Local Heat and Energy Efficiency Strategy (LHEES)

November 2023

Fife Council

PLAN 4 FIFE

Foreword

I am delighted to introduce Fife Council's first Local Heat & Energy Efficiency Strategy. This strategy and accompanying 5-year delivery plan[1] detail our approach to improve the energy efficiency and decarbonise heat sources of Fife buildings in a climate friendly, ready, and just manner.

Improving our buildings is a core part of the energy transition to net zero by 2045 and tackling the climate emergency. To achieve this means all building owners in Fife will need to do their part to cut building emissions and improve sustainability. This strategy details how we as a Council area will approach this challenge.

Our ambition for Fife's buildings is reflected across eight priorities and multiple actions. These focus on identifying, prioritising, and delivering high certainty of success measures to improve buildings, and where this is not possible to make a commitment to complete further research.

For a successful transition, our strategy also emphasises the need for a just transition to net zero. This includes actions focussing on tackling fuel poverty by aiming to reduce fuel bills; community wealth building; an inclusive economy with green skills and jobs; and ensuring all communities and stakeholders are aware of the green heat transition to low and zero emissions heating.

This strategy was informed through working with partners across Fife. Ongoing collaboration, including sharing of knowledge, data, and innovations will be pivotal to the success of Fife's Local Heat & Energy Efficiency Strategy. It will also improve our buildings, help overcome challenges, and help Fife achieve national targets.

With over half of Scottish energy demand in 2020 being for heating purposes, everyone in Fife will either help support and deliver the strategy and delivery plan through improving their homes and businesses; or experience the benefits of these measures by having more energy efficient homes and workplaces with low or zero emissions heating.

Cllr. Jan Wincott

Spokesperson - Environment & Climate Change

[1] To be published by early 2025.

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Glossary

ABS	Area-Based Schemes
ASHP	Air Source Heat Pump
BGS	British Geological Survey
CCZW	Climate Change and Zero Waste Team
DNO	Distribution Network Operator
ECO	Energy Company Obligation
EES:ABS	Energy Efficient Scotland: Area Based Schemes
EESSH	Energy Efficiency Standard for Social Housing
EPC	Energy Performance Certificate
ESP	Energy Skills Partnership
EST	Energy Saving Trust
FVA	Fife Voluntary Action
GIS	Geographic Information System
GSHP	Ground Source Heat Pump
HEEPS:ABS	Home Energy Efficiency Programmes for Scotland: Area Based Schemes
HES	Historic Environment Scotland
HiBS	Heat in Buildings Strategy
HNZ	Heat Network Zones
LA	Local Authority
LAEP	Local Area Energy Plan
LDP	Local Development Plan
LEAR	Local Energy Asset Representation
LHEES	Local Heat and Energy Efficiency Strategy
LPG	Liquefied Petroleum Gas
LTS	Local Transmission System
MoD	Ministry of Defence
NPF4	National Planning Framework 4
OVHA	Ore Valley Housing Association
PEAT	Portfolio Energy Analysis Tool
RIIO-ED (2/3)	Revenue = Incentives + Innovation + Outputs – Electricity Distribution
RSL	Registered Social Landlord
SAP	Standard Assessment Procedure
SDS	Skills Development Scotland
SRUC	Scotland's Rural College
SME	Small, Medium Enterprise
Solar PV	Solar Photovoltaic
STEM	Science, technology, engineering, and mathematics
TAHP	Transitional Affordable Housing Programme
UoSA	University of St Andrews
UPRN	Unique Property Reference Number

Overview

What is a Local Heat and Energy Efficiency Strategy?	A long-term, flexible strategy providing a local, tailored approach for where we live, to improve energy efficiency and change to climate friendly heating in buildings.
Why are the Council preparing a Local Heat and Energy Efficiency Strategy?	Increasing buildings' energy efficiency and changing to climate friendly heating will help Fife and Scotland tackle the climate emergency and reduce greenhouse gas emissions. The Scottish Government's Local Heat and Energy Efficiency Strategies (Scotland) Order 2022 requires local authorities to publish a strategy and delivery plan by 31st December 2023.
Focus of this Local Heat and Energy Efficiency Strategy?	This strategy needs to start delivering quickly, flexibly, and to a high standard. This will allow Fife to meet the pace and scale appropriate to tackle climate change. It will also allow for new policies, targets, and data to be added when required. The strategy and delivery plan will have actions which can be delivered in the first few years to tackle climate change. It will also identify where further work is needed. This includes actions on tackling key challenges to ensure we have a successful document which benefits Fife.
Call to Action	Making buildings greener and more environmentally friendly will help reduce greenhouse gas emissions and meet national targets. To achieve this means everyone in Fife will need to do their part to reduce greenhouse gases from buildings and improve energy efficiency. The Council, businesses, organisations, communities, and householders will all need to work together to act.
What is meant by climate friendly, ready, and just?	Climate Fife: Sustainable Energy and Climate Action Plan[2] is underpinned by three core principles, that by 2045 Fife will be: • **Climate friendly** having transformed the economy, infrastructure, land use and energy system to decarbonise how we live. • **Climate ready** with plans/projects increasing resilience of Fife communities and economy to help minimise impacts of unavoidable climate change. • **Climate just** ensuring everyone and the environment benefit from this transition.
What is meant by a just transition?	Scottish Government defines a just transition as *"both the outcome – a fairer, greener future for all – and the process that must be undertaken in partnership with those impacted by the transition to net zero. Just transition is how we get to a net zero and climate resilient economy, in a way that delivers fairness and tackles inequality and injustice."*[3]
Who are stakeholders?	Stakeholders include all public, private and third sector organisations in Fife, as well as people who live in Fife and their communities.
Where can I view the web map?	A web map showcasing baseline information for Fife and our strategic and heat network zones, is available here.

[2] Microsoft Word - Climate Fife FINAL
[3] National Just Transition Planning Framework - Just Transition - A Fairer, Greener Scotland: Scottish Government response - gov.scot (www.gov.scot)

Executive Summary

Introduction

In 2022, the Scottish Parliament passed The Local Heat and Energy Efficiency Strategies (Scotland) Order 2022[4]. This placed a statutory duty on local authorities to:

- Prepare, publish, and update a Local Heat and Energy Efficiency Strategy and Delivery Plan.
- Publish its first strategy and delivery plan on or before 31st December 2023.

Local Heat and Energy Efficiency Strategies are at the heart of a place based, locally led, and tailored approach to the heat transition. They underpin an area-based approach to heat and energy efficiency planning and delivery. For Fife, this was developed in partnership with key stakeholders, and:

- provides a long-term, flexible strategy, and iterative delivery plan, to decarbonise heat and improve energy efficiency, considering wider priorities and targets,
- details how segments of building stock must change to meet national and local targets,
- identifies opportunities for heat decarbonisation and energy efficiency[5], and
- uses an optioneering process to prioritise actions.

The 5-year delivery plan[6] provides a strong basis for action for stakeholders and communities. It identifies early, low-regrets measures; and where ongoing analysis is required. It also provides direction and informs wider energy planning with our regional city region deal partners.

This strategy will play a crucial role in helping the Council meet its 2045 net zero target, and help Fife be climate friendly, ready, and just by 2045. It will also contribute to meeting fuel poverty targets and the Council's duties under the Heat Network (Scotland) Act 2021.

Strategic Vision

Fife Council supports the Heat in Buildings Strategy's[7] vision "*that by 2045 our buildings are cleaner, greener, and easy to heat, and no longer contributing to climate change, as part of the wider just transition to net zero*." The vision for Fife's first Local Heat and Energy Efficiency Strategy is to:

Provide a focus for Fife to improve the energy efficiency and decarbonise heat sources of buildings in a climate friendly, ready, and just manner to meet targets.

Drivers

Chapter 3 details the key policies and drivers for this strategy. Heating is a significant contributor to Scotland's energy demands and greenhouse gas emissions. In 2020, ~53% of Scottish energy demand was for heating and responsible for ~20% of energy related greenhouse gas emissions[8].

Furthermore, the energy crisis is adding costs pressures to everyone. Fife's domestic gas and electricity costs alone rose to an estimated £500 million/year in 2022/23[9]. Higher fuel costs increase fuel poverty and costs for businesses. The likely cost for all energy in Fife is expected to be over £1Bn[10] - a sizeable proportion of Fife's total GDP which is mostly lost to the local economy.

By making recommendations to improve buildings' energy efficiency and switch to climate change friendly heating, this strategy will help reduce greenhouse gas emissions, and help keep money in Fife.

[4] The Local Heat and Energy Efficiency Strategies (Scotland) Order 2022 (legislation.gov.uk)
[5] Strategic zones, potential heat network zones, and delivery areas (to be identified in the detailed delivery plan).
[6] To be published by early 2025.
[7] Heat in Buildings Strategy - achieving net zero emissions in Scotland's buildings - gov.scot (www.gov.scot)
[8] Scottish Energy Statistics Hub (shinyapps.io)
[9] Calculation based on the UK Government October 2022 price cap figures.
[10] Estimation based on previous figures from Climate Fife and analysis on the UK Government Price Cap October 2022.

Opportunities

Several technologies and measures exist which will reduce energy consumption and decarbonise heat, detailed in Chapter 4.1. These include insulation, heat networks, and heat pumps, as well as other emerging technologies. Other opportunities were identified (Chapter 4.2) and include:

- economic benefits,
- supporting wider energy planning,
- green jobs and skills,
- utilising waste heat and natural assets,
- smart energy solutions, and
- improving stakeholder connections.

Challenges

During development, challenges were identified which need to be overcome to ensure the success of the strategy and delivery plan. These are detailed in Chapter 4.3, and focus on uncertainties with retrofit measures, heat pump data, the skills and funding gaps, amongst others.

Some challenges increase uncertainty of achieving a robust delivery or cause undesired impacts. These could potentially damage confidence in the strategy and early actions. To address this, **we will only include measures where there is a high certainty of success and positive impacts**. There are actions focussing on research and analysis to support this.

What is meant by high certainty of success and positive impacts?
Once published our detailed delivery plan will focus on measures where they are most likely to be possible, minimising potential damage to buildings, rising energy costs, or fuel poverty.

Priorities

This strategy focuses around eight priorities (Chapter 6), where areas of work will be focussed around. All priorities are equally reliant on each other to drive forward change, with some helping build strong foundations before any building level actions can be implemented.

1. **Being Climate Friendly & Ready –** an overarching priority focussing on meeting net zero and addressing the climate emergency, as well as adapting to a changing climate.
2. **Tackling Fuel Poverty, Health, and the Just Transition –** this focuses on the work required to help meet fuel poverty targets and to ensure health is not impacted by changes to indoor air quality. It also sets out the importance of ensuring everyone benefits from the heat transition.
3. **Supporting an Inclusive Economy, Jobs, and Skills –** this details the need for green skills and jobs (and supporting roles) to support the heat transition, as well as the funding gap. Both challenges will need addressed if the strategy is to be successful.
4. **Maximising Knowledge and Awareness –** a priority focussed on behavioural change and communications to ensure all stakeholders and communities understand the heat transition.
5. **Ensuring Certainty of Success** – this priority sets out how the Council will approach some of the key challenges, which is explored in more detail in Chapter 7.1.
6. **Transitioning the Energy System –** a priority tailored around working with utility providers to determine grid capacity, decarbonise utilities, and consider how this strategy fits within the wider energy system.
7. **Improving the Energy Efficiency of Buildings –** a priority supporting the identification of actions around installing energy efficiency measures for domestic and non-domestic buildings.
8. **Decarbonising Heat Sources -** a priority supporting the identification of actions around installing decarbonised heating for domestic and non-domestic buildings and identify potential opportunities for district heat networks.

1. Introduction

1.1. Purpose

In 2022, the Scottish Parliament passed The Local Heat and Energy Efficiency Strategies (Scotland) Order 2022[11]. This placed a statutory duty on local authorities to:

- Prepare, publish, and update a Local Heat and Energy Efficiency Strategy and delivery plan.
- Publish its first strategy and delivery plan on or before 31st December 2023.

Local Heat and Energy Efficiency Strategies are at the heart of a place based, locally led, and tailored approach to the heat transition. They underpin an area-based approach to heat and energy efficiency planning and delivery. For Fife, this was developed in partnership with key stakeholders, and:

- provides a long-term, flexible strategy, and iterative delivery plan, to decarbonise heat and improve energy efficiency, considering wider priorities and targets,
- details how segments of building stock must change to meet national and local targets,
- identifies opportunities for heat decarbonisation and energy efficiency[12], and
- uses an optioneering process to prioritise actions.

The 5-year delivery plan[13] provides a strong basis for action for stakeholders. It identifies early, low-regrets measures; and where ongoing analysis is required. It also provides direction and informs wider energy planning with our regional city region deal partners.

This strategy will play a crucial role in helping the Council meet its 2045 net zero target, and help Fife be climate friendly, ready, and just by 2045.

1.2. Strategic Vision and Priority Areas

Fife Council supports the Heat in Buildings Strategy's[14] vision "*that by 2045 our buildings are cleaner, greener, and easy to heat, and no longer contributing to climate change, as part of the wider just transition to net zero*." The vision for Fife's first Local Heat and Energy Efficiency Strategy is to:

Provide a focus for Fife to improve the energy efficiency and decarbonise heat sources of buildings in a climate friendly, ready, and just manner to meet targets.

Eight priorities (Table 1) form the basis of this strategy and delivery plan. These were developed from national and local strategies; engaging stakeholders; and analysis. They help ensure this strategy improves energy efficiency and decarbonises heat of buildings, and other important considerations such as fuel poverty and community wealth building. These are further explored in Chapter 6.

Table 1: Priorities

1		**Being Climate Friendly and Ready**
2		**Tackling Fuel Poverty, Health, and the Just Transition**
3		**Supporting an Inclusive Economy, Jobs, and Skills**
4		**Maximising Knowledge and Awareness**
5		**Ensuring Certainty of Success**
6		**Transitioning the Energy System**
7		**Improving the Energy Efficiency of Buildings**
8		**Decarbonising Heat Sources**

[11] The Local Heat and Energy Efficiency Strategies (Scotland) Order 2022 (legislation.gov.uk)
[12] Strategic zones, potential heat network zones, and delivery areas (to be identified in the detailed delivery plan).
[13] To be published by early 2025.
[14] Heat in Buildings Strategy - achieving net zero emissions in Scotland's buildings - gov.scot (www.gov.scot)

2. Structure and Function

2.1. Structure

The Local Heat and Energy Efficiency Strategies (Scotland) Order 2022, establishes a two-part structure:

- **Strategy** - a long-term strategic framework for the improvement of the energy efficiency of buildings; and the reduction of greenhouse gas emissions from the heating of such buildings.
- **Delivery plan** - sets out how Fife will implement its strategy.

2.2. Function

National guidance frames the strategy around six considerations[15]. These helped inform the development of our priorities:

- **Heat Decarbonisation considerations:**
    1. Off-gas grid buildings – transitioning from heating oil and liquefied petroleum gas in off-gas areas.
    2. On-gas grid buildings – on-gas grid heat decarbonisation.
    3. Heat networks – decarbonisation with heat networks.
- **Energy Efficiency consideration:**
    4. Poor building energy efficiency
    5. Poor building energy efficiency as a driver for fuel poverty
    6. Mixed-tenure, mixed-use and historic buildings

The guidance requires Local Heat and Energy Efficiency Strategies to:

- be evidence based,
- cover a local authority's full building stock as far as reasonably possible,
- be developed in collaboration with stakeholders and use extensive consultation,
- be linked to any previous iteration to show progress achieved against outcomes and carry forward outstanding actions,
- demonstrate how it supports equality and addresses inequality,
- be forward looking and delivery focussed, working towards local and national targets,
- be open and transparent regarding data used, its associated limitations in terms of scope, accuracy, and coverage, and be continuously reviewed with progress monitored.

Analysis and grouping of opportunities have been used to identify and prioritise actions:

- **Strategic zones** – visualisation of potential ways to decarbonise buildings at the strategic level[16]. These provide a mechanism to understand buildings' baseline performance; scale of potential; and prioritise initial areas of focus.
- **Delivery areas[17]** – a more granular level identification of opportunities. These present clusters of buildings within the same geographical area (area-based) or those with comparable characteristics with similar opportunities (theme-based).

This analysis will help the Council, Scottish Government, and partners develop new policy and actions.

[15] Local heat and energy efficiency strategies and delivery plans: guidance - gov.scot (www.gov.scot)
[16] Strategic zones are based on Data Zones - the key geography for the dissemination of small area statistics in Scotland. Fife has 494 data zones, with on average 376 households in each.
[17] To be included in the detailed delivery plan published by early 2025.

3. Policy and Drivers

3.1. Policy & Strategy Drivers

Many national, regional, and local policies and strategies have directed this document. It is primarily driven by Scotland's statutory targets for greenhouse gas emissions reduction; the Heat in Buildings Strategy; the Heat Network (Scotland) Act 2021; and fuel poverty targets. A list of all policies is in Appendix 2, and key targets in Appendix 3.

