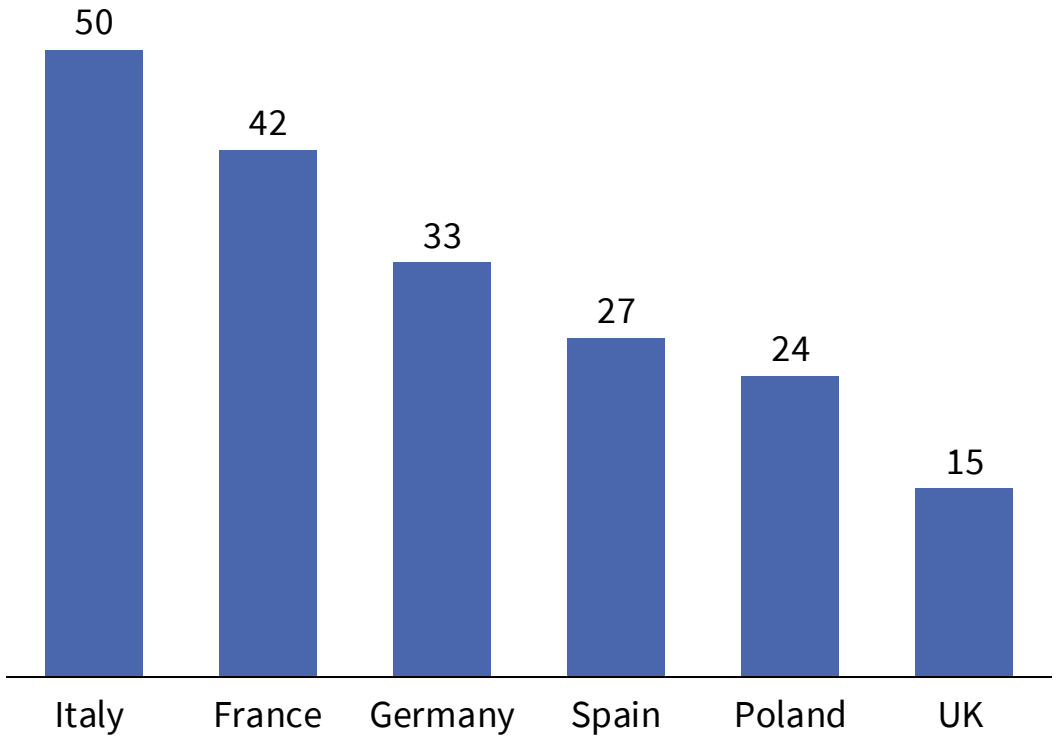
Panasonic Corporation: Panasonic has a robust presence in the heat pump market, particularly in Europe and Asia. They produce a variety of heat pumps and recently announced expanding their production capacity in Europe.

Samsung electronics: Samsung has been actively engaging in the heat pump sector, focusing on crafting innovative heat pump systems with pioneer technologies like variable-speed compressors and intelligent controls.



