
Decarbonisation of Heat Strategy

Our Updated View

April 2022



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Foreword

Climate change is the greatest challenge facing our generation. In July 2019, the UK became the first major global economy to legally commit to achieve 'Net Zero' emission of greenhouse gases by 2050. The heating sector in the UK accounts for almost one third of its annual carbon footprint. The decarbonisation of heat, whilst difficult, is therefore critical to meeting these commitments and mitigating the otherwise devastating impact of climate change on society.

We are excited to share our new strategy to facilitate the transition to decarbonised heating and cooling in support of the UK's Net Zero targets.

The need to decarbonise the provision of heating and cooling in the UK is beyond doubt and poses significant challenges given its complexity and the potential disruption for our customers. We are crystal clear that it will be a failure on our part if our customers are not able to connect low carbon technologies, such as heat pumps, quickly and easily.

During this period of transformational change, we will ensure that our industry-leading standards for reliability and customer service are not only maintained, but improved. Furthermore, to retain the confidence of our customers for the Net Zero transition, we will achieve all of this at the lowest possible cost. We will also continue to protect our vulnerable and fuel poor customers so that no-one is left behind by the energy transition. Given the cost-of-living crisis, and rising energy costs, this is more important than ever.



*We currently anticipate a **26-fold increase** in heat pumps from 27,000 today to 712,000 by 2028*

No strategy can claim to have all the answers worked out for a transformational change for which there is no precedent globally. Indeed, the nature, scale, pace and timing of this transformation remains the subject of significant uncertainty. The Government's heat policy is still under development, and the role of hydrogen will not be clear until at least 2026. The future demand for heat pumps is also unclear, although we currently anticipate a 26-fold increase in heat pumps from 27,000 today to 712,000 by 2028. What is clear, is that the electrification of heat will play a core role in any decarbonisation pathway.

As a network company, we therefore need to be demand-driven and able to adapt quickly as circumstances change and the needs of our customers become clearer. This strategy therefore focuses on how we can prepare for the decarbonisation of heat; continue to innovate; and learn from our customers and stakeholders, so that when our customers are ready to transition, we are able to help them make the right choice for them.



Engaging with our customers, our communities, and stakeholders is vital, not only to inform our understanding of their future needs, but to build public support and understanding for this difficult change.

We were the first UK electricity network operator to release a standalone Heat Strategy, which was published in March 2020, and served as an open and live consultation. This has formed the foundation for further customer and stakeholder engagement – we have engaged with over 1,500 different stakeholders and groups. In this new strategy, we take account of both the valuable feedback that we have received and the new market intelligence, data and Government guidance available. We also adopt a whole system and whole building approach to find balanced solutions that save energy, are cost efficient and maintain a comfortable and healthy environment for our customers. This is why our strategy now includes cooling and has a strong focus on improving the energy efficiency of buildings. This new direction has been validated by an expert forum of key external stakeholders in the heat space.

Our primary focus is on our customers and their experience of our services throughout the energy transition. As such, in order to ensure a smooth and low cost energy transition, we will:

- Inform and shape the debate with evidence backed data and insights.
- Give customers options and impartial support to decarbonise through whole system planning.
- Provide a reliable cost efficient network with streamlined processes.

Engaging with our customers, our communities, and stakeholders is vital, not only to inform our understanding of their future needs, but to build public support and understanding for this difficult change. Such engagement is an ongoing process. Understanding and awareness of the implications of the energy transition will evolve as forecasts are replaced by reality. Indeed, given the range of uncertainties around the future path of the energy transition, a process of ongoing engagement is essential for all parties, so that we can adapt together as the situation evolves.

We continue to innovate to make our service more reliable, more affordable, easier to connect, cleaner, and safer. We are encouraged by the progress we have made to date but are committed to going further and making sure that we are well positioned to face the challenges ahead.

Our Decarbonisation of Heat Strategy is therefore ambitious, with real, tangible actions that are consistent with our RIIO-ED2 business plan, which we published in December 2021, and sets out actions for the regulatory period from 2023 to 2028. However, we know that strategies that seem ambitious at the time can be rapidly eclipsed by events. As a result, we are committing to issue an updated Heat Strategy at regular intervals.

Please continue to get in touch – innovation@ukpowernetwork.co.uk – share your ideas with us, challenge our approach, and continue to hold us to account.



Our starting point

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The Net Zero challenge

The UK Government's legal commitment to achieve 'Net Zero' greenhouse gas emissions by 2050 is ambitious, but necessary. Heat is an integral part of our quality of life: we rely on it for both our health and our comfort. It is quite literally embedded into the fabric of our homes. However, it is also a major source of greenhouse gas emissions.

The heating sector in the UK accounts for almost one third of our annual carbon footprint. The decarbonisation of heat, whilst difficult, is therefore critical to meeting our commitments and mitigating the otherwise devastating impact of climate change on society. However, there is a general lack of public awareness and knowledge about the contribution of domestic heating to the UK's carbon footprint and what its required decarbonisation will involve in terms of cost and disruption. This lack of awareness is driven, at least in part, by uncertainty in decarbonisation pathways. For example, the Government is continuing to explore hydrogen as an option through research and trials with a firm decision on its role expected to be made by 2026.

The scale of the heat decarbonisation challenge in the UK is exacerbated by the fact that the UK's housing stock is one of the oldest and worst insulated in Europe with heat loss estimated to be up to three times faster in the UK than for some of our European neighbours¹. This directly affects energy consumption and costs, increasing the need for energy infrastructure and resulting in higher bills for customers. For customers in vulnerable circumstances, poor thermal efficiency will mean that many are unable to switch to low carbon heating without any additional support.



1. Tado study between Dec 2019 and Jan 2020 in 80,000 homes found compared to some Western European neighbours that UK homes lose heat up to three times faster. UK homes losing heat up to three times faster than European neighbours | Press Release (tado.com)

Who we are

We are UK Power Networks, the electricity distributor for London, the East, and South East of England. Our three network licence areas deliver power to 8.4 million homes and businesses across an area of 29,250 square kilometres, serving 19 million people (29% of Great Britain's population).

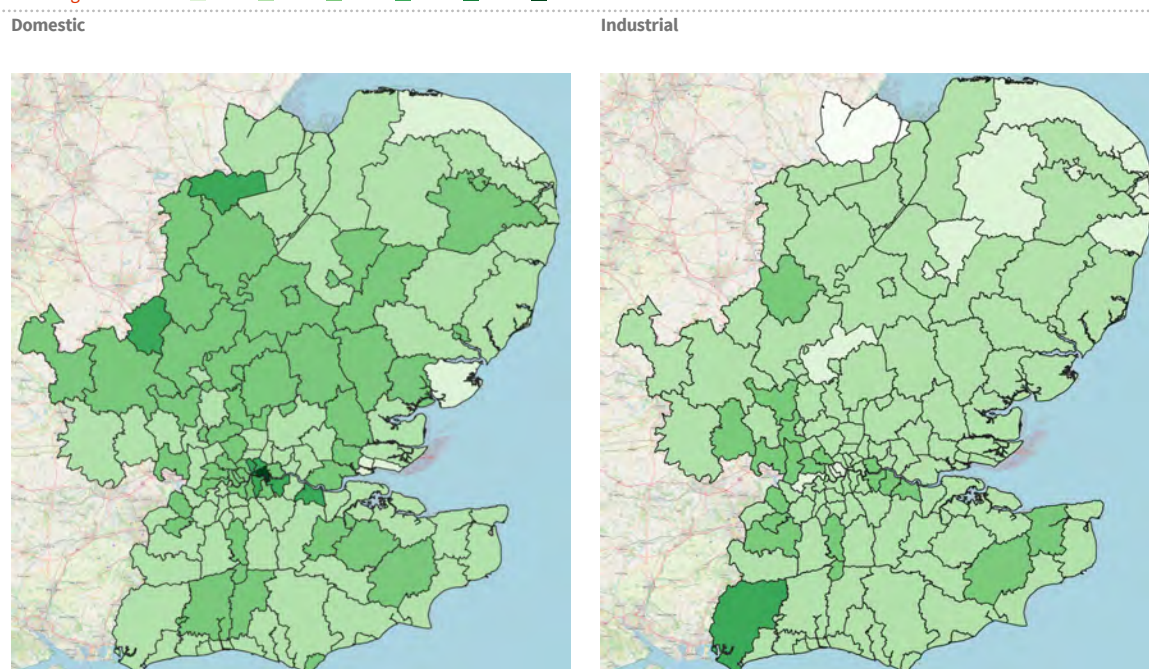
The buildings in our region have a total thermal energy demand for space heat and hot water of 119TWh, which is equivalent to 37% of the UK's total 2019 electricity generation. There are 7.88m residential buildings (a mix of on and off-gas grid multi-dwelling, high-rise, and individual properties) which is ten times the number of non-domestic properties (777,000). However, the floor area and heat demand per building is significantly larger for non-domestic buildings, so the difference in heating demand between domestic and non-domestic properties is less stark: with 74% and 26% of the total annual space heat and hot water demand in our licence areas, respectively.²

Approximately 60% of the buildings in our region have an EPC rating of D or below, which broadly reflects the national average EPC distribution.³

While all sectors will need to decarbonise to reach Net Zero by 2050, some sectors, such as electricity generation and transport, have made more progress than others. Our involvement in facilitating the decarbonisation of these sectors; by connecting distributed generation, and providing the network capacity required by electric vehicles; means that we have been facilitating the energy transition from the beginning. With our role in renewable energy and electric vehicles now well established, we are working towards the next big challenge – the decarbonisation of home heating and cooling.

Figure 1

Percentage of domestic and non-domestic buildings achieving an EPC of C or higher
Percentage of buildings with EPC \geq C: 20-29 30-39 40-49 50-59 60-69 70-100



2. UKPN_Heat_Street_DRAFT_250121 (ukpowernetworks.co.uk)

3. Approximately 61.4% of properties across the UK are EPC rated D and E. F and G rated properties total approximately 4.3% of all UK properties. Data based on the CCC 6th Carbon Budget, with original source BEIS housing Statistics (2019)

Heat Street project

Identifying pathways for the uptake of energy efficiency and low carbon heat

Heat Street was a first of its kind research project to help communities map out their Net Zero carbon future at a street level. The project, developed in direct response to uncertainty in decarbonisation pathways, took a data-driven and stakeholder-informed view of the future to support local authorities and community energy groups in forecasting and planning for the future deployment of energy efficiency and low carbon heat solutions in localised zones across our regions.

We partnered with the Association for Decentralised Energy and engaged with 188 stakeholders to advocate for a zoning approach to heat decarbonisation and energy efficiency. We formed a coalition of the willing and launched the Heat Street initiative to combine data sets and develop a common plan allowing local authorities and networks to understand which heat technologies their communities are likely to take up and where to focus first.

We assembled focus groups of other networks, consumer groups, trade associations and local authorities to develop a common tool to help prepare for the transition. We then mapped out the most cost-effective package of energy efficiency and low carbon heating technologies for every building type based on their heating, hot water needs and affordability, down to street level. We made this mapping available in the public domain, providing local authorities and community energy groups a practical framework to plan their decarbonisation approach and target support to local areas.

We took this further by identifying 54,000 customers at risk of being disadvantaged during the heat transition, whose energy bills could be reduced to under £1,500 via energy efficiency and low carbon heating. We shared this insight with 61 local authorities to help target support. For example, Hammersmith & Fulham Council used our data to target their Green Homes Grant support to over 2,000 residents.

Moreover, to inform targeted support programmes, we convened a forum to share our analysis and approach with over 135 central and local government representatives across the country. Though the project outputs focused on our regions, we have made the details of our approach, data, and insights openly available to ensure that the benefits extend beyond the boundaries of our network.



Training... standards... funding... all absolutely required. What I've learned here is that one size doesn't fit all; which speaks to empowering local authorities, with cash!

Julian Dean
Shropshire & Shrewsbury Town Councillor;
Green Party Climate Action Officer

Our first Heat Strategy

In March 2020, we became the first electricity network in the UK to launch a stand-alone heat strategy. This was designed to be both a near-term strategy and a consultation with customers and stakeholders to understand the challenge associated with heat decarbonisation, the impact of policy uncertainty, and the role we are expected to play to facilitate this transition.

This earlier Heat Strategy focused on three core objectives:

- Inform heat decarbonisation policy through provision of data and evidence.
- Deliver a great service experience to customers wishing to connect low carbon heating solutions.
- Undertake least regret actions to ensure network readiness.

We highlight some of the key outcomes of this strategy that we have delivered over the last two years below.

Inform heat decarbonisation policy through provision of data and evidence

We refined our Distribution Future Energy Scenarios (DFES) for greater accuracy, incorporating new learnings and deeper insights for low carbon heat and energy efficiency. Our scenarios indicate that the number of installed low carbon heat and cooling technologies could increase from 27,000 heat pumps today to around 712,000 heat pumps by 2028.

We also partnered with the Association for Decentralised Energy (ADE) and engaged with 188 stakeholders to advocate for a 'zoning' approach to heat decarbonisation and energy efficiency, informed by our Heat Street innovation project (see sidebar). Based on this, we co-created local granular pathways to decarbonisation, which can reduce cumulative CO₂ emissions by 34 million tonnes.





The Heat Pump Federation has been really encouraged with the increasing degree of collaboration with UK Power Networks on topics from upgrading connections to future-proofing and training materials. Getting the customer experience right is vital to give both homeowners and tenants the confidence to switch to low-carbon heating.

Bean Beanland
Heat Pump Federation



Decarbonising heating systems is crucial to tackling the UK's greenhouse gas emissions and I'm delighted that Barcombe is leading the way to demonstrate how to make the decarbonisation of heat a reality. It is fantastic to see UK Power Networks passionately collaborating with a range of stakeholders, to ensure they support rural constituents like mine to decarbonise as quickly and efficiently as possible.

Maria Caulfield
MP for Lewes Constituency

Deliver a great service experience to customers wishing to connect low carbon heating solutions

We used customer and stakeholder feedback to enhance our connections process and delivered 'Smart Connect' – a smart self-serve portal to automatically assess all customer applications for domestic LCT connections, including heat pumps. We participated in demonstration projects to understand the customer journey for transitioning customers from connection and installation through to operation. We are using real customer and stakeholder feedback to apply learnings, enhance our connections process and continuously improve the portal.

