



Opportunities for Swedish companies in the UK heat pump market

Agenda

- **Background and introduction**
- The Swedish heat pump experience
- Executive summary
- UK market analysis





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Introduction

Sustainable Heating and Cooling is a Swedish priority, nationally and internationally.

Transforming heat markets in Europe and globally by introducing more renewables and higher energy efficiency is key for achieving sustainability goals, including climate ambitions and better city environments.

District heating has a 90 per cent market share for heating multiple dwelling buildings in Sweden, while we also find the world's largest share of heat pumps for heating detached houses. District cooling networks are also already established in all major cities in Sweden. Fossil fuels have almost entirely been phased out from heating and cooling in Sweden.

The Swedish Energy Agency, in collaboration with Business Sweden and Sweheat&Cooling, is leading the Sustainable Heating and Cooling by Sweden program.

The program comprises of 45 Swedish suppliers of technology and services to the heating and cooling markets, including heat pumping technologies.

The purpose of this report is to give an overview of the UK and French markets for heat pumps, primarily in the commercial and industrial segments. The report identifies policy drivers, as well as inhibitors, for heat pumps in the respective markets.

The report is intended as a supporting document for the members of the SHCbySweden platform with the aim of identifying possible pathways for Swedish companies to enter these markets. It could also serve as an introduction to the Swedish know-how and development for stakeholders abroad.



The report sets out to better understand the conditions and opportunities in France and UK for Swedish companies within the heat pump industry

- On local, national and supranational levels, the world is going through an energy transition to bring down CO₂ emissions.
- The growing need for cooling and thermal comfort is a substantial contributor to greenhouse gases globally: the operational emissions from the buildings-sector represent approximately 28% of total carbon emissions in the world. As such, the transition to clean and renewable energy technologies within the sector is vital to bring down emissions and meet future energy needs.
- Heat pumps present a way to achieve both of these objectives
 - With heat pumps, the typical energy required for heating can be cut by four or more, optimising both economics and CO₂ emissions.
 - Renewable electricity, such as solar PV, wind and wave power can be integrated in the electricity grid to enable a larger share of renewable power input
 - Heat pumps make it possible to use very low temperatures (below 45 °C) in the district heating grid and can also minimise grid losses in the district heating grid
 - Together with energy storage, heat pumps can act as a balancing technology when electrical production fluctuates
- Sweden is a frontrunner in the heat pump industry. Although developments were initially driven by low electricity prices; today, the technology is widely implemented thanks to the multiple benefits it offers.
- The following report sets out to better understand the conditions and opportunities in France and the UK for Swedish companies within the heat pump industry.

This report focuses on heat pump developments within

- Large-scale heat pumps (exceeding 100kW).
- Industrial heat pumps.
- Heat pumps in district heating and cooling systems (often referred to as 5th generation district heating).
- *Note that report statistics illustrate the total heat pump stock on the designated market and could not be limited to the scope of the report*



Source: Heat Pumping Technologies by IEA, Nordic Energy Research, Business Sweden analysis

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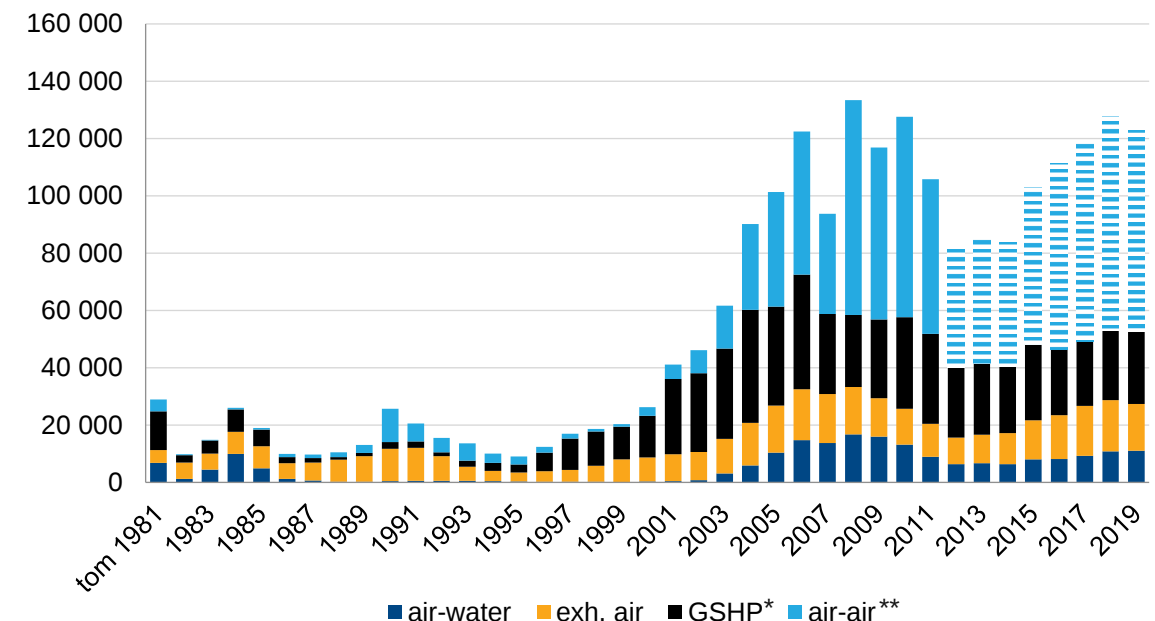


Historical events and favourable environmental conditions initiated and maintained the growth of heat pumps in Sweden