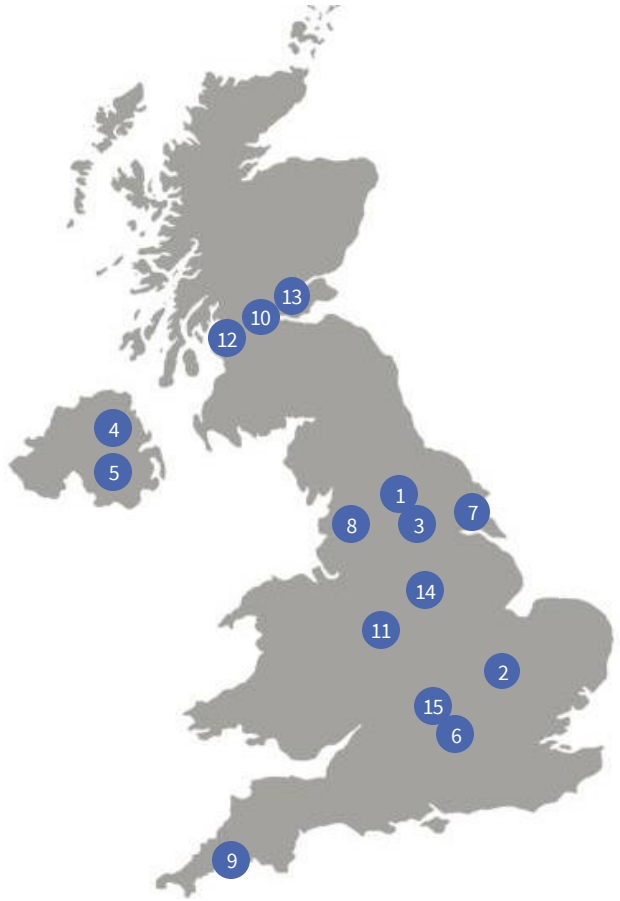
The heat pump production capacity is also growing in Europe and the UK, with over 250+ production sites in 2024.

The European heat pump manufacturing production is growing in Europe, with main of the sites located in Italy and France.



Heat pump and component manufacturing sites per country - EHPA

They are 15 manufacturing sites of heat pumps in the UK, most of them operated by British companies :



1. Airedale (UK)
2. Arriba Cooltech (UK)
3. Clade (UK)
4. Copeland (US)
5. Dimplex (UK)
6. Futraheat (UK)
7. Ideal (UK)
8. Isentra (UK)
9. Kensa (UK)
10. Mitsubishi (JAP)
11. SHEco
12. Star Refrigeration (UK)
13. Sunamp
14. Vaillant (GER)
15. Ventive

The heat pump supply chain is heavily reliant on imports; however, there are opportunities to develop a more local supply chain and accelerate the uptake of heat pumps in the UK

Raw materials

Raw material and components for heat pumps are largely produced outside of the UK, except for some compressors and refrigerants.

Not relevant

Manufacturing

In 2019, 32% of the total UK heat pump sales were produced domestically. The remaining 2/3 of heat pumps are imported from manufacturers in continental Europe and Asia.

Boiler manufacturing is well established in the UK. Given the similarities between heat pump and boiler production, the UK is well-poised to increase domestic heat pump manufacturing and reduce its reliance on imports.

Logistics

Import of heat pumps is a relatively streamlined process, however external factors such as Brexit-related customs delays have impacted the supply chain.

Not relevant

Wholesaler

Heat pumps are mostly sold through plumbers merchants or direct to installers, as is the case with boilers.

Ultimate Renewables is a wholesaler present in Oxford. This may be a good route to reach and support local installers.