3.1.1. National Policy Drivers

The main national policies are detailed below (Table 2), and in Appendix 2. These will be regularly reviewed to highlight any changes, and how they influence ongoing delivery.

Table 2: National Policy Summary

Policy	Details
Climate Change (Emissions Reduction Targets) (Scotland) Act 2019[18]	Sets a 2045 net zero emissions target and interim targets: 75% by 2030; and 90% by 2040.
Securing A Green Recovery on a Path to Net Zero: Climate Change Plan 2018–32[19]	Contains proposals/policies for meeting greenhouse gas emissions reduction targets up to 2032. Details a vision by 2032 a substantial majority of homes will have achieved a good energy efficiency rating.
Heat in Buildings Strategy[20] **(2021)**	Presents the pathway to meet 2045 net zero emissions from buildings, alongside ensuring poor energy performance is removed as a driver for fuel poverty. Contains several national targets[21] (Table 3).
Energy Efficiency Standard for Social Housing 2 (EESSH2)[22]	Aims to improve the energy efficiency of social housing, based on a minimum energy performance certificate[23] rating. All social housing must meet, or be treated as meeting, energy performance certificate band B, or is as energy efficient as practically possible, by December 2032.
Heat Networks (Scotland) Act 2021[24]	Regulates heat networks, supporting objectives in the Heat in Buildings Strategy to grow heat network opportunities. This strategy helps Fife Council meet part of its duty within the Act by identifying potential heat network zones. Other duties excluded from this strategy are identifying non-domestic building connections; designating zones; setting up permitting, regulation, and licencing processes; and developing a cost strategy.
Fuel Poverty (Targets, Definition and Strategy) (Scotland) Act 2019[25]	Sets targets for 2040 focussed on eradicating fuel poverty; defines fuel poverty; requires production of fuel poverty strategies and makes provision about reporting. Targets include: • < 5% of households in Scotland are in fuel poverty. • < 1% of households in Scotland are in extreme fuel poverty. • Median fuel poverty gap of households in fuel poverty is < £250.

[18] Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 (legislation.gov.uk)
[19] Executive Summary - Climate Change Plan: third report on proposals and policies 2018-2032 (RPP3) - gov.scot (www.gov.scot)
[20] Heat in Buildings Strategy - achieving net zero emissions in Scotland's buildings - gov.scot (www.gov.scot)
[21] These are yet to be put into legislation at the time of writing.
[22] Energy efficiency in social housing - Home energy and fuel poverty - gov.scot (www.gov.scot)
[23] An energy performance certificate measures the energy efficiency of a buildings and provides them with a score ranging from A (most efficient) to G (least efficient).
[24] Heat Networks (Scotland) Act 2021 (legislation.gov.uk)
[25] Fuel Poverty (Targets, Definition and Strategy) (Scotland) Act 2019 (legislation.gov.uk)

Table 3: Key Heat in Buildings Strategy Targets

2028	2030	2033	2040	2045
• Private rented homes to be energy performance certificate band C.	• Emissions from buildings must be 68% lower than 2020 levels. • Zero emissions heating in the equivalent of 50,000 non-domestic buildings.	• All homes to be energy performance certificate band C. • Zero emissions heating in 170,000 off-gas fossil fuel heated homes, and 1 million on-gas homes.	• All homes in fuel poverty to be energy performance certificate band B.	• Buildings no longer contribute to climate change.

3.1.1.1. National Planning Framework 4[26]

Scotland's national spatial strategy transforms the way planning and climate change are viewed together. It sets spatial principles, regional priorities, national developments, and planning policy. Spatial planning priorities have been developed to help guide the preparation of regional spatial strategies and local development plans[27] (Table 4).

Table 4: National Planning Framework 4 Central Region Priorities

Deliver **sustainable places**	Deliver **liveable places**	Deliver **productive places**
Regional Spatial Strategies and Local Development Plans in this area should support net zero energy solutions including extended heat networks and improved energy efficiency, together with urban greening and improved low carbon transport.	Regional Spatial Strategies and Local Development Plans in this area should pioneer low carbon, resilient urban living by rolling out networks of 20-minute neighbourhoods, future proofing city/town centres, accelerating urban greening, investing in net zero homes, and managing development on the edge of settlements.	Regional Spatial Strategies and Local Development Plans in this area should target economic investment and build community wealth to overcome disadvantage and support a greener wellbeing economy.

Across these priorities, there is a need for greater investment in, and development of, net zero homes and places supporting green jobs. Local Development Plans, and strategies like Local Heat and Energy Efficiency Strategies, will focus on decarbonising heat and energy networks, and the just transition to greener, low carbon heat generation.

Appendix 2 summarises where National Planning Framework 4 aligns against relevant priorities and outcomes in this strategy.

3.1.2. Local Policy Drivers

The main local policies this strategy aligns with/supports, and stakeholders each relates to, are detailed below (Table 5), and in Appendix 2. These will be regularly reviewed for future iterations to highlight any changes, and how these will influence ongoing delivery.

[26] National Planning Framework 4 - gov.scot (www.gov.scot)
[27] Fife is included in the Central Region which has three priorities.

Table 5: Local Policy Summary

Policy	Details	Stakeholders
Plan4Fife (Local Outcome Improvement Plan) 2017-27[28]	Details a vision by 2027 Fife will: "*be a place where all residents live good lives, make informed choices and have a sense of control so that they can reach their full potential, and where all children are safe, happy and healthy … make best use of our assets and facilities, while sustaining them for future generations*." A post-COVID response was produced[29] with new recovery and renewal priorities up to 2024: Community wealth building; Leading economic recovery; Tackling poverty and preventing crisis; Addressing the climate emergency. The priorities in this strategy are closely aligned to these. The Local Heat and Energy Efficiency Strategy will be influenced by any future revisions to the Local Outcome Improvement Plan and will provide the context for Fife-wide action.	Communities
FIFEplan[30] **(Local Development Plan) 2017** *(Low Carbon Fife*[31] *and Making Fife's Places*[32] *Supplementary Planning Guidance Documents)*	Details policies/proposals for land development and use, including: • Policy 2: Homes – Increase availability of good quality homes to meet local needs. • Policy 3: Infrastructure and Services – Low carbon measures including local energy generation and heat networks must be addressed as part of development proposals. • Policy 10: Amenity – Places in which people feel their environment offers them a good quality of life. • Policy 11: Low Carbon Fife – Energy resources are harnessed in appropriate locations and in a manner where the environmental and cumulative impacts are within acceptable limits. This strategy will support the development of Fife's Local Development Plan 2.	All developments (domestic and non-domestic)
Climate Fife: Sustainable Energy and Climate Action Plan[33] **(2020)**	Details a Fife-wide approach to tackling the climate emergency, and actions to limit its most harmful impacts. It is underpinned by three core principles, which the Local Heat and Energy Efficiency Strategy takes forward, that by 2045 Fife will be: • **Climate friendly** having transformed the economy, infrastructure, land use and energy system to decarbonise how we live. • **Climate ready** with plans and projects to increase resilience of Fife communities and economy to help minimise the impacts of unavoidable climate change. • **Climate just** ensuring everyone in Fife and the environment benefit from this transition. It has multiple priorities and actions across eight themes, including: energy efficiency; low carbon energy; and move, store, and transform energy.	Fife-wide
Local Housing Strategy 2022-27[34]	The strategic vision of Fife Housing Partnership. It lists five priorities of which "A Warm Low Carbon Home" is relevant to this strategy, with outcomes of ensuring people: do not live in fuel poverty, live in energy efficient homes, and reduce carbon emissions.	Domestic Properties
Fife's Fuel Poverty Covid-19 Recovery Plan[35]	An interim plan addressing fuel poverty during the pandemic, with five objectives. This strategy supports the objective of considering long term recovery plans.	Fife residents

[28] A Plan for Fife | Our Fife - Creating a successful, confident, and fairer Fife
[29] Plan for Fife 2021-24 | Our Fife - Creating a successful, confident, and fairer Fife
[30] Local Development Plan (FIFEplan) | Fife Council
[31] Adopted Low Carbon Fife SG Jan 2019
[32] Making-Fifes-Places-Supplementary-Guidance-August-2018.pdf
[33] Microsoft Word - Climate Fife FINAL
[34] Local Housing Strategy | Fife Council
[35] Fifes-Fuel-Poverty-Covid-19-Recovery-Plan-2021-22-Final-1.pdf

3.2. Other Drivers

In 2020, **~53%** of Scottish energy demand was for heating and responsible for **~20%** of energy related greenhouse gas emissions[36]. Scotland set targets of 50% of energy from renewable sources by 2030,[37]. To support this, the Scottish Government committed:

- £2.8 billion of investment over the current parliament[38] (to 2026).
- At least £200 million of investment in the public sector estate to improve and reduce energy use and install zero emissions heating systems[39].
- £479.6M for energy in the 2023-4 budget[40], of which £231.1 million is for tackling fuel poverty and improving energy efficiency.

The Scottish Government have also indicated Local Heat and Energy Efficiency Strategies will be a consideration when allocating funding.

Another driver is the energy crisis, with costs adding pressure to everyone. Fife's domestic gas and electricity costs alone rose to an estimated **£500 million/year** in 2022/23[41]. Higher fuel costs increase fuel poverty and costs for businesses. The likely cost for all energy (including transport) in Fife is expected to be **over £1 billion**[42] - a sizeable proportion of Fife's total gross domestic product which is mostly lost to the local economy.

This strategy can bring potential benefits for Fife, and support the just transition to net zero, by helping reduce:

- Financial burdens of energy for buildings (domestic, business, public sector estate, and others including social enterprises and community organisations).
- "Loss" to Fife's gross domestic product and increasing retention as part of community wealth building.
- Energy demand and costs as a driver of fuel poverty.
- Energy demand in the cost of doing business.
- Energy as a driver of the climate emergency in Fife.
- Energy demand to increase energy resilience.

[36] Scottish Energy Statistics Hub (shinyapps.io)
[37] Scottish Energy Statistics hub.
[38] https://www.gov.scot/publications/heat-buildings-strategy-achieving-net-zero-emissions-scotlands-buildings/documents/
[39] https://www.gov.scot/publications/heat-buildings-strategy-achieving-net-zero-emissions-scotlands-buildings/ & https://www.gov.scot/publications/heat-networks-delivery-plan/
[40] https://www.gov.scot/publications/scottish-budget-2023-24/pages/10/
[41] Calculation based on the UK Government October 2022 price cap figures.
[42] Estimation based on previous figures from Climate Fife and analysis on the UK Government Price Cap October 2022.

4. Opportunities and Challenges

4.1. Technology Opportunities

What can help make these changes? Several technologies and measures exist which will reduce energy consumption and decarbonise heat (Table 6).

Table 6: Heat decarbonisation and energy efficiency technologies

Insulation[43]	Heat Networks[44]	Air[45] and Ground[46] Source Heat Pumps
All types of insulation reduce heat and energy loss: • cavity wall and solid wall, • floor, roof, and loft, • draught proofing, • double and triple glazing, • energy efficient doors, and • tanks, pipes, and radiators.	Supplies heat (or cooling) to buildings, by taking excess heat from a central source. By supplying multiple buildings, this removes the need for individual boilers or heaters. Sources of excess heat include combined heat & power plants, landfills, mine water, wastewater treatment works.	Transfers heat from air, ground, or water, outside of a building to radiators, underfloor heating, and hot water cylinders. Heat is absorbed into a thermal transfer fluid, passed through a heat exchanger into the pump. This raises the temperature of the fluid and transfers heat to water.
New Energy Sources	**Energy Storage**	**Other**
New energy sources could expand existing electricity supply to meet demand. New energy options are being explored such as hydrogen – e.g. H100 Fife[47] project in Levenmouth (Chapter 6.6.2.2).	For the energy transition it is expected the value of energy storage will increase. Thermal storage for buildings ensures efficient operation of zero emission heating systems. It usually consists of hot water storage tanks or compact heat batteries. Thermal storage may also support heat networks.	Other decarbonised heat sources include infra-red /electric heaters combined with solar photovoltaic; and solar water heating[48].

[43] Measures to help reduce home heat loss - Energy Saving Trust
[44] Heat networks - GOV.UK (www.gov.uk)
[45] A guide to air source heat pumps - Energy Saving Trust
[46] A guide to ground source heat pumps - Energy Saving Trust
[47] H100 Fife | Fife Council
[48] Advice on installing solar water heating - Energy Saving Trust

4.2. Other Opportunities

4.2.1. Just Energy Transition

Local Heat and Energy Efficiency Strategies focus on decarbonising heat in buildings and improving energy efficiency. However, as well as heating homes, energy is required for other uses such as transport, business, and industry[49]. To change a whole energy system – the transition can be an economic opportunity. Energy prices are a key factor in the cost of doing business, however, a just energy transition brings significant supply chain opportunities, requiring jobs, skills, and knowledge transfer[50]. The benefits for Fife are potentially huge:

1. If on average two measures are undertaken by all homes below energy performance certificate band B, this would equal **~20,000 interventions per year** from now to 2040.
2. The opportunity for internalising even **10%** of Fife's energy spend could equal an additional **~£100 million/year** circulating Fife's economy, building community wealth.
3. For every **1% reduction** in energy demand through efficiency measures, Fife's energy cost would reduce by **~£10 million/year**.

4.2.2. Wider Energy Planning

This strategy recognises energy is unconstrained by council properties and borders. Use of energy for heating needs to be balanced against other purposes such as regional plans and electric vehicle charging. This strategy and delivery plan will help provide direction and inform wider energy planning with our city region deal partners. It will also support the development of Fife's Local Development Plan 2. This will include consideration via the site selection process (where future development will be most capable of benefitting from heat sources); and identifying local policy priorities and opportunities for heat networks. To leverage commercial investment in the just transition, the scale of wider energy planning is a necessity. Ensuring this strategy and delivery plan feed into wider energy planning will help support this.

4.2.3. Green Jobs

The level of investment required to improve Fife's building stock is significant. To retrofit Fife's **domestic buildings** alone could cost upwards of **£3 billion**[51]. Though undoubtedly a challenge, this level of investment offers an opportunity to further develop the green jobs and skills sector in Fife (Chapter 6.3).

4.2.4. Use of Fife's natural assets and waste heat

Development of heat networks (Chapter 6.8.2.5), provides an opportunity to utilise heat which is going to waste, to benefit local communities. This may be from local industry and businesses, or natural resources. These include:

- Water source heat pumps utilising heat from the Rivers Tay and Forth.
- Ground source heat pumps taking heat from up to 200m underground.
- Extracting heat from flooded disused coal mines and mine water treatment schemes (Pitfirrane and Frances schemes in particular).
- Heat pumps on wastewater treatment works (e.g. Dunfermline) and sewer pipes.
- Opportunities to use business and industrial waste heat.

[49] Energy requirements for these sectors are covered in documents such as the Local Transport Strategy, and regional energy plans.
[50] https://www.gov.scot/publications/heat-buildings-supply-chains-delivery-plan-towards-industry-green-heat/
[51] Estimated costs based on Energy Saving Trust, Portfolio Energy Analysis Tool – High Ambition Scenario. Figures exclude recent price rises.

4.2.5. Smart Energy Solutions

As Fife, and Scotland, move forwards with the heat transition, opportunities will be presented from digital and flexible energy solutions. These may provide benefits such as:

- More detailed data insights to inform modelling and roll-out of decarbonised heat sources.
- Provide tools and software which can help manage energy assets.
- Help understand and plan for competing energy demands.
- Smart buildings and energy systems to help save/optimise energy use and reduce costs.

It is important, this strategy and delivery plan are viewed as live and flexible documents. This will allow smart energy solutions to be considered and incorporated at later dates once they become available.

4.2.6. Stakeholder Connections

As this strategy, and future iterations, will cover all buildings in Fife, it is critical all property owners are brought with us in this just transition. To ensure ongoing success, and evolution, we will continue to understand stakeholders' wants and needs– and align outcomes to these. We will forge new partnerships. identifying new projects. Due to the size of Fife's building stock, we will look to leverage in investment and innovative technologies to help meet targets.

Table 7: Examples of Wants and Needs

Stakeholder example	Examples of wants and needs
Registered Social Landlords	• Alignment to Energy Efficiency Standard for Social Housing 2 targets • Certainty of measures
Owners of large building estates	• Alignment to organisational strategies • Support to achieve net zero
Third sector organisations	• Information and funding support
Utility providers	• Long-term planning to support future energy projects
Public	• Advice • Lower energy bills

4.3. Challenges

Stakeholders identified challenges which will be addressed, otherwise they may impact the success of this strategy and delivery plan. Short term actions will look for opportunities to work collaboratively to find solutions to these challenges. The main challenges are below and in Table 8:

- uncertainty of measures,
- energy performance certificates,
- heat pumps,
- Skills, knowledge & supply chain, and
- ongoing funding and delivery.

Some challenges increase uncertainty of achieving a robust delivery or cause undesired short- and long-term impacts. These could potentially damage confidence in the strategy and early actions. Potential impacts, if not correctly addressed, may include:

- higher energy costs,
- increasing or not reducing fuel poverty,
- damp/mould, and
- interstitial (inter-wall) condensation leading to degradation over decades.