We published a Net Zero resources web page and heat pump guidance as well as customer point-of-view videos explaining heat pump installations and fuse upgrades. We also worked with Citizens Advice, community energy groups, local authorities and trade associations to produce tailored heat information packs. We published these on our website and shared them with domestic consumers, other community energy groups, local authorities, and developers as well as mailing them to early adopters through Community Energy South to keep them engaged and informed. This led to a 1,689% increase in traffic to our LCT connections portal and 9,471 views of our heat packs.

We co-developed staff training material with the Heat Pump Federation, South East London Community Energy, Isoenergy, and Trane Technologies, and used it to upskill over 300 customer service staff in heat decarbonisation and heat pumps to enhance our customer support. Working together with energy supplier OVO on heat pump installations, we gained practical insights to improve our training programmes for wider field staff and our service offering to transitioning customers.

Undertake least regret actions to ensure network readiness

We partnered with gas network Cadent to support the Greater London Authority in developing a cost-effective Local Area Energy Plan (LAEP) for the Isle of Dogs, blending the use of heat pumps, gas, hydrogen, and district heating. This LAEP will enable the building of 10,000 low-carbon homes, support 110,000 jobs and avoid as much as 286,794 tonnes of CO₂ emissions in a full electrification scenario.

To transition a whole community to decarbonised heating is complex, especially in an efficient and co-ordinated way. We worked with partners in Barcombe, an off-gas grid village in East Sussex, to develop a repeatable framework for other off-gas grid communities to follow (see sidebar). We are very proud to be writing the UK's first playbook for the electrification of heat in off-gas grid communities.

We engaged with 53 local authorities to proactively upgrade fuses in customers' homes so that they are ready to adopt low carbon heating as part our Net Zero Make-Ready programme. This approach will enable customers to reduce disruption and minimise installation time for their electric heating or transport solutions. As a result of this campaign, we observed an 11% increase in customer supply upgrade requests.

CommuniHeat project

Engaging with communities to write the off-gas grid book

At our Local Authorities Forum, 95% of stakeholders identified off-gas grid customers and new builds as the most likely early adopters of low carbon heating, a finding reinforced by the Climate Change Committee. Engagement with regional gas network operators validated that electrification of heat is the most cost-effective energy pathway for the majority of off-gas grid customers.

To transition a whole community is complex, especially in an efficient and co-ordinated way, so we worked with partners in Barcombe, an off-gas grid village in East Sussex, to develop a repeatable playbook for other off-gas grid communities to follow.

Working with Community Energy South, Buro Happold and Lewes Council, we engaged with over 600 individual households and businesses, including the wider community via digital town-hall meetings, to understand their needs and challenges, identifying customer journey improvements and evaluating the benefits of a locally coordinated transition. We installed energy monitors in 50 homes to assess customer comfort and the associated network impact of transitioning to electrified heat alongside other LCTs such as electric vehicles and solar panels. This approach could now be replicated to benefit our 340,000 off-gas grid and wider GB customers who are yet to transition.

Outcomes

We found that 57% of the existing housing stock is poorly insulated.

Our assessment also indicated that retrofitting could reduce community peak energy consumption by over 50%, and annual average heat consumption per property by 10-15%.

Barcombe's coordinated transition is expected to deliver, with energy efficiency measures and electric heating installed, over £200k energy savings, avoid £199k of network reinforcement costs, and could reduce CO₂ emissions by 5,400 tonnes.

Two

Market Overview and Outlook

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Market introduction

The transition to Net Zero by 2050 requires unprecedented change in both scale and pace, with just under 1,900 homes⁴ across the UK each day between now and 2050 requiring some form of a retrofit including an upgrade to their heating system.

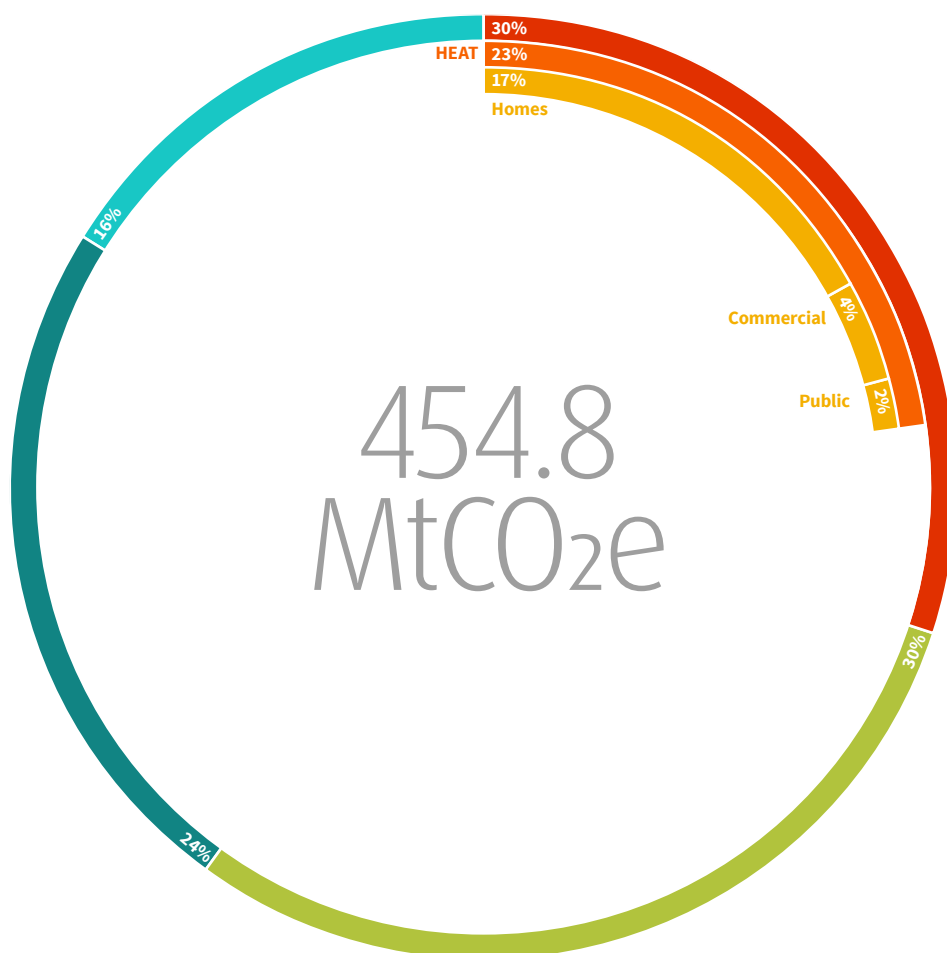
The heat and cooling used in buildings account for 40% of the energy consumed in the UK, and is one of the largest sources of greenhouse gas emissions as shown in Figure 2 below. It is therefore critical that homes and buildings decarbonise by switching away from fossil fuel heating, such as natural gas, whilst achieving greater energy efficiency.

Approximately 85% of domestic buildings and 65% of non-domestic buildings are heated by natural gas, and will therefore need to change to low carbon heating. Whilst this change will not be simple, it will also present a significant opportunity for jobs, growth and levelling up. Improving the efficiency of buildings will also help to insulate customers from the volatility of global commodity markets (an issue particularly acute at the time of writing) and build healthier communities.

Figure 2

UK emissions by sector in 2019⁵

Percentage of buildings with EPC ≥ C: ■ Buildings ■ Transport ■ Industrial and miscellaneous ■ Agriculture, land use, land use change, forestry, waste



4. <https://www.theguardian.com/reimagining-sustainability/2022/feb/22/without-retrofitting-we-wont-reach-net-zero-can-we-make-our-homes-carbon-neutral-by-2050>

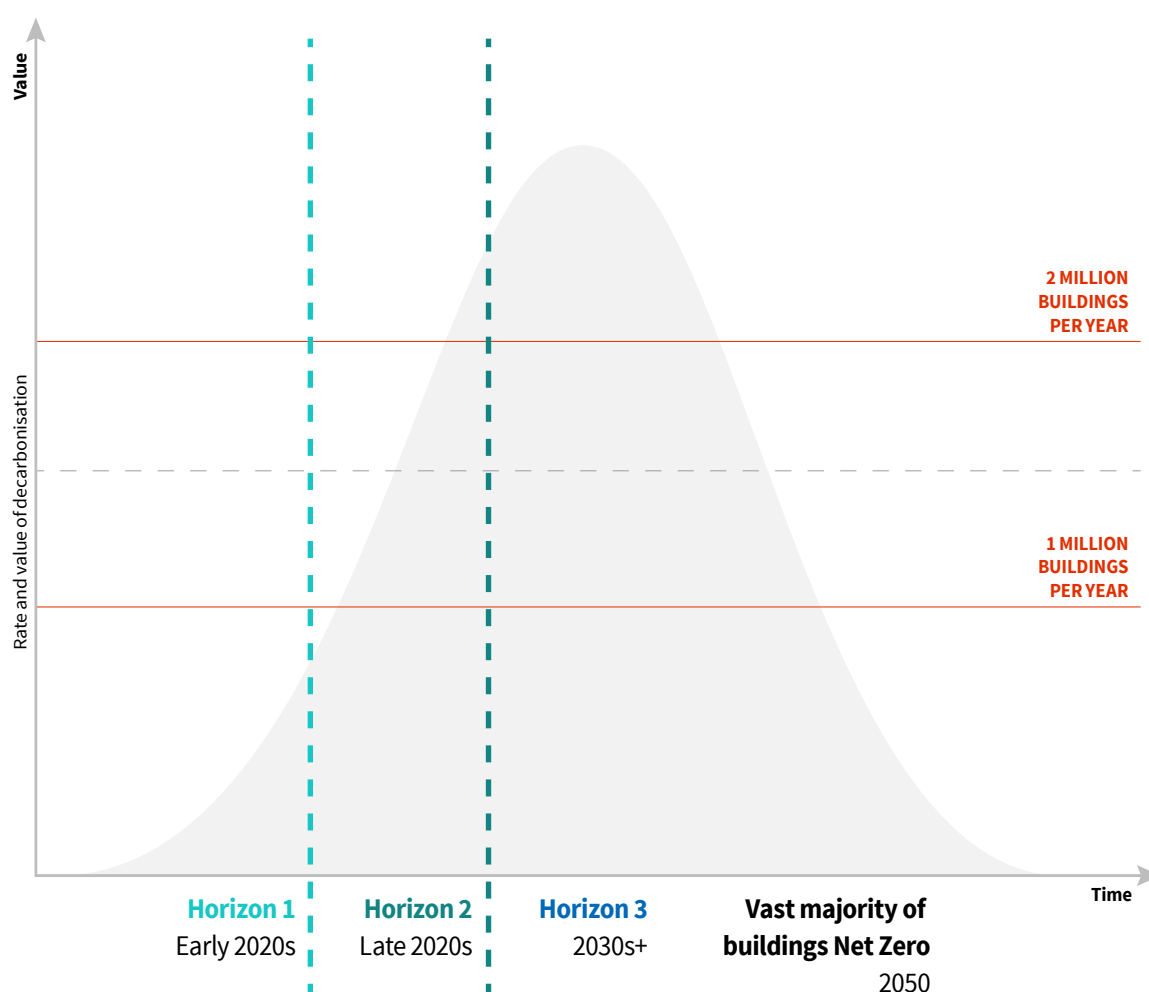
5. Heat and Buildings Strategy 2021, UK emissions in 2019. Shows the proportion of emissions in 2019 from buildings to the nearest whole number

Market horizons: Evolution of the market over the coming decade

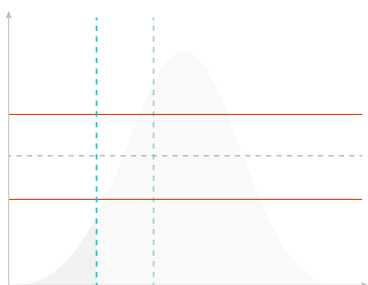
The market can be viewed across three time horizons, with each requiring different capabilities and tools to enable the successful decarbonisation of homes and buildings. In order to achieve success across each of these three time horizons, specific actions are required today.

There is no single pathway for heat decarbonisation, but there are a number of policy milestones that have already been set out that will prompt a market response. The role hydrogen will play in heating buildings remains unknown, with a decision expected in 2026 to provide clarity, but the electrification of heating and hot water is expected to be a significant pathway in all scenarios and across all three horizons.

Figure 3
UK buildings decarbonisation pathway
Three Horizons to heat decarbonisation



Source: Baringa analysis 2021

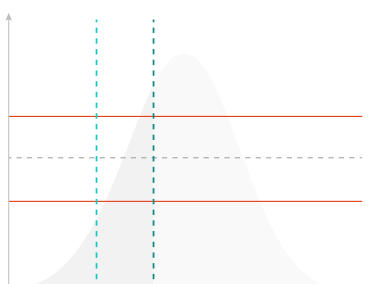


Horizon 1 (Early 2020s)

represents the here and now with a focus on decarbonising heating for social housing, private rental (including high rise buildings), and low-income households, as well as large non-domestic off-gas grid premises. This horizon is largely driven by government policy and programmes, including the Green Homes Grant Local Area Delivery Scheme (LAD) and the Energy Company Obligation (ECO), which both focus on home insulation and installing more energy efficient and low carbon heating solutions.

The government interim milestone to raise as many fuel poor homes as reasonably practical to EPC Band D by 2025 is a key driver of activity. This investment will decrease bills for many low income and vulnerable occupants, increasing the quality and warmth of homes. It will also provide greater energy security through lower energy demand on the grid and reduced fuel imports. It is in this period that we will see the start of a shift away from schemes incentivising single measures installed into a home, towards a 'whole-house' approach that takes an overall view of the building requirements and installs multiple measures to improve the housing stock.

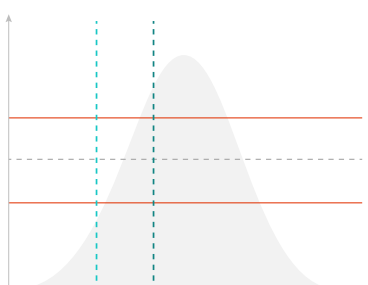
These types of schemes target home energy efficiency improvements, but gas boilers are likely to remain the dominant heat source for the mass market.



Horizon 2 (Late 2020s)

encompasses the Future Homes Standard policy that new homes cannot install gas boilers from 2025, and the planned legislation that off-gas grid (both non-domestic and domestic) consumers will no longer be able to install new fossil-fuel heating solutions from 2026. Building fabric upgrades will remain key - the 2020 Energy White Paper⁶ confirmed the intention that by 2030, all social and private domestic rental properties should achieve EPC Band C and all rented non-domestic buildings should achieve EPC Band B. The Government has also consulted on setting UK lenders minimum performance standards for their mortgage book which would further drive this market if adopted.