A short history of the Swedish heat pumps market

- The oil crisis in the 1970's was the catalyst for Sweden's transition from oil fuelled heating systems. Many nuclear power plants began operating at this time, resulting in declining electricity prices while oil prices were increasing. Electric heating became popular as consumers looked for alternatives to their oil furnaces.
- However, the government wanted to ensure that electricity was used efficiently so research funding was made available to develop solutions that would decrease energy use, such as heat pump technology. The cold climate and long heating season in Sweden present high energy savings opportunities with heat pumps.
- Today, Sweden has by far the highest penetration of heat pumps per capita in the world, with sales reaching approx. 123 000 units in 2019. Although mainly utilised by households, heat pumps are also widely used in district heating systems in cities where suitable heat sources are available.
- A CO₂ tax on fossil fuels, low and stable electricity prices, as well as a large heat demand has driven the strong growth in heat pumps in Sweden over the past 40 years. Financial incentives in the form of subsidies have also been provided by the government to encourage the transition from oil boilers and electric heating, favouring solutions such as heat pumps.
- The Swedish Energy Agency has played an important role in the transition through R&D programmes, capacity building, and end-user information about heating and cooling solutions.

Heat pump sales in Sweden 1982-2019, units



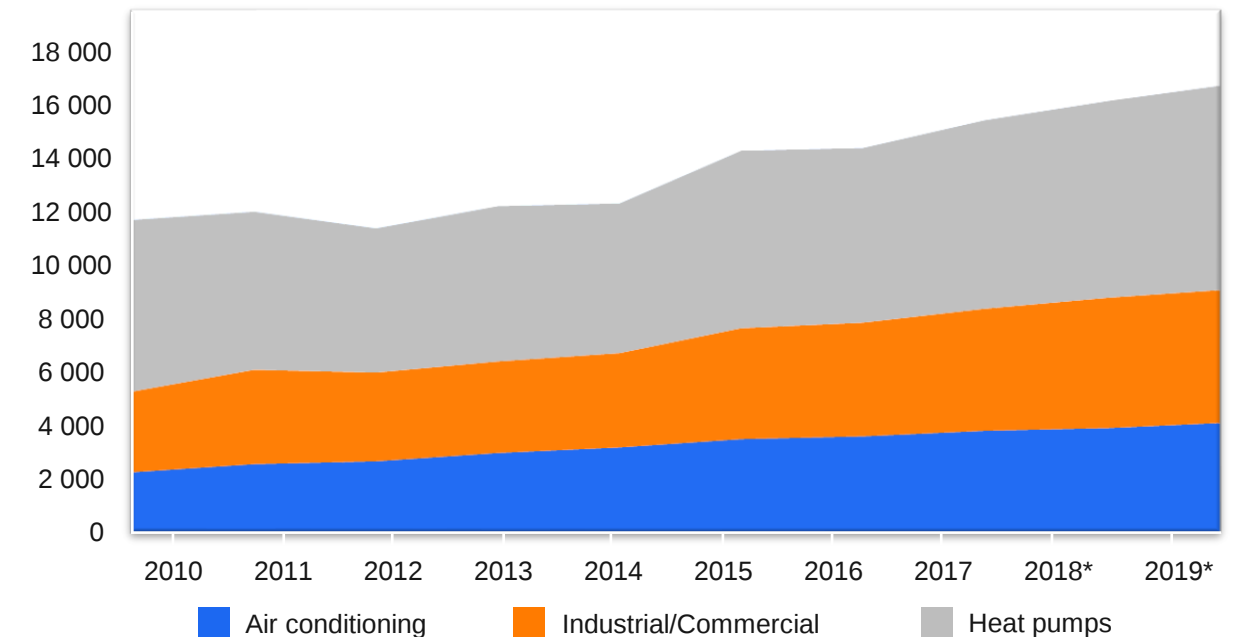
Source: Swedish Refrigeration & Heat Pump Association, IEA country report Sweden * Ground source heat pumps **Air-air HP striped sales figures are estimations

Industry collaboration, the development of innovative solutions, and regulatory competence among technicians has made Sweden an industry frontrunner

The Swedish heat pump industry today

- Industry collaboration has been instrumental in creating the solutions of today.
 - Multiple suppliers and installation technicians must often come together to implement commercial heat pumps solutions, which has created collaborations and innovative combinations of solutions.
 - Buyers can today purchase complete system solutions for their needs without having to turn to several suppliers and service providers.
- Sweden has become a frontrunner in energy efficiency and reducing environmental impact. Heat pumps integrated in district heating and cooling systems, and large-scale heat pumps for large buildings, have been developed as a result of extensive industrial experience and technology competence within the industry.
- Industry regulations, including the phase out of ozone depleting substances under the Montreal protocol, were implemented early in Sweden due to the widespread use of heat pumps. As a consequence, many European regulations have been based on the Swedish framework.
 - Today, Sweden remains a country with one of the strongest regulations in Europe, making Swedish installation companies experienced in adhering to regulations on national and EU level.
 - The increasing demand for both cooling and comfort heating has resulted in installation companies becoming competent in both heating and cooling systems.