Installation

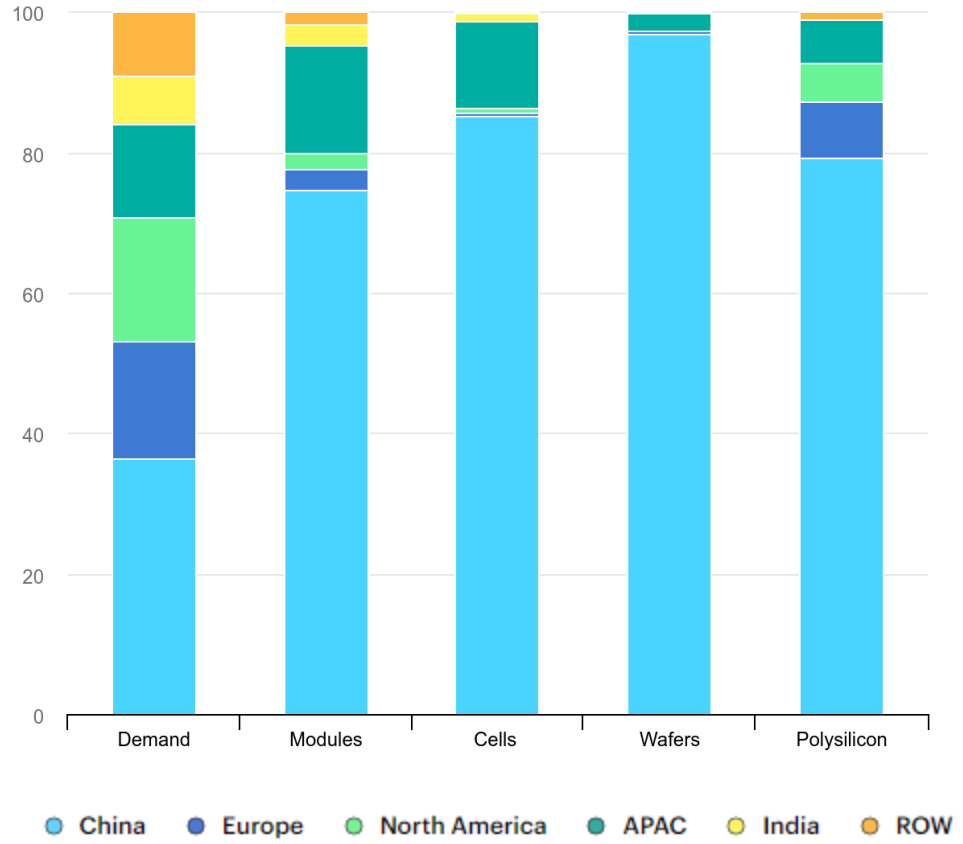
A shortage of trained installers and qualified retrofitters puts pressure on this aspect of the supply chain.

An estimated 40-50% of the final cost of a heat pump is the installation (labour) cost. There is scope to improve efficiency of the process to reduce costs and raise standards.

Legend:
Current state of the supply chain
Opportunities for improvements

The solar PV supply chain is dominated by China, due to significant investments from the country to increase production capacity

- **China has invested over USD 50 billion in new photovoltaic supply capacity, which is ten times more than Europe**, and has created more than 300,000 manufacturing jobs across the solar PV value chain since 2011. Currently, China's share in all manufacturing stages of solar panels—including polysilicon, ingots, wafers, cells, and modules—exceeds 80%.
- The concentration of the supply chain in China introduces vulnerabilities in procurement. The global market is projected to rely almost entirely on China for the supply of key components necessary for solar panel production through 2025.
- **Diversifying the supply chain could mitigate these vulnerabilities**, attract new investments, create additional manufacturing jobs, and help reduce GHG associated with solar PV construction.



Solar PV manufacturing capacity by country and region, 2021, IEA

Most of UK-based manufacturers import photovoltaic cells from overseas before assembling them into panels domestically

- The solar PV market in the UK as grown significantly over the past decade due to government incentives like the Feed-in Tariff scheme and decreasing costs of solar technology. **A number of UK-based manufacturers have emerged in the past years**
- Most of these manufacturers primarily operate at the end of the supply chain, focusing on the assembly of solar panels. The solar cells used in these panels are often imported from overseas, particularly from China.

Example of UK-based manufacturing companies

UKSOL, viridian solar, REA SOLAR®, TW SOLAR, gbsol® ARCHITECTURAL SOLAR POWER, Project Solar UK