To address this, **we will only include measures where there is a high certainty of success and positive impacts** (Chapters 6.5 and 7.1). There are also actions focussing on research and analysis to help identify high certainty building level measures. We will raise nationally significant challenges to the Scottish Government to allow for a centrally coordinated response and action (Chapter 7.2).

What is meant by high certainty of success and positive impacts?
Once published our detailed delivery plan will focus on measures where they are most likely to be possible, minimising potential damage to buildings, rising energy costs, or fuel poverty. This may mean focussing on early wins and easy to implement measures (e.g. double glazing).

During workshops other potential challenges were raised. Solutions for these will be addressed either as delivery plan actions or during project delivery. Examples of challenges and their solutions include:

1. **Minimal time to meet national targets** - Actions to increase certainty allowing building level actions to be identified.

2. **Changes in national policy decisions** - Regular reviews of strategy to ensure it aligns with national policy.

3. **Failure to adapt historic & traditional buildings** - Development of retrofit guidance.

4. **Manage grid capacity to ensure future projects are not blocked** - Engagement with SPEN and use of the Local Heat and Energy Efficiency Strategy Portal.

5. **How to encourage owners to improve their buildings** - Engage Scottish Government to develop national communications/ behavioural change campaign.

Table 8: Key Challenges and Solutions

Topic	Challenges raised	Solutions raised
Uncertainty of measures	• The basic measures are known, but how these should combine in different building types is still not understood in a way we can roll out across Fife, or Scotland. • The wrong combination may increase fuel cost, fuel poverty, in building damp, and inter wall damp. Future building damage across most buildings is unknown. • Existing models (e.g. building energy models), were not designed for the energy transition - generating uncertainty on the exact measures required. • Some measures may have fewer challenges; however, understanding is still mixed.	• Focus on early wins where data is accurate. • Early actions to undertake more detailed analysis of certain aspects/archetypes of building stock, providing accurate and reliable data to identify "high certainty" actions.
Energy performance certificates	• Some may lack accuracy and not accurately consider several energy transition actions.	• No immediate solution. • The system is likely to change necessitating revisions to the strategy.
Heat pumps	• Strategy methodology does not account for a range of factors which may impact effectiveness of heat pumps. • Improper categorisation of buildings suitable for heat pumps, coupled with gaps in sector knowledge on their effective installation and use, may result in inefficient performances – possibly leading to higher utility bills, increasing fuel poverty levels. • Noise from air source heat pumps is a consideration, and how heat pumps impact homes with pre-paid meters will also need to be considered.	• Early actions on analysis of heat pump suitability at the building level. • Skills development on installation, maintenance, coordination. • Communications on heat pump use.
Skills, knowledge & supply chain	• There is a significant skills gap for the installation of energy efficiency and heat decarbonisation measures, potentially delaying implementation of delivery plan actions. • Incorrect installation may cause severe problems in the future, such as systems not working as expected, or rising damp and black mould. • There is also a potential market capacity cap due to delayed action in installing heat pumps resulting in an increased workload in the later years of the programme.	• Upskill the supply chain. • Strategy and delivery plan provide job certainty. • Development of skills baseline. • Nationally coordinated action on the skills gap.
Ongoing funding and delivery	• The strategy and delivery plan will provide the framework for delivery of capital projects across Fife. However, delivery of the actions and ongoing analysis will require significant levels of additional funding and support. There is a possibility of revenue and capital grants being unavailable to support this. • The cost for building owners is also potentially significant and needs to be recognised when considering future funding streams.	• Use of in-house expertise. • Engage with funders to source revenue and capital funds. • Engage with Scottish Government on funding need.

5. Building Stock

5.1. Domestic[52]

Fife has a domestic building stock of over 180,000 homes[53]. The majority (73%) were built pre-1984 (similar to the national average - 70%[54]) (Figure 1) – with older housing located in areas such as the North-East and older town centres. 8% of homes are in conservation areas, with 3% listed[55] (Table 9), comparable with national figures[56].

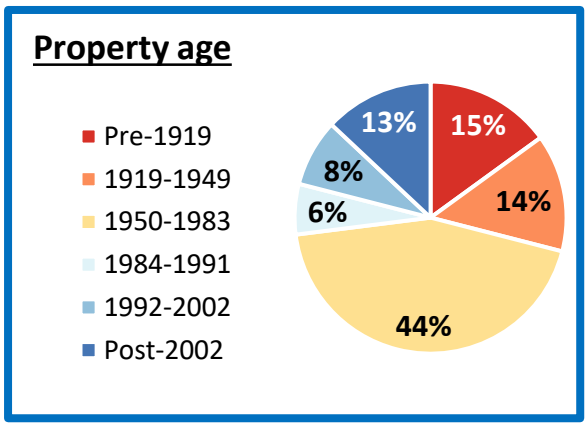

Figure 1: Property Age (Domestic)

Table 9: Listed Status (Domestic)

Listed status	%
Listed Buildings A	0.1%
Listed Buildings B	1.4%
Listed Buildings C	1.6%
Not Listed	96.9%

Over half (54%) are either detached, semi-detached or end of terraced, with 30% flats (lower than national average - 40%) (Table 10). The tenure profile shows 65% of homes are owner-occupied, a 22% social housing, and 13% privately rented, similar to the national average[57] (Figure 2). 15% of homes are mixed tenure.

Table 10: Building Type (Domestic)

Building type	%
Detached	23%
Semi-detached	22%
End-terraced	9%
Mid-terraced	16%
Small block of flats/dwelling converted into flats	17%
Block of flats	7%
Flat in mixed use building	3%
Large block of flats	2%

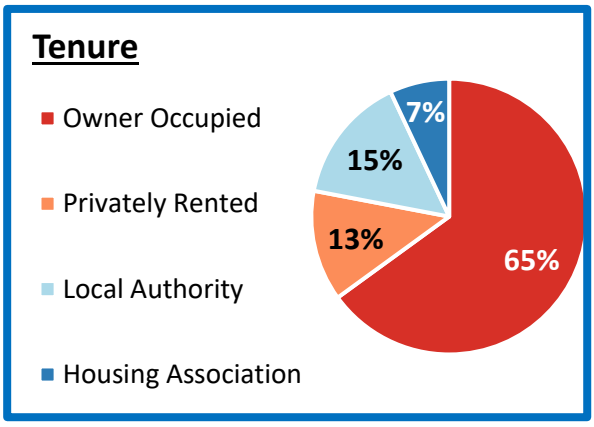

Figure 2: Tenure (Domestic)

[52] From Home Analytics data.
[53] 184,517 listed in Local Heat & Energy Efficiency Strategy Domestic Baseline Tool.
[54] National averages provided by Energy Savings Trust and are taken from Home Analytics v3.8 aggregated to a national level.
[55] Historic Scotland categorises listed buildings based on their level of importance; Category A is assigned to buildings of national importance, Category B for buildings of regional importance, and Category C for buildings of local importance.
[56] Heat In Buildings Strategy: Achieving Net Zero Emissions in Scotland's Buildings (www.gov.scot)
[57] National tenure figures – 63% owner occupied; 11% housing association; 12% local authority; 13% privately rented; 1% unknown.

5.2. Non-Domestic[58]

There are ~15,000 non-domestic buildings in Fife[59]. The most common types being retail (32%), offices (18%) and light manufacturing, industry & workshops (18%) (Table 11). There is a relatively even split between those built before 1949 (47%) and those after (53%) (Figure 3) – with (40%) built pre-1919. A large proportion of pre-1919 properties are hotels, retail, and clubs & community centres.

Table 11: Business Type (Non-Domestic)

Business type	%
Retail	32%
Offices	18%
Light manufacturing/industry/ workshops	18%
Clubs & community centres	6%
Residential	5%
Cafes, pubs, restaurants & takeaways	4%
Hotels	3%
Storage / distribution	3%
Education	3%
General sports & leisure	3%
Health	1%
Other	2%
Screened out	2%

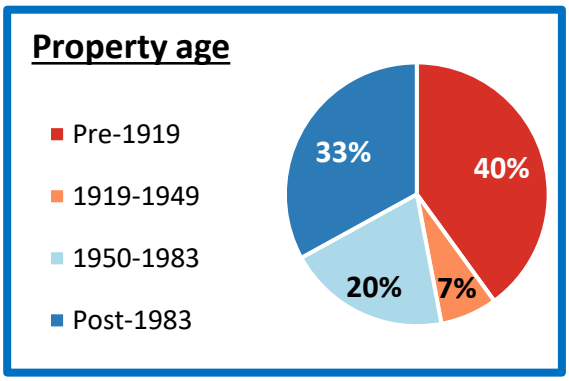

Figure 3: Property Age (Non-Domestic)

64% of properties are in urban areas, with the rest divided between accessible rural and accessible small towns[60] (Table 12). Retail, offices, and light manufacturing have the highest proportion of properties in 'Other Urban Areas.' These may benefit from better developed infrastructure and access to skilled labour but have more diverse stakeholders requiring engagement. A large proportion of hotels and residential properties are in Accessible Rural and Small-Town areas. Most properties have a floor area size 0-100 m^2 and 100-500 m^2 [61] (Figure 4).

Table 12: Urban Rural Classification (Non-Domestic)

Urban rural classification	%
Other Urban Area	64%
Accessible Rural	24%
Accessible Small Town	12%

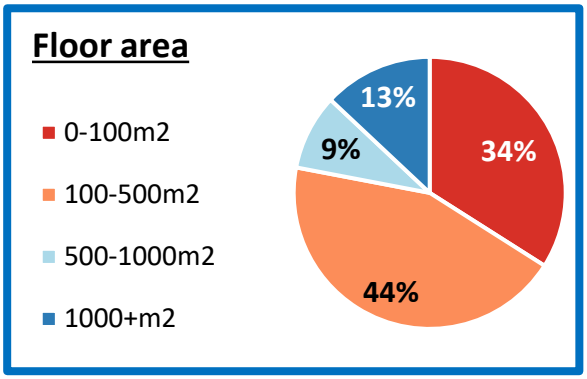

Figure 4: Floor Area (Non-Domestic)

[58] From Non-Domestic Analytics data, certain buildings like utilities are not included for consideration as demands attributed are likely to be erroneous.
[59] 14,779 properties, based on Non-Domestic Analytics and Non-Domestic Baseline Tool.
[60] As per urban rural classification definitions - Scottish Government Urban Rural Classification 2020 - gov.scot (www.gov.scot).
[61] Floor area refers to the total useful floor area (m^2) of all enclosed spaces measured to the internal face of the external walls.

6. Priorities and Outcomes

For each priority, outcomes have been identified (Table 13). The following pages explore each priority in detail. It is critical each priority is not viewed in isolation. All priorities are equally reliant on each other to drive forward change and the order below does not signify level of importance.

Table 13: Priorities and Outcomes

1		**Being Climate Friendly and Ready**	• **1.1 Net Zero & Climate Emergency** - Fife buildings contribute towards the national net zero target and help address the climate emergency. • **1.2 Adaptation** - The resilience of Fife's buildings, communities and economy is supported to adapt to the impacts of climate change.
2		**Tackling Fuel Poverty, Health, and the Just Transition**	• **2.1 Tackling Fuel Poverty, Health, and the Just Transition** - All communities experience a just transition to net zero, with fuel poor homes becoming more energy efficient, and actions only implemented where there will be no detrimental impact.
3		**Supporting an Inclusive Economy, Jobs, and Skills**	• **3.1 Skills & Jobs -** The skills and jobs required to support retrofit actions across Fife are identified and supported, as part of the just transition. • **3.2 Community Wealth Building -** Actions will continue to support recovery, focus on place and work in partnership with our communities, as part of the just transition. • **3.3 Finance -** Fife actions are identified where local, regional, and national expenditure and funding could support the just energy transition.
4		**Maximising Knowledge & Awareness**	• **4.1 Awareness & Knowledge** - Everyone in Fife is aware of how to improve energy efficiency, decarbonise heat, and access support programmes to facilitate behaviour change.
5		**Ensuring Certainty of Success**	• **5.1 Ensuring Certainty** - Actions will be prioritised on certainty of success and minimal potential unintended consequences.
6		**Transitioning the Energy System**	• **6.1 Energy System Opportunities & Constraints -** Actions are informed via engagement with utility providers to determine capacity, opportunity, and security of projects, whilst taking a holistic view of the wider energy system.
7		**Energy Efficient Buildings**	• **7.1 Domestic; 7.2 Social Housing; 7.3 Private Rented; 7.4 Mixed-Use, -Tenure & Historic -** Homes across Fife become more energy efficient and contribute Fife's share, on a proportional basis, of the national targets, recognising the challenges. • **7.5 Non-Domestic -** Non-domestic buildings across Fife become more energy efficient, recognising the challenges.
8		**Decarbonising Heat Sources**	• **On Gas and 8.2 Off-Gas -** Homes across Fife have decarbonised heat and contribute Fife's share, on a proportional basis, of the national targets, recognising the challenges. • **Non-Domestic -** Non-domestic buildings across Fife have decarbonised heat and contribute Fife's share, on a proportional basis, of the national targets recognising the challenges. • **8.4 Heat Networks -** Potential heat network zones identified, including expansion of existing networks, as a mechanism to decarbonise heat.

6.1. Priority 1: Being Climate Friendly and Ready

6.1.1. Outcomes

	**Being Climate Friendly and Ready**	• **1.1 Net Zero & Climate Emergency** - Fife buildings contribute towards the national net zero target and help address the climate emergency. • **1.2 Adaptation** - The resilience of Fife's buildings, communities and economy is supported to adapt to the impacts of climate change.

6.1.2. Context

In 2019, Fife Council declared a climate emergency[62], with progress being made with reducing emissions and increasing resilience. However, pace and ambition need to accelerate. Climate Fife details the next phase of a Fife-wide approach to tackling the emergency and sets out actions to limit its most harmful impacts. As noted in Chapter 3.1.2, the Climate Fife vision is by 2045 Fife will be climate friendly, ready, and just.

Tackling the climate emergency means everyone will need to do their part to cut emissions, improve sustainability, and adapt to the impacts of the changing climate. To achieve this building owners will need to improve the energy efficiency of their buildings and decarbonise heating systems.

The targets within the Heat in Buildings Strategy and Energy Efficiency Standard for Social Housing 2 fall under the overall net zero targets. Therefore, all actions in the delivery plan will in some way align with this priority and help Fife's buildings meet net zero and other targets.

Actions will take consideration of the consequences of the changing climate, such as increased frequency of extreme weather events. For example, the levels and type of insulation may need to differ to ensure a building is resilient to the impacts of climate change.

The delivery plan also supports, or is supported by, multiple actions within Climate Fife.

[62] https://www.fife.gov.uk/kb/docs/articles/environment2/climate-change,-carbon-and-energy

6.2. Priority 2: Tackling Fuel Poverty, Health, and the Just Transition

6.2.1. Outcomes

	**Tackling Fuel Poverty, Health, and the Just Transition**	• **2.1 Tackling Fuel Poverty, Health, and the Just Transition** - All communities experience a just transition to net zero, with fuel poor homes becoming more energy efficient, and actions only implemented where there will be no detrimental impact.

6.2.2. Context

6.2.2.1. Just Transition and Health

As part of Fife's approach to net zero and the climate emergency, everyone in Fife and the environment must benefit from this transition in a just manner – understanding socio-economic inequalities[63]. A just transition will require Fife being "*a resilient, fair, and prosperous place to live and work and puts fairness and social justice at the heart of achieving climate goals.*"

Definition of Just Transition
"A just transition is both the outcome – a fairer, greener future for all – and the process that must be undertaken in partnership with those impacted by the transition to net zero. Just transition is how we get to a net zero and climate resilient economy, in a way that delivers fairness and tackles inequality and injustice." - Just Transition - A Fairer, Greener Scotland: Scottish Government response

Climate Fife notes tackling climate change aligns to the socio-economic goals in Plan4Fife. Existing challenges to communities will get harder, with those least responsible/most vulnerable impacted the hardest and unable to adapt. Achieving any socio-economic objectives will be impossible without addressing climate justice; both by preventing disproportionate impacts to marginalized groups and ensuring all communities share in the health, economic, and social benefits of a clean energy economy.

For health, a significant concern for this strategy is indoor air quality. This is influenced by several factors, making estimates of health impacts challenging. The Cleaner Air for Scotland 2 Strategy[64] states a "*need for policy integration and coherence to avoid the risks of unintended consequences.*" It notes non-health-related developments (e.g. energy efficiency measures) could have unexpected adverse health impacts if a wider perspective is not taken. Poor installation of insulation may cause damp and mould, worsening indoor air quality, leading to negative health and wellbeing impacts. Scottish Government and national partners need to ensure indoor air quality is researched further and considered in the context of Local Heat and Energy Efficiency Strategies.

This strategy follows the Plan4Fife's and Climate Fife's ethos, with actions having a positive impact for all, ensuring social divisions are not widened, parts of society excluded, or health detrimentally impacted.

6.2.2.2. Fuel Poverty

This priority also focuses on reducing and preventing fuel poverty in Fife via energy efficiency and heat decarbonisation measures. All poverty was increasing in Fife pre-pandemic, with it expected to have increased further[65], considering rising fuel costs and the cost-of-living crisis.