Annual sales of heat pumps, MSEK



Examples of Swedish heat pump suppliers



Source: Heat Pumping Technologies by IEA, Swedish Refrigeration & Heat Pump Association, Statens Energimyndighet

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UK overview



EXECUTIVE SUMMARY

- The UK heat pump market is still very much in its infancy, but with recently announced ambitions from the government and the policies to support those ambitions, the market is expected to grow rapidly in the coming years.
- At the end of 2020, the government announced the target to increase heat pump installations from 37,000 to 600,000 annually by 2028. A range of financial incentives are in place to support this transition, with additional regulation proposed for introduction.
- Air-source heat pumps are by far the most commonly installed type. Currently, heat pump sales occur predominantly for a domestic setting, i.e. homes, with sales for commercial and industrial settings comprising a tenth of the market value.
- In the deployment of heat pumps in the UK, the gas grid constitutes a major challenge. The majority of buildings are connected to the gas grid, where the heating systems are often incompatible with low-temperature heating technology like heat pumps
- In the short term, however, there are about 5 million buildings for which heat pumps are deemed to be the most effective low-carbon option. Additionally, ambitious objectives for new property developments will result in more buildings which are prime candidates for heat pump deployment.
- Swedish equipment and service providers have an opportunity to leverage their strengths to establish a firm position ahead of expected market growth in the UK

Agenda

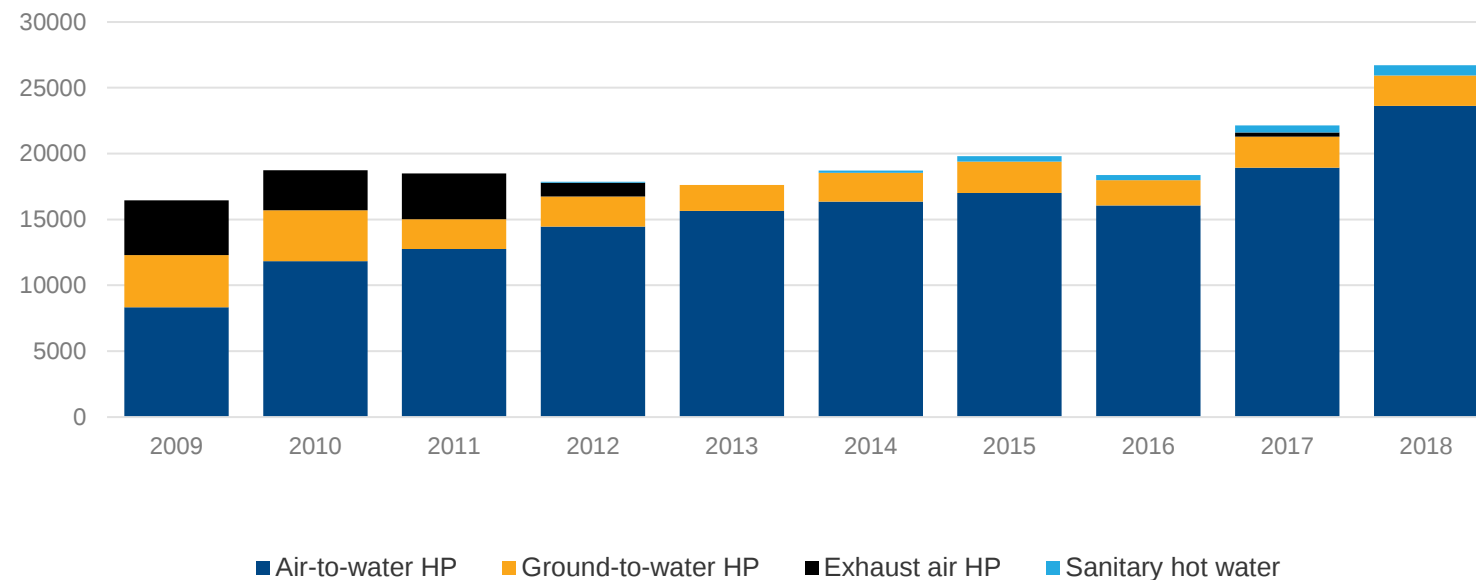
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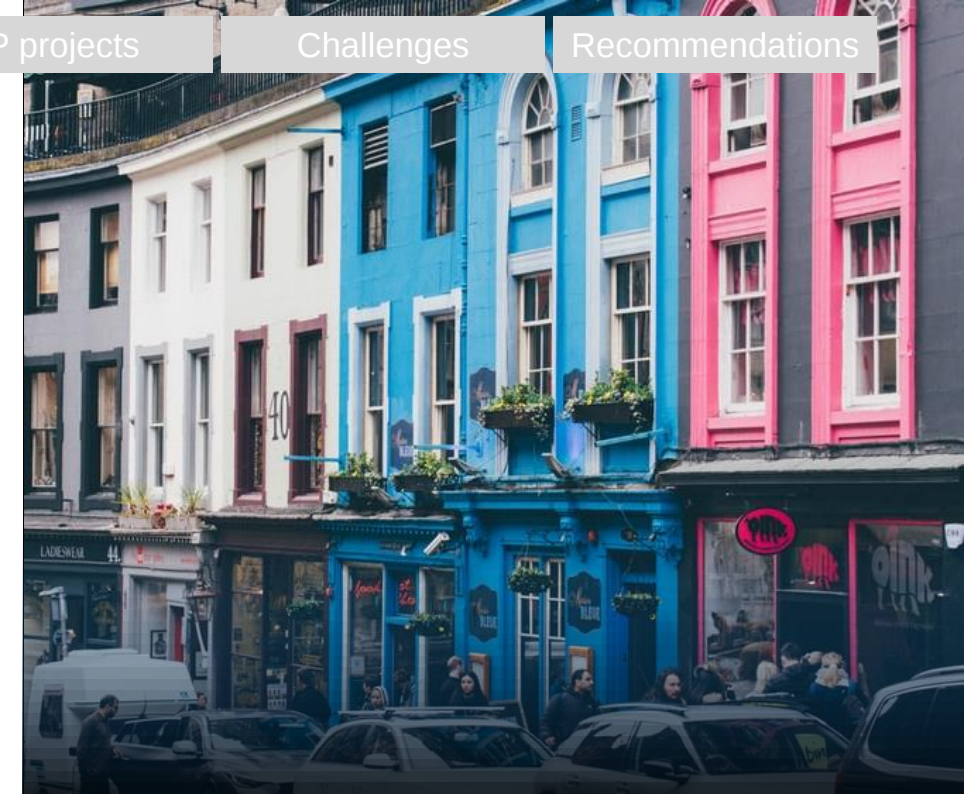
The UK heat pump market is dominated by air-source heat pumps aimed at the residential building sector