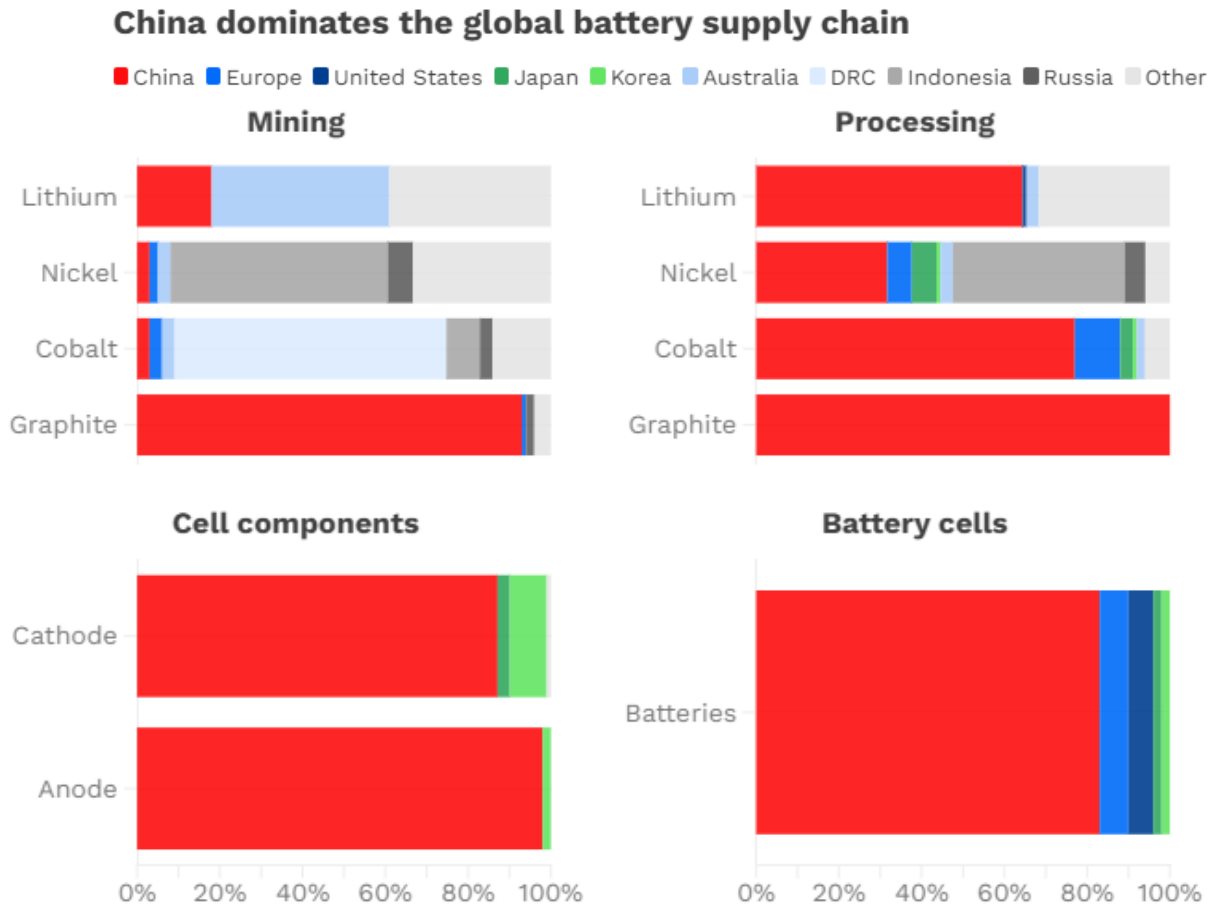
- In response to concerns regarding the ethics and sustainability of overseas sourcing, members of the UK solar industry have committed to fostering an industry that promotes the "highest possible levels" of transparency, social responsibility, and good governance throughout global solar supply chains.
- As of now, **55 companies and organizations within the sector have pledged their support to the Solar Stewardship Initiative (SSI).** This initiative serves as a specialized supply chain assurance scheme aimed at enhancing sustainability and traceability in the solar value chain.

