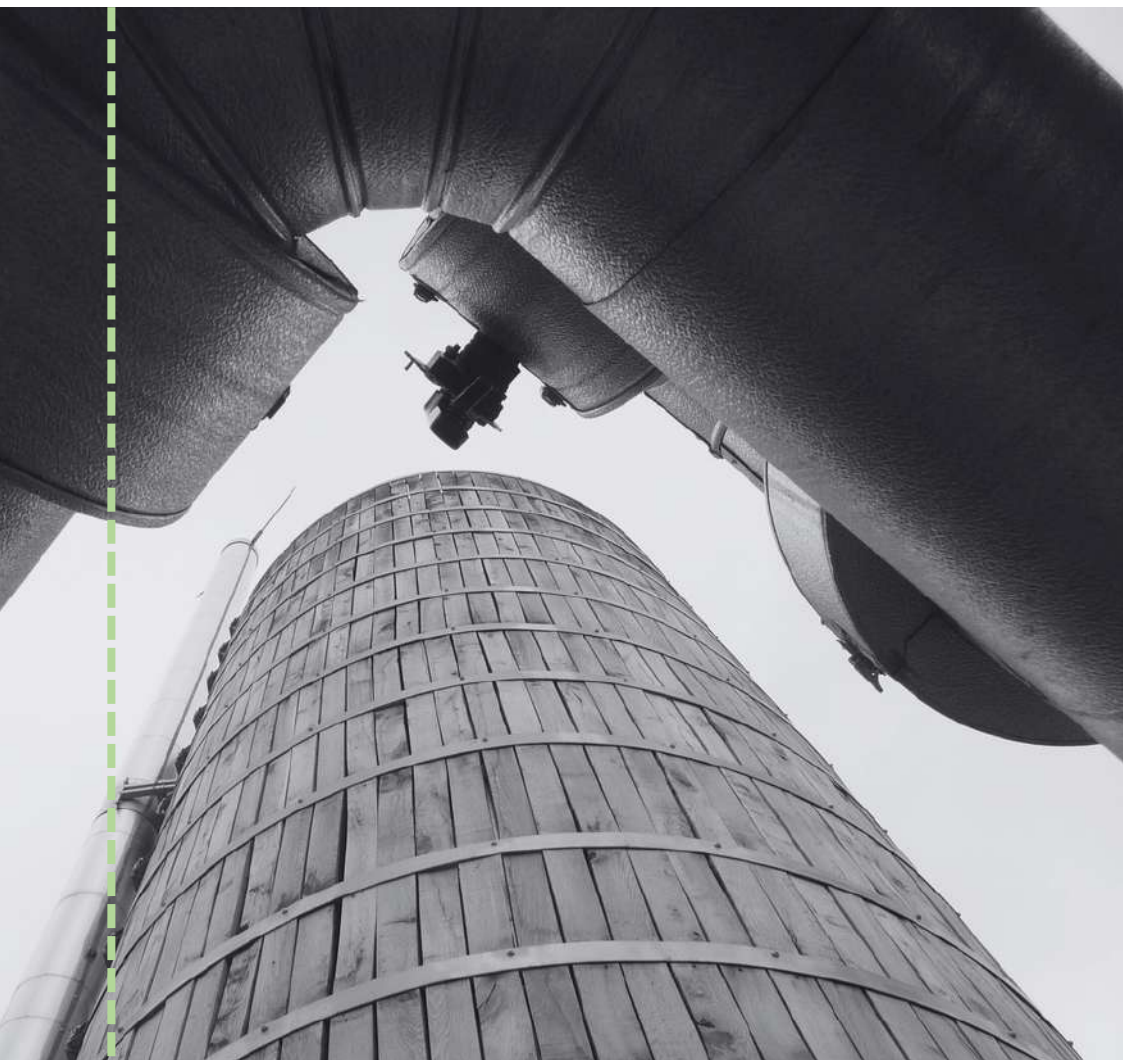




CONNECTING THE PIPES

A joined-up approach to delivering Clean Heat by 2040



Bunhill Heat and Power Energy Centre

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INTRODUCTION | Executive Summary

Clean Heat by 2040 is possible and Heat Networks have a significant role to play in meeting the needs of people, communities, the energy system and the economy.

MEETING NEEDS

People need heat and it cannot cost the earth

Communities need support and information to access resources and create local opportunities

The energy system needs to put value in low-carbon heat as it values low-carbon power

The economy needs to grow and needs to balance demand and supply of available resources to do so

GOALS

Low-carbon heat networks will be cost competitive to gas boilers and fuel poverty will significantly reduce

Communities will utilise **local heat opportunities** and create **100,000 jobs by 2050**

A heat system will exist that helps **realise benefits** across the whole energy system

£100bn of investment will be drawn to Heat Networks by 2050 and our exposure to gas linked volatility will end

RECOMMENDED ACTIONS FOR DELIVERY

HMT should commit to creating an incentive to switch and provide long-term support to Heat Network

DESNZ should commit to impactful and sequential strategic zoning to fully realise benefits for communities