In the Government's 10 Point Plan⁷, a target was set for 600,000 heat pumps to be installed each year from 2028 and it is consulting on a minimum target for heat pump rollout each year. In the recently published Heat and Building Strategy⁸, plans to drive the reduction in installation costs for Heat Pumps were also set out. The Government decision on hydrogen's role in heating homes, scheduled for 2026, will provide much needed clarity on the role of electrification of heating relative to other solutions.



Horizon 3 (2030s+)

is when the owner-occupied mass market will drive towards Net Zero, with mass adoption of low carbon heating driven by the intended 2035 gas boiler ban for all new heating installations and the EPC Band C target for all owner-occupied buildings. By this stage, emerging technologies will be better understood and EPC Band C levels of thermal efficiency will be achieved, allowing decarbonisation at scale.

⁶ Energy white paper: Powering our net zero future - GOV.UK (www.gov.uk)

⁷ The ten point plan for a green industrial revolution - GOV.UK (www.gov.uk)

⁸ Heat and Buildings Strategy (publishing.service.gov.uk)

Illustrative view of market economics

Within this market context, we have gone a step further by engaging with key stakeholders across the heating sector to understand the market economics, and hence the most cost-effective outcome for each local area and every consumer across our regions. For the purposes of illustration, we have summarised our findings for two key areas.

Retrofitting energy efficiency measures

A key part of decarbonising heating and cooling is investing in retrofitting, taking an energy efficiency first approach as championed in our RIIO-ED2 business plan.

The cost of measures is dependent on several factors, including property size and condition. The Committee on Climate Change (CCC) set out in its sixth Carbon Budget report that the full domestic home retrofit cost is £10,000 on average, but could, depending on property type, rise to more than £25,000. To achieve EPC Band C, which the Government has set targets to be achieved in the rental sector by 2030 and owner-occupied market by 2035, costs are expected to be in the region of £3,400 per home on average.

Heating upgrades: Heat pumps

The CCC cost estimates for an average medium-sized home installing a Ground Source Heat Pump (GSHP) with output of 8.1kWth and an Air Source Heat Pump (ASHP) with an output of 5.4kWth, are £13,380 and £6,415⁹ respectively. Given that the equivalent cost for a gas boiler is approximately £1,200, the market has a long way to go to achieve parity.

However, costs are expected to fall as the market evolves. The Government expects to see a significant reduction in the cost of heat pump installation by 2025 and is launching schemes including the 'Heat Pump Ready' programme and 'Green Finance Accelerator Scheme' this year (2022) to provide the market with financial stimulus for research and innovation. By 2035, the CCC estimates that the GSHP and ASHP cost will be closer to £10,365 and £4,970 respectively.

Even where payback is compelling ([see page XX, Spotlight on off-gas grid customers](#)) customers need to be able to make an upfront payment or arrange appropriate finance.

The question of payback is further complicated for rental properties as the landlord would be responsible for the upfront costs whilst the tenant would receive the benefits. This is particularly true for smaller business and commercial premises, which are rarely owned. The lack of clear and independent information exacerbates this challenge.

⁹ Cooling in the UK (publishing.service.gov.uk) citing Building Energy Efficiency Survey (BEES) - GOV.UK (www.gov.uk)



Cooling is predominately fuelled by electricity – one of the major differences compared to heating – therefore decarbonising this sector is more reliant on maximising energy efficiency and flexibility.

The advent of cooling

Given the nature of the UK's climate, heat is the predominant source of emissions from buildings, but as temperatures rise the International Energy Agency (IEA) anticipates an increasing need for the cooling of buildings.

The way we cool our buildings today is often quite wasteful. Many cooling systems are inefficient and ventilation measures can sometimes inadvertently drive a need for cooling, particularly when thermal efficiency measures create airtight spaces. Furthermore, some cooling systems use hydrofluorocarbons (HFC), which have a far greater impact on global warming than CO₂, increasing the need for environmentally friendly solutions. There are some existing LCTs such as a heat pump and heat networks that can offer both heating and cooling solutions and exploiting such synergies by taking a whole-building view of thermal needs could help to minimise the costs of decarbonisation.

Market size

Around 10%¹⁰ of all UK electricity today used is for air conditioning and cooling. This demand is concentrated predominately in non-domestic buildings and in England, especially in the UK Power Network areas of London and the South East. Much of the cooling demand is seasonal in nature, largely limited to the summer, and dominated by non-domestic buildings with a constant requirement for cooling.

Cooling of non-domestic sites is already common, with offices and retail accounting for 44% and 19% of total cooling consumption respectively, and small shops consuming 11% of the retail total¹⁰.

It is estimated that approximately 3%¹¹ of households have some form of cooling unit, with the bulk of systems thought to be portable, designed to condition one room only. As with heat decarbonisation, there is a lack of information and knowledge about cooling systems and an under-developed supply chain.

¹⁰ Cooling in the UK (publishing.service.gov.uk) citing Building Energy Efficiency Survey (BEES) - GOV.UK (www.gov.uk)

¹¹ Cooling in the UK, BEIS, citing the data source 'Energy Follow Up Survey 2011'; which estimated that approximately 2-3% of households surveyed have some form of portable or fixed cooling unit (Section 3.6 Electrical cooling equipment, table 25), as well as BSR/A estimates which range between 3% and 5% for the period 2013 – 2019

Market growth

It is anticipated that with rising temperatures, urbanisation, and more people working from home, the demand for domestic cooling will increase and could be as high as 12TWh by the year 2100¹². BEIS forecasts indicate that domestic properties could account for 75% to 85% of cooling energy consumption by the end of the century¹³. This demand is expected to be driven by new systems, not the replacement of existing assets.

Demand in the non-domestic sector has been relatively static over the last decade. It is a market heavily influenced by new build development which has seen significant disruption to growth. There is already a high uptake of cooling in this sector, so we do not expect significant growth. But nor do we expect demand to fall. Growth areas have been identified as hospitals and schools that need to maintain comfort levels and air quality thresholds, and warehouses that require goods to be kept at set temperatures.

Given the potential impact of cooling demands on electricity needs, we believe it is important to consider cooling requirements as part of decarbonisation decisions for an efficient and cost-effective transition.



¹² Cooling in the UK (publishing.service.gov.uk)

¹³ Cooling in the UK, BEIS – Department for Business Energy and Industrial Strategy Research Paper 2021/050, August 2021

Heat customer segmentation: Different customers face different issues

Each customer's heating and cooling needs are specific to them and will vary according to their health and personal preferences, whether they are connected to the gas network, their current heating solution and the thermal efficiency of their home. As a result, there is no 'one size fits all' solution.

In recognition of the specific needs and requirements of our customer base, we have focused our Decarbonisation of Heat Strategy around five customer segments as shown in Figure 4 below. We conducted further analysis to forecast the evolution of each segment aligned with our Consumer Transformation, Distribution Future Energy Scenario (DFES) out to 2028.

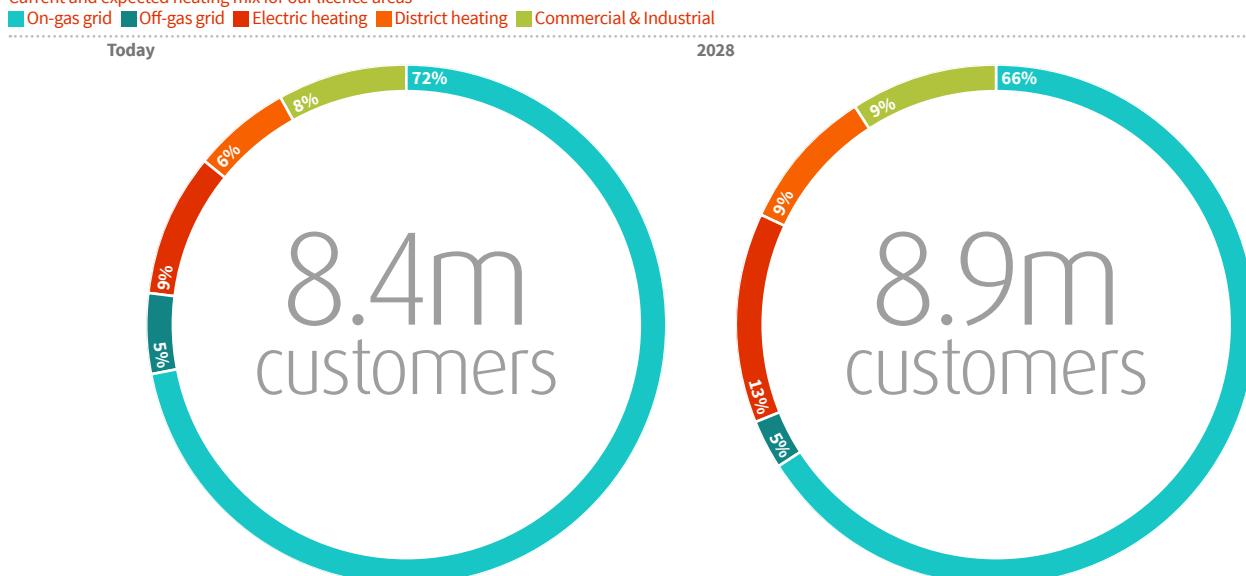
At present, a large proportion of electric heating is a mix of direct electric or inefficient and old storage heating, both of which contribute to high fuel costs. Similarly, district heating is a combination of emerging heat networks and communal heating that serves a tower block with a relatively small number of properties. The district heating fuel mix is largely non-electric with many existing networks fuelled by CHP (Combined Heat and Power) systems.

Our forecasts suggest that the fuel and technology mix is trending towards efficient systems and low carbon, primarily electric, sources. By 2028, we forecast 0.5 million more connected customers, many of which will be in the 'new builds' category. With the fossil fuel ban in new builds from 2025, we predict these to be electrified. We also forecast a shift to electric heating for both residential and non-domestic sectors, with heat pumps being the dominant technology replacing old electric heating systems as well as gas and oil boilers.

Our forecasts also anticipate an increase in district heating, in both residential and non-domestic sectors, particularly in urban areas or those with a high heat density. We also expect district heating to transition towards electrification, supported by waste heat.

Given that a decision on hydrogen is not expected until 2026, it is unlikely to play a major role in the period to 2028. However, the number of hybrid heating systems is expected to increase at a modest pace.

Figure 4
Current and expected heating mix for our licence areas





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AND OUTLOOK

**CUSTOMER & STAKEHOLDER
ENGAGEMENT & INSIGHTS**

OUR REFRESHED STRATEGY

CUSTOMER OUTCOMES

HOW YOU CAN GET INVOLVED

Changing weather patterns linked to climate change, rising energy prices and wider environmental issues are creating a growing awareness and urgency amongst our customers of the need to change the way energy is produced and consumed. Customer expectations of what they need from us are changing too, and now is the right time to be bolder in our approach to support them to 'do their bit'. We have taken the opportunity to listen to our customers and stakeholders and reflect on what we have learnt from our trials and innovation projects.

Our customers and stakeholders have shaped our approach to heat decarbonisation and cooling. Over the last 24 months, we have engaged with over 1,500 customers and stakeholders, including a mix of domestic consumers, businesses, local authorities, industry and consumer protection trade bodies, heat pump manufacturers and energy efficiency installers, energy suppliers, district heat networks, developers, social housing associations, and other utilities.

One of the consistent key findings of our extensive engagement was that customers view the environment as a high and growing priority, but within the context of a desire to keep bills low. Our customers want to see a just and inclusive energy transition achieved through a collaborative approach.

Our customers and stakeholders have told us that we must play our part in the Net Zero transition but operate within the bounds of our role. Nonetheless, they expect us to undertake a coordination role and work with relevant stakeholders to deliver tangible outcomes for our customers. They have also told us that they want us to have a credible voice and to build awareness around decarbonising heat and providing information on energy efficiency.

Engagement feedback also made it clear that the transition cannot come at the expense of leaving customers in vulnerable situations behind and that the move to low carbon must be fair to all.

Our customers' lack of awareness and knowledge about the contribution of domestic heating to the UK's carbon footprint, and concerns about the difficulty and expense of installing low carbon heating solutions remain significant barriers to its adoption. Stakeholders have told us that we should address such barriers by participating in national campaigns to educate people and raise general awareness of the technologies available to them. They agreed that we should take a collaborative approach. In particular, they suggested that we should work with communities, and the private and public sector to develop local area energy plans, and coordinate with local councils and housing associations to deliver low carbon heating and energy efficiency solutions for those most at risk.

Our customer engagement confirmed that, for customers who are fuel poor or vulnerable, low carbon technologies feel unaffordable and out of reach. The change required is seen as too big and too much for them to address alone, without help.

Our stakeholders advised us to invest ahead of need in areas where we have a high confidence of need, such as off-gas grid customers, by adopting a 'touch the network once' approach to minimise the need for repeated costly and resource intensive interventions. They have also asked us to focus on the following six areas:

Awareness

With natural gas being the default energy source for heat, we will need to interact with our customers and raise awareness of the options available to them and the services we can offer when connecting electric heating.

Customer experience

The more reliant that customers become on electricity, the more they will expect from us, in terms of the customer journey they experience when connecting an LCT (from their first contact with us through to installation) and also our reliability on an ongoing basis i.e. the capacity and quality of the electricity supply they receive.

Affordability

The cost of retrofits to improve thermal efficiency of the property is prohibitive without grants and other support, so we have a role to play in supporting customers with access to such schemes. We must also ensure that we facilitate the transition to low carbon heating at the lowest possible cost.

Least disruption

All decarbonisation pathways will involve some level of disruption for customers. We must work with wider stakeholders to ensure this transition remains as seamless as possible, whilst also using the opportunity to deliver superior services.

Consumer vulnerability

Currently the unit cost of electricity is four times higher than gas¹⁴, and the upfront cost of installing an LCT is more than three times higher than the cost of installing a gas boiler. We should work with trusted third parties and local authorities to support customers in vulnerable circumstances that will increasingly rely on electrified heating.

Leave no one behind

We must continue to develop partnerships and collaborate with government and local stakeholders to ensure that the needs of all customers, including those in rental properties, are considered and no one is left behind during the energy transition.

We also established an external forum of heat experts with representatives from over 15 organisations working across the heat and energy systems to co-develop and validate our strategy direction.