"This includes action to minimise and reduce the impact of extracting raw materials, to conserve water and to lower carbon emissions across the value chain, and to ensure the industry is free of any human rights abuses, including forced labour, anywhere in the global supply chain"

Extract from the UK Solar Industry Supply Chain Statement 2024

Similarly to PVs, the battery manufacturing supply chain is largely dominated by China

- The first link in the battery supply chain is mining for critical minerals such as lithium, nickel, cobalt, and graphite. **This first stage is more diversified** than later stages:
    - China dominates graphite mining (over 90%), the Democratic Republic of Congo accounts for over 60% of cobalt mining, and Indonesia has more than 50% of nickel mining.
- After extraction, these metals must be processed for battery production, where China's dominance is evident:
    - China processes nearly two-thirds of lithium, virtually all graphite, almost 80% of cobalt, and about one-third of nickel.
- The two last steps are the manufacturing of battery component (cathode and anodes) and final assembly of battery cells. **For both, China dominates the supply chain, producing more than 80% of the final battery cells.**



Europe and the UK have ambitious goals of re-industrialisation in PVs and battery production, through the development of gigafactories

European Goals

The Zero Industry Act set for at least 40% of manufacturing of targeted net-zero technologies to occur within Europe by 2030, reducing dependency on imports.

- Solar PV Capacity Expansion: The EU aims to increase its solar PV capacity to 30 GW 2030 [1].
- Battery Manufacturing Growth: The EU plans to scale battery cell manufacturing capacity to 550 GWh by 2030, focusing on establishing gigafactories to support this growth [2].

UK Goals.

- Investment Commitment: Over £2 billion is allocated for capital and R&D funding for the automotive sector, including batteries, from now until 2030.
- Gigafactory Development: The UK is working on establishing multiple gigafactories, including:
  - AESC Group's gigafactory in Sunderland, **with a capacity of 15.8 GWh**.
  - Tata’s new gigafactory, projected to produce 40 GWh of batteries annually and create up to 4,000 jobs.

The Oxford Industrial Cluster could take action to promote supply chain engagement in the short term and encourage local manufacturing in the long term

Short term: focus on the final part of Oxford's supply chain

- Partners should concentrate on developing the **final part of the supply chain**, focusing on the skills and services required for installation, maintenance, and procurement as the development of a local supply chain is not the priority.
- To engage the supply chain effectively, it's crucial to demonstrate Oxford's growing demand for these technologies, making it an attractive market for investors and installers.
- Partners should focus on building partnerships with local suppliers, and installers. This could be done by establishing a network or forum for stakeholders to collaborate, and identify opportunities to support installers to expand. Regular workshops, webinars, and roundtables could be organised to facilitate collaboration across the local supply chain.
- A **collective procurement scheme** could pool orders to reduce both procurement and installation costs. This approach would also give suppliers visibility into Oxford's decarbonisation efforts, potentially reducing delays and ensuring faster service. Such procurement schemes can be applied either at the installer level or for bulk supply.

Long term: Reduce dependance on imports

- Currently, procurement for low-carbon technologies relies on companies that source equipment mainly from abroad. However, in the long term, reducing **Scope 3 emissions** could drive local installers to explore sourcing equipment closer, reducing transport emissions.
- Oxford City Council can play a pivotal role in fostering a local, ethical manufacturing supply chain, benefiting both the environment and local employment. This can be done by:
    - Offering **incentives** such as grants to SMEs exploring domestic manufacturing opportunities.
    - Supporting businesses looking to start or expand their production capacity in low-carbon technologies.
    - **Lobbying the UK government** for national policy interventions and investments in local manufacturing.
- The **ZCOP partners** could further support local manufacturers by using their buildings (e.g., public buildings and social housing) as **pilot sites** for the installation of UK-made heat pumps and solar energy systems. These pilot projects would demonstrate the reliability and scalability of locally produced products, encouraging further investment and interest in domestic manufacturing.

Recommendations

The Oxford Industrial Cluster can undertake enabling activities to engage the supply chain and fill the skill gap in low-carbon technologies

Building local networks

A clear pathway from training and qualification into the labour market must be established. The Oxford Industrial Cluster could facilitate **regular industry roundtables,** including installers, wholesale suppliers, and educational institutions, enabling dialogue on the challenges faced by installers.