Definition of Fuel Poverty
Fuel poverty is when total household fuel costs are more than 10% of adjusted net income; and if after deducting fuel and care costs, the remaining net income does not allow for an acceptable standard of living. For extreme fuel poverty, more than 20% of net income is needed.

[63] Plan_for_Fife_2017_2027_June19-1.pdf
[64] Cleaner Air for Scotland 2 - Towards a Better Place for Everyone - gov.scot (www.gov.scot)
[65] Plan-for-Fife-2021-24-23-Aug.pdf

The Fuel Poverty (Targets, Definition and Strategy) (Scotland) Act 2019[66] requires the Scottish Government to publish a fuel poverty strategy and detail how the following targets will be reported:

< 5% of households in fuel poverty by 2040.	< 1% of households in extreme fuel poverty by 2040.	Median fuel poverty gap <£250 by 2040.

As of 2019[67], 24% of Fife homes experience fuel poverty[68] (in-line with the national average); with 11% in extreme fuel poverty (1% less than national average). 43% of households in flats experience fuel poverty, compared to 17% of houses. In addition, over 40% of social and private rented households experience fuel poverty, compared to 14% of owner-occupied homes.[69]

Average probability of fuel poverty and extreme fuel poverty is higher in off-gas homes. The five areas with the highest probability of fuel poverty are in Cupar, Bowhill, Lochore, Kirkcaldy and Collydean (Figure 5). Research indicates several groups more likely to experience fuel poverty[70]:

Young & middle-age groups	Women	Single marital status	Families with 2+ children/lone parents	People with disabilities
Ethnic minority communities	People with the lowest net income	Social housing and private rented	Rural areas	People relying on electric heating

Poor building energy efficiency is a recognised factor contributing to fuel poverty. National guidance notes the strategy and delivery plan: "***should identify … where poor building energy efficiency acts as a driver for fuel poverty.***" Representation of this in the key domestic dataset is mixed, with energy efficiency measures not appropriately weighted against fuel poverty. Combined with uncertainties on the combination of measures and potential heat pump inefficiencies (Chapters 4.3 and 6.5); this means building level actions which will not place people into fuel poverty are difficult to identify.

This strategy also considers The Child Poverty Delivery Plan's[71] commitment to only take forward decarbonisation actions "***where they will have no detrimental impact on fuel poverty rates***." Installation costs are not considered under the definition of fuel poverty. Raising awareness of funding measures and options will also be required.

6.2.3. Summary

This priority focuses on how to have a positive impact for all, ensuring social divisions are not widened, parts of society excluded, health detrimentally impacted, and lifting people out of fuel poverty.

There are gaps in understanding on indoor air quality, data, and uncertainties on the right combination of building level measures to implement which will not place people into fuel poverty. This means most actions supporting this priority focus on improving understanding of impacts measures may have on fuel poverty and health. We will review and improve the methodology, modelling, and data to ensure future actions are identified which will not have detrimental impacts. Actions supporting this, include:

- Planned building level energy efficiency/heat decarbonisation projects.
- Exploring potential heat network zones which may reduce heating bills.
- Advocation and promotion of further funding, support, and advice.

[66] Fuel Poverty (Targets, Definition and Strategy) (Scotland) Act 2019 (legislation.gov.uk)
[67] 2021 data unavailable. Key 2021 findings at the national level are available, these pre-date the 2022 energy crisis.
[68] Scottish House Condition Survey: Local Authority Analysis 2017-2019 - gov.scot (www.gov.scot)
[69] 2021 data is unavailable. Although key findings at the national level are available[69] these pre-date the 2022 energy crisis and are incomparable to previous surveys due to methodology changes and have a sample bias.
[70] Not everyone in these groups will be struggling to the same extent to pay for fuel - in social research studies, evidence suggests high levels of people classified as being in fuel poverty, stated they did not have heating problems and were managing well financially.
[71] Executive Summary - Best Start, Bright Futures: tackling child poverty delivery plan 2022 to 2026 - gov.scot (www.gov.scot)

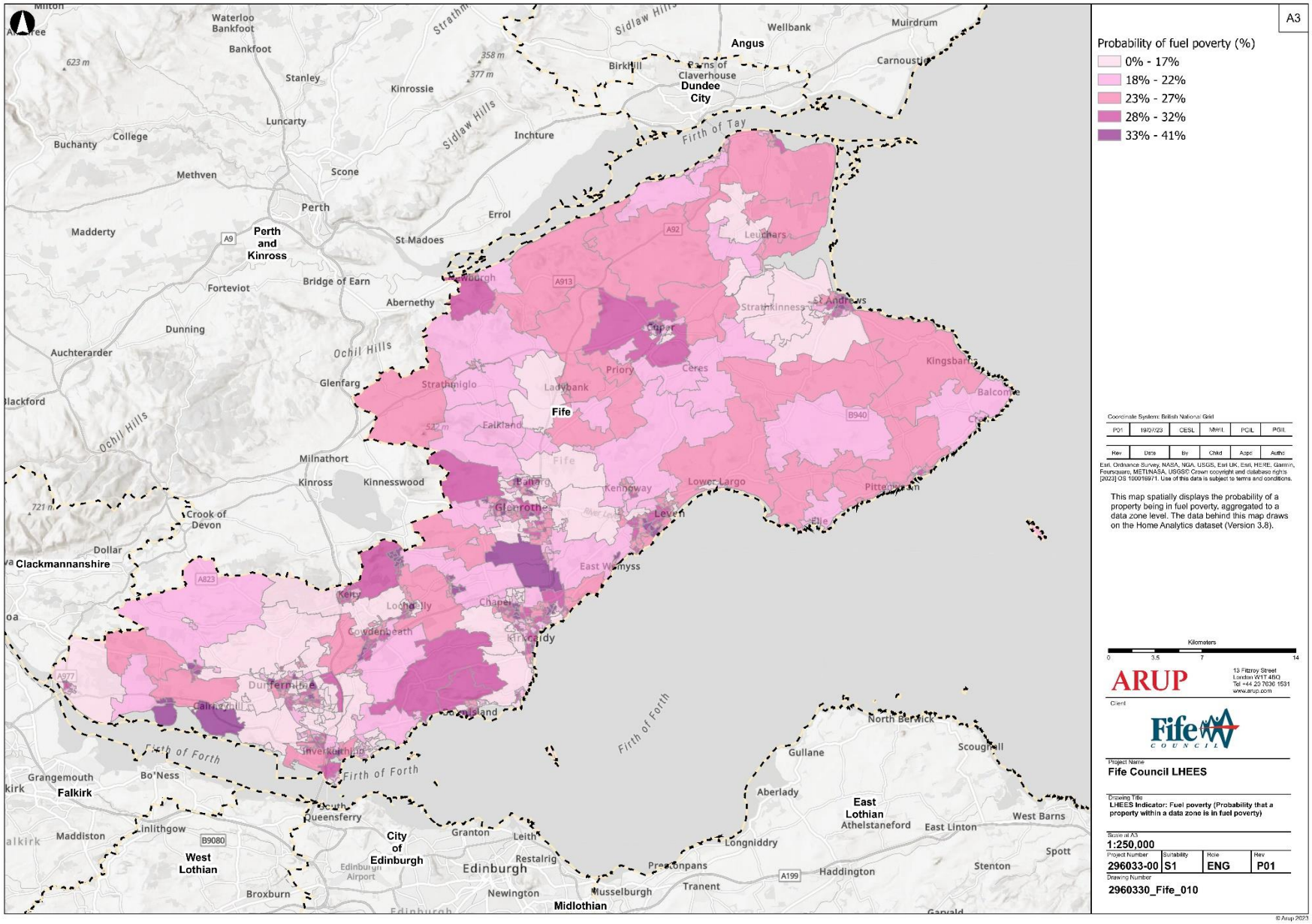

Figure 5: Probability of Fuel Poverty

6.3. Priority 3: Supporting an Inclusive Economy, Jobs, and Skills

6.3.1. Outcomes

£	**Supporting an Inclusive Economy, Jobs, and Skills**	• **3.1 Skills & Jobs -** The skills and jobs required to support retrofit actions across Fife are identified and supported, as part of the just transition. • **3.2 Community Wealth Building -** Actions will continue to support recovery, focus on place and work in partnership with our communities, as part of the just transition. • **3.3 Finance -** Fife actions are identified where local, regional, and national expenditure and funding could support the just energy transition.

6.3.2. Context

6.3.2.1. Skills and Jobs

Improving energy efficiency and decarbonising heat sources may make significant economic contributions to businesses. This includes strengthening supply chains, creating jobs, enabling innovative technologies, and supporting new sector entrants. To meet the just energy transition aims, supply chains must grow, most notably needing trained heating and energy efficiency installers. Nationally identified economic opportunity and challenges are detailed in Table 14.

Table 14: National Economic Opportunities & Challenges (Heat in Buildings Strategy)

Opportunities	Challenges
Heat and energy efficiency sectors generate turnover of **£2 billion/year** and support **~12,500 full time equivalent** jobs.	Construction sector and supply chains are still recovering from COVID-19 and European Union Exit.
An additional **~16,400 jobs** will be supported by 2030 due to investment in decarbonised heating deployment.	There is a skills gap to meet existing demand; with demand expected to grow.
Total investment to meet net zero targets for buildings is **~£33 billion**; investment will peak at **~£2-2.5 billion/year**.	Requirement to understand supply chain demand to ensure availability of skilled labour will not increase prices and throttle ambitions.
Opportunities for Scottish companies to service wider UK and internal demand.	Consider just transition for jobs in traditional, fossil-fuel based sectors.
Maximise benefits for Scottish manufacturers (investment and access to a skilled workforce).	Material shortages and increased prices.

Other challenges noted by stakeholders were:

- A broad lack of understanding of the whole-building approach required to install heat pumps.
- Understanding of ventilation, air tightness, and condensation points when installing insulation.
- Most of the insulation sector may only have manufacturer qualifications[72].
- Heat pump courses are undersubscribed, maybe due to job uncertainty.
- Poor understanding of the local skills baseline and gap.
- Delays in installing heat pumps may increase workload in later years[73].

Despite the challenges, as referenced in Chapter 4.2, the level of investment required to retrofit Fife's buildings (~£3 billion for domestic), provides the opportunity to further develop the local green jobs sector.

[72] Not deemed as competent qualifications by Scottish Government.
[73] Manufacturers and installers will only invest in increasing capacity when demand is high, causing a lag when market demand increases, potentially increasing costs and constraining the roll out.

The number of homes to be retrofitted each year to meet targets is significant, requiring a substantial skilled workforce. The more interventions per house, the higher the number of houses needing retrofitted each year to meet the targets, requiring more jobs (Table 15). Each year targets are missed this issue will be exasperated.

Table 15: Interventions Required to Meet Targets

Target	No. of houses	Number of intervention stages and houses to be retrofitted per year.
Social housing to energy performance certificate band B by 2032	~36,000	• 1 intervention equals ~4,500 houses retrofitted per year. • 2 interventions equals ~9,000 houses retrofitted per year. • 3 interventions equals ~13,500 houses retrofitted per year.
All other homes to energy performance certificate band C by 2033[74]	~69,000	• 1 intervention equals ~7,500 houses retrofitted per year. • 2 interventions equals ~15,000 houses retrofitted per year. • 3 interventions equals ~22,500 houses retrofitted per year.
Fuel poor households to energy performance certificate band B by 2040[75]	~136,000	• 1 intervention equals ~8,500 houses retrofitted per year. • 2 interventions equals ~17,000 houses retrofitted per year. • 3 interventions equals ~25,500 houses retrofitted per year.

The skills and jobs required to support this include:

Insulation	Heat pump installation/ maintenance	Heat network construction/ operation	Smart energy	Data & digital
Emerging innovative technologies	Funding	Retrofit coordination	Traditional skills for historic buildings	Supporting roles (e.g. welders, scaffolders)

Due to multiple, often competing, variables to be understood when retrofitting a building, a retrofit coordinator role was deemed a necessity[76]. This role would require an understanding the most suitable measures for each building archetype, and ensure retrofits meet a desired standard. There is a growing understanding nationally and locally of the need for this role, with bodies such as Energy Skills Partnership and Fife College considering how to take this forward.

6.3.2.2. Community Wealth Building

Community wealth building uses the economic power and leverage of local organisations to tackle challenges and inequalities within communities. It transforms local economies to enable more communities to own, have a stake in, access and benefit from the wealth the economy generates[77]. The Plan4Fife 2021-24 update has community wealth building as a key focus. It notes it focuses on topics which are important to us: community wealth, wellbeing, environmental sustainability, and fairness, and is to be placed at the heart of all things the Council plans moving forwards.

[74] Excludes private rented who must achieve an energy performance certificate band C by 2028.
[75] Assuming all homes are at risk of fuel poverty and excludes social housing.
[76] Existing courses: Retrofit Academy's Level 5 Diploma in Retrofit Coordination and Risk Management and Retrofit Coordinator Bootcamp.
[77] Community wealth building - Cities and regions - gov.scot (www.gov.scot)

This strategy adheres to this, with actions involving communities, local projects, and organisations; improving understanding of local employment opportunities; and other benefits. An example is supporting Climate Action Fife's[78] Climate Friendly Homes project. This helps people tackle the climate emergency at home by providing impartial information on how they can reduce their impact – provided via Cosy Kingdom (see Chapter 6.4). This could be supported by peer-learning and sharing of information and data to help build capacity of organisations and communities.

This strategy will also help maximise local supply chain opportunities as part of community wealth building and procurement, by identifying and prioritising areas for retrofit delivery - enabling Fife businesses to remain competitive.

6.3.2.3. Finance

As noted in Chapter 6.3.2.1, total investment made available to meet net zero targets for buildings is **~£33 billion**; with annual investment peaking at **~£2-2.5 billion** by 2030. This will not be sufficient to transition all buildings in Scotland to net zero, **averaging just under £11,500 per building**[79]. Significant levels of additional funding will be required. At the local level, Fife has over 200,000 buildings, the majority of which will need to be retrofitted – necessitating significant levels of investment. Consideration also needs to be given to the availability of funding for building owners to take forward their own retrofit actions. To help support all of this, the strategy and delivery plan will:

- Help understand and promote the range of funding available (Chapter 6.7.2.4).
- Provide evidence and prioritise where funding should be directed.
- Have actions which help minimise the cost of doing business/infrastructure construction.
- Have actions focused on exploring alternative funding sources, and to maximise existing energy spend to benefit Fife.
- Ensure funding aligns with network operators' business planning cycles (see Chapter 6.6)

The Scottish Government have also indicated Local Heat and Energy Efficiency Strategies will be used as a prospectus for where funding and investment could be targeted.

6.3.3. Summary

Overcoming the skills gap to ensure a just transition to net zero is a key backbone to ensuring success of this strategy. A green skills workforce will help Fife transition its heating needs and adapt to the changing climate. It is crucial workers are taken with us on this journey, allowing their skills previously developed in traditional, fossil fuel orientated industries to be applied in the net zero economy. Actions are included focussing on working with local training providers and industry, understanding Fife's skills baseline, and collaborating with schools to highlight career opportunities. There is also a role for Scottish Government and national stakeholders to lead in this area, with Fife and other local authorities providing local knowledge and supporting delivery mechanisms.

This strategy also aligns with the Plan4Fife and has actions supporting community wealth building, including working with local community organisations providing energy advice; improving community buildings; and raising awareness and knowledge of energy efficiency and heat decarbonisation.

This strategy and delivery plan provides a framework for future capital and revenue spend to move Fife's buildings towards meeting net zero targets. To ensure funding is available to achieve this, Scottish Government and funders will be made aware of the challenges and retrofit actions required to decarbonise Fife's buildings. This will help inform future funding steams.

[78] Home: Climate Change Workshops | Climate Action Fife - a Fife-wide partnership project between Greener Kirkcaldy, Fife Council, Fife College, and Fife Communities Climate Action Network who are working to tackle the climate emergency.
[79] Based on 2.7 million domestic properties (National Records of Scotland) and ~220,000 non-domestic (Heat in Buildings Strategy).

6.4. Priority 4: Maximising Knowledge and Awareness

6.4.1. Outcomes

	**Maximising Knowledge & Awareness**	• **4.1 Awareness & Knowledge** - Everyone in Fife is aware of how to improve energy efficiency, decarbonise heat, and access support programmes to facilitate behaviour change.

6.4.2. Context

The just transition requires all building owners, and stakeholders, to be engaged with and informed on the Local Heat and Energy Efficiency Strategy. This includes its purpose and actions; how to improve their buildings' energy efficiency and decarbonise heat sources; and support services available. Provision of this information in a clear and open format will help drive behaviour change across Fife, and Scotland.