¹⁴ <https://www.edfenergy.com/heating/advice/electric-vs-gas-heating-whats-best#:~:text=On%20the%20face%20of%20it,times%20those%20of%20gas%2C%20however>

Engagement across heat customer segments

We have talked to our customers and stakeholders represented by each heat segment to understand the issues that they face, as summarised in Figure 5. This has confirmed that there are a number of issues that are common across customer segments, such as the need for advice and financial support for customers switching to low carbon heating and the importance of energy efficiency solutions.

It has also confirmed our assumption that new build homes, and those that are not connected to the gas grid, will be early adopters of decarbonised heating solutions. Further, that for industrial and commercial customers and property developers, data availability, for example, increased visibility of network capacity and constraints is particularly important.

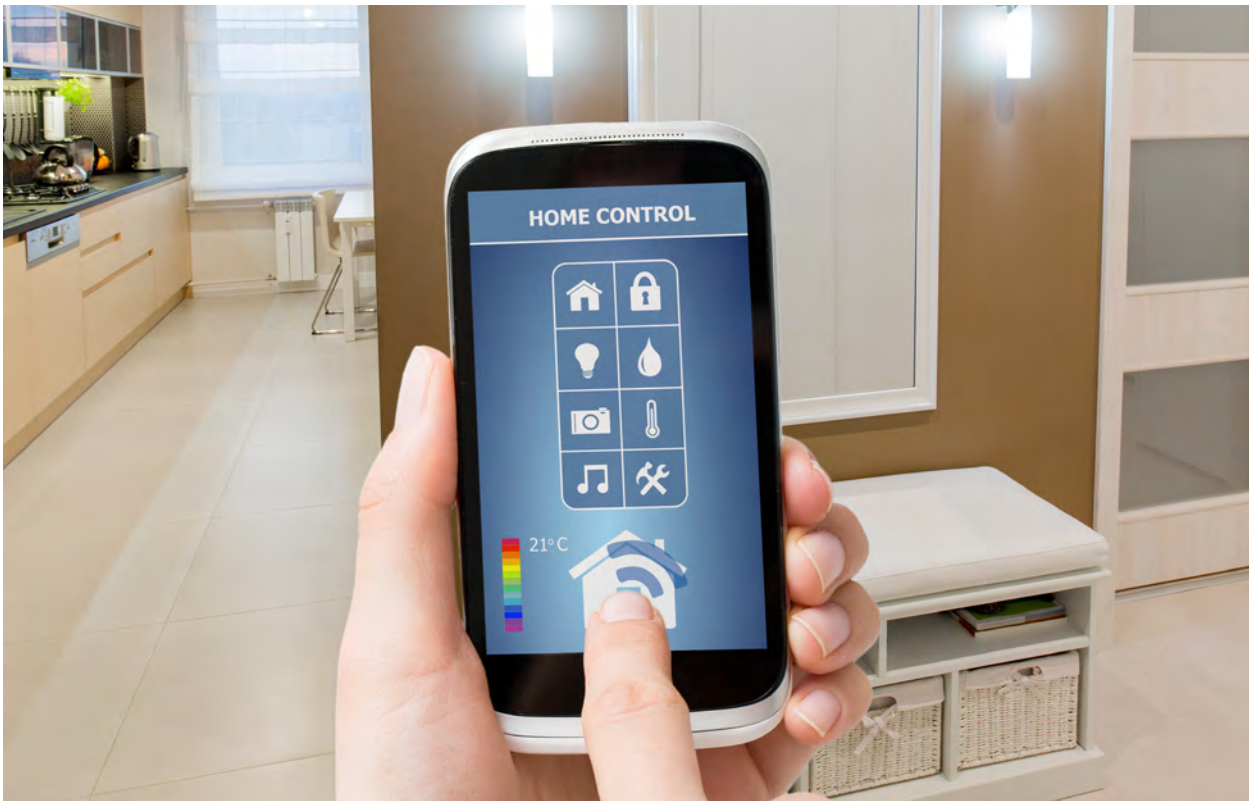
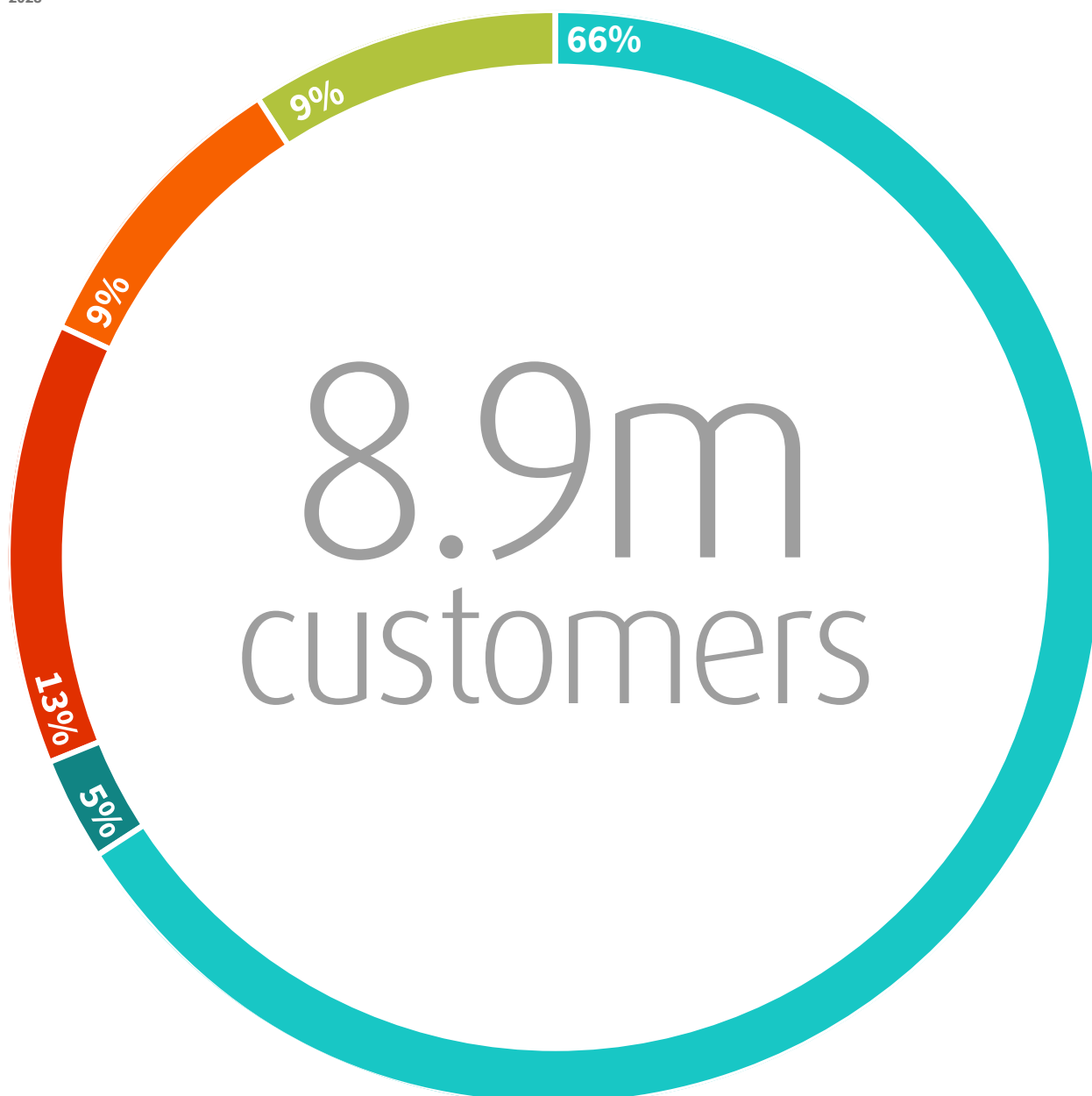


Figure 5

Summary of stakeholder feedback for different customer segments

■ On-gas grid
 ■ Off-gas grid
 ■ Electric heating
 ■ District heating
 ■ Commercial & Industrial

2028

**Common to all segments**

Up-front costs, lack of policy and awareness/education are the biggest barriers for low carbon heating and energy efficiency

UKPN should take a coordinated/zoning approach and consider energy efficiency

Would need advice or financial support to transition

Expect additional support at "before connecting" phase of the transition

Residential: On-gas grid

After Heat Pumps at 63%, stakeholders said that hybrid heat pumps would be the first technology they would consider installing

Residential: Off-gas grid

Residential off-gas grids will likely be the early adopters of low carbon heat

Residential: New builds

New builds will be the early adopters of low carbon heat with potential for district heating (heat pumps in the fuel mix)

Networks should intervene and take a more proactive role in supporting new builds for LCTs

Want to understand the load/ADMD for decarbonisation of housing to be able to assess the implications on new developments and district heating

Commercial & Industrial

Increased visibility of the network capacity and constraints

Four

The background of the page is a solid orange color. Overlaid on this background are several large, thin, light-orange circles that overlap each other in a complex, abstract pattern. The circles vary in size and position, creating a sense of depth and movement. The word "Four" is written in a large, white, serif font, positioned vertically on the left side of the page, partially overlapping the circles.

Our Refreshed Strategy

Heat Decarbonisation and Cooling

OUR STARTING POINT

MARKET OVERVIEW
AND OUTLOOK

CUSTOMER & STAKEHOLDER
ENGAGEMENT & INSIGHTS

OUR REFRESHED STRATEGY

CUSTOMER OUTCOMES

HOW YOU CAN GET INVOLVED

We are publishing our refreshed Decarbonisation of Heat Strategy to prompt further engagement across the whole energy ecosystem and as an invitation to work with us to deliver tangible outcomes for our environment and all our customers. This refreshed strategy, is based on a two-pronged approach.

Enabling those ready to change now

For those market segments where there is greater clarity on the preferred decarbonisation solutions, such as new build homes and those not connected to the gas grid, we will act to ensure that the transition is smooth, timely and low cost.

Supporting those who need more information or time

For other customer segments, we will focus on helping our customers to fully understand the need for change, potential impact on lifestyles and behaviours, the options available to them and their associated costs and benefits. While it is important that customers understand the potential cost and disruption associated with the switch to low carbon heating, it is equally important that we communicate the significant potential benefits that go beyond the mitigation of climate change risks to include increased comfort, reduced exposure to volatile energy prices, improved air quality and a smarter system that allows customers to capture the value of the flexibility services that they can offer.

Our strategy is a blueprint for change, setting out clear actions that will deliver measurable results and have a lasting impact. Outcomes from the activities undertaken as part of our first heat readiness strategy have informed our approach. It has provided valuable insights that enabled us to further develop our understanding of the market, allowing us to take more informed positions on key issues.

However, we acknowledge that we are not publishing our strategy in a vacuum. The next few years are critical to the success of the Net Zero transition and technology, customer expectations and government policy will continue to evolve. We will therefore continue to:

- **monitor** the market – our RIIO-ED2 business plan commits us to have the best market intelligence, at both an aggregate and local level, drawing on different types of market data including customer attitudes, data from LCT suppliers, manufacturers and other third parties, intelligence from our ongoing engagement with local authorities and stakeholders;
- **engage** with our customers and stakeholders to understand and address their key challenges and needs;
- **ensure** that we continue to build an in-depth understanding of the impact of LCTs on our network and the wider system, which we will gain from deploying LV monitoring, use of smart metering data and advanced analytics;
- **explore** unconventional and innovative cross-sector collaborations and partnerships taking a whole systems approach to planning; and
- **unlock** whole system opportunities through innovation, research, and demonstration.

This will ensure that we continue to make well-informed policy decisions that both facilitate and minimise the cost of the transition and that we can respond with agility as circumstances evolve.



An issue-led, action-based, customer-focused strategy

Based on our experience and steered by our external heat expert forum, we have identified three issues that we will need to address in the coming years as shown in Figure 6 below:

Figure 6
Key issues influencing our strategy

ISSUE	Policy uncertainty	Consumer interaction, understanding and affordability	Network and technology readiness
CHALLENGES TO ADDRESS	<ul style="list-style-type: none"> Policy not consistently delivered Large proportion of policy to be finalised Ofgem access & forward-looking charges SCR Economics of different heat options are evolving but uncertain (i.e. electrification vs. hydrogen) 	<ul style="list-style-type: none"> Lack of high quality information Competing priorities Installation complexity (heat and energy efficiency) Upfront and ongoing cost disparity between gas and electricity prices Connection cost and complexity Lack of simple and scalable connections process for heat customer journeys 	<ul style="list-style-type: none"> Need to advance low carbon/ electric heating technologies and understand network implications No unanimous view on ADMD Heat flexibility poorly understood Integration between UKPN systems and other smart systems supporting LCTs Cost prohibition – connection and network operation costs

Issue area one: Policy uncertainty

While the Government's 2021 Heat and Building Strategy announced some useful initiatives, such as the Boiler Upgrade Scheme, there remain policy gaps that must be urgently addressed. There is therefore a continued need for us to inform policy and lead this discussion backed with clear data and evidence. It is critical that the regulatory environment in which we operate is supportive of the transition and we use the best available information to drive decisions.

Issue area two: Consumer interaction, understanding and affordability

The customer journey to install low carbon heat and cooling technology remains complex and confusing for most. The market needs support to unpack the process and improve and simplify the customer journey. Consumers need more information, as do key stakeholders such as local authorities who have declared climate emergencies and are developing their own Net Zero plans. Our engagement highlighted the urgency in the need to better support our customers, installers, and key stakeholder groups in the transition through wide-ranging information and deeper interactions. Moreover, the disparity between the unit cost of electricity and gas, exacerbated by the recent increase in wholesale prices and COVID-19, has made it challenging for some customers to even consider the switch to low-carbon heating. This is particularly true for those in vulnerable circumstances and others who are at risk of fuel poverty.

Issue area three: Network and technology readiness

Improved thermal efficiency of buildings enables more flexible use of energy, by reducing heat loss, and this can be a valuable resource for the Distribution System Operator (DSO) looking to operate the low carbon electricity system of the future. While flexibility and energy efficiency are expected to play a key role in enabling the transition to low carbon heating, the true value and feasibility of these options remain under research. There will also be instances where network investment and new connections are required to facilitate the energy transition, which may be cost prohibitive for some customers. Therefore we, in the electricity sector, need to understand the implications of a combination of different electric heating technologies better, for example the 'after diversity maximum demand' (ADMD), so we can better serve our connecting customers.

Given the scale and magnitude of these issues, now is the right time to be bolder in our approach and ensure we are supporting our customers to 'do their bit'.