Partnerships between colleges and local industry can support targeted training, creating a skilled labour pool.

These networks would **streamline procurement, enable group purchasing**, and build a cohesive community of stakeholders attracting suppliers and investors.

The Oxford Industrial Cluster should create an **online platform to link employers and apprentices/re-trainers.**

Targeted training and support

The Oxford Industrial Cluster should collaborate with technical schools, industry associations, and training providers to **establish clear routes into the industry, including hands-on training programs**.

A particular focus could be on creating **hands-on retraining/upskilling programmes and short-term stipends to boost the salary for mid-career professionals** who may not be able to live on an apprenticeship wage.

To boost attractiveness of the sector for students, the Oxford Industrial Cluster can **launch campaigns to highlight career opportunities and showcase success stories**. Emphasis should be placed on **the long-term job security** of renewables installation, and the profitability of the associated businesses.

Increase public awareness to drive demand

Unawareness and perceived complexity of low-carbon technologies are key barriers to customer demand.

The Oxford Industrial Cluster can gather and share information on anticipated installations resulting from **the carbon reduction commitments of local businesses and strengthened planning requirements** for new construction. This will increase confidence on the growth of the sector in the coming years.

To build confidence in low-carbon technology, the Oxford Industrial Cluster could invest **in educational and showcase projects on their own buildings**. This would provide experience to local, newly trained installers, and allow other businesses to better understand the systems and benefits.

Financial incentives for SME installers

Financial incentives such as **grants or low interest loans** would make it more financially viable for existing installation SMEs to grow in size and expand their offerings.

Installers could receive support to cover the costs of certification, staff training or salary support for new starters, ensuring they have the resources and confidence to move forward with expanding their activities.

Large industrials/corporates are beginning to prioritise suppliers based on full ESG performance and standard of secondary/tertiary suppliers. In the 5-10 year time frame, the Oxford Industrial Cluster should tailor any incentives to **support installers that source materials locally,** and/or **with transparent supply chains.**

The Oxford Industrial Cluster needs to act upon key issues to enable supply chain engagement and skills development (1/2)

Recommendations	Skills/supply chain	Barriers addressed	Relevant players	Long / medium / short term
Gather concrete information on local businesses that plan to adopt heat pumps or solar PV to demonstrate the customer demand with real numbers	Skills Supply Chain	Customer demand Weak supply chain	OCC, ZCOP partners	Short term
Establish a network or forum for stakeholders to collaborate, share best practices, and identify mutual opportunities for support	Supply chain	Weak supply chain High costs of business expansion	OCC, ZCOP partners	Short term
Create a clear guidance on the training routes with practical, hands-on trainings for mid-career entrants	Skills	Unawareness of existing training routes	OCC, training providers	Short term
Online platform or forum specifically to match new entrants in the sector and re-trainers with SMEs who are looking to recruit.	Skills Supply chain	Unawareness of existing training routes Difficulty in recruiting	OCC, training providers	Short term
Create local network for apprentices in the industry to connect to each other, this is particularly important for under-represented groups.	Skills	Difficulty in recruiting Unawareness of existing training routes	OCC and ZCOP partners	Short term
Create procurement frameworks that prioritise local and sustainable sourcing of materials	Supply chain	Weak supply chain	OCC	Short term
Launch campaigns to highlight career opportunities in the sector, while showcasing success stories to inspire potential entrants.	Skills	Attractiveness of training	OCC, community colleges, training providers	Medium term
Develop a salary support scheme (3 to 6 months) for older apprentices and re-trainers starting their first position with a local company	Skills Supply chain	Attractiveness of training	OCC	Medium term

The Oxford Industrial Cluster needs to act upon key issues to enable supply chain engagement and skills development (2/2)