Heat in Buildings Strategy
The strategy states: *"We want individuals and organisations to see energy efficiency and low and zero emissions heating as a positive choice, understand the options available, and know where they can get help and trusted advice."*

6.4.2.1. Challenges

There is an ongoing requirement to provide information and support to help consumers make informed choices. However, there are challenges to raising awareness on Local Heat and Energy Efficiency Strategies, energy efficiency, and heat decarbonisation, and therefore changing behaviours:

- The scale of the task is significant if all buildings are to be net zero by 2045 – necessitating a centrally driven nationwide communications campaign (see box below).
- There is a lack of information and awareness on how to improve buildings to meet the climate challenge.
- There is a need for a mass behavioural shift in understanding of how we heat our homes and buildings. This includes understanding of new technologies.
- Knowing where to find support can be confusing.
- How to effectively change behaviours and encourage owners to improve buildings.
- Awareness of how energy performance certificate bands are calculated, and the most effective measures for improving them.
- Cost of installation, and disruption arising from this, may prevent people from engaging further.
- Understanding which energy efficiency measures, and other factors, are most suitable to ensure a heat pump works efficiently is a complex topic to convey.

The Heat in Buildings Strategy has an action to:
"Deliver a public communications programme to raise awareness of the support and advisory services available and to encourage home upgrades, in order to maximise uptake of these schemes." This information and support will be provided on the NetZeroNation.scot website.

6.4.2.2. Existing Support

Various organisations exist to provide information and advice (examples in Table 16). These will be promoted across Fife, as well as any funding opportunities. It is important the Council works with our local organisations who provide a variety of information and advice in this area. This could be supported by peer-learning and sharing of information and data to help build capacity of organisations and communities.

Table 16: Examples of Information and Advice Services

National Public Energy Agency[80] (*Launched 2025*)	Will provide leadership and coordination to deliver heat decarbonisation, by: • Accelerating transformational change in how we heat and use energy in buildings. • Aiding public understanding and awareness. • Coordinating delivery of investment.
Net Zero Nation[81]	A Scottish Government website providing resources and advice for a range of net zero issues including energy efficiency.
Energy Saving Trust[82]	Delivers energy programmes with governments, and support householders and businesses make informed energy choices through provision of online advice; research; assurance; and communications.
Home Energy Scotland[83]	Helps people create warmer homes, reduce bills, and lower carbon footprints, delivered via an advice centre network.
Business Energy Scotland[84]	Provides support and access to funding to help small and medium-sized enterprises save energy, carbon, and money – including energy efficiency assessments.
Fife Council[85]	Have webpages dedicated to heating advice, focussing on providing support following the increase in energy bills.
Cosy Kingdom[86]	A partnership offering free and impartial energy and debt advice, and a free handy service for those eligible for free energy-saving measures.
Fife Voluntary Action[87]	Fife's Third Sector Interface provide a range of services, including informing community organisations of available funding, and recommending they undertake energy audits.

6.4.3. Summary

This priority recognises, to meet our vision, all building owners (homeowners, landlords, businesses, public sector, community organisations etc.) and supporting organisations must be brought with us on this journey. All stakeholders need to be aware of the considerations identified whilst developing this strategy, and the national funding and support available, to ensure retrofits are successful.

Actions are included focussing on developing a communications strategy, materials, and presentations, and engaging with Scottish Government to encourage a nationally coordinated campaign supporting all Scottish stakeholders.

[80] The National Public Energy Agency - Energy efficiency - gov.scot (www.gov.scot)
[81] About Net Zero | Net Zero Nation
[82] Energy Saving Trust
[83] Home Energy Scotland
[84] Business Energy Scotland · Make Your Business Greener
[85] Heating advice | Fife Council
[86] Cosy Kingdom – Stay warm, save energy
[87] Fife Voluntary Action: Supporting volunteers, voluntary organisations, and social enterprises in Fife (fva.org)

6.5. Priority 5: Ensuring Certainty of Success

6.5.1. Outcomes

	**Ensuring Certainty of Success**	• **5.1 Ensuring Certainty** - Actions will be prioritised on certainty of success and minimal potential unintended consequences.

6.5.2. Context

As detailed in Chapter 4.3 a range of challenges were raised which increase uncertainty of achieving a robust delivery or cause undesired impacts. Some of these are covered in other priorities (e.g. skills and knowledge) or will be during project delivery (e.g. minimising disruption). This priority, and actions supporting it, focuses on the following challenges: uncertainty of measures; Energy Performance Certificates; heat pumps; historic buildings; and changes in national policy.

The potential impacts, if addressed incorrectly, include higher energy costs; increasing/not reducing fuel poverty; damp/mould; and interstitial (inter-wall) condensation.

6.5.2.1. Uncertainty, Energy Performance Certificates, and Heat Pumps

The challenges included gaps in understanding and data on the right combination of retrofit measures, energy performance certificates, and heat pumps. These are the main limiting factors to identifying building level actions. Across Scotland projects/forums are being undertaken to find solutions (Table 17).

Table 17: Examples of Existing Projects

Local Authority Local Heat & Energy Efficiency Strategy Forum	Forum for Local Heat and Energy Efficiency Strategy Officers, allowing for challenges to be brought forward, with ideas shared on how these might be overcome.
Energy Efficiency Standard for Social Housing 2 review sub-groups[88]	1. **Just transition metric & heating system** – reviewing options for a measurable target for a new standard which does not worsen effects of fuel poverty. 2. **Measures & finance** – recommend options for guidance to identify appropriate measures for housing stock/archetypes, and funding/finance options. Is also considering a new metric using kWh/m2/year. 3. **Fabric & hard to treat** – reviewing options for ensuring the largest proportion of stock can achieve the new standard, which supports the principle of "Fabric First" and provides alternatives for properties exempt from the target.
Passivhaus Trust Report[89]	Reviewed energy performance certificates and alternatives. It notes the rating system has become increasingly inaccurate and recommends using space heating demand as the primary metric.
Zero Emission Social Housing Taskforce[90]	Recommended how to maximise social housing's contribution to climate change targets. Including to "*develop an understanding of the needs and solutions of the different archetypes in Scotland's social housing stock.*"
Link Housing	Developing a Stock Condition Plus[91] survey to help plan property upgrades towards net zero based on archetypes and key components.
Electrification of Heat Project[92]	Funded by UK Government, this project aims to understand the technical and practical feasibility, and constraints, of the roll-out of heat pumps.

[88] Heat in buildings: Energy Efficiency Standard for Social Housing Review Group - gov.scot (www.gov.scot)
[89] Guidance (passivhaustrust.org.uk)
[90] Zero Emission Social Housing Taskforce - gov.scot (www.gov.scot)
[91] link-group-sustainability-strategy.pdf (linkhousing.org.uk)
[92] Mass rollout of heat pumps feasible, but innovation needed to accelerate take up - Energy Systems Catapult

Fife Council will support this national work by considering these challenges and other priorities when identifying building level actions. The Council will develop a model to analyse retrofit options (Chapter 7.1). This will use existing data, research, and knowledge to determine building level actions with a high certainty of success and positive impact. This may also highlight data and knowledge gaps, where further research is required. The model will also be used to identify early wins, where energy efficiency actions are more straightforward and can be supported in the short term.

6.5.2.2. Historic Buildings

Fife has **~27,750 domestic and ~6,000 non-domestic pre-1919 properties**. Retrofitting these is a substantial challenge, due to[93]:

- Repair work may be needed prior to retrofit and preventing damage when retrofitting.
- Cost of retrofitting.
- Listed status and conservation areas, and the restrictions these entail.
- Ensuring air flow and water vapour dispersal are not compromised to the building's detriment.
- Consideration of using natural materials better able to buffer moisture and prevent condensation.
- Maintaining historic character, such as use of lime render as external wall insulation.
- Presence of lath and plaster potentially restricting internal wall insulation options.

The Council can assist in overcoming these challenges and consider any impact where necessary consents are required. To help achieve this, we will:

- Work in collaboration with experts on historic buildings (e.g. Fife Historic Buildings Trust, Historic Environment Scotland, Fife Council Built Heritage Officer).
- Implement and build upon Historic Environment Scotland guidance focussing on Local Heat and Energy Efficiency Strategies and historic buildings. This will include existing resources and research (e.g. Guide to Energy Retrofit of Traditional Buildings).
- Gather more data on historic buildings and undertake small-scale pilot research projects.

This will also inform the additional modelling for the development of the detailed delivery plan. It will ensure these challenges are considered when determining building level actions for historic buildings.

6.5.2.3. Changes in National Policy

This long-term strategy is aligned to national strategies and targets which may change over time. This may alter priorities, outcomes, and actions, and necessitate re-modelling, requiring a flexible approach. Engagement with Scottish Government and stakeholders to ascertain policy changes, reviewing new policies, and implementing findings, will help keep this strategy relevant.

6.5.3. Summary

To ensure a successful, high-quality strategy it must meet its priorities and targets and have actions with a high certainty of success and positive impacts. Failure to do so may erode trust; prevent buildings meeting net zero; cause potential building damage; or fail to tackle fuel poverty. To help improve certainty of success, the following actions are included:

- Review and revise the methodology, data, and modelling, and incorporate lessons learned.
- Develop work packages to help understand the most appropriate measures for historic buildings.
- Ongoing reviews of policies, strategies, and targets.
- Review projects and research, and incorporate findings, lessons learned and data.
- Sharing of best practice between stakeholders of how to improve building stock.
- Raise nationally significant challenges to the Scottish Government to allow for a centrally coordinated response and action.

[93] Inform Guide: Improving Energy Efficiency in Traditional Buildings (historicenvironment.scot)

6.6. Priority 6: Transitioning the Energy System

6.6.1. Outcomes

	Transitioning the Energy System	• **6.1 Energy System Opportunities & Constraints -** Actions are informed via engagement with utility providers to determine capacity, opportunity, and security of projects, whilst taking a holistic view of the wider energy system.

6.6.2. Context

Fife's just transition towards decarbonising heat will require the changing use of existing energy infrastructure. This will be influenced by where grid improvements and additional generation are required, and in the long-term moving away from natural gas. SP Energy Networks, SGN and Scottish Government must take the lead role in this – SP Energy Networks upgrading the electricity grid, SGN looking at alternative fuels, and Scottish Government providing national coordination. Fife Council should have a supporting role, providing local context, based on the outputs of this strategy.

When considering energy generation requirements, it is important to determine the amount of energy demanded and how this can be reduced (e.g. energy efficiency). This provides an energy generation baseline to meet demand. However, transition towards renewables means energy not always being available when and where required, necessitating methods to move and store it.

Figure 6: Energy Choices

6.6.2.1. Electricity

This strategy recommends installing decarbonised heating systems running off electricity (individual heat pumps or pumps supporting heat networks). The number of heat pumps to be installed up to 2045 is significant, placing demand pressures on the grid. This will be carefully managed in discussion with Distribution Network Operators[94] (SP Energy Networks for Fife) to ensure grid constraints are identified and considered when prioritising actions. Discussions will also identify future opportunities for grid expansion and consider other energy projects competing for capacity. We will also explore opportunities for battery storage to help manage the network, noting batteries use up grid capacity under current definitions however this is likely to change. By working with SP Energy Networks, this will support them to make informed decisions and investments.

Nationally it is estimated fossil fuel use must reduce by 28 TWh in 2030[95] to meet decarbonised heat ambitions. If the main method is via heat pumps[96], levels of renewable electricity required is equivalent to an additional 3 GW of onshore wind or 2 GW of offshore wind[97].

SP Energy Networks has been engaged throughout this strategy's development. It is expected the cost of investment in the grid will be significant. SP Energy Networks are following Revenue = Incentives + Innovation + Outputs – Electricity Distribution 2[98]. This is a 5-year price control (ending in 2028) which sets the outputs Distribution Network Operators must deliver, and the revenues they are allowed to collect. To ensure the long-term success of this strategy, we will continue to engage SP Energy Networks on planned projects to inform the new price control, and future grid reinforcement.

[94] Distribution Network Operators run the distribution of electricity from the national grid to properties.
[95] Compared to 2021.
[96] With limited contribution from hydrogen.
[97] Heat In Buildings Strategy: Achieving Net Zero Emissions in Scotland's Buildings (www.gov.scot)
[98] Network price controls 2021-2028 (RIIO-2) - Electricity distribution price control 2023-2028 (RIIO-ED2) | Ofgem

Heat decarbonisation must start as soon as possible. This will require working under current grid constraints, or where minor upgrades are possible. To achieve this, regular engagement will take place with SP Energy Networks to assess feasibility of short-term actions. One mechanism is SP Energy Networks' Local Heat & Energy Efficiency Strategy Portal[99]. This identifies current cable capacity and how it is impacted by additional loads. Once developed further, this will become a critical tool to prioritise and plan building level actions and help ensure early adopters do not potentially block implementation of future projects.

6.6.2.2. Gas

The majority of properties in Fife use mains gas for heating; mainly natural gas. The Heat in Buildings Strategy sets targets for zero emissions heating by 2030 in:

1 million on-gas homes	**50,000 non-domestic buildings**
= 84,000 in Fife	*= 4,600 in Fife of which ~1,470 are on mains gas*

To achieve, and go beyond, these targets, demand for unabated natural gas must be phased out and replaced by low carbon and ultimately renewable energy sources. There are two main mechanisms for doing so:

1. Alternative heating systems (heat pumps/heat networks) described in Chapters 4.1 and 6.8.
2. Switching to decarbonised alternatives (gas blending[100] or hydrogen).

Switching to 100% hydrogen, providing trials are successful, is a long-term potential solution to decarbonisation. SGN have the leading role in exploring decarbonised alternatives and are collaborating with other gas networks to provide evidence for UK Government's 2026 heat policy decision on hydrogen's future role in heating homes.

Scottish Government do not envisage hydrogen having a role in heating buildings in the near term [101], and is not a focus in modelling for this strategy. However, SGN projects in Fife are leading the way in exploring hydrogen opportunities. This includes the H100 Fife[102] project in Levenmouth. H100 is the world's first 100% hydrogen-to-homes heating network supplying three hundred homes with hydrogen produced by an electrolysis plant powered by an offshore wind turbine.

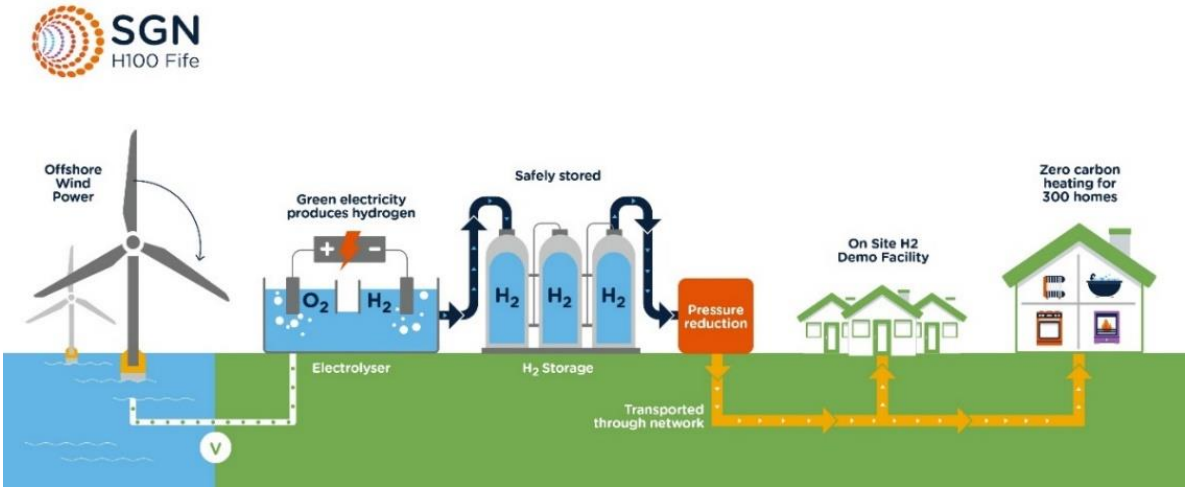

Figure 7: H100 System Diagram – Copyright © SGN

[99] LHEES Portal (derryherk.com)
[100] Gas blending is being explored across the UK and is the blending of natural gas alternatives (e.g. biomethane) into the network, to lower short-term emissions and hopefully displace natural gas in the long-term.
[101] Draft Energy Strategy and Just Transition Plan (www.gov.scot)
[102] H100 Fife | Fife Council

Local Transmission System Futures Programme
SGN's Local Transmission System Futures Programme will research, develop, and test compatibility of assets, pipelines, associated plant, and ancillary fittings with hydrogen.

H2 Caledonia
A SGN project routing new hydrogen transmission pipelines to connect production, storage and network injection locations across the East Coast and Central Belt. In Fife, there are several emerging hydrogen projects which will be connected by the new pipelines. These pipelines would form a backbone, providing the fuel required to support the phased conversion of gas distribution networks.

Consideration needs to be given to continuing to understand the long-term role hydrogen may have in heating buildings, the opportunities, and timescales. We will continue to meet with SGN regarding their leading role in exploring hydrogen use. The greater our understanding, the more it could possibly be incorporated into scenario planning. Increasing our awareness will make the just transition easier and help understand the best time to transition to hydrogen, if deemed appropriate to do so. Decisions would also be required on whether hydrogen is more or less appropriate than heat pumps and networks. Modelling will also need to consider the costs if sections of the gas network need to be decommissioned.

For hydrogen, Fife Council will maintain a supportive watching brief. With progress of this the responsibility of SGN, Scottish Government and other gas distribution networks.