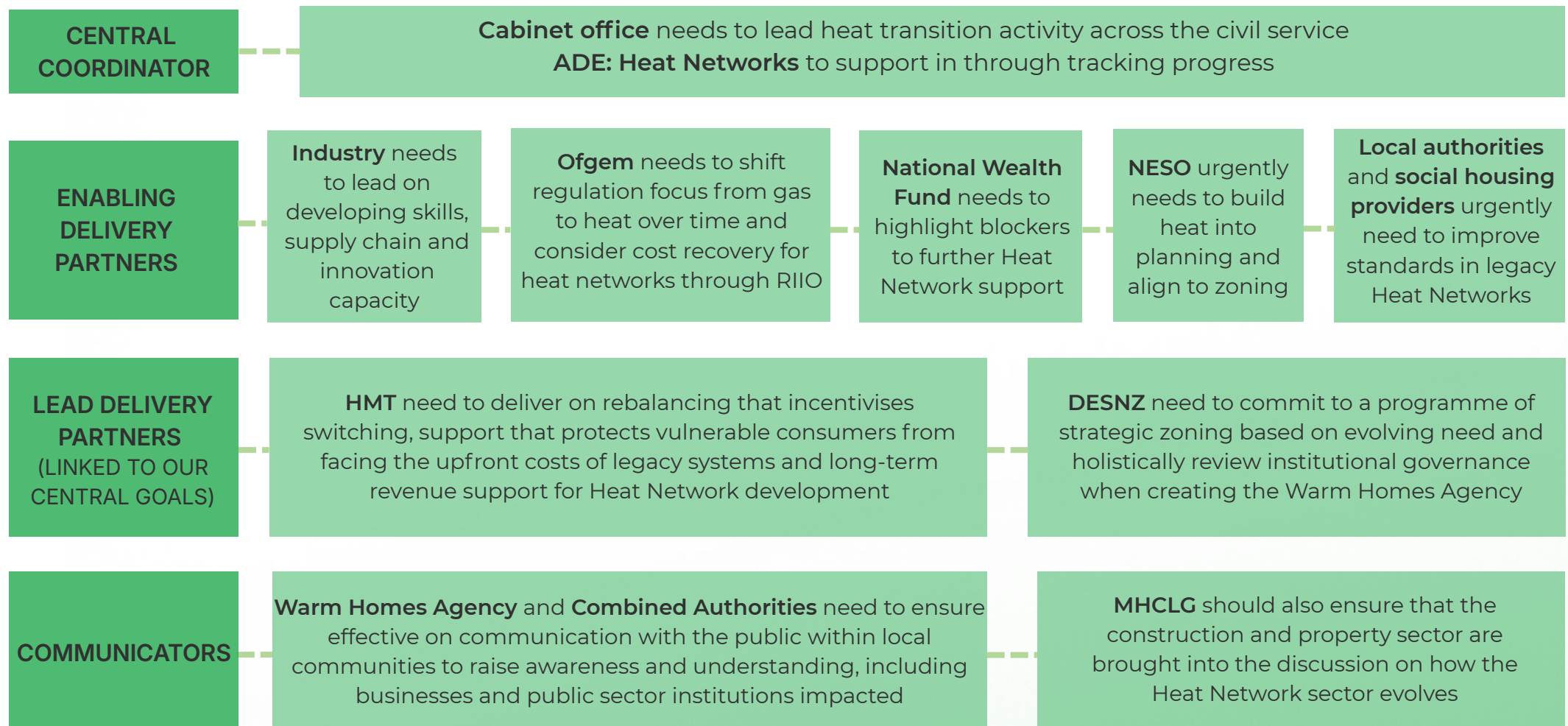
DESNZ should holistically review institutional governance when creating the Warm Homes Agency

Coordination across many institutions is needed to build foundations for an economy of networked heat



INTRODUCTION | Coordination is needed across all actors to realise the scale of change desired

The complexity of the heat decarbonisation challenge requires that a number of different bodies fulfil different roles in building the economy of networked heat described.





INTRODUCTION | Foreword

If Government is serious about transforming how the UK heats its homes and buildings, heat networks must be treated as essential national infrastructure. They require the same clarity of responsibility, accountability and long-term planning that underpin electricity, gas and water networks.

The case for this has become increasingly clear. In recent years the UK has experienced stark reminders of the risks inherent in relying on imported fossil fuels for heat. In 2022 a surge in global gas prices exposed the vulnerability of the gas market to geopolitical shocks, costing the nation £40bn in a single winter and leaving millions of households facing impossible choices and mounting energy bill debt. Heat sits at the centre of the energy system's biggest challenges:

- How can people live and work in affordable comfort?
- How can communities make the best use of local resources?
- What is the fairest way to invest across the whole energy system?
- How can the heat transition unlock opportunities for economic growth?

To date, our approach has been too incremental. Meeting these challenges requires thinking at a different scale. We need to build an economy of low-carbon networked heat: one that unlocks the UK's abundant domestic heat sources and connects them efficiently to homes, buildings and industry. This report sets out the sector's vision for making that economy a reality.

Achieving this will require a shift in mindset and a far greater alignment of investment, policy, planning and skills across Government, industry and communities. This report sets out the challenge to both Government and industry. The opportunity is clear; the responsibility now is to deliver.



Aaron Gould

Aaron Gould

ADE: Heat Networks Interim CEO





MEETING NEEDS



MEETING NEEDS | Affordable heat is a fundamental need Needs across all levels must knit together

The heat transition is complex involving a number of different public bodies and sectors to move in tandem. Not shying away from this complexity means that benefits can be realised across all levels of society.



Economic needs

The economy needs to grow and needs to balance demand and supply of available resources to do so



Energy system needs

The energy system needs to put value in low-carbon heat as it values low-carbon power



Community needs

Communities need support and information to access resources and create local opportunities

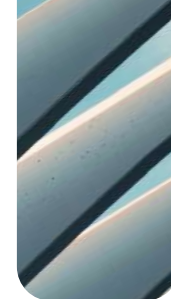


Peoples' needs

People need heat and it cannot cost the earth



Each of these needs must knit together so that outcomes can serve everyone

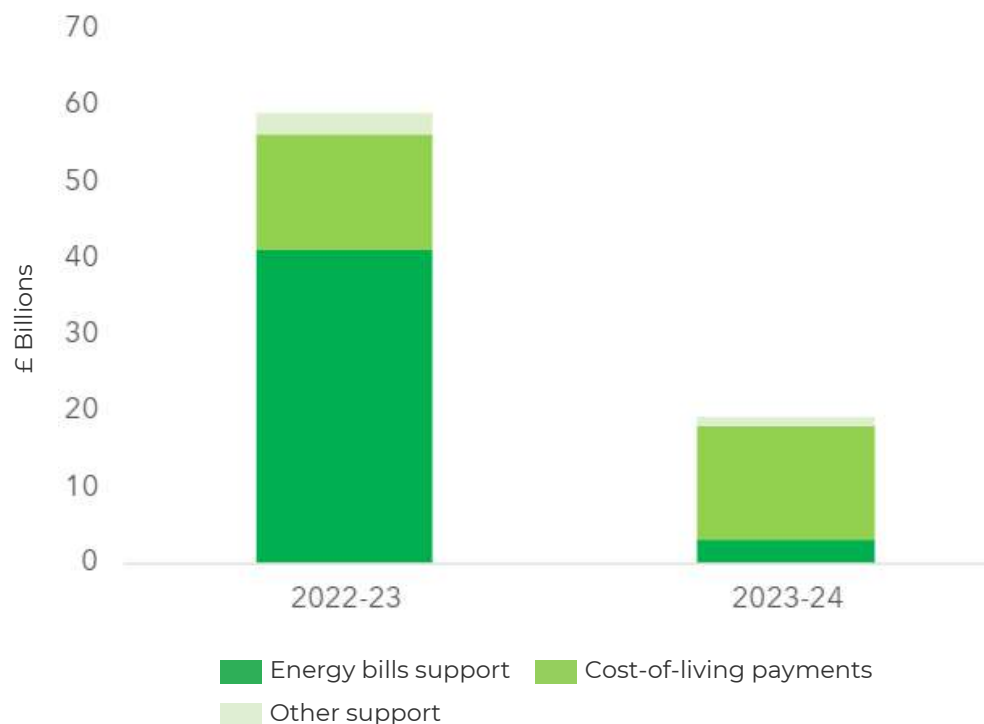




MEETING NEEDS | People need heat and it cannot cost the earth

Natural gas is used for heating in most buildings across the country today, this exposes nearly everyone to price spikes through international markets and accounts for a significant proportion of the country's carbon emissions.