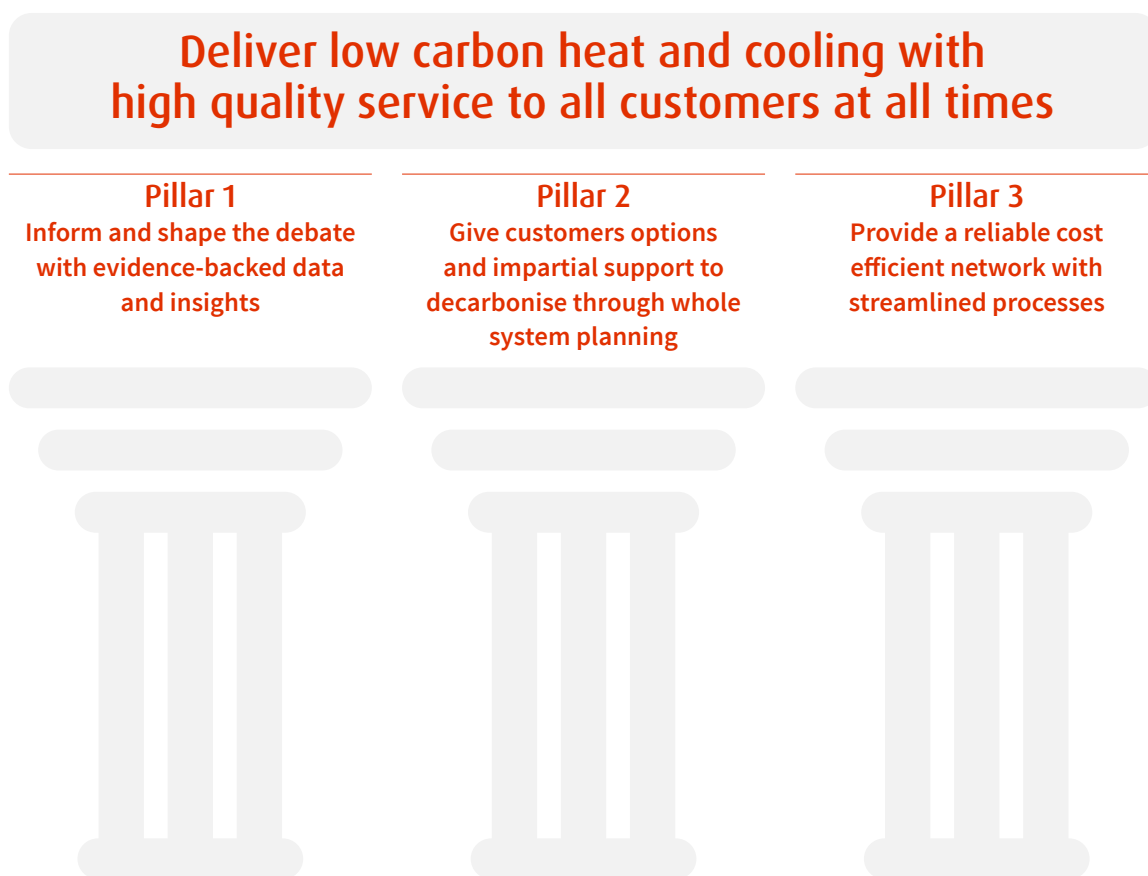
The three pillars of our strategy

Our strategy consists of three linked pillars, each designed to address the three issues above, as illustrated in Figure 7 below.

We will take a holistic whole system approach and focus on the priority areas that deliver tangible outcomes for our customers and accelerate the drive towards Net Zero, whilst delivering low carbon heat and cooling at a high-quality level of service, to all customers, at all times.

Figure 7

Our Heat Decarbonisation and Cooling Strategy Three Pillars





Pillar 1: Inform and shape the debate with evidence backed data and insights

Heating provided by natural gas is expected to be substituted by either district heat networks, low carbon electric solutions (such as heat pumps or thermal storage), hydrogen (or other green gas) heating or hybrid systems. This will ultimately depend on the decarbonisation pathway selected locally and at a national level.

To achieve Net Zero by 2050, Government policy will need to take a whole system view to minimise disruption and cost for both industry and consumers. It will be necessary to facilitate the uptake of LCTs through grants and green funding, increased public awareness and innovative technological and deployment solutions.

Current policies focus on social housing and private rental sectors as well as low-income households and large non-domestic premises. There is also greater clarity on the need for electrification of heating for new build homes and those that are not connected to the gas network, with new fossil fuel heating banned from 2025 and 2026 respectively. For vulnerable customers, there are a number of policies that seek to provide early support for improvements to their housing stock such as the Social Housing Decarbonisation Fund. However, even in these segments, the Government and relevant authorities are asking for data and evidence for the development of roll-out mechanisms and actionable plans. Given the magnitude of the change required, policymakers are also considering the future of the on-gas segment and high-rise buildings.

There is therefore an opportunity to take a leading role in opening up access to our network data, forecasts and research on capacity and constraints via digital platforms to help build confidence in technology and delivery pathways at both a regional and a national scale.

We will therefore focus our efforts on continuing to engage extensively with customers and refining our forecasts, such as DFES, to help us to understand the most cost-effective and least disruptive solutions for our regions. We aim to use the outcome of this exercise, together with our research findings and operational learnings, to further shape the market by bridging the gap between areas of policy and technical uncertainty. We will proactively share our data and insights with the Government, local authorities, and key stakeholders to provide evidence-backed insights and demonstrate the validity of certain actions through innovation projects. Sharing our data and knowledge will also mean that we can provide more targeted support, especially to those who really need it now, so that no one is left behind by the energy transition.



Data is an asset. We believe that sharing as much of our data as possible, and encouraging others to do the same will accelerate the transition.



Pillar 2:

Give customers options and impartial support to decarbonise through whole system planning

The decarbonisation of heating and cooling is in its early stages. Despite the remaining policy uncertainty in some areas, we believe that we can help to accelerate the transition by increasing public awareness, not only of the need for low-carbon heating, but of the options available and their associated costs and benefits.

Given that heat is delivered through a combination of the gas and electricity systems (and water for district heating), a 'whole systems approach' is critical for the transition to Net Zero heating with close collaboration between the electricity and gas networks a critical component. Each local and regional area must determine its own pathway whilst aligning with the needs and expectations of individual homeowners and businesses. Taking a 'whole building' approach will also allow us to find balanced solutions that save energy, are cost efficient and maintain a comfortable and healthy environment for our customers so that they can make the best choice for them. This is why our strategy now includes cooling and has a strong focus on improving the energy efficiency of our buildings.

Energy efficiency delivers value for the entire energy value chain from generation through to end consumer by reducing the amount of energy consumed, and hence produced and transmitted. We believe there are two strands to energy efficiency: one through efficient appliances and lighting, and the other through retrofits to improve the thermal insulation of the properties.

Thermal insulation or efficiency is a pre-requisite to the cost-effective uptake of low carbon heat and cooling solutions. Though the required measures can differ from one building type to another, the commonality is the disruption and upfront cost. This becomes more pronounced for those in vulnerable circumstances either due to affordability issues or because of understanding barriers. Whichever way we look at it, upgrading our homes in the UK – the worst housing stock across Europe – will be a huge undertaking that requires a collective effort at a national and local level.

We understand that our efforts to decarbonise heating will need be complemented by offering a seamless customer journey from the point of first contact through to LCT connection and ongoing operational service. We will streamline our internal processes, continually upskill our staff, and digitise our information and data to offer best-in-class service and support to all our customers.



Pillar 3: **Provide a reliable and cost-efficient network with streamlined processes**

During this period of transformational change, we will ensure that our industry-leading standards for reliability and customer service are not only maintained, but improved. Furthermore, to retain the confidence of our customers for the Net Zero transition, we will achieve all of this at the lowest possible cost.

No strategy can claim to have all the answers worked out for a transformational change for which there is no precedent globally. Indeed, the nature, scale, pace and timing of this transformation remains the subject of significant uncertainty. The future demand for heat pumps is also unclear, although we currently anticipate a 26-fold increase in heat pumps from 27,000 today to 712,000 by 2028. One thing we do know is that the electrification of heat will play a core role in any decarbonisation pathway and our customers will rely on our network more than ever before – to charge their vehicles and to keep themselves warm.

As a network company, we therefore need to be demand-driven and able to adapt quickly as circumstances change and the needs of our customers become clearer. Our strategy therefore focuses on how we can efficiently facilitate the electrification of heat, so that when consumers are ready to move, we are able to help them make the right choice for them and deliver the capacity they need at the lowest cost.

It is essential that we understand the network impact of low carbon heating and cooling and maximise the utilisation of our existing network to avoid unnecessary network investment and ensure that any investment we undertake happens in the right place and at the right time to facilitate the seamless and timely connection of low carbon technologies.

In our RII0-ED2 business plan, we committed to an ‘energy efficiency and flexibility first’ approach, which includes expanding our flexibility markets to lower voltage levels. This will ensure that we maximise the use of our existing network capacity before approving asset-based solutions, and that we don’t deploy solutions today that are inappropriate for meeting the problems of tomorrow.

We have already talked about the importance of energy efficiency. Flexibility also has a central role to play in the future. We want to better understand heat flexibility and assess market-based solutions. We will co-develop products with suppliers and aggregators that offer domestic and non-domestic customers new benefits by recognising the value of the flexibility that they can offer to support the operation of a low carbon electricity system, thus making the transition more affordable.

In our RII0-ED2 business plan, we also committed to take a ‘touch the network once’ approach to network readiness by investing strategically, ahead of demand, where there is a high certainty of need across potential scenarios to minimise the need for repeated costly and resource intensive interventions.

Our priority areas

In developing our strategy, we have identified three priority areas:

Off-gas grid customers

Customers in vulnerable circumstances

High-rise and multiple occupancy dwellings



We view off-gas grid communities as areas of confidence for the electrification of heat due to the lack of cost-effective alternatives.

PRIORITY SPOTLIGHT

Off-gas grid customers

Across our regions, we have identified 341,000 customers that are not connected to the gas distribution network and burn oil or solid fuel for their heating – our “off-gas grid” customers. These customers tend to be located in rural clusters or communities that are radially connected to our network.

The Government has prioritised off-gas grid customers for the provision of low carbon heating solutions, such as heat pumps, and our stakeholders also see off-gas grid customers as potential early adopters of electric heating.

We have collaborated with our regional GDNs, applying the ENA's (Energy Networks Association) whole systems cost benefit analysis tool, to determine that the least disruptive and most cost-effective energy pathway to decarbonise these off-gas grid communities is electrification for the majority of off-gas grid customers. Our RIIO-ED2 business plan therefore states that we will ensure that 71% of off-gas grid homes in our regions have the suitable capacity to decarbonise their heating and transport by the end of RIIO-ED2 in 2028.

This commitment is based on a whole system approach, informed by the learnings of our [CommuniHeat](https://communiheat.org/)¹⁵ innovation project. We will form partnerships with local authorities and community energy groups and mobilise resources to deliver a coordinated network capacity release programme. Our delivery will begin with engagement at a community level and on a one-to-one basis to provide information on energy efficiency, technology and funding options, and to develop collective and individual decarbonisation plans, particularly for those in vulnerable circumstances. We will prepare the electricity network for the uptake of electric heating and transport, making homes ready through fuse and service upgrades and applying a combination of traditional reinforcement and smart market-based solutions.

Our CommuniHeat and [Heat Street](https://innovation.ukpowernetworks.co.uk/projects/heat-street-local-system-planning/)¹⁶ projects have enabled us to demonstrate the benefits of collaboration with the wider supply chain, including energy efficiency installers, to facilitate the transition for off-gas grid communities. We also plan to go beyond traditional sectoral boundaries to enable this transition, for example by coordinating excavation works with the Telecoms sector fibre roll-out programme in rural areas¹⁷ to reduce the cost and disruption to customers.

¹⁵ <https://communiheat.org/>

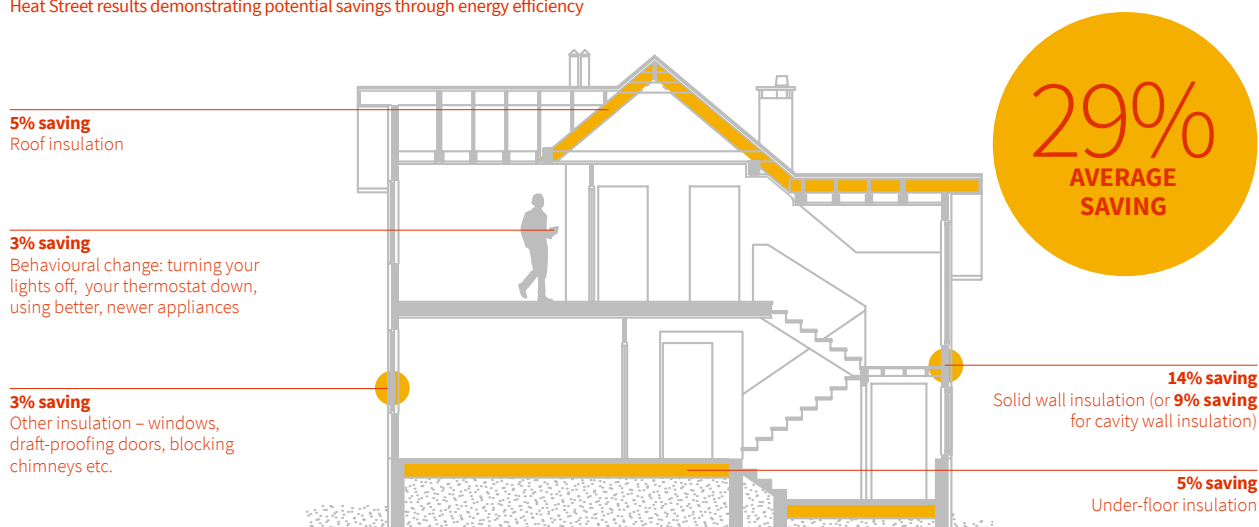
¹⁶ <https://innovation.ukpowernetworks.co.uk/projects/heat-street-local-system-planning/>

¹⁷ Home - Shared Rural Network (srn.org.uk)

We understand that cost of transition to consumers – both upfront and ongoing will play a key role in the decision-making process. The example below provides an indicative view of the cost of installing a new ASHP to heat a typical three bed semi-detached home in an off-gas grid area.

For off-gas grid customers who largely run oil boilers, a heat pump is overall cheaper to run and delivers significant environmental benefits. Additional factors contribute to a faster switch to low carbon heating over customers on the gas grid. Customers switching today from an oil boiler to a heat pump, using available funding such as the Boiler Upgrade Scheme¹⁸ available from April 2022, will make a positive saving over the asset's lifetime.