6.6.3. Summary

This priority focuses on how this strategy, and the just transition towards decarbonising heat, will interact with the wider energy system. Most notably use of current electricity infrastructure, impacts on future grid capacity, and the transition from natural gas to other fuels. SP Energy Networks and SGN are key stakeholders in leading this transition and will be engaged throughout the lifetime of the strategy to ascertain their progress. To help meet this priority, actions are included in the delivery plan focussing on supporting SP Energy Networks and SGN:

- Engaging with SP Energy Networks on using their Portal to forward plan heat decarbonisation measures for buildings; and for their price control review to ensure Fife's energy system needs for heat decarbonisation from 2028 onwards are met.
- Collaborating with SGN to explore potential for hydrogen for heating in buildings in Fife, including potential expansion of H100.

Furthermore, a pilot settlement level energy plan will be developed for the Dunfermline & Rosyth area. This will consider the wider energy system and will help inform decisions and modelling for heat network and heat pump placement. Opportunities for wider funding will be explored to support, and potentially expand this.

6.7. Priority 7: Improving the Energy Efficiency of Buildings

6.7.1. Outcomes

	Energy Efficient Buildings	• **7.1 Domestic; 7.2 Social Housing; 7.3 Private Rented; 7.4 Mixed-Use, -Tenure & Historic -** Homes across Fife become more energy efficient and contribute Fife's share, on a proportional basis, of the national targets, recognising the challenges. • **7.5 Non-Domestic -** Non-domestic buildings across Fife become more energy efficient, recognising the challenges.

6.7.2. Context

Improving energy efficiency of buildings will help reduce energy demand. It will also support the rollout of decarbonised heating by acting as a "***critical precursor to deployment of many zero emissions systems***[103]." It will help to reduce energy costs, with a no/low regrets fabric first method being central to the Heat in Buildings Strategy's approach to reduce fuel poverty and meet net zero.

6.7.2.1. Domestic

The Heat in Buildings Strategy and Energy Efficiency Standard for Social Housing 2 have targets focused on buildings' energy performance certificate bands:

Private rented homes to be energy performance certificate band C by 2028	All social housing to be energy performance certificate band B by 2032	All other homes to be energy performance certificate band C by 2033	All fuel poor homes to be energy performance certificate band B by 2040
= ~14,000 in Fife	*= ~36,000 in Fife*	*= ~69,000 in Fife*	*= ~136,000 in Fife*[104]

The challenge for Fife is huge, with only 7% of homes in Fife having an energy performance certificate band of A or B, and over half (53%) lower than C and not meeting any targets (Figure 8). These figures are similar to the national average (51%)[105, 106].

The 2040 target also presents a challenge. It is difficult to identify fuel poverty risk years in advance, and there is potential for all homes to be fuel poor if living situations change. Therefore, this target has been applied to all homes for this strategy and delivery plan. It is estimated, 64% (118,349) of Fife homes will need some level of retrofit to meet the national targets.

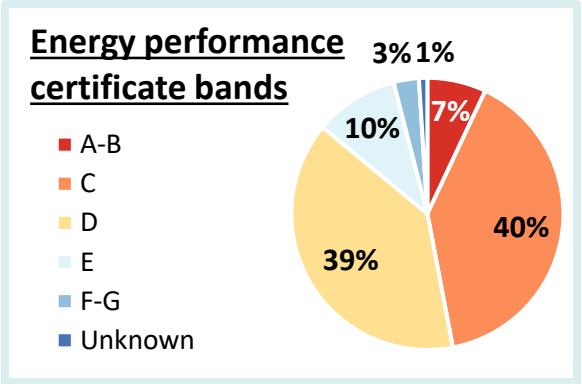

Figure 8: Energy Performance Certificate Bands (Domestic)

[103] Heat In Buildings Strategy: Achieving Net Zero Emissions in Scotland's Buildings (www.gov.scot)
[104] Assuming all homes are at risk of fuel poverty and excludes social housing.
[105] National averages provided by Energy Savings Trust and are from Home Analytics v3.8 aggregated to a national level.
[106] All data from Home Analytics.

Along with energy performance certificates, analysis identified other indicators for poor energy efficiency. These include 7% of homes have single glazed windows[107]; 8% with low loft insulation[108] (Figure 9); and 37% with uninsulated walls (Table 18 and Table 19), lower than national average of 41%.

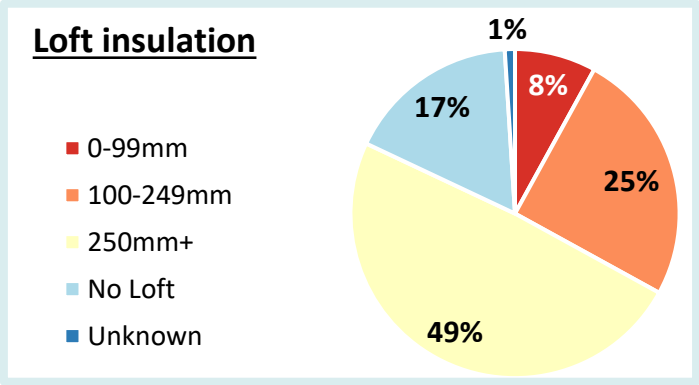

Figure 9: Loft Insulation (Domestic)

Table 18: Wall Construction and Insulation (Domestic)

Wall construction & insulation	%
Cavity (insulated)	42%
Cavity (uninsulated)	15%
Solid brick/stone (insulated)	3%
Solid brick/stone (uninsulated)	15%
System built (insulated)	3%
System built (uninsulated)	3%
Timber frame (insulated)	14.5%
Timber frame (uninsulated)	4%
Unknown	0.5%

Table 19: Uninsulated Walls by Tenure (Domestic)

Tenure	Proportion with uninsulated walls
All domestic properties	37%
Owner-occupied	27%
Privately rented	7%

[107] In line with the national average of 8%.
[108] Less than 100mm - similar to the national average of 9%.

~1,700 homes have all three indicators of poor energy efficiency (Table 20).

Table 20: Proportion of Properties with Multiple Poor Energy Efficiency Indicators

Low loft insulation	Single glazed windows	Uninsulated walls	No. of Properties
✓	✓		1,686 (1%)
✓		✓	9,184 (5%)
	✓	✓	8,955 (5%)
✓	✓	✓	1,698 (1%)

Social Housing

The majority (89%) of social housing is below energy performance certificate band B. Scenario modelling to determine how these homes can be compliant with Energy Efficiency Standard for Social Housing 2 focussed on a fabric first approach. Energy Efficiency Standard for Social Housing 2 is being reviewed, with outputs expected in 2024. If this recommends decarbonised heat for social housing, the modelling may need to be revisited.

Private Rented Homes

The private rented homes target was amended following the pandemic to reduce pressure on the sector. However even with the new target, 14,000 homes (57% of all private rented) have only 4 years to achieve energy performance certificate band C. Failure to do so may impact the ability of these homes to be rented out.

Concerns have been raised of high, potentially prohibitive, retrofit costs increasing proportion of vacant properties if landlords determine cost of investment is not worthwhile. We will work closely with the Private Housing Team and Private Landlord Forum to ensure this strategy supports rather than restricts landlords.

The average energy performance certificate band is lowest in North and East Fife (Figure 10).

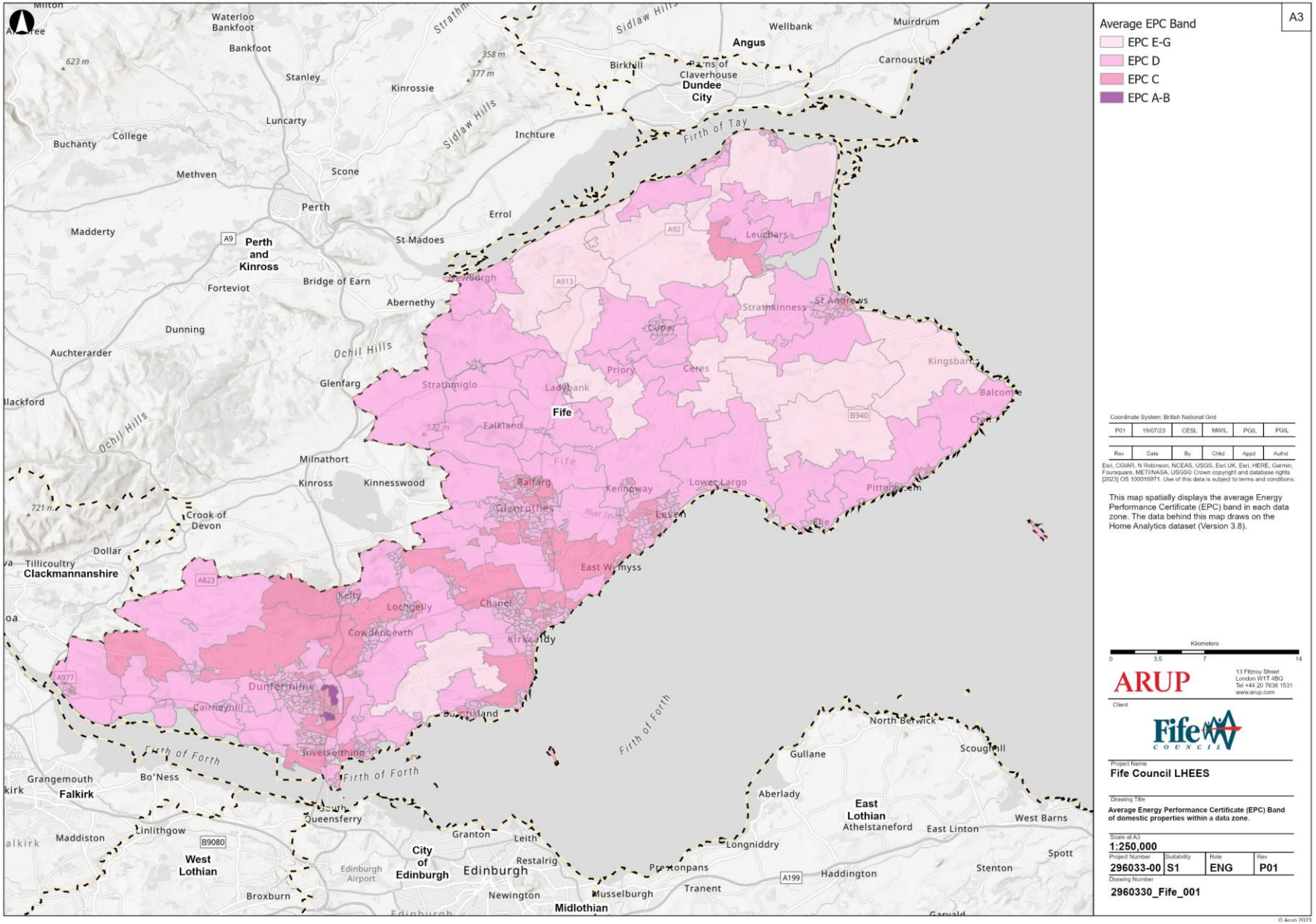

Figure 10: Average Energy Performance Certificate Band

6.7.2.2. Non-Domestic

62% of non-domestic buildings in Fife are uninsulated, of which the majority have solid brick or stone walls (Figure 11 and Table 21)[109].

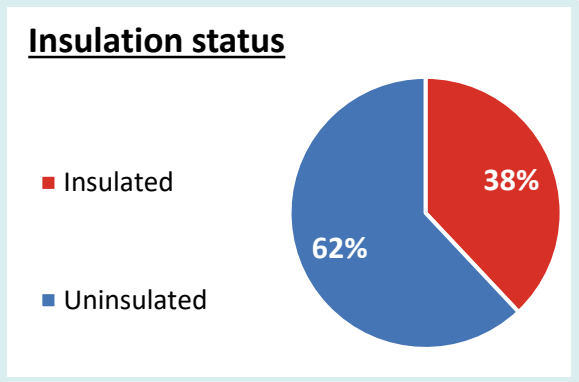

Figure 11: Insulation Status (Non-Domestic)

Table 21: Wall Construction & Insulation (Non-Domestic)

Wall construction & insulation	%
Cavity (insulated)	17%
Cavity (uninsulated)	16%
Solid brick/stone (insulated)	6%
Solid brick/stone (uninsulated)	43%
System built (insulated)	1%
System built (uninsulated)	1%
Timber frame (insulated)	15%
Timber frame (uninsulated)	2%

Levels of uninsulated walls are high in retail, clubs and community centres, and food and drink establishments (Table 22). These may be in Victorian era high streets or converted residential properties. Pre-1919 properties are more likely to have poor energy efficiency and will be more challenging to retrofit due to high proportions of solid brick/stone wall construction. They are also more likely to be listed or in conservation areas. Hotels, education, and health facilities also have high proportions of properties with uninsulated walls.

Table 22: Uninsulated Walls by Business Type (Non-Domestic)

Business type	Proportion with uninsulated walls
Retail	75%
Offices	60%
Light manufacturing/industry/ workshops	37%
Clubs & community centres	75%
Residential	66%
Cafes, pubs, restaurants & takeaways	79%
Hotels	73%
Storage / distribution	14%
Education	77%
General sports & leisure	61%
Health	72%
Other	54%
Screened out	58%

Non-Domestic Data

Non-domestic data is less accurate than domestic data. Therefore, despite the long-term outcome is for all non-domestic buildings across Fife to become more energy efficient, in the short term the focus will be on “core” buildings where more accurate data is available (e.g. Fife public buildings, and buildings of key partners with large estates).

[109] All data from Non-Domestic Analytics, certain buildings like utilities are excluded for consideration as demands attributed are likely to be erroneous.

6.7.2.3. Project Level Challenges

In addition to the challenges identified previously (Chapter 4.3), there are also building level challenges which could be considered at the project level:

- repair work being required prior to retrofitting,
- affordability of measures,
- consideration of embodied carbon, and
- minimising disruption.

6.7.2.4. Existing Mechanisms

Funding exists to support local authorities to complete and/or fund retrofits (Table 23). This strategy will provide the evidence for, and prioritisation of, potential projects where this funding could be best directed.

Table 23: Retrofit Funding Examples for Local Authorities

Area-Based Schemes[110]	Awarded for energy efficiency programmes in high fuel poverty areas.
Energy Company Obligation (ECO) – Local Authority Flexibility Scheme[111]	Used by energy suppliers to meet up to 25% of their Energy Company Obligation Affordable Warmth obligation by installing energy saving measures in properties declared eligible by local authorities. Local authorities are responsible for ensuring households are in private tenure and either living in fuel poverty or have a low income and vulnerable to living in the cold.
Scottish Central Government Energy Efficiency Grant scheme[112]	Capital grant funding support to enable the delivery of heat decarbonisation and energy efficiency projects across the public sector.

In addition, other funds and support are available directly for domestic and non-domestic properties including Warmer Homes Scotland[113]; Home Energy Scotland Grant and Loan[114] and Private Rented Sector Landlord Loan[115]; and Business Energy Scotland Small & Medium Enterprise (SME) Loan Scheme[116]. As mentioned in Priority 4 (Chapter 6.4) these will be promoted across Fife.

6.7.3. Summary

This priority focuses on improving energy efficiency of Fife's buildings to meet national targets; support decarbonisation; and help building owners have lower energy costs. To help achieve this building level actions will be identified and prioritised. To ensure quality, building level actions have only been included where there is a high certainty of success and positive impacts (Chapter 4.3) or are planned for implementation. Actions include:

- Building level studies to understand specific energy efficiency measures required[117].
- Planned projects improving energy efficiency such as installation of wall insulation; floor and loft insulation; double/triple glazing; insulating pipes; and draught proofing.
- Ongoing analysis and modelling to identify further high certainty building level actions.
- Advocation and promotion of funding and support for energy efficiency measures.
- Raising awareness and knowledge of energy efficiency.

[110] Area-Based Schemes - gov.scot (www.gov.scot)
[111] Energy Company Obligation (ECO): Help to Heat scheme - flexible eligibility - GOV.UK (www.gov.uk)
[112] Overview - Scottish Central Government Energy Efficiency Grant scheme: form and guidance - gov.scot (www.gov.scot)
[113] Warmer Homes Scotland Funding · Home Energy Scotland
[114] Home Energy Scotland Grant and Loan · Home Energy Scotland
[115] Private Rented Sector Landlord Loan · Home Energy Scotland
[116] SME Loan Scheme · Business Energy Scotland
[117] A comprehensive assessment of a building's characteristics will be needed to inform any retrofit.

6.8. Priority 8: Decarbonising Heat Sources

6.8.1. Outcomes

	Decarbonising Heat Sources	• **On Gas and 8.2 Off-Gas -** Homes across Fife have decarbonised heat and contribute Fife's share, on a proportional basis, of the national targets, recognising the challenges. • **Non-Domestic -** Non-domestic buildings across Fife have decarbonised heat and contribute Fife's share, on a proportional basis, of the national targets recognising the challenges. • **8.4 Heat Networks -** Potential heat network zones identified, including expansion of existing networks, as a mechanism to decarbonise heat.