The cost to the UK Government of the energy and cost-of-living support linked to the Russia/Ukraine war¹

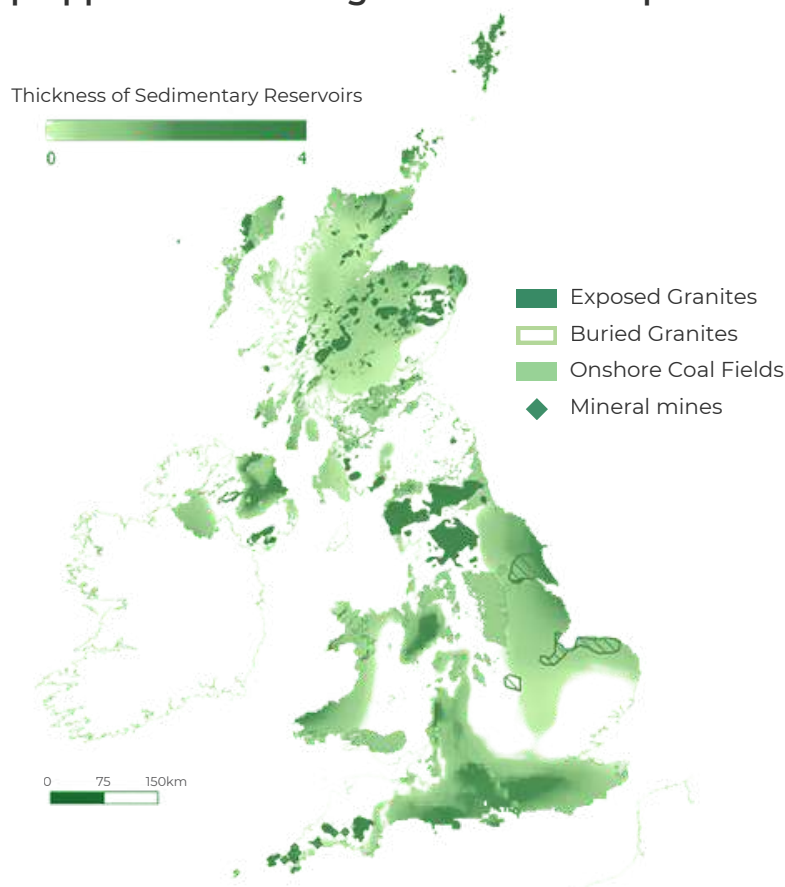


- **Affordability:** Over 12 million people in the UK still struggle with the cost of their energy bills and heating.²
- **Exposure to international gas price:** In 2022, when gas prices spiked, 2 in 5 needed to make choices about which essentials to have including whether to put on heating or not.³ This can happen again as long as we are reliant on gas for heating.
- **Fuel Poverty:** In 2024, 2.7 million households across England were in fuel poverty.⁴ Many low-income households will not be able to afford the costs associated to upgrading legacy systems.⁵
- **Health:** Everyone is vulnerable to damp and mould in a poorly heated and ventilated home.⁶ Change is needed for the 4 million in England who live in non-decent homes.⁷
- **Options:** A spatially informed combination of heat pumps and heat networks can achieve a low-cost heat transition for all.⁸ Consumer trust needs to be built around these options.

MEETING NEEDS | Communities need support and information to access resources and create local opportunities

The resources that many communities have been dependent on have run out or closed without opportunities for replacement being considered. Local level funding has also been lower than is necessary.

Map of UK Geothermal Potential, showing shallow and deep opportunities alongside mine water potential¹



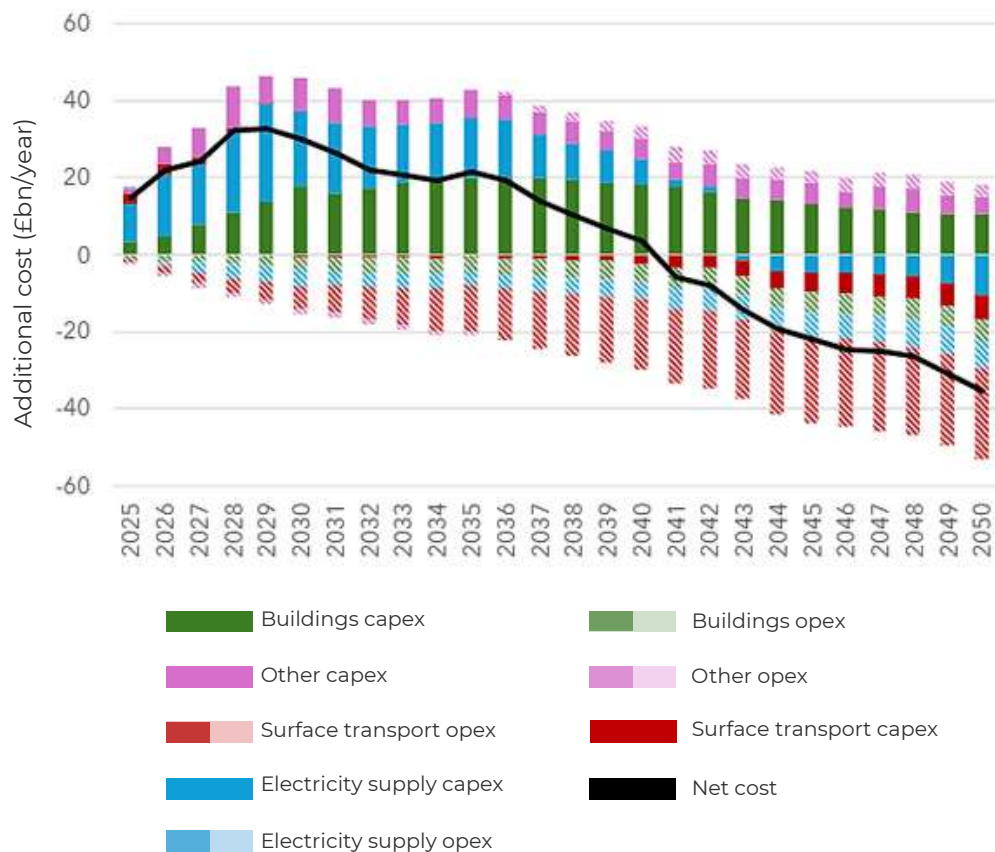
- **Physical resource:** British Industry today produces a massive quantity of heat which is currently wasted. We don't recover or access much of this today, instead we waste it and burn gas to produce more heat.²
- **Emerging physical resource:** Developments relating to deep geothermal, mine water heat,¹ data centre heat³ and heat from other potential growth sectors such as small modular reactors⁴ all provide emerging forms of heat.
- **Skilled resource:** The coal industry was an example of a resource sector closing without suitable replacement for skilled labour.⁵
- **Digital resources:** Maps are available to highlight where heat can be accessed in local areas.⁶ Heat Networks developers need to come in and convert these plans into reality.
- **Local authority resource:** Local and combined authorities need the funding and support to make best use of these sources highlighted above.⁷



MEETING NEEDS | The energy system needs to put value in low carbon heat as it values low carbon power

To meaningfully decarbonise the whole economy, we need to remove siloes in these sectors and better plan integration and cooperation between heat and power.