- Most recent statistics from the EHPA, stated that in 2020; the UK had an installed base of **264,000** heat pumps that collectively generated **4.3 TWh** of renewable energy and saved **1.1 Mt CO₂**.
- 37,000** heat pumps were sold in 2020 (a **9.2%** increase compared to 2019). **Air-source heat pumps** are by far the dominant type, comprising approximately **90% of units sold**.
- The UK heat pump market value in 2020 was ca. £100 million. Around **90%** of the heat pump market value can be attributed to the residential building sector, with around **40%** in new builds and **60%** in retrofits.
- For the 10-year period leading up to 2018, **heat pumps connected to district heating represented a very small part of the composition**, EHPA reported these sales as zero.

UK 2018: units sold by heat pump type



Source: EHPA, BEIS, Business Sweden Interviews



Heat pumps in the UK - key facts (2020)

Installed base:
264K units

Renewable energy
production:
4.3 TWh

Growth:
9.2%

Emissions savings:
1.1 Mt CO₂

The government has set ambitious targets for carbon emissions reduction and heat pump deployment

UK objectives for carbon emission reductions and heat pumps

78%

Carbon emissions in the UK should be reduced by 78% by 2035 compared to 1990 levels. In 2020, carbon dioxide emissions from fossil fuels had decreased by 46.4% compared to 1990 levels, mainly achieved through the shift away from coal

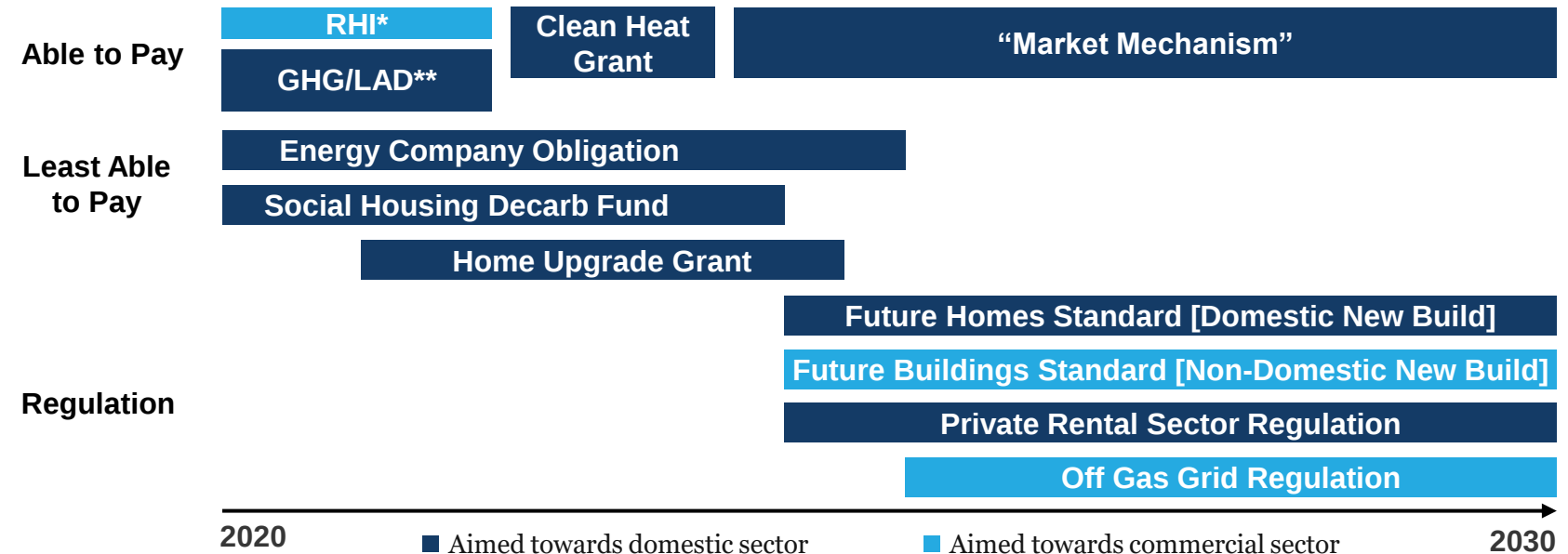
20%

Roughly 20% of UK heat will need to come from heat networks by 2050 if the UK is to meet its carbon targets cost effectively

600K

The Ten Point Plan for a Green Industrial Revolution outlined the UK government's plan to enable heat pump installations to increase from 37,000 installations a year in 2020 to 600,000 installations a year by 2028

A mix of policies consisting of grant funding and regulations have been or will be introduced to stimulate heat pump deployment



"Given that heating is responsible for a third of our emissions, it's essential that we reduce those emissions quite rapidly. To meet our net-zero target will require virtually all our heating of buildings to be completely decarbonised by 2050, and likely even sooner"