Figure 8
Heat Street results demonstrating potential savings through energy efficiency



5kW Air Source Heat Pump (ASHP) vs. New Oil Boiler utilising a Time of Use Tariff and the Boiler Upgrade Scheme

A typical off-gas grid customer living in a three-bed semi-detached property will find a new ASHP is cheaper overall than installing a new oil boiler. This example does not include any additional costs of insulation that may be required.

Upfront costs to replace an existing oil boiler

This customer will pay approximately £11,800, reduced to £6,800 with the Boiler Upgrade Scheme grant of £5,000 (available from April 2022), for a new ASHP vs £4,500 for a new oil-fired boiler.

Ongoing running costs

Each year the economics indicate that a consumer with an ASHP will be better off, both compared to the existing oil boiler and a new oil boiler. There are additional environmental and health benefits not considered in this example.

£470 p.a. for new ASHP in 2022

£703 p.a. for new oil boiler in 2022

£886 p.a. for existing oil boiler in 2022

*Analysis from Baringa 'Decarbonisation: heat pumps in the home (2020)'.

¹⁸ ?????????????????



We define 'vulnerability' as a situation that can arise when aspects of the energy market combine with someone's personal circumstances or the characteristics of their environment to create conditions where they are more likely to suffer detriment. This means that anyone including commercial customers can experience vulnerability in given circumstances.

PRIORITY SPOTLIGHT

Customers in vulnerable circumstances

Our longstanding engagement with customers, stakeholders and expert partners tells us that vulnerability is complex, multidimensional, and ever-changing.

Across our regions, we currently have 3.5m households in vulnerable circumstances who are eligible for our Priority Services Register (PSR), over 980,000 households in fuel poverty and 1.58m disadvantaged customers who are at risk of being left behind in the energy transition by 2030. Given the current energy crisis, we expect these numbers to increase.

It is essential for us to ensure that the heat transition works for everyone with no one left behind in the journey. Heat and hot water are essential services and as electrification of these services increases, an increasing number of customers will be reliant on cheap and reliable electricity to keep themselves warm. Customers in vulnerable circumstances, or on low incomes, may also be less flexible in how they use their heat and hot water provision. For these customers, we must consider the challenges they may have in accessing fair and appropriate opportunities presented by the energy market, for example because of disabilities, language barriers or a lack of understanding. They may be struggling financially and uncomfortable asking for the support they are entitled to. This can mean that they are less able to protect, or represent, their interests effectively in the energy market, and that their choices may be limited and not best suited to their needs.

We have therefore identified customers in fuel poverty and wider vulnerable circumstances as a priority area. In our RIIO-ED2 business plan, we acknowledge the importance of our societal role to help alleviate the critical challenges of fuel poverty. We want to ensure that no one is left behind in the changing energy system by focusing on maximising digital inclusion, facilitating a fair and just Net Zero transition and maximising participation in a smart and flexible future. We have made a commitment to provide information and help to 500,000 vulnerable customers over the RIIO-ED2 period (which runs from 2023 to 2028). As part of this, we will co-fund grants towards the installation of LCTs via the UK Power Networks Foundation.

We have also committed to work in collaboration with regional partners to provide targeted support to a total of 500,000 fuel poor customers over the same period, delivering £67m of benefits by 2028. We recognise that due to increasing energy costs and the continued impact of COVID-19, many other customers may be at risk of falling into fuel poverty. Therefore, we will work with trusted partners to provide fuel poverty information to 800,000 such customers annually between 2023 and 2028.

We have encapsulated these ambitions in our Decarbonisation of Heat Strategy, making this area a priority for us in the coming years. We will be proactive in providing additional support for our customers, including training our frontline staff to respond to enquiries, and partnering with local authorities and community groups to provide information relating to energy efficiency, low carbon heating, and relevant grants. Through our innovative projects such as Social Connect¹⁹, we will develop tools to identify customers in vulnerable circumstances at a street level and collaborate with the right partners to provide tailored support to those customers.

We understand from our customer and stakeholder engagement that such customers are conscious of the impact of their current heating systems on the environment, but face an affordability challenge, particularly in relation to the upfront and operational costs of electric heating systems and energy efficiency measures. We have therefore taken a technology agnostic approach and are taking forward our innovative research to demonstrate the practicality of novel smart solutions for those in a social housing setting.

Social renters are one of the dominant groups in vulnerable circumstances. To support them, we have taken forward learnings from our [HyCompact](#)²⁰ innovation project (see page 45), and are leading a cross-sector partnership through our '[Right to Heat](#)'²¹ project with gas distribution network SGN, Stonewater, Social Energy, Passiv UK and Sime to demonstrate the feasibility of single-unit hybrid heating systems coupled with solar PV installations, smart controls, and access to the flexibility market. We will trial different ways of lowering the cost to the end customer to better understand the benefits a hybrid system can offer vulnerable customers. We believe such hybrid solutions can provide an interim solution (for one boiler replacement cycle) to users that are currently connected to the gas grid and wish to transition, but are struggling to switch to a full electric solution such as a heat pump, until the issues of fuel price disparity and technology costs are addressed. We will use this opportunity to share our data, insights and continue our engagement in the community so that our vulnerable customers have different ways to access good quality information to better support their choices.

In our customer journey illustration overleaf, Barry is a customer who needs additional support to make the best choice for his family. Through upgrading the thermal efficiency of the property there is an opportunity to improve the air quality and make the home a healthier place. Barry needs to understand what his options are and how to find an accredited installer that can be trusted to install the right heat equipment. Barry's circumstances may also allow him to access government incentive schemes to partly fund the new measures. In our role of supporting customers, we will look at options to make installers more accessible and collaborate with energy suppliers and local authorities to help vulnerable customers more easily access available funding.

¹⁹ <https://innovation.ukpowernetworks.co.uk/projects/social-connect/>

²⁰ <https://innovation.ukpowernetworks.co.uk/projects/hycompact/>

²¹ https://smarter.energynetworks.org/projects/nia_ukpn0078/

Figure 9
Illustration of a customer journey for those in vulnerable circumstances

BARRY

Vulnerable homeowner

Barry lives in a town. He has a gas boiler that needs to be replaced and wants to understand his options. His house is poorly insulated. He receives a number of benefits and struggles financially to pay the bills each month. His son is asthmatic. Barry has seen an advert offering free measures but he isn't sure if he meets the criteria.



I want a comfortable home that is affordable to heat in a low carbon way



CUSTOMER WANTS AND NEEDS

CONNECTING CUSTOMERS

"I want to replace my boiler to something that is reliable and keeps my house warm"

"I want to insulate my home so that it is warmer, and my bills are lower and I understand the health benefits"

"I want to know if I can get a grant that will help me pay for my measures"

DSO SERVICES

Simple, impartial information accessible and relevant to my demographic, available through different forums on the types of options. Available (e.g. is there a heat network to connect to, a link to find providers (e.g., Gas Safe, MCS, Trustmark))

Frontline agents who are trained to answer queries

Collaboration with consumer representatives and service providers to ensure consumers can access energy efficiency schemes (e.g. Energy Company Obligation and Local Area Delivery schemes)

OPERATIONAL CUSTOMERS

For low carbon heating measures, I want control over my electricity usage and production to save and make money

I want a single energy bill that is accurate and rewards my flexibility

I want to avoid spending too much time with different services or portals

We need to be informed about grants and schemes available to customers in our region

Flexibility product and smart DUoS tariff designs that enable residential participation and reward energy efficiency

Integration of technical and business processes with retailers and aggregator who hold the billing relationship with customers

Collaboration and data sharing with energy suppliers and local authorities on schemes to inform customers

Easy, low-cost integration of systems for market and network data flows (e.g. through APIs)

HyCompact project

Cross-sector collaboration to build data and evidence

The Government has identified two primary pathways for decarbonising heat: hydrogen and electricity. We explored the possibility of a hybrid pathway for our customers, joining forces with our gas colleagues, Wales & West Utilities (WWU), smart control providers Passiv UK and manufacturer Sime.

A quarter of developers, local authorities and trade associations said that hybrid heat pumps are the first heating technology they would consider installing. However, WWU found that common barriers to hybrid solutions are space requirements, the disruption of installing a hybrid heat pump alongside a standard gas boiler, and the higher costs of maintaining two units.

Through HyCompact we engaged with 1,000 customers across Great Britain from a variety of socio-economic demographics to explore their attitudes to the uptake of low carbon hybrid heating solutions and found that comfort and reliability are key concerns in making the switch. Almost 60% of respondents had little to no understanding of heat pumps and even fewer understood other LCTs. This prompted us to expand our range of heat guidance to give customers more information.

The partnership then engaged with manufacturers to combine the gas boiler and heat pump into a first-of-a-kind hybrid unit and install these in customers' homes, significantly reducing the space requirements and installation disruption compared to existing separate-unit alternatives. We identified the need to model what impact a hybrid pathway would have on the network. We also found that hybrid heat pump solutions reduce space requirements by 50% and can be installed in a third of the time compared to dual-unit hybrids. Initial findings also showed a 43% reduction in carbon emissions from switching to a hybrid heat pump and increasing heating system efficiencies.

PRIORITY SPOTLIGHT

High-rise and multi-occupancy dwellings

We have identified high-rise multi-occupancy homes as a priority area as they represent a further building type where we have confidence of the need for heat electrification.

Converting these buildings to clean gas heating, e.g., hydrogen when it becomes available, would not generally be appropriate given the bespoke conversion required, the need for a building-specific quantitative risk assessment and the uncertainty on the timescales for the commercial availability of hydrogen, which would result in long lead times and high conversion costs.

Similarly, the piecemeal conversion of individual properties within a high-rise to electric heating over a prolonged period, as individual consumers decide to switch would be inefficient, disruptive, and expensive for the residents.

As such, we believe that in instances where there are multiple points of connections, like in the high-rise scenario, district heating or heat networks powered through a fuel mix consisting of large heat pumps can offer a better outcome for the end customer. District heating is cost-effective in areas of high heat demand density as the costs of distribution pipework and energy generation facilities can be shared between a large number of users as well as being able to fulfil the heating needs of space constrained buildings.

Our studies and analyses have indicated that for such high-rise dwellings, a heat network offers more value than individual heat pumps:

Ease of connection

Heat networks are expected to be connected as single point loads, connecting to the High Voltage network. Electricity will be used to power the larger heat pumps, amongst other heat sources, that can then serve multiple dwellings. This avoids the need for individual property service upgrades and other associated work.

Greater customer and network resilience

Heat networks can be fed via multiple, varying sources, combining for example large heat pumps with reclaimed waste heat. Diversification of heat sources and fuels provides resilience against technical issues and against price volatility of individual commodities. Electricity connection can also be secured from multiple sites, improving the resilience against network outages.

Space and size benefit

The individual property would not need space for a separate heat pump, allowing for more useable space.

Value added services

Heat networks would allow centralised storage at a lower cost per unit energy stored and more cost-effective use of flexibility.

The benefit of heat and cooling

As set out earlier, there is an expectation that the demand for cooling in the domestic sector will grow. Heat networks can provide both heating and cooling to buildings.

Sustainability benefits

The use of residual heat from industry and heat from waste to power heat networks reduces the carbon footprint of the energy system and helps customers to contribute to local and national climate goals.

While the majority of existing heat networks are supplied by natural gas, the proportion of networks powered by low carbon sources, such as waste heat and heat pumps, is increasing²². This shift is supported by policy signals and schemes such as the Green Heat Network Fund²³. Our forecasts are aligned with this trend.

However, the market for heat networks is not yet regulated, which poses potential risks for customers who would be locked in with no ability to switch, particularly those in vulnerable circumstances.

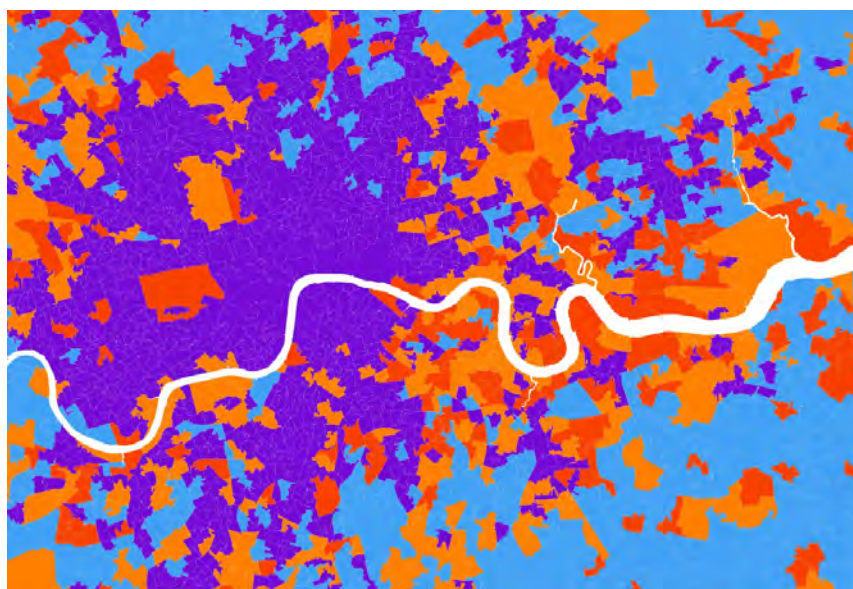
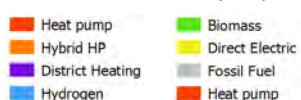
The Government's response to its Heat Network consultation²⁴ confirmed that heat networks will be regulated by Ofgem. It is believed that regulation will start to impact the technology choices of heat networks in the early 2030s to capture the natural replacement cycle of existing assets, while maximum carbon emission limits will be set as part of the market framework which would grant long term investment signals to the industry.

Additionally, the Government is leading pilot projects to introducing heat network zoning. We are engaging with the Government and other local authorities to identify areas that are suitable for a heat network, such that a framework could be developed for other regions to follow.

Figure 10

Heat Street project insights: Dominant heating technology – Central London System Transformation 2050

Even in the System Transformation (high hydrogen) scenario, by 2050 most of London will be electrified, with District Heating being a predominant source due to building types (inc. high rise), thermal efficiency, and concentration of heat demand and consumption patterns.