Capital investment in low carbon technologies brings cost down¹



- **Siloed thinking:** Heat and power have been seen largely as separate – in policy, regulation, planning, industry, and investment. However, heat decarbonisation will affect all other systems.
- **UK leadership in valuing low-carbon power:** The UK led globally on the investment framework created for low-carbon, zero-marginal cost but capital cost intensive power generation assets when establishing contracts for difference (CfDs) in 2010.²
- **Valuing heat:** Giving long-term support to technologies and assets that can access recoverable heat, such as heat networks and thermal storage, would move our energy systems closer to placing value on heat where there is fundamental need.⁴
- **Whole energy system benefit:** Heat networks also have the potential to generate electricity cost savings of up to £3.46bn a year.⁵ They also have the potential to create savings through avoiding sunk assets in the gas system.⁶



MEETING NEEDS | The economy needs to grow and needs to balance demand and supply of available resources to do so

The clean energy sector has a big role to play in ensuring economic growth in the UK, but capital investment is needed to make it a reality.

Benefits to the economy of the clean energy sector¹



Gross Value Added
£83.1 bn



Year on Year
GVA Growth
10.1%



FTE Employment
951,400 Jobs



Year on Year Growth
(FTE Employment)
10.2%



Investment funding
& FDI (2024)
£23 bn



Productivity
£105,542

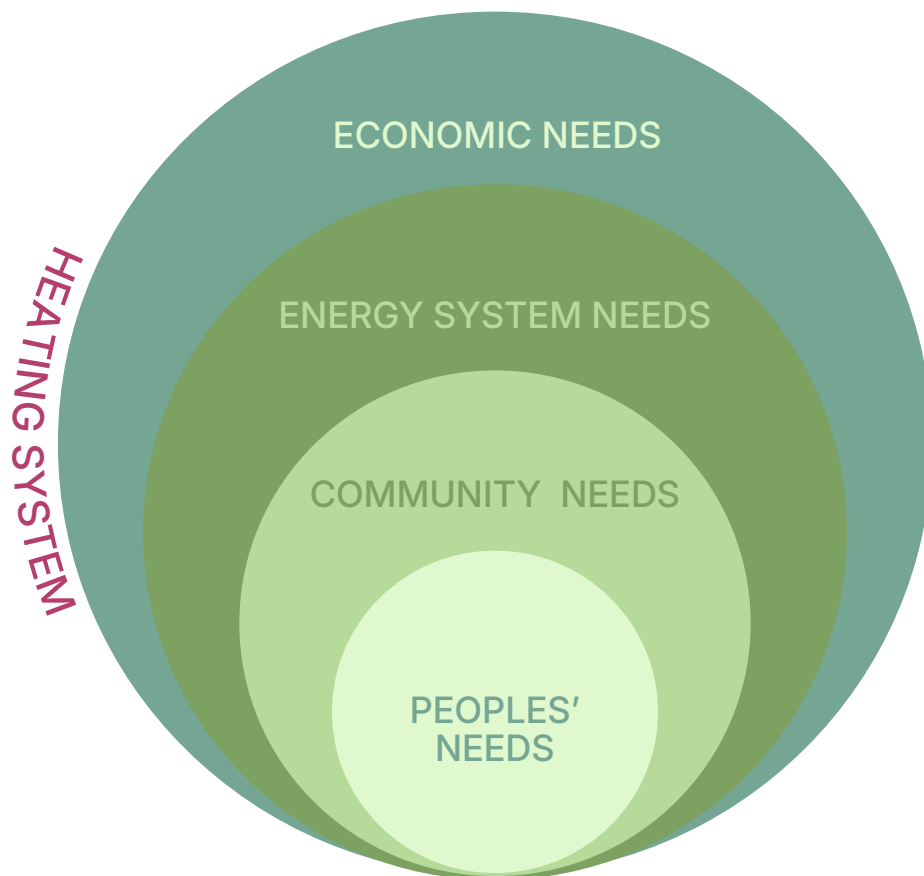
- **Clean Growth:** Between 2023 and 2024, the clean energy sector grew 10.1% and made a significant contribution to growth for the UK. Roughly 1 in 40 people in the UK are employed in the clean energy sector accounting for ~1 million people.¹
- **Gas is not abundant:** Investment in our gas system was made when gas in the north sea appeared to be abundant, however this is no longer the case.²
- **Recoverable heat is abundant:** Great Britain currently produces a significant amount of industrial heat that isn't used.³
- **Anchoring British Industrial heat:** Heat Networks provide avenue for connecting British Industry further into the local communities in the surrounding area, adding to any local job creation benefit.⁴
- **Engine for Growth:** Cheaper energy bills, direct growth through clean investment and retention of British Industry through better use of recoverable heat creates a virtuous cycle of benefits for productivity and the economy.⁵



MEETING NEEDS | Each of these needs must knit together so that outcomes can serve everyone

A systems approach to Clean Heat by 2040 will ensure that the heating system of the future meets the needs of all considered. Familiarising all parties with the necessary information will facilitate, and highlight areas of opportunity.

How needs across heating nest together



- **Systems thinking:** A systems thinking toolkit has been rolled out for civil servants that highlights how to acknowledge connections between different needs and how to act.¹
- **Cross-government national ambition:** The heat transition is relevant at a national and local level and requires coordination action across several public bodies and departments. As a result, the Cabinet Office should coordinate efforts.
- **Application to energy transition:** Guidance on applying systems thinking across the energy system and transition also exists. This highlights how to think across the complexity of the whole energy system, the various vectors that need to be considered and the needs of those making contributions across the system, particularly demand.²
- **Planning and systems thinking:** Institutions across the energy system are publishing strategic plans to show how strategic intention across these systems moves into implementation and planning.³ However, how interventions between different public sector institutions fit together often is not clear.

ade Heat Networks



@Tony Pick / BUUK

PROGRESS TO
DATE AND
GOALS FOR
CLEAN HEAT 2040



PROGRESS TO DATE | Untapped opportunities

Although opportunity exists to meet needs across the energy system and the economy, the needs of people and communities are not being met.