(BEIS, 2021)

The government has implemented financial incentives for those who are “Able to Pay”, with plans for additional incentives in the future

Renewable Heat Incentive

• Description:

- The Renewable Heat Incentive (RHI) is a financial support programme that provides incentives for consumers to install renewable heating systems. Consumers receive quarterly payments for the amount of renewable heat their system produces
- The RHI consists of two parts– the domestic RHI and the non-domestic RHI. The domestic RHI is open to homeowners and landlords. The non-domestic RHI was open to commercial, industrial, public, not-for-profit and community generators of renewable heat, but closed in 2021
- BEIS is currently working on successor mechanisms with funding and support for non-domestic consumers

• Funding and duration:

- The domestic RHI budget cap for 2021/22 is £155m
- The non-domestic RHI closed to new applicants on the 31 March 2021

Green Homes Grant / Local Area Delivery

• Description:

- The Green Homes Grant (GHG) scheme provided grants for energy efficiency improvements in homes
- The Local Authority Delivery (LAD) scheme was launched in 2020 with £500m committed to energy efficiency and low carbon heating projects for low-income households
- The GHG scheme has now blended seamlessly into the LAD scheme, with local councils delivering heat pumps at scale for compensation

• Funding and duration:

- The LAD scheme is being delivered in three phases:
- Phase 1A: £74 million allocated to upgrade 10,000 homes by June 2021
- Phase 1B: £126 million allocated to upgrade 15,000 homes by September 2021
- Phase 2: £300 million allocated to upgrade 30,000 homes by December 2021

Clean Heat Grant

• Description:

- BEIS will introduce the Clean Heat Grant to provide an upfront grant to cover some of the costs of installing heat pumps in domestic settings

• Duration:

- The Clean Heat Grant is currently under consultation but will likely be introduced in the spring of 2022

“Market Mechanism”

• Description:

- In the long-term, the ambition is to move into what is currently referred to as the Market Mechanism
- It will be a market-led incentive where there is likely to be an obligation on heating appliance manufacturers’ sales, where a particular percentage needs to be from low carbon alternatives

The government has further implemented financial incentives for those who are “Least Able to Pay”, to ensure decarbonisation of buildings across the economy

Energy Company Obligation

• Description:

- The Energy Company Obligation (ECO) is a scheme to help improve energy efficiency and reduce CO2 emissions for low-income households or vulnerable consumers
- The scheme was first introduced in 2013 and has since then been run in several iterations
- Under the scheme, obligated medium and large gas and electricity suppliers can install energy saving upgrades and carbon emission reduction measures in premises that have been declared eligible by local authorities

• Funding and duration:

- Expansion of the ECO scheme was announced in the government’s Fuel Poverty Strategy for England in 2021
- The ECO scheme will run from 2022 to 2026 with a spending commitment of £1b per year, up from £640m previously

Social Housing Decarbonisation Fund

• Description:

- The Social Housing Decarbonisation Fund (SHDF) is a commitment by the government to decarbonise socially rented homes with poor energy efficiency
- As part of this, the SHDF Demonstrator was launched to start decarbonisation of social housing during 2020/21
- The Demonstrator project is a first investment to catalyse innovation and gain knowledge for further investments
- Following the launch of the SHDF Demonstrator in October 2020, £62m in funding was awarded to 17 local authorities for 19 projects

• Funding and duration:

- In the 2021/22 financial year, funding of £60m has been committed for the SHDF
- The government’s wider financial commitment to the SHDF comprises £3.8b of funding, likely to be distributed over four waves in the next decade

Home Upgrade Grant

• Description:

- The Home Upgrade Grant (HUG) was announced in the government’s Ten Point Plan in November 2020
- HUG is aimed to support low-income households by upgrading the energy efficiency of poorly performing properties off the gas network in England
- The funding intends to enable the installation of multiple measures in these homes to substantially improve performance

• Funding and duration:

- The HUG scheme is scheduled to commence delivery in early 2022
- The financial commitment to the scheme is set to £150m

The government has plans for various regulations which will govern both the domestic and commercial side of heat pump deployment

Future Homes Standard [Domestic New Build]

• Description:

- The Future Homes Standard will require newly built homes to be future-proofed with low carbon heating as well as high levels of energy efficiency
- The government has confirmed that building regulations will be changed to enable the Future Homes Standard to deliver homes that are zero-carbon ready
- Heat pumps are expected to become the main source of heating for the majority of new homes'

• Introduction:

- The new regulations of the Future Homes Standard will be introduced in 2025
- Consultation on the technical specification of the Future Homes Standard will take place in 2023
- Legislation will be introduced in 2024, ahead of implementation

Future Buildings Standard [Non-Domestic New Build]

• Description:

- Building on the Future Homes Standard, the Future Buildings standard is focused on non-domestic buildings as well as existing residential buildings
- Similar to the Future Homes Standard, the Future Buildings Standard is intended to deliver non-domestic buildings using low-carbon heat with high energy efficiency
- The regulations will likely require consumers to install heat pumps in commercial new builds

• Introduction:

- Consultation on the proposed regulation have recently closed, and the standard will likely to be introduced in 2025
- Following the closing of consultation, 21 environmental and construction organizations signed a joint letter to the Ministry of Housing Communities and Local Government, to raise shortcomings of the Future Buildings Standard

Private Rental Sector Regulation

• Description:

- Regulations for the private rental sector is under review, aimed to improve the energy performance of privately rented homes

• Introduction:

- No date for the introduction of new regulations has been officially announced

Off Gas Grid Regulation

• Description:

- The Off Gas Grid Regulation will target homes and businesses off the gas grid with regulation that will essentially force them to install low carbon heating measures

• Introduction:

- The regulation is aimed to be introduced in 2026, but it is subject to consultation

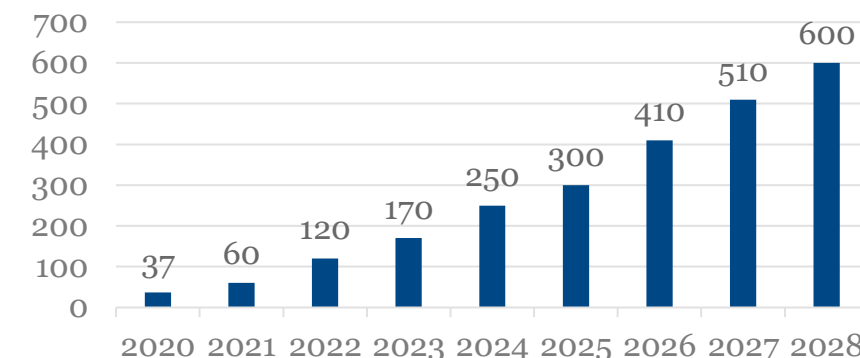
Source: BEIS, National Housing Federation, The Energyst, Business Sweden Interviews

The government will prioritise new build homes in the deployment of heat pumps, followed by properties off the gas grid, and lastly on gas grid buildings

To meet the net-zero targets, heat pumps will need to be deployed rapidly

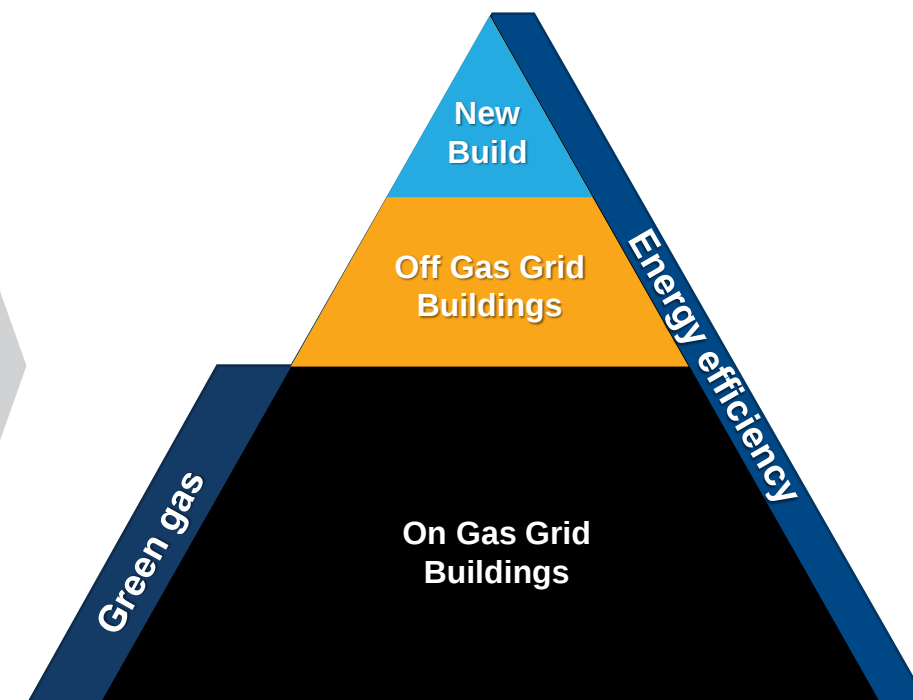
- The UK government has set a target to achieve net-zero for 2050, which will require an acceleration of decarbonising heat in buildings
- Heat pump deployment will be central in achieving that target, and will likely see an acceleration in the coming years given the ambitions outlined by the Ten Point Plan for a Green Industrial Revolution
- The trajectory to the right illustrates the ramp-up of heat pump deployment targeted by the UK government, from roughly 37,000 in 2020 to 600,000 in 2028

Desired trajectory of heat pump deployments ('000)



The government is focusing their efforts to decarbonise homes hierarchically

- The strategy can be described as a top-down pyramid based on lowest-cost, least-regrets options
- The top focus is on newly built homes, where the UK government aims to deliver 300,000 new homes annually from the mid-2020s. Given the lower heat demand of new homes, heat pumps are deemed to be well suited and are estimated to be installed in around 200,000 to 250,000 properties
- The second priority is to decarbonise homes and business off the gas grid, which number roughly 5 million. The government has committed to phasing out high carbon heating in 1.3 million buildings off the gas grid during the 2020s, with heat pumps seen as the most cost-effective solution
- The biggest challenge is represented in the 24.5 million buildings on the gas grid, for which the best solutions are yet to be determined. There is a wide range of options considered, including the use of heat networks, heat pumps and hydrogen, the latter of which requires further evidence of viability
- Heat networks are likely to have a role in densely populated areas while heat pumps are more likely to be deployed in more rural or suburban areas





Government objectives largely drive heat pump uptake, with low running costs an added incentive

Drivers

Description



Technology Readiness

- Heat pumps are a very mature technology compared to other alternatives for green heating, though the UK has lagged behind in terms of implementation
- There is still room for improvement in the supply chain, where increased product compatibility between heat pumps and e.g. smart controls and thermal stores along with better installation can strengthen the heat pump offer