Recommendations	Skills/supply chain	Barriers Addressed	Relevant Players	Long / medium / short term
Develop a collective procurement scheme to pool orders to reduce both procurement and installation costs	Supply chain	Customer demand Weak supply chain	OCC, ZCOP partners	Medium term
Create a bursary or low/zero cost loan system to assist individuals or companies with the costs of training, MCS accreditation and other administrative tasks	Skills	High costs of business expansion	OCC	Medium term
Leverage projects in social housing, local authority buildings, and ZCOP companies to provide opportunities for new entrants and re-trainers to gain practical hands-on experience.	Supply chain	Difficulty in recruiting staff Customer demand	OCC and ZCOP Partners	Medium term
Local companies to work together with national companies or companies from other geographies to upskill and build confidence in installations	Supply chain Skills	Difficulty in recruiting staff High costs of business expansion	OCC and ZCOP Partners	Medium term
Work with local colleges and local businesses to offer specialist apprenticeships like the Low Carbon Heating Technician course	Skills	Difficulty in recruiting staff Attractiveness of training	OCC, training providers	Medium term
Work with local training providers to ensure that students and junior technicians get hands on experience with low-carbon technology (not just theory)	Skills	Difficulty in recruiting staff Attractiveness of training	OCC, training providers	Medium term
Lobbying for national policy interventions and investments in local manufacturing to strengthen the UK's position in the global supply chain for renewable technologies	Supply chain Skills	Weak supply chain High costs of business expansion	OCC	Long term
Offering incentives such as grants to SMEs exploring domestic manufacturing opportunities.	Supply Chain	Weak supply chain	OCC	Long term
Supporting businesses looking to start or expand their production capacity in low-carbon technologies	Supply chain	Weak supply chain	OCC	Long term

Recommendations

- To achieve significant decarbonisation by 2040, the Oxford Industrial Cluster must address critical barriers in skills and supply, ensuring the city builds a robust workforce and resilient supply chain for the transition.
    - Without **clear customer demand**, many installers remain reluctant to invest time and resources into offering low-carbon services. This challenge is especially pronounced for Oxford's SMEs. Those companies, predominant in Oxfordshire, are small, resource-constrained businesses that often lack the capacity to train, certify, and expand into new technologies.
    - **Attracting new talent** to the sector is essential to bridge the skills gap in the transition. Establishing a local apprenticeship network, highlighting success stories, and promoting demand in the low-carbon sector could strengthen the talent pool. It is crucial to make training programs attractive, with competitive incentives for both young entrants and mid-career retrainers.
    - The transition also depends on **ensuring the availability of equipment**. Currently, fragmented demand from small-scale projects limits Oxford's visibility and attractiveness to suppliers, who tend to prioritize large-scale, aggregated projects.
- In light of these barriers, Oxford City Council and the Zero Carbon Oxford Partnership have an opportunity to drive and scale the net zero transition. Success will rely on Oxford's ability to foster a **collaborative ecosystem of stakeholders**—including industrial leaders, installers, suppliers, training providers, and apprentices.
- By showcasing local demand, stimulating interest, and attracting new entrants to the sector, OCC and ZCOP can enhance workforce capabilities and strengthen the supply chain needed for the transition

Appendix - Case Studies

Your Energy Your Way trainee renewables schemes was launched to meet the skills shortage of low-carbon energy experts

- Your Energy Your Way is an SME installer of heat pumps, solar panels, and batteries, based in Egham, Surrey.
- The Your Energy Your Way (YEYW) training scheme is an initiative aimed at bridging the skills gap in the renewable energy sector, specifically in heat pump and solar panel technologies.
- This program seeks to attract a more diverse pool of technicians, with a particular emphasis on encouraging women to enter the profession. By providing more supportive learning environments, access to a range of role models, and an increased wage, the traineeship hopes to create an alternative path for those wanting to re-train or enter the industry.
- Launched last year, the program focuses on providing comprehensive training to new entrants in the field during a two-years apprenticeships. The program is backed by Samsung who provides training and product awareness but also plays a mentorship role for trainees.
- Upon completion of the course, trainees will undergo peer assessments conducted by YEYW staff and recognized industry professionals to ensure they are fully prepared for industry demands.