The relationship between needs and opportunities

ECONOMIC NEEDS

Heat as a low-cost resource exists across the country in abundance, there are plenty of opportunities to achieve economic growth by focussing on heat itself, rather than on gas. However, action is needed to help unlock this economic opportunity.¹

ENERGY SYSTEM NEEDS

The status quo focusses too heavily on security of supply for electricity and gas.² However, emerging roles for institutions to consider whole energy system and heat networks provide opportunities for a heat system to emerge³ and for the benefits of low carbon heat for the electricity system to be seen.⁴

COMMUNITY NEEDS

Heat opportunities exist locally and planning/zoning helps highlight said opportunities,⁵ but holistic thinking is needed to maximise all possible benefits.⁶ Zoning and planning policies need real teeth to be effective.

PEOPLES' NEEDS

The high ratio of electricity to gas cost does not enable switching to low-carbon heat and exposes consumers to volatility.⁷ Fuel poverty persists,⁸ people are not sufficiently aware of their options⁹ and standards and regulation are the foundations for trust, rather than the mechanism for building trust.



@Rendesco

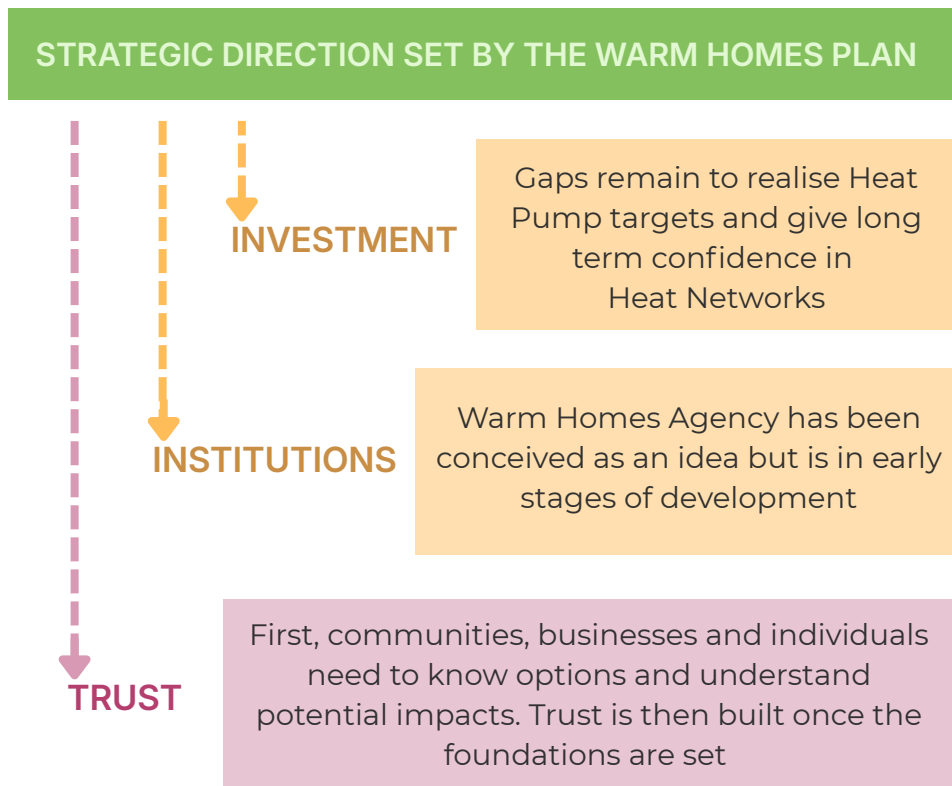




PROGRESS TO DATE | On knitting across needs, strategic direction needs to flow into investment, institutions and awareness

The Warm Homes Plan sets the direction and intent on the heat transition. Aspects of this flow through into good progress in some areas, but more is needed to realise the full scale of change

How far has strategic direction translated into change across investment, institutions and elsewhere



RAG RATING
GOOD PROGRESS
SOME PROGRESS
NO PROGRESS

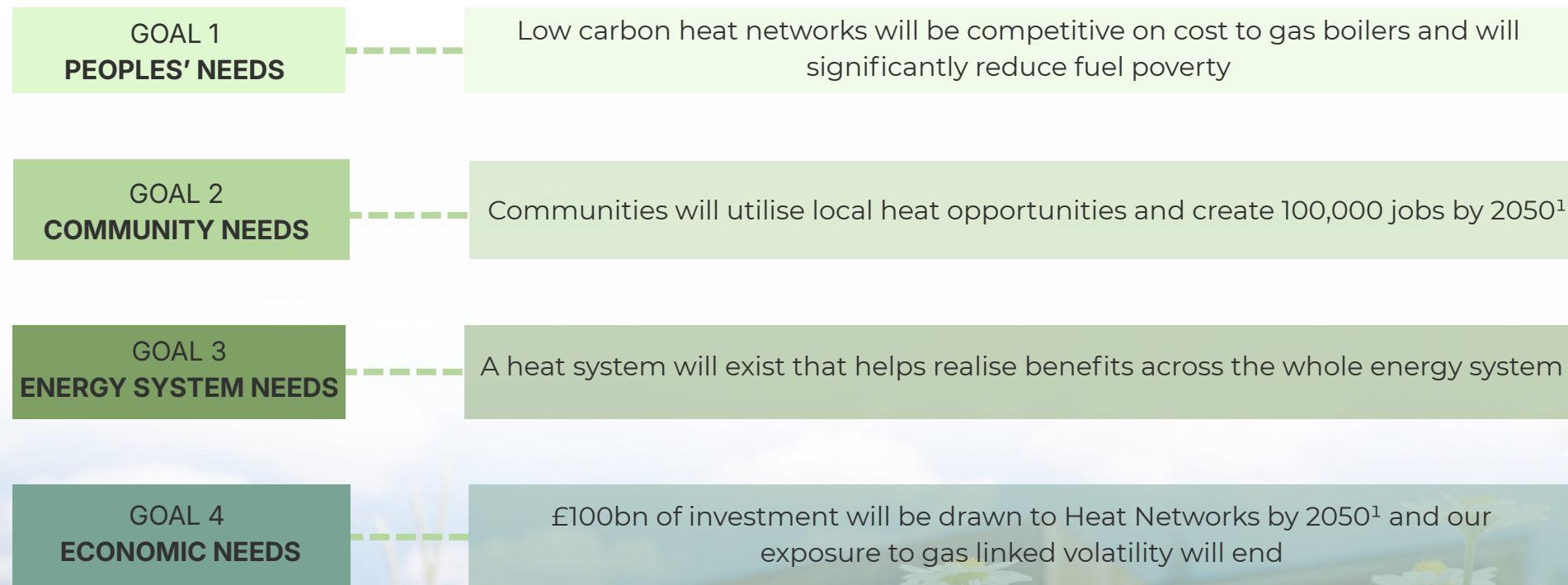
- **Strategic Direction:** The Warm Homes Plan sets direction to 2030 and identifies five pillars for collaboration.¹
- **Investment:** The Boiler Upgrade Scheme (BUS)² and the Green Heat Network Fund (GHNF) exist to encourage uptake of low carbon technologies.³ BUS does not get close to the desired level of Heat Pump uptake,⁴ doesn't support heat network connection costs and GHNF does not yield a long-term investment signal that gives certainty over cost recovery.⁵
- **Institutions:** Heat specific institutions such as the Warm Homes Agency, the Zoning Authority and Coordinators are being created.⁶ However, impacts on existing institutions and their roles across heat,⁷ GDNs, and DNOs have not been clarified,⁸ despite being codified in the Energy Act.⁹
- **Trust:** The need for broader heat engagement programmes has been previously signalled without subsequent action.¹⁰ Regulation and standards set a foundation for trust, but building trust will always be blocked if consumers mainly see negative press coverage.