6.8.2. Context

Decarbonised heat sources are low and zero emissions heating. They include heat pumps, heat networks, infra-red heating or electric heaters combined with solar photovoltaic; solar water heating; and thermal storage. Implementation of new heating systems will help reduce emissions, and help Fife meet net zero and tackle the climate emergency.

6.8.2.1. Domestic

The Heat in Buildings Strategy states "*there are low and zero emissions heating options available for all domestic dwellings*"[118] and sets targets for zero emissions heating by 2030 in:

170,000 off-gas homes using high emission fuels *= ~6,500 in Fife*	**1 million on-gas homes** *= 84,000 in Fife*

To meet these targets, and net zero; decarbonisation of heating must accelerate, with the Heat in Buildings Strategy focusing on implementation of tried and tested no/low regrets measures.

90% of properties are connected to the gas grid (Figure 12), greater than the national average (80%)[119, 120]. ~165,000 domestic properties (89%) have mains gas as their main fuel type[121], with 99% of these on the gas grid[122]. Half of these require to be transitioned to decarbonised heat in the next six years. To achieve this, this strategy is taking forward the no/low regrets approach. This involves having heat decarbonisation actions for domestic properties only where there is a high certainty of success (Chapters 4.3 and 7.1). This will help ensure heat pumps have a high enough coefficient of performance, hopefully reducing energy bills, whilst moving towards net zero.

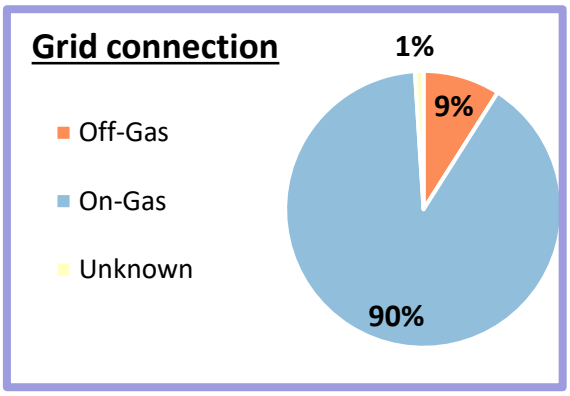

Figure 12: Grid Connection (Domestic)

[118] Heat in Buildings Strategy - achieving net zero emissions in Scotland's buildings - gov.scot (www.gov.scot)
[119] National averages provided by Energy Savings Trust and are taken from Home Analytics v3.8 aggregated to a national level.
[120] From Home Analytics data.
[121] The difference between main fuel type and off-gas is due to postcode being a main identifier as to whether a property is on the gas grid. It is possible some properties are within the cover of the grid and therefore classed as on- gas but have non-gas heating systems.
[122] Most off-gas properties are heated by either electricity (57%) or oil (26%).

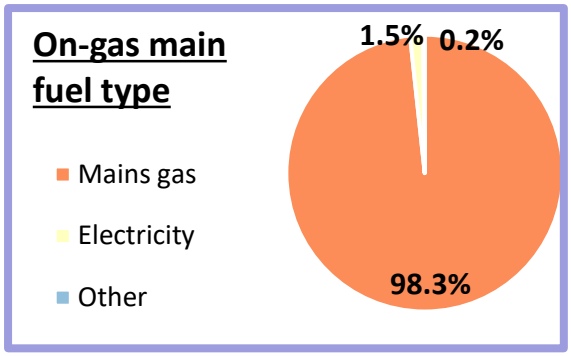

Figure 13: On-gas Grid Fuel Type (Domestic)

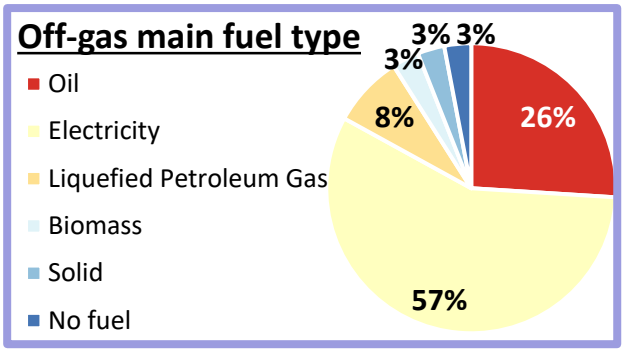

Figure 14: Off-gas Grid Fuel Type (Domestic)

The national methodology categorises properties to indicate potential heat decarbonisation pathways[123]. Most on-gas homes are at least moderately suitable for heat pumps. Homes least suitable would likely either require additional retrofits or use alternative low/zero carbon heating systems. Over half of off-gas properties may be immediately suitable for heat pumps or require moderate upgrades.

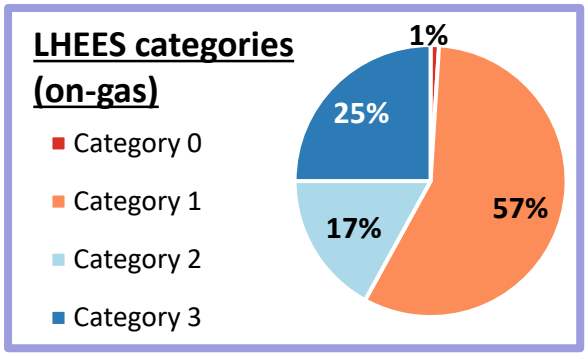

Figure 15: Local Heat & Energy Efficiency Strategy Category – On-Gas Grid (Domestic)

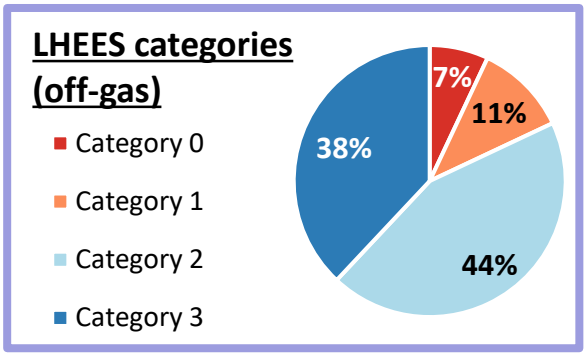

Figure 16: Local Heat & Energy Efficiency Strategy Category – Off-Gas Grid (Domestic)

Private Rented and Social Housing
Like Priority 7 (Chapter 6.7), this priority will need to consider the Energy Efficiency Standard for Social Housing 2 review if it revised to include decarbonised heat. Concerns regarding high, prohibitive retrofit costs increasing proportion of vacant properties if landlords determine the investment is not worthwhile will also be considered.

[123] Category 0 identifies properties connected to a heat network or have a heat pump whilst Categories 1 to 3 determines the properties heat pump suitability, with 1 being highly suitable and Category 3 least suitable/ requiring retrofit action. This is a strategic appraisal of the building stock, and more granular analysis would be necessary prior to any heat pump installation.

6.8.2.2. Non-Domestic

Decarbonised heating systems are "*applicable to a large proportion of the non-domestic building stock, however enabling works such as upgrading distribution systems … and increasing site electricity capacity may often be needed*[124]." The Heat in Buildings Strategy sets targets for zero emissions heating for non-domestic building by 2030:

50,000 non-domestic buildings
= 4,600 in Fife of which ~1,470 are on mains gas

Unlike domestic, most non-domestic properties have electric heating; with only 32% on mains gas (Figure 17)[125]. Offices, clubs & community centres, hospitality, education, and health sectors have higher than average proportions of properties on mains gas (Table 24). Storage and distribution properties are more likely to have oil heating.

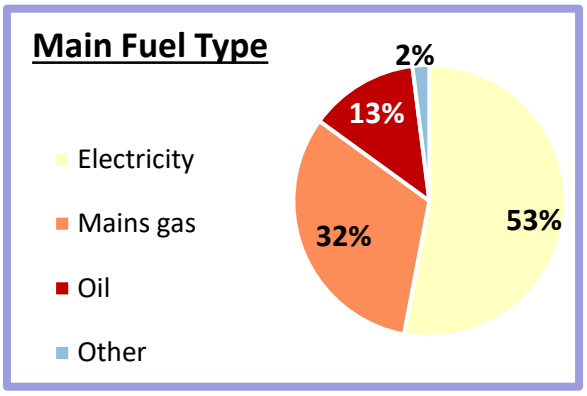

Figure 17: Main Fuel Type (Non-Domestic)

Table 24: Main Fuel Type by Business Type (Non-Domestic)

Business type	% electricity	% mains gas	% oil	% other
Retail	69%	21%	9%	1%
Offices	49%	42%	5%	4%
Light manufacturing/industry/workshops	30%	32%	35%	3%
Clubs & community centres	51%	44%	3%	2%
Residential	58%	29%	10%	2%
Cafes, pubs, restaurants & takeaways	51%	42%	5%	1%
Hotels	53%	38%	4%	5%
Storage / distribution	16%	26%	56%	2%
Education	49%	46%	3%	2%
General sports & leisure	63%	27%	4%	6%
Health	50%	48%	2%	0%
Other	56%	30%	9%	6%
Screened out	61%	24%	12%	3%

[124] Heat in Buildings Strategy - achieving net zero emissions in Scotland's buildings - gov.scot (www.gov.scot)
[125] All data from Non-Domestic Analytics, certain buildings like utilities are not included for consideration as demands attributed are likely to be erroneous.

Non-Domestic Data
Like Priority 7 (Chapter 6.7), available non-domestic data is less accurate than domestic data. Therefore, despite the long-term outcome for all non-domestic buildings across Fife to transition to decarbonised heating, in the short term the focus is on "core" buildings where more accurate data is available. Public buildings are now required to submit Building Assessment Reports to inform suitability for connection to heat networks – helping to improve confidence in heat demand data.

6.8.2.3. Existing Mechanisms

Funding for building level decarbonised heating for both local authorities and building owners are the same as those in Chapter 6.7.2.4. This strategy will provide the evidence for, and prioritisation of, potential projects where this funding could be best directed in the short, medium, and long term. In addition, funding for building owners will be promoted.

6.8.2.4. Building Level Challenges

Regarding installing decarbonised heating at the building level, and considering the challenges identified in Chapters 4.3 and 6.5, challenges to be overcome on a project level are similar to those in Priority 7 (Chapter 6.7). Other challenges are:

- Additional costs, time, and labour to adapt pipework and radiators.
- Cost of installation for building owners.
- Surveying properties to ascertain whether they have the appropriate levels and placement of insulation to ensure a heat pump works efficiently.
- Consideration of staged implementation of heat pumps and insulation for non-domestic properties. Insulation can be disruptive and costly. Heat pumps could be initially installed alongside existing boilers, to help satisfy peak winter conditions. Insulation could be installed at a later stage, making boilers redundant and increasing heat pump efficiency. This method would allow maximum carbon dioxide reduction to happen sooner with less capital investment.

6.8.2.5. Heat Networks

The Heat Networks (Scotland) Act 2021 established new statutory targets for heat networks. These require the combined supply of thermal energy by heat networks to reach:

2.6 TWh of output by 2027 and 6 TWh by 2030

The Act also requires local authorities to review potential areas suitable for a heat network. Following on from this strategy, Fife Council will use this information to formally designate areas for heat networks (zones). This will require further analysis and modelling. Additional national legislation and guidance is expected to support this.

Definition of Heat Network and Potential Heat Network
Heat Network: Supplies heat (or cooling) to buildings, by taking excess heat from a central source. By supplying multiple buildings removes the need for individual boilers or heaters.

Potential Heat Network Zone: An area where a heat network provides a potential heat decarbonisation opportunity. The identification of a zone does not necessarily mean it will be designated.

6.8.2.5.1. Benefits of Heat Networks

Heat networks have several potential benefits:

- Make best use of local energy and support the energy transition. Including utilising waste heat from businesses and industry, natural assets, and other sources.
- Help in creating opportunities for community wealth building and reducing fuel poverty.
- Decarbonise heat at scale, helping to achieve net zero targets.
- Provide business and industry with an incentive to locate and create jobs and income.
- Providing opportunity for increased private sector interest in heat networks delivered at scale (settlement level solutions).

6.8.2.5.2. Existing Heat Networks

Fife has three existing district heat networks (Table 25). The potential to expand these, including options of switching to decarbonised heat sources, will be explored during the delivery stage of this strategy.

Table 25: Existing Heat Networks

Dunfermline Community Energy Scheme	Active from 2006 (with expansions), this network heats nearly three hundred properties in North Dunfermline. These include Broomhead Drive flats; the Linen Quarter; Tesco; and Carnegie Leisure Centre. Heat is sourced from the Lochhead Landfill site, located north of Wellwood, taking heat from sources including an anaerobic digestor and landfill gas.
Glenrothes Energy Network	The Glenrothes Energy Network, launched 2018-19, takes excess heat from the RWE biomass plant located in central Glenrothes and supplies buildings including 85 homes in partnership with Kingdom Housing Association, 9 business units, 2 office blocks (including Fife House), a care home, and Rothes Hall.
University of St Andrews	University of St Andrews has a network running off biomass, commissioned in 2017. A 6.5 MW boiler in Guardbridge provides heating and hot water to ~50 campus buildings. The University are undertaking a feasibility study to assess potential expansion of the network, of which Fife Council are a partner organisation. A second, smaller network (commissioned in 2020) heats five buildings from a gas-powered energy centre at the Arts & Library building[126].

[126] Planning permission has been granted for a phase 2 extension to add a further two buildings. The network was intended to convert to low-carbon heat generation, or possibly connect to the larger network.

6.8.2.5.3. Potential Heat Network Zones

Potential heat network zoning analysis has been carried out for Fife. An approach was developed to generate post-retrofit potential zones and potential expansions of existing networks. The approach builds upon the national methodology, and will identify three levels of zones:

- Level 1 – follows the national methodology using linear heat density, buffer radii, and number of anchor loads to provide potential zones which might be economically viable now.
- Level 2 – takes account of a larger range of factors (e.g. heat sources, social housing, strategic sites, etc.) to prioritise zones, not solely based on economic viability. This supports generation of material in accordance with the Heat Network (Scotland) Act 2021.
- Level 3 – longer term, settlement level, zones, taking account of the range of factors.

As part of the delivery stage, level 2 and 3 analyses will be taken forward. This will help improve confidence to support zone prioritisation. During this process the Council will confirm waste heat supply opportunities and support stakeholder buy-in for the preferred energy solution.

Definition of Linear Heat Density and Anchor Load

"*Linear heat density is an industry standard metric that relates heat to distance, for a heat network it is heat demand per meter of pipe*."

"*Anchor loads are high heat demand buildings and key connections on a heat network that usually drive the economics of heat works*."

Local Heat & Energy Efficiency Strategy methodology: Heat Networks – Generation of Potential Zones Detailed Practitioner Approach.

6.8.2.5.4. Heat Sources

Chapter 4.2.4. lists several natural assets and waste heat sources which could be utilised for heat networks to benefit local communities. Significant heat sources identified during analysis include: the River Forth; Pitfirrane and Frances mine water treatment schemes; flooded disused coal mines; waste water treatment schemes (e.g. Dunfermline); sewer pipes; and some large industry and businesses.

6.8.2.5.5. Potential Heat Network Zones – Level 1 Analysis

Level 1 analysis identified a significant opportunity for heat networks in Fife. This is mainly due to the large number of industrial estates, which contain buildings with high heat demand which could form anchor loads for a potential network.

Level 1 zones were identified using a set of baseline and stringent criteria (Table 26 and Figure 18). **35 baseline zones** and **11 stringent zones** were identified with a total heat demand of 876 GWh/year (~12% of total heat demand in Fife) and 308 GWh/year (~4% of total heat demand) respectively.

In addition to heat networks zones identified in industrial estates, zones have also been identified in the centres of Kirkcaldy, Glenrothes, Dunfermline and St Andrews. A relatively high proportion of domestic properties within Kirkcaldy, Dunfermline and St Andrews also have limited suitability for heat pump installation. This suggests connecting to a heat network may be an attractive route to decarbonise heat in these properties. However, most of these properties are privately owned, which may present a challenge.

Table 26: Thresholds criteria used for potential zone identification and prioritisation.

Criteria	Linear heat density benchmark (kWh/year/m)	Anchor load threshold (MWh/year)	Minimum number of anchor loads per cluster
Baseline	4,000	500	3
Stringent	8,000	500	5

Why has my area not been identified as a Potential Zone?
For a heat network zone to be financially viable it needs to have:

1) A high linear heat density (4000 kWh/year/m and 8,000 kWh/year/m was used).
2) A minimum of three anchor loads with a significant heat demand (<500 MWh/year).

If an area has not been identified as a potential zone, it is because there are not enough buildings with significant heat demand (>500 MWh/year) close enough together to meet the heat demand density threshold. This analysis is based on data made available to the Council. Buildings with a high heat demand may have been missed where:

- There are multiple smaller properties within a larger building which are represented by several small heat loads.
- The heat demand data may be incorrect.

11 baseline zones are within or close to the Dunfermline/Rosyth area; 6 in Kirkcaldy; 5 in Glenrothes; and 5 in Leven/Methil. Each zone can be viewed in more detail on the published web map, with a summary of key statistics in Table 27 and Appendix 4.