Nesta is supporting new installers to advance their heat pump installation skills and increase the uptake in the technology

- Nesta, in partnership with the Scottish and Northern Ireland Plumbing Employers' Federation (SNIPEF), is providing experienced plumbing and heating professionals with the opportunity to install heat pumps in their own homes after completing heat pump training.
- This initiative aims to evaluate whether gaining first-hand experience can accelerate the frequency of retrofit heat pump installations, enhance installer confidence, and attract more customers.
- The participating installers are all members of SNIPEF, operating as sole traders or holding senior positions within very small or micro businesses (fewer than 15 employees). This project is particularly beneficial for installers who struggle to secure their first customers and achieve MCS certification during their initial installations. Many of these professionals often feel uncertain about their practical skills and may harbor doubts about the effectiveness of heat pump technology.
- All participants will undergo training in heat pump installation, including low-temperature heating systems, over the summer. Following the training, 20 participants will be selected for in-home installations and will begin designing their projects, receiving a free heat pump for this purpose. The remaining 20 participants will serve as a comparison group, consisting of newly trained installers who do not receive a heat pump. Nesta will then compare the experiences of both groups of installers to assess the impact of this hands-on training approach.

The Scottish Government MCS Certification Fund is an example of government intervention in the renewable installation skill shortage

- The Scottish Government, in partnership with the Energy Saving Trust, provide **funding towards MCS Certification** for heating engineers looking to install heat pumps.
- The grant awards 75% of the cost of the MCS certification, **up to £1,000**.
- The program will run until **March 2025**
- Awardees must be a small or medium enterprise and have an office in Scotland.

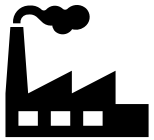
Abingdon & Witney college offers free courses in green skills, accessible to adults living or working within specific Oxfordshire postcodes

- Thanks to the UK Shared Prosperity Fund, Abingdon and Witney College now offers free courses in Green Skills and Care. Funding has been approved by West Oxfordshire District Council to support local skills development in care and expand Green Skills training. Additional funding has also been allocated for South Oxfordshire, Vale of White Horse, and Cherwell, specifically focused on Green Skills courses.
- This initiative provides an excellent opportunity for local residents working in the care, construction, and building sectors to upskill, as well as for newcomers to these fields to gain valuable entry-level experience.
- Courses offered include:
    - BPEC Domestic Air Source Heat Pump Installer
    - Level 3 Award in Domestic Retrofit Advice
    - Unvented Hot Water Systems: Initial Certification
    - Electrical Energy Storage Systems

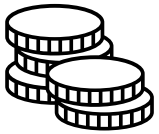
Appendix – Heat Pumps

High temperature heat pumps for industry process heating

Technology: High-temperature air source heat pumps (HTASHP) are designed to deliver temperatures greater than standard ASHPs. They can reach temperatures between 90 and 150 degrees Celsius (a standard AHSP might operate at 35 to 55 degrees).



Use: HTASHP have two primary use cases: industrial processes, district heat systems. HTASHPs can be used in the **food & beverage, chemical, paper and pulp, and textile industries**. The technology is emerging, and primarily serviced by small, specialist companies.



Cost: Industrial grade high temperature heat pumps typically cost €1,000/kW to € 5,000/kW[1]. Government grants, such as the IETF, are available for plants that are looking to electrify their processes. The high efficiency of heat pumps means that the up-front investment will pay for itself.

Skills: HTASHP installation in industrial and district heat settings is highly specialised. For this reason, installation is often carried out by the supplier as part of the purchase.

Supply chains: Multinational companies such as Siemens, Daikin, and Mitsubishi manufacture HTASHPs. Some smaller UK based firms, such as Futraheat, are growing.

1. ECN (2017). Dutch program for the acceleration of sustainable heat management in industry

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