Sources: 1- [Gov, 2026](#); 2 - [Ofgem, 2025](#); 3 - [DESNZ, 2022](#); 4 - [DESNZ, 2025](#); 5 - [NWF, 2023](#); 6 - [DESNZ, 2024](#); 7 - [Nesta, 2025](#); 8 - [Energy Strategy Reviews, 2023](#); 9 - [Gov, 2023](#); 10 - [NESO, 2025](#)



PROGRESS TO DATE | Clean Heat by 2040 Goals

The heat sector should set its sights on 4 goals, meeting needs for people, communities, the energy system and the economy.



Goal 2 and 4 relate to 2050 as the jobs and investment benefits carry through beyond 2040, even in the scenario where Clean Heat is wholly or mostly delivered by 2040.

Sources: 1- [ADE](#), [HNIC](#), [UKDEA](#), 2025.

ade Heat Networks



BUILDING AN ECONOMY
OF NETWORKED HEAT
AND TAKING ACTION
TO DELIVER
CLEAN HEAT BY 2040

DELIVERY | What is a heat network?

Heat networks involve a series of pipes that carry heat via a medium, usually water, from a heat source, to another building where it can be used.

Heat networks can be communal, where they share heat to only one building, or district, where several buildings are connected to the same network. Heat networks can also connect a series of dwellings that each have a low-carbon heating asset. Cooling networks are also possible, where heat is transferred away from a user.

Strategic infrastructure that carries heat over a great distance is also possible with similar efficiency losses to electricity carried on the transmission network. Several different heat sources can also be connected into the same network to increase system resilience and flexibility.

HEATING
COOLING





DELIVERY | Economy of Networked Heat to realise Clean Heat by 2040

	 2026 – 2030 SCALING & EMERGENCE	 2031-2035 GROWTH	 2036-2040 MATURITY
 HEAT SOURCE	• Currently available heat sources, such as industrial heat, enable district heat network development	• Recoverable heat from industry and data centres play a larger role and build resilience	• Resilience built even further with addition of SMR heat, last of gas contribution removed
 NETWORKS & INFRASTRUCTURE	• Zoning focussed on lowest cost for demand feeds into RESP • Heat Networks given equal consideration to other utilities and strategic infrastructure in terms of rights and powers as well as in revenue support through mechanisms such as a RAB and CfDs	• Strategic zoning yields opportunities for transmission mains,² large scale thermal storage³ and alleviating fuel poverty⁴ • Zoning highlights opportunities for cooling⁵ • Initial areas for gas network repurposing or decommissioning identified	• Heat Network maturity enables zoning focussed on exploring options for last gas consumers to switch and resulting in widespread gas grid decommissioning
 USE & REGULATION	• Focus on new build, commercial, and public sector • Heat Networks defined as subset of non-domestic in regulation¹	• Heat networks expand to target fuel poverty⁴ • Gas, electricity, and heat network customers benefit from equivalent consumer protections	• Increasing demand for active cooling • Regulation focusses on electricity and heat



DELIVERY | Different institutions need to take ownership for different elements of delivery

DELIVERING GOAL 1

HMT should commit to creating an incentive to switch and provide long-term support to Heat Network

DELIVERING GOAL 2

DESNZ should commit to impactful and sequential strategic zoning to fully realise benefits for communities

DELIVERING GOAL 3

DESNZ should holistically review institutional governance when creating the Warm Homes Agency

DELIVERING GOAL 4

Coordination across many institutions is needed to build foundations for an economy of networked heat

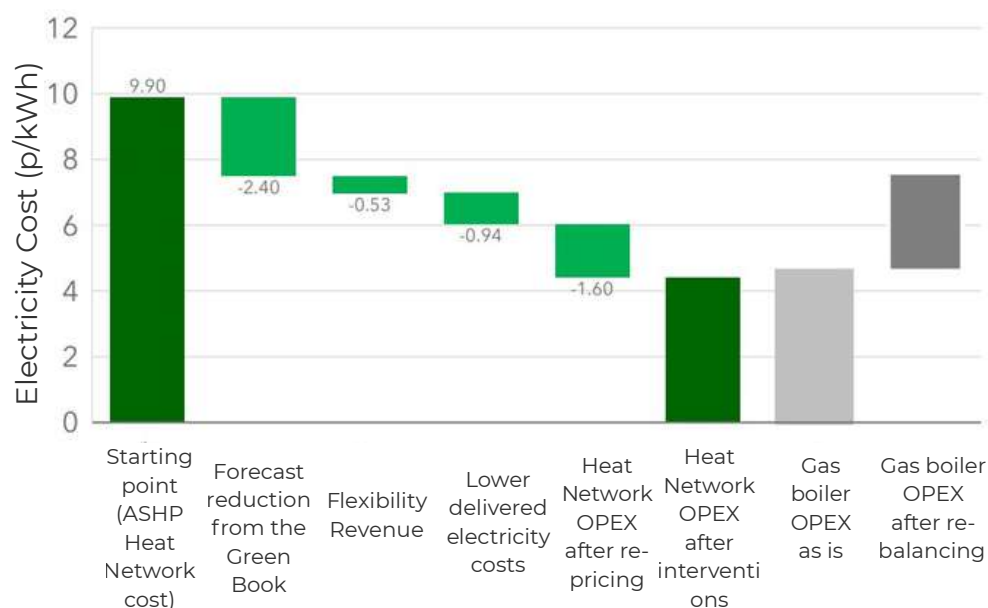




DELIVERY | There needs to be a clear incentive to switch, and Heat Networks need equivalent long-term support

The Treasury need to keep up the momentum on rebalancing to create confidence in the heat transition and need to recognise the strategic long-term value of Heat Networks as infrastructure and give appropriate support.