Source: Element Energy

²² The Association for Decentralised Energy, January 2018. Market Report: Heat Networks in the UK

²³ <https://www.gov.uk/government/news/next-generation-of-heat-networks-to-power-uks-green-revolution>

²⁴ <https://www.gov.uk/government/consultations/heat-networks-building-a-market-framework>

Five

Customer Outcomes

What you can expect from us

OUR STARTING POINT

MARKET OVERVIEW
AND OUTLOOK

CUSTOMER & STAKEHOLDER
ENGAGEMENT & INSIGHTS

OUR REFRESHED STRATEGY

CUSTOMER OUTCOMES

HOW YOU CAN GET INVOLVED

The three pillars of our strategy will enable us to focus on the key issues over the coming years, underpinned by our RII0-ED2 plans. They will enable us to facilitate the low carbon transition for heat and cooling demand in the most cost-effective way for all our customers. In this section we set out our strategic aims for each pillar in turn, and the actions that we will take to achieve them.



Pillar 1

Inform and shape the debate with evidence backed data and insights

Have a voice, be vocal and inform, educate, and focus on our customers' needs

REMINDER

PILLAR 1 STRATEGIC AIMS

Provide an easy to digest evidence base that offers accurate insights.

Proactively share data, with the right groups in the right way – keeping it simple.

Use evidence-backed insights (e.g., targeted projects) to bridge the gap between areas of policy and technical uncertainty.

Closely collaborate with key stakeholder groups across the market to find common ground and solutions to challenges.

Work with Government, local authorities and policymakers to enable the creation and delivery of effective and suitable policy.

Provide an easy to digest evidence base that offers accurate insights

In order to provide an easy to digest evidence base that offers accurate insights, we will take the following actions:

We will work with the industry to provide data access in the best way possible, building on the success of our [Open Data Portal](#), which provides over 1.6m data points of demand forecasts, network capacity and constraint data, allowing our stakeholders to make optimal decisions for their businesses and end customers.

By 2024, we will provide core planning datasets via an online self-service energy planning tool to support the planning process for local authorities, helping them make the best choices for their communities.

Proactively share data, with the right groups in the right way – keeping it simple

We will proactively share data, with the right groups in the right way by taking the following actions:

We will continue to proactively generate and share insights from our innovative research and projects in a targeted way to shape policy development, enable us to be more effective with our market collaboration, and help accelerate the drive to Net Zero for the wider industry. The raw data, insights and interactive mapping tools generated by our projects have given local authorities and community energy groups a practical framework to plan their decarbonisation approach and target support to local areas. For example, Hammersmith & Fulham used our data to target their Green Homes Grant support to over 2,000 residents.

We will invest further in our data provisioning and evaluate the methods in which we share data and insights from trials to improve accessibility. This will provide better, more granular, accurate and real time information to enable the development of whole system and local area energy plans where resources can be optimised to better serve customers.

We will digitalise and share data more openly across all our customer interactions, specifically in the pre-application stage. This will equip stakeholders such as developers with more visibility of our network, such that they can extract more value from their assets, for instance, through increased participation in the energy services market.

Use evidence-backed insights to bridge the gap between areas of policy and technical uncertainty

We will take the following actions to ensure that we use evidence-backed insights to bridge the gap between areas of policy and technical uncertainty:

We will roll out targeted innovation research and trials that delivers meaningful and practical insights to address known and unknown uncertainties, making these initiatives more visible to encourage collaboration and accelerate the uptake of LCTs. As an example, we will leverage learnings from our Heat Street project based on the concept of ‘zoning’ and build further confidence through trials to demonstrate the benefits of extending zoning beyond Heat Networks to energy efficiency and other heating technologies, incorporating socio-economic assessments to avoid any unintended consequences on vulnerable groups.

We will look beyond heat pumps to consider a range of other low carbon heating and cooling technologies, acknowledging that one size does not fit all. For example, in terms of electric solutions, we will collaborate with manufacturers and start-ups to investigate other forms of electric heating, e.g. infra-red, heat boilers and batteries, as well as electric storage heating.

We will use data and evidence to support our policy consultation responses and interactions with the regulator – continuing to be vocal on the need for a fair and just transition.

Closely collaborate with key stakeholder groups across the market to find common ground and solutions to challenges

We believe collaboration with the market is critical. We will closely collaborate with key stakeholder groups across the market to find common ground and solutions to challenges by taking the following actions:

We will adopt a whole systems approach to form the right partnerships, avoiding piecemeal efforts and working in silos. This has been reinforced by our experience of working on the decarbonisation of electricity and transport, where we were able to unlock value for customers by working with the right partners.

We will venture beyond sectoral boundaries to work with gas distribution networks to develop solutions that are both cost-effective and climate friendly. We are aware of the market sensitivities today, especially those affecting purchasing power and affordability due to the energy market crisis. In such a climate, we believe it is even more important than ever to venture beyond sectoral boundaries to work with GDNs and develop solutions that are both cost-effective and better for the environment. For example, we will work together with public and private sector owners of high-rise flats to leverage our HyCompact innovation project to inform new use-cases and further explore the value of hybrid heating systems through our Right to Heat project, which is trialling this approach in a social housing setting, to support the development of incentives and funding. We believe such hybrid solutions, combined with smart controls, PV, batteries and flexibility or Time of Use Tariffs, can provide an interim solution (for one boiler replacement cycle) to users that are currently connected to the gas grid and wish to transition, but are struggling to switch to a full electric solution such as a heat pump, until the issues of fuel price disparity and technology costs are addressed, especially for disadvantaged customers.

We will continue to leverage the output of our collaboration, sharing our findings with policy-makers and the wider industry. For example, the HyCompact project has generated evidence that we have shared with policy-makers on hybrid solutions and the CommuniHeat project has supported the development of a coordinated approach to support the uptake of energy efficiency and low carbon heating solution for local areas.

Where possible, we will coordinate discussions through industry forums such as the Energy Networks Association (ENA) to put forward cohesive and collective arguments that work in the best interests of all energy stakeholders and customers.

Work with Government, local authorities and policymakers to enable the creation and delivery of effective and suitable policy

We will work with Government, local authorities and policy makers to enable the creation and delivery of effective and suitable policy by undertaking the following actions:

We will work collaboratively to support the development of local and regional pathways within a centralised national policy framework. The differences in geography, location, building archetypes and socio-economics mean that no one size fits all. We will be ambitious with our support to local authorities and local area energy planning, taking a whole system planning approach to help them to find the right solutions.

We will play an active role in responding to Government and Ofgem consultations that relate to the decarbonisation of heating and cooling to enable more effective policy and regulatory outcomes. For example, by working with the Government and Heat Networks on district heating, powered through a fuel mix dominated by large heat pumps, which has an important role in the heat transition. The Government has recently published the proposals for Heat Network Zoning confirming that heat networks will become regulated under Ofgem's remit. In this period, we are committing to continue working with the regulator to enable more effective policy and regulatory outcomes.



Pillar 2

Give customers options and impartial support to decarbonise through whole system planning

Bringing others on the journey to benefit customers through partnering with the community and supply chain to help meet the scale of the challenge.

REMINDER

PILLAR 2 STRATEGIC AIMS

Collectively work with stakeholders and partners to take a whole system view, including Local Area Energy Planning to determine viable options, to support the customer in making their decision.

Take a customer focused approach to understand customer requirements and inform them of their choices. Translate into tangible action to better facilitate the installation of energy efficiency and low carbon heat and cooling.

Make sure our people can support you. Set the business up for success, upskilling staff to meet the needs of the changing market landscape.

Work with others to create best practices in delivering engaging and simple customer propositions. For propositions to be as cost effective as possible, we will promote energy efficiency, and reward flexibility.

Act as a trusted advisor to all customers aiming for equitable outcomes.

Collectively work with stakeholders and partners to take a whole system view, including Local Area Energy Planning to determine viable options, to support the customer in making their decision

We will work with stakeholders and partners to take a whole system view on all issues relating to the decarbonisation of heat, including Local Area Energy Planning, by taking the following actions:

We will take a leading role in facilitating a whole systems approach to create a positive experience for our customers. The transition to low carbon heat and cooling requires a whole system approach, with each intervention working towards facilitating Net Zero in a cost optimal way. Time is limited to meet the challenge of Net Zero, and so are available capital and workforce. Therefore, taking a whole system approach that leverages cross-sector synergies to enhance the system is necessary to deliver the transition in time. We acknowledge that up until now there has been limited joined up thinking across the industry, and we want to take a leading role, as supported by our customers and stakeholders, in facilitating this approach and create a positive experience for our customers.

We will further develop our Local Area Energy Planning toolkit and establish a new team of 20 FTEs to provide expertise and data support to 116 local authorities. Building upon our DFES and Strategic Forecasting System (SFS), we will further develop our Local Area Energy Planning toolkit and establish a new team to provide expertise and data support to local authorities. We will build a platform for them to assess their existing strategies and Climate Action Plans. This enables us to work together to align on plans and the necessary grid investment needed. We will create a new team of 20 FTEs to work closely with 116 local authorities in our patch to deepen this relationship. Through this we plan to offer a three-tiered support service, utilising a framework to self-assess, develop action plans, and deliver investments where a prescribed level of certainty is achieved.

We will develop our position on the role of district heating and support the roll-out of zoning to best consider where heat networks should be deployed and the benefit this can deliver both to our customers, as well as our networks. We are collaborating with BEIS on its Heat Network Zoning Pilot to understand the implications of this approach on our network and customers, for example the consequences for customers of being locked in to a heat network (unable to switch) and potentially facing high standing charges. However, we are equally mindful that every local area has a different requirement and as such, the development of any solution should only be mandated through consultation with the relevant stakeholders. Therefore, we intend to work with heat networks, central and local government, and other key stakeholders to better understand and promote the benefits of district heating networks in these situations, whilst also being clearer on what is required to effectively meet customer needs.

Customer-focused approach to understand customer requirements and inform them of their choices

We will address the customer barriers to the adoption of low carbon heating, such as the lack of awareness and reliable information, concerns about the difficulty and expense of installing the technology, and customer confidence in their choices. We will do this through the following actions:

We will convene a Citizens Panel to continue direct and deep engagement with our customers to simplify the process for them and develop industry-leading customer journeys. Our customers who rely on electricity to provide all their heat needs, rightly expect a better customer journey, from the connection process through to the provision of on-going value when connected, and greater reliability, both in terms of capacity and quality of supply. For this, we need to incorporate the feedback of our customers to make things simple for them.

We will further enhance our support, advice, and information services to customers. To encourage the uptake of low carbon heating, we will build upon the success of our '[Heat Packs](https://innovation.ukpowernetworks.co.uk/2021/02/03/heat-packs/)'²⁵ which were co-developed with a range of industry stakeholders, to update the content with new information required by our customers. We will also update our website with relevant information on connection requirements, extending it out to other electric heating technologies besides heat pumps.

We will develop our own evidence base to inform customers about the changes required. One example of this action is through being clearer on the potential for efficient cooling systems and address the limited amounts of information available about the national needs for cooling systems, both across non-domestic and domestic sectors, and the benefits of energy efficiency for both heat and cooling needs.

²⁵ <https://innovation.ukpowernetworks.co.uk/2021/02/03/heat-packs/>

Make sure our people can support you. Set the business up for success, upskilling staff to meet the needs of the changing market landscape

We will learn from experts in the heat sector to make sure that our people have the skills to support our customers. To be successful we must recognise our own limitations and reach out to partners across the eco-system, who are experts in their own field, to provide answers and insights we do not have. By continuing to build up our knowledge and understanding of customer needs, we will be able to translate this more effectively into stronger customer journeys and propositions.

We will continue to invest in our people, training and upskilling them to support customers who have switched or are planning to switch to electric heating. We will take steps to better understand the market and requirements to be able to support our customers and stakeholders. This will mean we will be able to resolve our customer queries more effectively. One example of this is the provision of first line support to first movers to electric heating. Should they experience an issue with their supply or heating system, we want to be able to offer them the first line of support through our customer call centre. We have already co-developed staff training material in collaboration with industry experts to upskill over 300 customer service staff in heat decarbonisation and heat pumps to enhance our customer support. We want to take this further and upskill other teams across our business to better understand the needs of an increasing volume of customers who either have switched or want to switch to electric heating or cooling. For instance, those who may contact us for fuse or service cable upgrades. It is essential we understand their needs and timescales to deliver a quick resolution aligned with our enhanced customer journey.

Work with others to create best practices in delivering engaging and simple customer propositions. For propositions to be as cost effective as possible, we will promote energy efficiency, and reward flexibility

We will work with others to create best practices in delivering engaging and simple customer propositions by taking the following actions:

By 2028, we will proactively provide LCT and energy efficiency information to 1.4m of our customers located within zones earmarked for electrified heating.

We will provide further information to 800,000 customers who are at risk of fuel poverty, in each year of the RIIO-ED2 period (from 2023 to 2028).

We will seek to develop new commercial propositions and an energy efficiency market-based product to drive the uptake of these measures. We will do this in conjunction with suppliers and aggregators who have an important role in educating customers and deploying innovative technology solutions to optimise consumption in a way that helps the system and returns income to their customers.



UK Power Networks must work with local councils and housing associations to deliver low carbon and particularly heat and energy efficiency to those most at risk.

Net Zero Webinar
Heat breakout room

Acting as a trusted advisor aiming for equitable outcomes

We will act as a trusted advisor to our customers, with the aim of achieving equitable outcomes. We will do this by taking the following actions:

During the RIIO-ED2 period, we will provide information and help to 500,000 vulnerable customers to ensure no one is left behind in the changing energy system, at no cost to customers. As part of this, we will also co-fund grants towards the installation of LCT systems via the UK Power Networks foundation.

We will work closely with our non-domestic customers and stakeholders to understand their constraints and provide them with support. Though we have come a long way in building up our knowledge and services for domestic customers, we acknowledge that we need to do more to support our non-domestic customers. Our initiatives such [White Van Plan](#)²⁶ have already started that deep engagement with commercial businesses, especially for small and medium enterprises (SMEs), to facilitate their EV transition. We will take this further and expand this work for heat and cooling, for example by making our EV products applicable for heat and cooling use-cases such as those being delivered through our [Optimise Prime](#)²⁷ Network Innovation Competition (NIC) project for EV fleet charging solutions.

For our non-domestic customers, we will also explore a funding model to look at electrifying their heat needs. We presented this concept at our Net Zero Forum with wide ranging stakeholders and are progressing research in the area. The feedback received from local authorities who were the use case for EVs has been overwhelmingly positive and the next step is to apply these learnings to heat.



UK Power Networks has a role in supporting organisations to do good fuel poverty work. Service providers should provide solutions – networks should coordinate, provide information, but not do stuff in the household.