Government objectives

- To support the target of achieving 600,000 heat pump installations annually by 2028, the government has introduced subsidies and other measures to accelerate heat pump uptake
- Besides financial support, skills development is a key focus area for the government, with an emphasis on training installers



Innovation

- The government is focused on supporting the heat pump industry through innovation funding and programmes
- In late summer 2021, a multi-million funding pot will likely be launched to overcome some of the barriers facing the industry by developing e.g. higher temperature heat pump models and thermal batteries which would increase flexibility in the heating system



Low running costs

- Given the efficiency of heat pumps, particularly air source heat pumps for which the heat output can be much greater than the electricity input, running costs are low compared to other heating options
- It is especially beneficial for buildings currently using electric heating to switch to heat pumps, while savings from switching from gas are modest



High costs due to skills shortages and grid upgrades prevent heat pump adoption

Inhibitors

Description



Electricity grid readiness

- Ensuring that the electricity networks can meet the demand cost effectively is a challenge in the UK
- In order to accommodate a heat pump, commercial stakeholders face the cost of upgrading their network connection
- BEIS will conduct a survey for non-domestic buildings in 2021, which will determine the need for additional funding support for upgrading electricity connections to install heat pumps in commercial buildings



Skills shortage

- Given the legacy of the gas boiler system, there is a large skills shortage in the UK heat pumps installation sector
- There are about 3,000 – 4,000 heat pump installers in the UK, compared to over 130,000 gas boiler installers
- The limited number of installers have also driven up installation costs, while quality is sometimes lacking or inconsistent



Lack of regulation

- While there are technical standards, or guidelines, for the installation and the products for domestic installation of heat pumps, regulation in terms of technical standards is lacking for the commercial setting
- This is a dilemma, as regulation can help ensure consistency of quality but at the same time put bureaucratic pressure on the still somewhat immature heat pump market



High cost of installation

- Installation and design is more expensive in the UK than in Europe, with estimates stating a 20% higher cost than the average across Europe
- This is partly driven by the fact that heat pumps are still a new technology in the UK, but also because of resistance from installers who come from a gas boiler or CHP background

Several district heating projects implementing air, water or ground source heat pumps are progressing in the UK

1 Plymouth

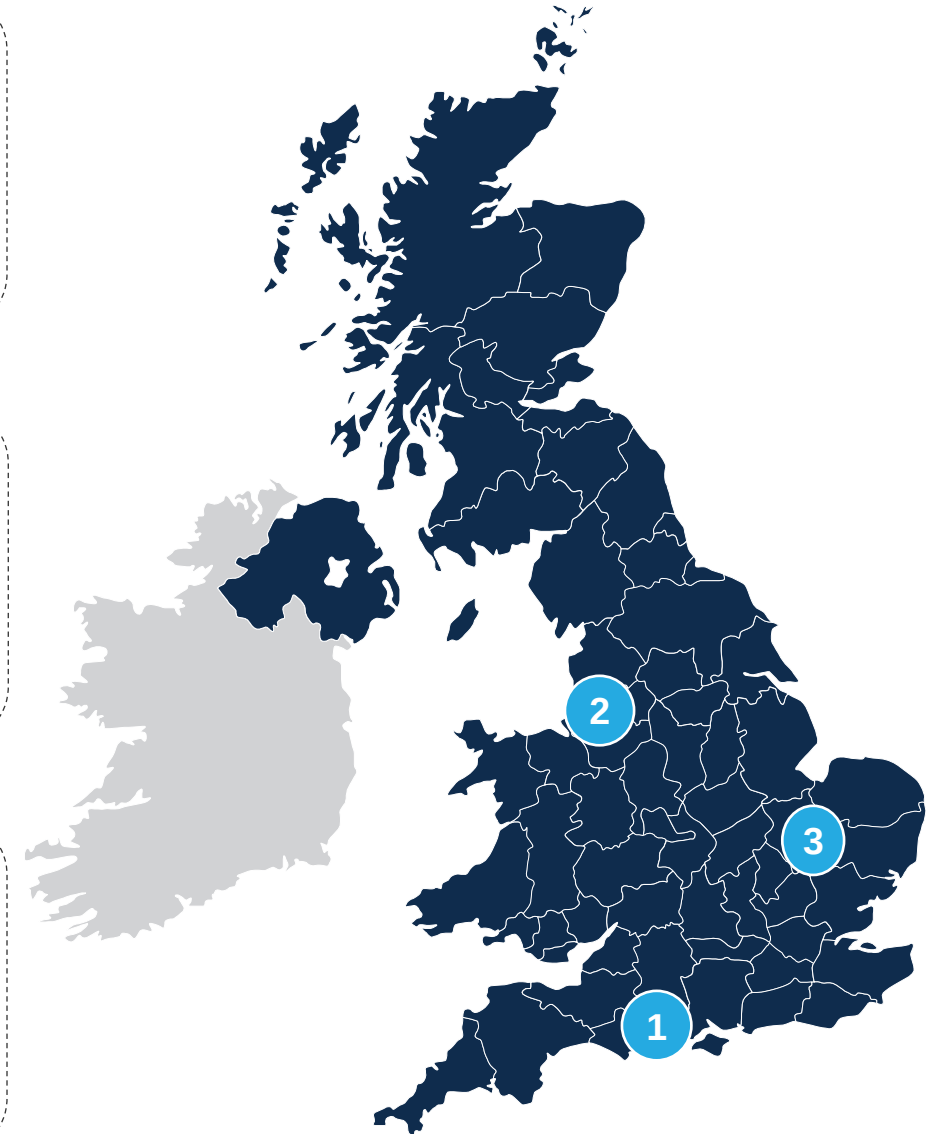
- Plymouth, a town on the south coast, are deploying a 5th-generation heat network with heating and cooling provided by heat pumps.
- The scheme will utilise renewable heat from a 'principal aquifer' in the underlying limestone across this area of the City via water source heat pumps. The future phases may also link to marine source heat pumps.