Levelised cost of heat and the impact of Government and Industry interventions in a medium ambition scenario¹



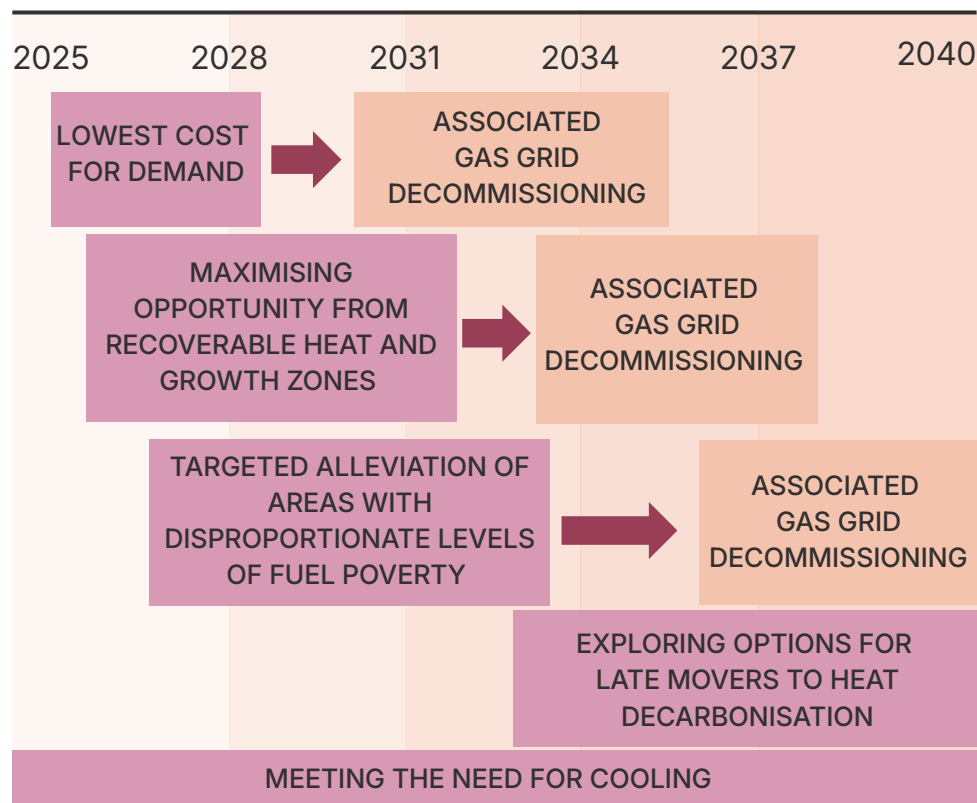
- **Cost of heat:** Electricity bills need to be cost competitive with gas bills for consumers to meaningfully consider switching to low-carbon heating technologies.²
- **Rebalancing:** Electricity levy rebalancing onto taxation from the recent Budget effects the cost of heat,³ more could be done to make this signal to switch stronger including extending benefits to Heat Networks and rebalancing levies onto gas.²
- **Critical national energy infrastructure:** CCUS and nuclear receive long-term support,^{4,5} Heat Networks do not receive equivalent support.⁶
- **Options:** Long-term support, shown in the graph, that could build confidence include a RAB/CfDs, utilising Warm Homes Fund debt or a Targeted Electricity Discount.⁷
- **Funding improvements to legacy systems:** £5bn is needed through the Heat Network Efficiency Scheme or local/social housing funds to build consumer trust and support heat networks in reaching HNTAS standards, without these refurbishment costs fall solely on vulnerable consumers.⁸



DELIVERY | Incremental zoning needs to be used to realise the full benefits of Heat Networks as the need evolves

Internationally, Heat Networks have evolved naturally as new technologies become available¹ and as interest in connection grows. Shifting the objective of zoning over time would help to highlight opportunities as they emerge.

Proposed phasing of Strategic Heat Network Zoning focussing on an evolving scope with subsequent gas decommissioning