Heat Focus Group



²⁶ <https://innovation.ukpowernetworks.co.uk/projects/white-van-plan/>

²⁷ <https://www.optimise-prime.com/>



Pillar 3 Provide a reliable cost-efficient network

Set the business up for success and address the immediate opportunities to support the transition, while maintaining a longer-term view for 2050

REMINDER

PILLAR 3 STRATEGIC AIMS

Address the issues in the market today, whilst making sure the business is preparing for the future.

Take proactive steps, including data management, to understand how the switch to electrification will impact the network.

Provide a reliable and efficient network and take action to deliver investment in the right areas.

Invest in and deliver market-based propositions, specifically around energy efficiency and flexibility.

Invest, deliver, and collaborate on network solutions including technical solutions to release network capacity, deliver service upgrades and new customer connection offerings.

Address the issues in the market today, whilst preparing for the future

A core part of our role as an electricity distribution network is to provide a reliable, safe, and cost-effective grid suitable for delivering decarbonisation and Net Zero targets. The additional load from the electrification of heat and increasing cooling demand will have a significant impact on the distribution grid, both in terms of base and peak load. This is in addition to the increased load due to the electrification of transport. These developments are likely to drive a need for network reinforcement and upgrades to continue the safe delivery of power to the communities and businesses we serve.

However, before turning to asset-based solutions, it is essential that we maximise the utilisation of our existing network as far as possible so that the energy transition is provided at the lowest possible cost and we don't deploy solutions today that are inappropriate for meeting the problems of tomorrow.

We will address the issues in the market today, whilst preparing for the future, by taking the following actions:

We will invest in innovation and business readiness programmes to support the transition today and in the future. While we invest in our innovation programmes, focussing on themes such as Whole Systems, Net Zero and Consumer Vulnerability to build the evidence case for policy and enhance journeys for transitioning customers today, we will ensure that our business continues to evolve. Therefore, we will invest in our people to upskill them in digital and customer experience domains to better serve the customer base of tomorrow.

We will review our existing planning and connections processes to enable the low carbon transition at pace whilst continuing to future-proof our network.

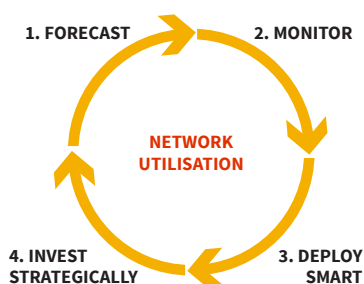
We will collect real time data through monitoring in all LV networks where we are forecasting constraints over RIIO-ED2, and will target 100% coverage of the rest of the network through advanced analytics using smart meter data. This will give us better insight to run the network at higher utilisation and to defer reinforcement actions for as long as possible.

We will develop smart solutions that build upon on our 'energy efficiency and flexibility first' approach supported by our LV monitoring.

Where necessary, we will deliver strategic investment programmes in coordination with other sectors where there are limitations to such solutions. Our network readiness approach is summarised in Figure 11.

Figure 11

Our approach to network utilisation and readiness



Take proactive steps, including data management, to understand how the switch to electrification will impact the network

Understanding the impact of the Net Zero transition on our network is crucially important for us to set the business up for success and address the immediate opportunities to support the journey, while maintaining a longer-term view for 2050.

We expect network reinforcement to be required, but the extent to which we need to reinforce, where, and when, are aspects we do not have sufficient visibility of. These aspects will be determined by the uptake rate, the technology mix, performance and cost aspects of low carbon heat, cooling and storage solutions as well as unlocking the potential of energy efficiency and flexibility. Some examples to illustrate the often delicate interplay between interventions are:

Better performing ASHP require less electricity to deliver a certain amount of heat, and this increased efficiency might make it a suitable solution for larger part of the building stock, reducing the share of hybrid heat pump resulting in a higher winter peak.

Energy efficiency interventions increase the thermal inertia of a building, reducing the demand but increasing the relative amount of flexibility, illustrating that the need for, and availability of, flexibility, are strongly influenced by the uptake of measures largely outside our control.

Rooftop solar can provide a meaningful reduction of network loads from cooling and can therefore best be combined with cooling propositions, but it does very little for peak loads from heat.

Policy (including incentive schemes and financing options), building owner and individual customer priorities and preferences factor into this as well as they impact deployment and development of low carbon heat and cooling solutions.

Therefore we need to better understand the network implications of the electrification of heat by taking the following actions:

We will collaborate with the wider industry to focus on the priority areas that we have identified to trial and evaluate the effectiveness of numerous options to find the right balance for our customers. i.e. electrification of off-gas grid areas in coordination with local trusted partners; decarbonisation of public and private sector owned high-rise multiple occupancy dwellings focussing on collective electric and hybrid heating solutions that offer retrofitting and operational benefits over a piecemeal conversion to individual solutions for both heating and cooling; and support for those in vulnerable circumstances ensuring no one is left behind in the journey to Net Zero by developing and trialling cost effective pathways for electric and hybrid solutions.

We will collate and utilise our and third-party open data more effectively to inform our business decisions and interventions. Granular and accurate data can generate insights to help us understand what LCTs are connected to our network and where, the usage patterns of these technologies, and the potential impact of energy efficiency, storage and flexibility on the peak loads on our network. We will identify white spots in our understanding of the impact low carbon heat and cooling solutions on our network and conduct research and run demonstrations on low carbon heat alternatives, analysing the data to develop use-cases to inform investment decisions. This will also enable us to explore the interplay between different low carbon heating and cooling sources technologies, and the combined impact of energy efficiency measures, renewable generation and LCTs on the network.

Heating technologies

Understanding network impact and demand diversity

New technologies connecting to electricity networks in the delivery of Net Zero will lead to increased domestic demand and a change in diversity factors as well as load profiles. There is a need to understand what normal domestic loads and After Diversity Maximum Demand (ADMD) will be in the future, and the impacts that these are likely to have on network operational performance, so that networks can be planned and managed appropriately. If this is not done in a timely manner, it puts at risk the industry-wide goal of upgrading the electricity network in an efficient cost-effective manner.

Our Neighbourhood Green project will leverage the 'cloud bridge' established between the Energy Systems Catapult (ESC) and the Power Networks Demonstration Centre (PDNC). It will virtually cluster ESC's Living Lab participants' homes with electric heating and other LCTs. We will use qualitative research with customers to understand their requirements and LCT experience. We will also use real-life trials on different network topologies, using the PDNC's real-time digital simulator to analyse the network impact of these LCTs under a range of scenarios. This will help us to determine the ADMD for a mix of LCTs that can then be incorporated in our planning process and help the industry converge on an informed view to facilitate connecting customers and enhance investment strategies.

Neighbourhood Green

Provide a reliable and efficient network and take action to deliver investment in the right areas

We will invest strategically, ahead of demand, where there is a high certainty of need across potential scenarios. In doing so, we will accelerate the transition, smooth workload and ensure that we only touch the network once to upsize to 2050 demand requirements where it is demonstrably efficient to do so. For those market segments where there is greater clarity on the preferred decarbonisation solutions, such as new build homes and those not connected to the gas grid, we will act to ensure that the transition is smooth, timely and low cost.

To provide a reliable cost-efficient network we are going to undertake the following key actions:

We will ensure that 71% of off-gas grid homes in our regions have the suitable capacity to decarbonise their heating and transport by 2028. To reduce costs, we will leverage other asset driven programmes, such as our replacement of PCB loaded transformers and the Telecom sector's fibre roll-out in rural areas.

We will continue to roll-out our 'make homes ready' programme for proactive supply upgrades based on the combined future requirements for all LCTs (e.g., 100A to those with EV + drive and Heat Pump). Where possible, we will coordinate our proactive readiness approach with existing local authority programmes for home upgrades to minimise disruption and future waiting time for customers to use their electric heating – effectively enabling them to 'plug and play' their new heating systems and cars.

We will refine our customer journey for customers urgently replacing their heating system. Octopus Energy's research confirms that 80% of boiler replacements are carried out under duress. Through our innovation project [Emerge](#)²⁸, we will go a step further and develop a customer journey that offers an enhanced service to such consumers.

We will strive to better understand how the uptake of millions of different technologies can be managed by smart integrated systems such as our [Constellation](#)²⁹ NIC funded project which will create revolutionary smart substations which free up capacity for renewable energy to facilitate Net Zero emissions. We will continue developing new innovative solutions as well as identifying new heat focussed use-cases for existing solutions.

Invest in and deliver market-based propositions, specifically around energy efficiency and flexibility

Widespread electrification of our homes will require significant network reinforcement and new generation to meet both the overall increase in demand for electricity, as well as the high peak loads. Energy efficiency, both in fabric and appliances, has a central role to play to help reduce demand, as well as being key for improving the efficiency of heat pumps, and supporting flexibility by minimising heat loss and energy consumption in buildings.

²⁸ https://smarter.energy.networks.org/projects/nia_ukpn0077/

²⁹ <https://innovation.ukpowernetworks.co.uk/projects/constellation/>

Flexibility has a central role to play in the future. We want to better understand heat flexibility and assess DSO³⁰/market-based solutions and expect the innovation programmes to drive valuable insights on the roles of DNOs, retailers and aggregators in unlocking flexibility from heat (and cooling). We will do this by taking the following actions:

We will keep our costs down by taking a ‘flexibility and energy efficiency first’ approach over the RIIO-ED2 period (from 2023 to 2028) and will market test all network needs before considering reinforcement. These needs will be procured through a range of long-term and short-term markets and products, which are inclusive by design and ensure no customer is left behind in the energy transition.

We will develop an energy efficiency flexibility product, running tenders every six months, starting in 2023.

We will build trust and confidence by establishing a legally separate DSO business unit by 2023, creating an independent DSO Supervisory Board, and through our annual DSO forward plan of action. Our DSO function will deliver significant reductions in load related expenditure through increased competition and use of LV flexibility.

We will make a range of firm and flexible connection products available to all customers, from lowest cost through to highest access, with a maximum curtailment commitment from the start of RIIO-ED2, and will annually update our products based on stakeholder feedback.

Invest, deliver, and collaborate on network solutions including technical solutions to release network capacity, deliver service upgrades and new customer connection offerings

We will deliver network solutions to release network capacity, deliver service upgrades and new customer offerings by taking the following actions:

We will collaborate to develop technical solutions. We understand that market-based solutions may not be suitable for all our customers, and that network reinforcement can be cost prohibitive. To help our customers that wish to switch to low carbon electric heat, we will continue to collaborate with traditional and emerging vendors to develop novel solutions and practices to release network capacity and service upgrades.

Refine operational processes to improve our network visibility, particularly for Industrial and Commercial customers. To meet the changing expectations of our customers, we will enhance our SFS (Strategic Forecasting System) tool and day-to-day planning and operation of the network. This will enable us to better assess and communicate network reinforcement needs and headroom in our networks for connecting low carbon heating and cooling solutions.

³⁰ The increasing, and increasingly dynamic production and use of electricity requires us to more actively manage our network, using new-technology and real-time data, to make sure we keep the lights on, operate a cost-effective distribution network for our customers and enable markets.

SiX

How you can get involved

OUR STARTING POINT

MARKET OVERVIEW
AND OUTLOOK

CUSTOMER & STAKEHOLDER
ENGAGEMENT & INSIGHTS

OUR REFRESHED STRATEGY

CUSTOMER OUTCOMES

HOW YOU CAN GET INVOLVED





Our Decarbonisation of Heat Strategy is aimed at accelerating the energy transition and ensuring the outcome is fair and equitable for all our consumers. The potential rewards are there for us all if we get it right – a smart and responsive energy system, a low carbon economy and clean air for generations to come.

We are excited to be at the centre of this transition and want to work collaboratively and effectively to meet the needs of our customers and make a positive impact.

We know that strategies that seem ambitious at the time can be rapidly eclipsed by events. As a result, we will issue an updated Decarbonisation of Heat Strategy at regular intervals.

We are publishing our refreshed Decarbonisation of Heat Strategy to prompt further engagement across the whole energy ecosystem and as an invitation to work with us to deliver tangible outcomes for our environment and all our customers.

**This is a call to action.
Please join us.
Share your ideas with us.
Collaborate with us.
We can't do this alone.**

Please contact us at: Innovation@ukpowernetworks.co.uk

Glossary

Decarbonisation	Reduction of carbon dioxide emissions through the use of low carbon sources
DG	Distributed Generation The generation of electricity through many small, localised energy sources. Also called Dispersed Generation (DG)
CHP	Combined Heat and Power The concurrent production of electricity and thermal energy (heating and/or cooling) from a single source of energy
Cooling	Uses electricity, and the focus is on optimising it to be more efficient and explore synergies with local generation from solar PV
DNO	Distribution Network Operators
DSO	Distribution System Operator DNOs are developing smart commercial arrangements and smart technologies to make the transitions to a Distribution System Operator
ENA	Energy Networks Association
EV	Electric vehicle A car, van, truck, motorbike, or scooter with a rechargeable battery, which uses electricity in place of petrol or diesel
GDN	Gas Distribution Network
Heat Pumps	Devices that extract heat from one source and transfer it to another at a much higher temperature. Used to heat (and also cool) buildings, swimming pools etc
HFC	Hydrofluorocarbon HFCs are commonly used refrigerants in most cooling units
Heating	<p>Has no single solution and at a macro level there are several potential solutions for heating our buildings, including:</p> <p>Hydrogen To be used via a hydrogen boiler, this is currently not generally available but green hydrogen trials are running</p> <p>District heating This is infrastructure that provides heat and cooling to buildings via a network from a single central energy source and utilise different technologies such as a CHP, Biomass boiler, heat pump, energy from waste, and hydrogen</p> <p>Electric heating A range of options that use electricity to heat the home. Includes night storage heater, hybrid heat pump, air source heat pump (ASHP), ground source heat pump (GSHP), water source heat pump (WSHP)</p> <p>Other renewable fuels Renewable fuels include biogas boiler/CHP, biomass boiler that would be for non-domestic buildings or as part of a heat network</p>
I&C	Industrial and Commercial
Insulation	Includes internal and external wall insulation, loft insulation and floor insulation. It is recommended for all properties and can lead to a reduction in the demand and therefore cost to the customer, as well as improving the thermal comfort of the property
LV	Low Voltage
Ofgem	Office of Gas and Electricity Markets Government regulator for the electricity and downstream natural gas markets in Great Britain
RIIO	Revenue = Incentives + Innovation + Output RIIO-ED2 is the electricity distribution price control review to reflect the new regulatory framework
TWh	TeraWatt Hour(s) A measure of electrical energy
UKPN	UK Power Networks