2 Liverpool

- A new facility is being developed in Liverpool which will be connected to the Mersey Heat Network
- The new facility will provide the Mersey Heat Network with heat through the use of water source heat pumps and thermal stores. Two 3MW water source heat pumps will absorb heat from the Leeds/Liverpool canal before distributing it back into the system

3 Cambridgeshire

- The village of Swaffham Prior in Cambridgeshire has been awarded £3.2m of HNIP funding to develop a community heat network
- The heat network will combine a ground source heat pump and an air source heat pump powered by solar panels to heat 300 properties in the village.
- The project could serve as a best practice blueprint for community heating in the UK



Challenges for UK operators and opportunities for equipment manufacturers

Key challenges for UK operators

Lack of effective financing models

Many of the larger energy operators and the ESCOs who manage their heating infrastructure are struggling to achieve effective financing models for low-carbon heating, both for large and small non-domestic through to domestic consumers



Opportunities for equipment and service providers

- **Future-proof technology** for alternative financing models. As energy operators look to innovate their financing models through e.g. **Heat-as-a-Service**, **asset leasing** and **shared ground loops**, the technology used should be able to accommodate different approaches

High upfront and installation costs, and low quality

The UK has not seen the needed increase of qualified heating installers in the market, resulting in a lack of competition needed to drive down costs and drive up quality



- **Invest in capability development** to capture market share by offering installation with consistent quality at a lower cost
- As the UK heat pump market is set to take off, competition is likely to increase which will drive down costs

Import-reliant supply chain of heat pumps

The UK is heavily reliant on heat pump imports to satisfy the current demand, with approximately 70% of UK heat pumps currently imported. Regardless of future demand, imports are expected to continue to account for a large share of units sold



- **Establish local presence** and build relationships with key stakeholders
- Given the small number of qualified heat pump installers, efforts, **initiating partnerships** with the right installers is key to ensure a competitive offering

Inter-system compatibility

The gas grid constitutes a major challenge because the heating systems, e.g. radiators, are designed to operate at higher flow temperatures, whereas heat pumps work best at lower temperatures



- **Develop and offer standardised solutions** that are compatible with the underlying infrastructure
- **Ensure compatibility** with other, complementary technologies such as smart control systems and digital tools for monitoring and automation of processes

Recommendations for Swedish companies

KEY RECOMMENDATIONS FOR SWEDISH COMPANIES

Leverage knowledge and establish local partnerships with skilled installers

1.

- The current shortage of skilled heat pump installers and the lack of regulations in the UK has resulted in inconsistency in the quality of installations. This, combined with an historical lack of technical know-how has caused prohibitively high upfront installation costs.
- Swedish equipment and service providers can leverage their knowledge and their native quality standards frameworks to bring an improved offering to the UK market.
- Establishing close partnerships with key installers in the UK is important to facilitate knowledge exchange and to reduce the gap in quality between the markets, which could increase UK heat pump sales and uptake.

Future-proof and adapt the technology offering to match local demands

2.

- Heat pump compatibility with the underlying infrastructure as well as with adjacent technologies is key, both in terms of current and future demands.
- If heat pumps are to play a role in decarbonisation in off-gas-grid buildings in the future, they would potentially see increased adoption if there is compatibility with the higher flow temperatures of existing gas heating systems. Hybrid heat pumps for the gas network are also likely to increase in demand in the coming years
- Swedish equipment suppliers should invest in product development to ensure future competitiveness

“

The expected growth in the market is likely to lead to increased opportunities for companies in Sweden. Even if we have an expectation of UK manufacturing increasing, there is likely to be a significant and growing market for imports of technology.

BEIS

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One of the key issues we have is that because of the high penetration of gas and oil boilers, and because all the heating systems are designed to operate at high flow temperatures above 80C, they are generally incompatible with low temperature heating systems like heat pumps

BEIS

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Recommendations for Swedish companies

KEY RECOMMENDATIONS FOR SWEDISH COMPANIES

Develop holistic offerings for the commercial sector

- Expertise in turnkey solutions is demanded by UK manufacturers and operators, and could increase heat pump uptake through easier deployment.
- A holistic offering where different stakeholders of the value chain collaborate to bring the system to the market would reduce inefficiencies in design and installation.
- Swedish equipment and service providers could greatly benefit from collaborating with other companies in the Swedish heat pump eco-system and local UK stakeholders to bring ready-to-use solutions for the commercial sector.

“Manufacturers of commercial appliances typically don’t have the same capabilities or finance behind them as manufacturers of domestic appliances. Because of that they tend to focus more on manufacturing rather than design and installation or turn-key solutions.”

BEIS

Establish a firm market position ahead of expected growth

- Given the UK government’s ambitions for heat pump deployment, and the proposed regulations for newly built properties, the market is set to take off
- Developing close relationships with property developers, energy operators and the wider heat pump industry is key to capturing the expected growth in the market
- The UK market for heat pumps is only just beginning to ramp up, presenting the opportunity for Swedish suppliers to establish themselves within the supply chain

“At the moment, there is significant interaction with Sweden in the supply chain. There is also a lot of opportunity in the supply chain for Swedish companies to grow their market share.”

BEIS