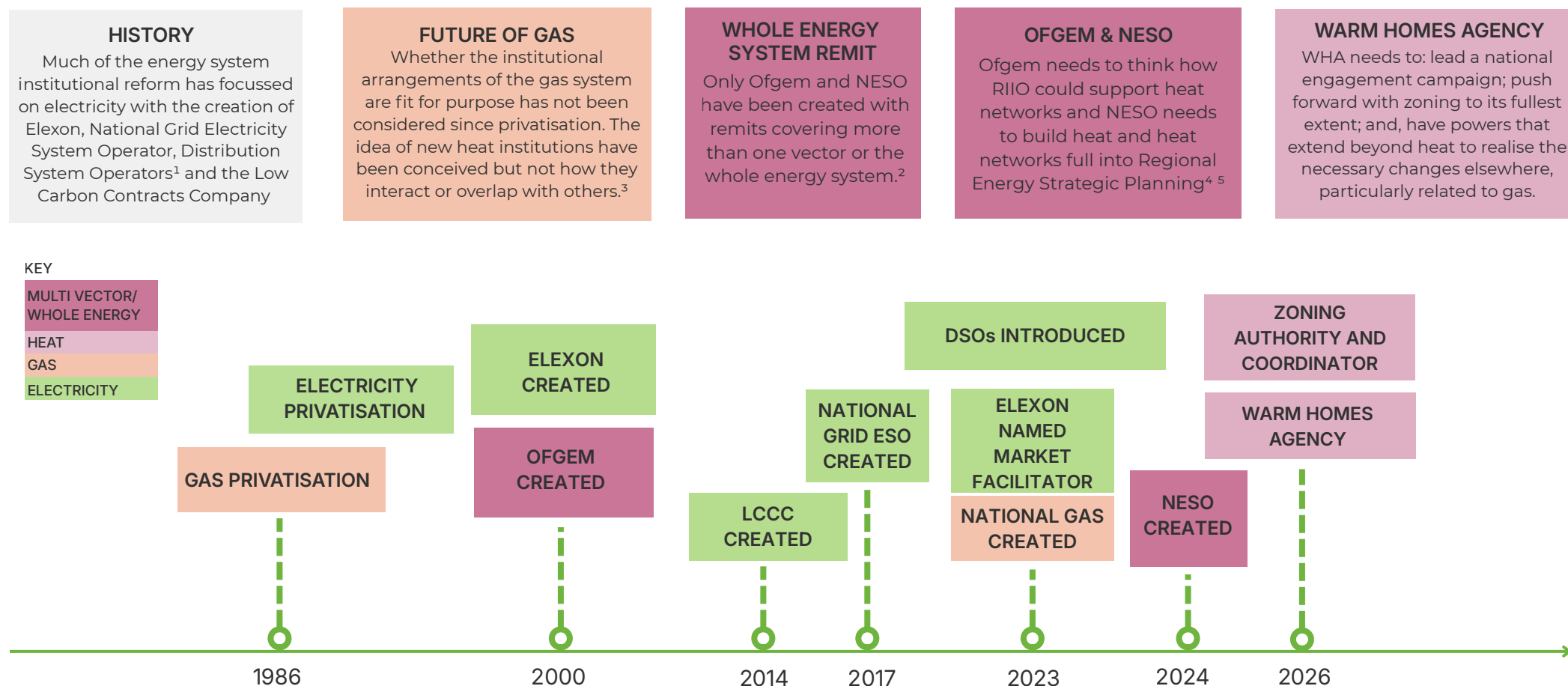


- **Zoning:** Introduced to highlight opportunities for Heat Network development across the UK, this follows similar patterns for Heat Network sector development internationally.²
- **Initial DESNZ focus:** To identify projects in high density areas where heat networks provide the lowest cost of heat, and where there are logistical constraints for alternatives.³ This approach is appropriate at first, but doesn't acknowledge all the benefits of Heat Networks including cooling.⁴
- **Next steps:** Zoning focussed on recoverable heat transmitted by transmission level infrastructure would connect free or cheap heat enabling the development of growth zones and new-builds.⁵ This in turn should reduce the cost to connect.
- **Once established:** Zoning could focus on opportunities to share the benefits of low-cost heat to fuel poor areas not already connected and eventually to those who have struggled to decarbonise.⁶
- **Final stages:** These stages could inform a phased and planned approach to gas grid decommissioning or repurposing.⁶



DELIVERY | Energy system institutions need to be designed holistically and with the future need in mind

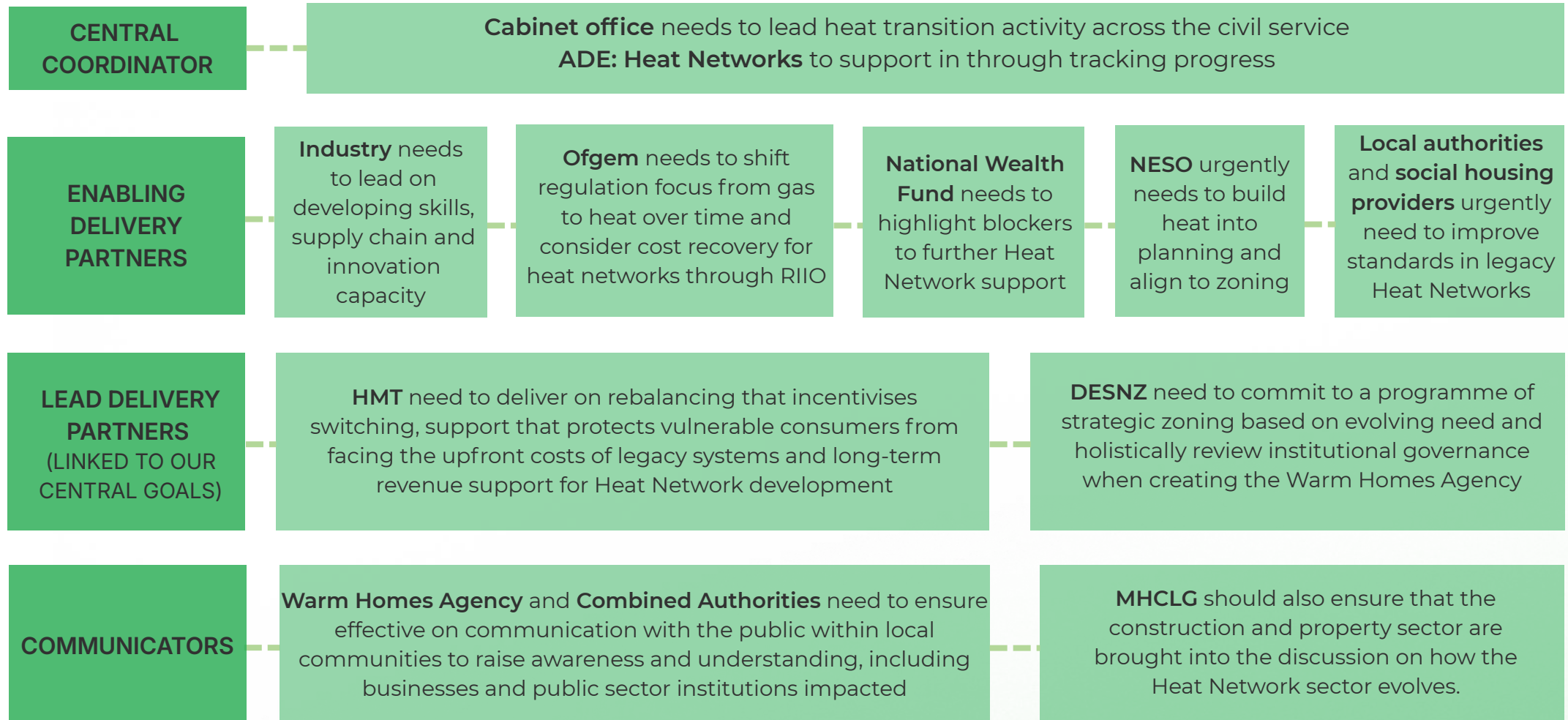
DESNZ needs to look holistically over energy system institutions and think about the what institutions are needed to deliver low-carbon heat and power, paying close attention to the role of gas and heat institutions. This is the institutional governance evolution over time:





DELIVERY | Coordination is needed across all actors to realise the scale of change desired

The complexity of the heat decarbonisation challenge requires that a number of different bodies fulfil different roles in building the economy of networked heat described.





DELIVERY | Energy system institutions need to be designed holistically and with the future need in mind

This report has demonstrated how needs are not being met to make progress on heat decarbonisation, but that there is also great potential to create a great number of positive outcomes through meeting said needs. This report sets out recommendations for action that drives delivery and ADE: Heat Networks welcomes working closes with delivery partners to push forward progress.

MEETING NEEDS	GOALS	RECOMMENDED ACTIONS FOR DELIVERY
People need heat and it cannot cost the earth	Low-carbon heat networks will be cost competitive to gas boilers and fuel poverty will significantly reduce	HMT should commit to creating an incentive to switch and provide long-term support to Heat Network
Communities need support and information to access resources and create local opportunities	Communities will utilise local heat opportunities and create 100,000 jobs by 2050	DESNZ should commit to impactful and sequential strategic zoning to fully realise benefits for communities
The energy system needs to put value in low-carbon heat as it values low-carbon power	A heat system will exist that helps realise benefits across the whole energy system	DESNZ should holistically review institutional governance when creating the Warm Homes Agency
The economy needs to grow and needs to balance demand and supply of available resources to do so	£100bn of investment will be drawn to Heat Networks by 2050 and our exposure to gas linked volatility will end	Coordination across many institutions is needed to build foundations for an economy of networked heat



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