Table 27: Baseline zone summary

Non-domestic properties	• 263 GWh/year of heat demand is estimated to come from non-domestic properties with a high suitability for heat network connection (46% of the heat demand from all non-domestic properties within the zone).
Social Housing	• Within these zones, ~46 GWh/year of heat demand is from social housing. • Social housing makes up 13% of domestic properties within the zones, and 15% within 250m of the zones. This suggests there are opportunities within certain zones to connect to social housing. • The zones with highest proportion of social housing are Zone 8 (Woodmill High School (38%)) and Zone 24 (Levenmouth Campus (40%)).
Fuel Poverty	• Within these zones an estimated 63 GWh/year of heat demand is from households in fuel poverty (28% of domestic properties within the zones). • There are also households in fuel poverty located in close proximity to zones. • The zones with the highest proportion of properties in fuel poverty are Zone 23 (Methil – Links Drive (37%)) and Zone 12 (Kirkcaldy South (33%)). • There may be socio-economic benefits of connecting these homes to networks.
Heat Resource	• Many zones intersect strategic greenspaces which indicates potential for ground source heat pumps. • Some zones are within buffer zones for mine water treatment operations which may provide opportunities for low carbon heat supply. The Council will continue to engage with the Coal Authority to understand the extent of these opportunities. • Opportunities for other waste heat sources include Scotland Heat Map Energy Suppliers and/or National Atmospheric Emissions Inventory Point Emitters. Follow on work will explore other opportunities.
Local Development Plan sites	• The majority of zones intersect at least one local development site, with 161 sites identified within zones. • As part of heat network zone designation, the Council will consider proximity to local development plan sites.

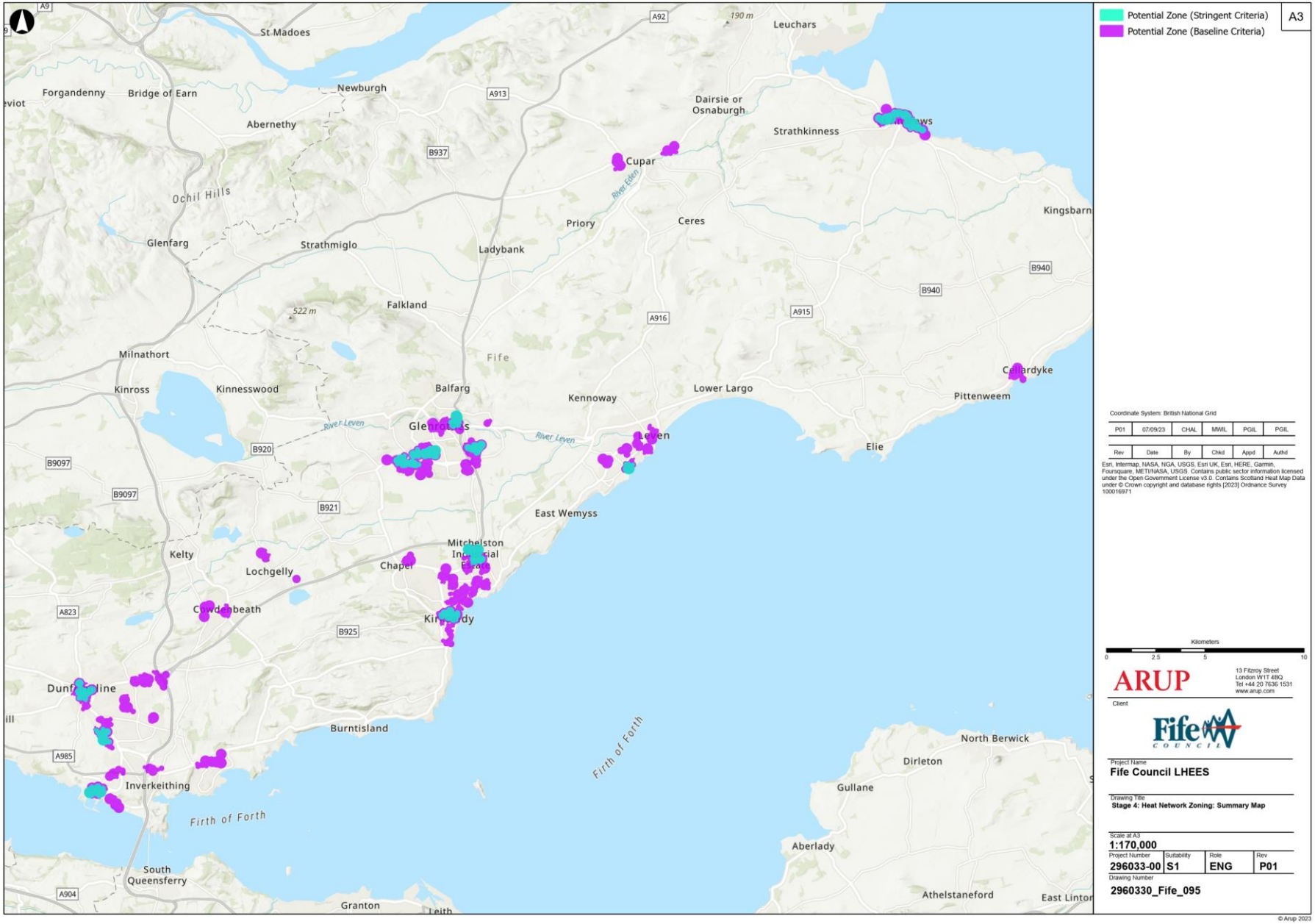

Figure 18: Potential Heat Network Zones (Level 1 Analysis)

6.8.2.5.6. Potential Heat Network Zones – Level 2 Analysis

Four zones have undergone Level 2 analysis, a summary of which is detailed in Table 28. Maps of these zones are in Appendix 5.

Table 28: Level 2 analysis summary

Zone	Anchor Loads	Total Heat Demand (GWh/year)	Heat demand from houses in fuel poverty (GWh/year)	Heat demand from social housing (GWh/year)	Opportunity summary
Glenrothes North	18	43.7	2.1	2.6	Explore expansion of the existing heat network. 29% of households in the zone are in fuel poverty and 15% are social housing.
Rosyth Waterfront	16	26	0.6	<0.1	Opportunity to explore potential for a new heat network as part of development of the Green Freeport, with potential heat sources opportunities from ground/water.
Dunfermline North	16	75	7.4	3.8	Explore expansion of the existing network which contains multiple Local Development Plan sites.
Kirkcaldy Centre and Kirkcaldy North West (Victoria Hospital)	28	155	9.8	4.4	Explore a new network due to high proportion of public buildings in the town centre. There is also a high proportion of private homes with low suitability for heat pumps.

6.8.3. Summary

This priority is focussed on decarbonising heating of Fife's buildings to meet national targets and net zero; tackle the climate emergency; and help building owners have lower energy costs. To help achieve this, building level actions will be identified and prioritised. To ensure quality, building level actions have only been included where there is a high certainty of success and positive impacts (Chapters 4.3, 6.5 and 7.1) or are planned for implementation. Actions include:

- Building level studies to understand specific heat decarbonisation measures required[127].
- Planned projects to decarbonise buildings' internal heat sources such as installation of heat pumps, infra-red heating, and panel heaters.
- Identify opportunities for new, and expand existing, heat networks – including exploring possibility of switching to decarbonised heat sources. This will include exploring funding and operating models, and potential building connections.
- Ongoing analysis and modelling to identify further high certainty building level actions.
- Advocation and promotion of funding and support for heat decarbonisation measures.
- Raising awareness and knowledge of heat decarbonisation, including heat pumps.

[127] A comprehensive assessment of a building's characteristics will be needed to inform any retrofit.

7. Delivery Plan

A high-level summary of actions to take forward in the first delivery plan are detailed below (Table 29). Actions are placed into seven categories[128]. 'Sub-actions' are being identified and assigned against stakeholders for delivery, with an initial action to finalise and publish a detailed 5-year delivery plan by early 2025. This will include timescales, delivery partners, and key performance indicators. Sub-actions in the plan will include retrofits scheduled for implementation, new building level actions (Chapter 7.1), supporting measures (e.g. communications, skills & jobs, etc.), and further analysis.

Table 29: Summary of Actions

Building Level[129]	• Building level studies to understand the specific energy efficiency and heat decarbonisation measures required. • Planned projects to decarbonise buildings' internal heat sources. • Planned projects improving buildings' energy efficiency.
Heat Networks	• Identify opportunities for new heat networks. • Expand and optimise (smart grids/networks) existing heat networks and explore changing to decarbonised heat sources. • Explore heat network delivery model options.
Energy System	• Identify existing electricity grid capacity to meet heat decarbonisation requirements. • Explore potential opportunities for expansion of energy systems to meet heat decarbonisation requirements. • Development of pilot Dunfermline & Rosyth area energy plan.
Skills & Jobs	• Skills and jobs baseline. • Training of existing providers. • National and regional coordination to tackle the skills gap. • Transitioning skills. • Fostering and feeding the skills pipeline. • Supply chain development.
Funding	• Help inform the direction of new funding sources. • Identify and promote existing funding sources. • Explore alternative funding sources to support retrofit/heat decarbonisation. • Maximize existing energy spend to benefit Fife.
Knowledge & Awareness Raising	• Raise Awareness of the Local Heat and Energy Efficiency Strategy. • Improve knowledge of how to improve energy efficiency of buildings and decarbonise heat sources.
Data, Modelling & Methodology	• Publish detailed delivery plan. • Review methodology to inform future versions. • Data collection to inform future iterations and identify high certainty actions. • Modelling to inform analysis and identify high certainty actions. • Improve insight of smart energy solutions to support the heat transition.

[128] Some actions may apply to multiple categories and have been assigned where most appropriate.

[129] To ensure quality of delivery, building level actions have only been included they are most likely to be possible, minimising potential damage to buildings, rising energy costs, or fuel poverty.

7.1. Optioneering Approach

The Local Heat & Energy Efficiency Strategy guidance, states delivery plans should identify areas for "targeted interventions and early, low regrets measures." To help achieve this, and as referenced in Chapter 6.5, the Council will develop an optioneering model to identify suitable and deliverable building level actions.

What are low regret measures?
The Heat in Buildings Strategy defines low regret measures as "*technological solutions where cost uncertainty is low and we already understand (a) the costs of installation and (b) running costs for Consumers*." The strategy specifically references:

- installation of cost-effective energy efficiency first improvements (e.g. roof, windows, wall, and floor insulation).
- Heat pumps – see Chapters 4.3 and 6.8 for comments on potential challenges.
- Low and zero emissions heat networks in areas deemed suitable.

What is optioneering?
A process to analyse and evaluate different options to help solve a problem.

To help prioritise areas for delivery, this model will analyse various retrofit scenarios for different building types and/or geographic areas. It will include multiple indicators and measure positive/negative impacts a scenario may have on each. Proposed indicators will be based on stakeholder need, and may include:

- Ability to meet national targets and this strategy's priorities.
- Certainty of success[130] – where measures are most likely to be possible, minimising potential damage to buildings, rising energy costs, or fuel poverty.
- Estimated cost of retrofit, funding approaches, and cost savings.
- Grid capacity, proximity to heat network zone, energy use, carbon savings.
- Just transition, including fuel poverty, skills, and jobs.

Each indicator will be scored based on the potential impact. This will help stakeholders understand how proposed actions align with their priorities.

A summary of the outline optioneering approach is detailed in Figure 19.

[130] Once published our detailed delivery plan will only include measures/actions where we are sure the recommended measures will not damage buildings, increase energy costs, or fuel poverty.

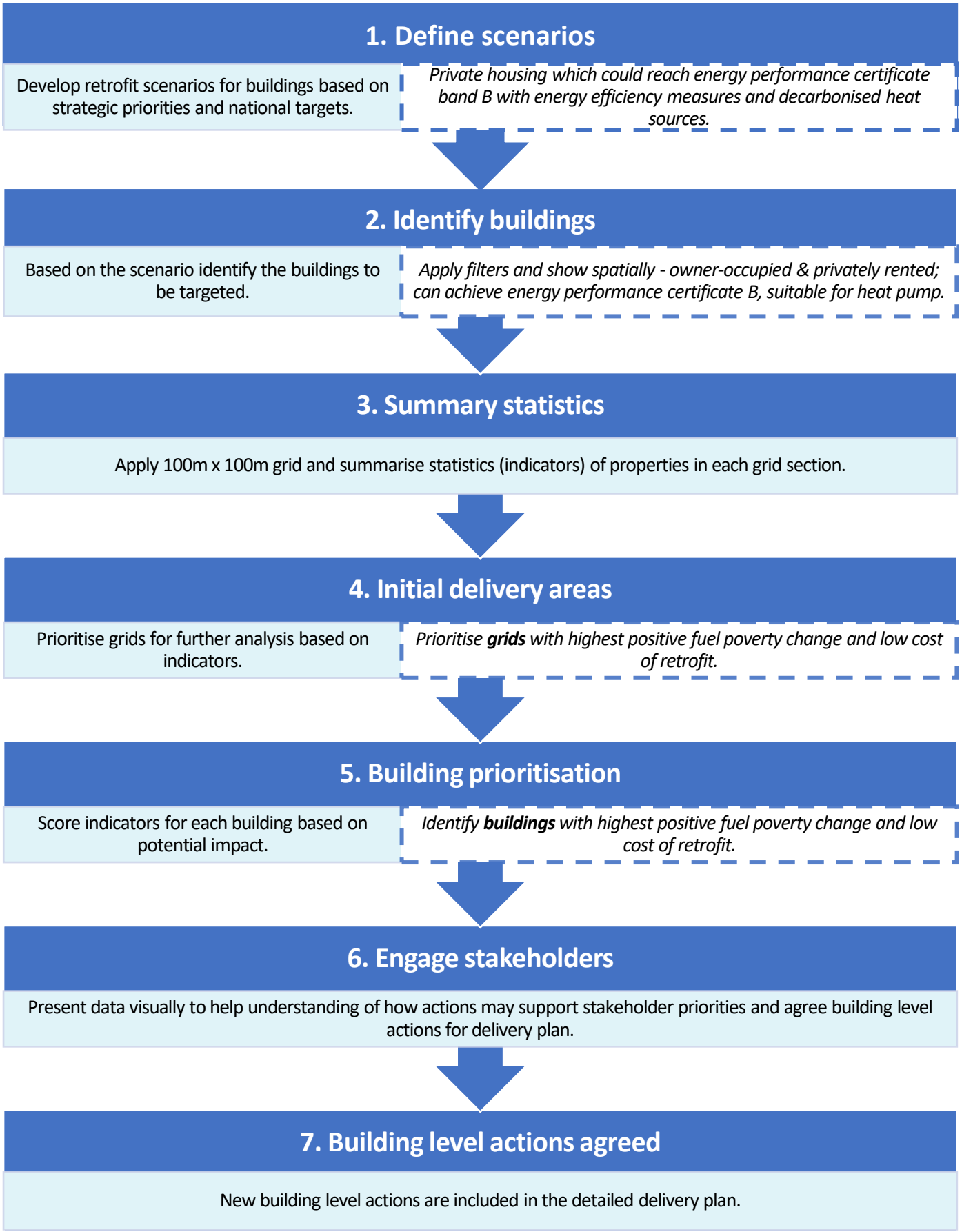

Figure 19: Outline Optioneering Approach

7.2. Asks for Scottish Government

To support success of this strategy, ongoing support from Scottish Government is required (tablets below). This includes funding, communications, research, and policy support.

Table 30: Funding Asks for Scottish Government

Funding Ask	Outcomes
Provide a significant increase in funding to support energy efficiency and heat decarbonisation projects, and supporting activities (fuel poverty; data collection, modelling, and analysis; funding for community organisations).	Greater funding availability.
Provide significant funding for research institutions, local authorities, social landlords, and others to develop studies and Building Information Modelling for archetypes.	Guidance for each archetype.

Table 31: Knowledge & Awareness Ask for Scottish Government

Knowledge & Awareness Ask	Outcomes
Produce a national communications toolkit to raise awareness of Local Heat and Energy Efficiency Strategies; energy efficiency and heat decarbonisation measures; support and advisory services.	Improved awareness and behavioural change.
Deliver “a public communications programme to raise awareness of the support and advisory services available and to encourage home upgrades, in order to maximise uptake of these schemes."	Improved awareness and behavioural change.

Table 32: Research & Data Asks for Scottish Government

Research & Data Ask	Outcomes
Encourage use of Building Energy Management Systems and sub-metering by building owners and sharing of data.	Greater awareness of building performance.
Develop a sustainable data sharing model and platform.	Improved data accessibility.
Research the density of new housing/building developments required to support a new heat network.	Improved modelling.
Research how indoor air quality is impacted/improved by energy efficiency/heat decarbonisation measures by: • Ensuring indoor air quality and retrofitting buildings are fully considered in the Clean Air Strategy 2 review. • Agreeing standard methodology for monitoring indoor air quality pre- and post-retrofit – including pilot projects. • Developing a framework model to identify how factors impact indoor air quality (e.g. insulation type, air tightness). • Convening task group to identify actions to be undertaken to address issues associated with indoor air pollution.	An understanding of how risks related to poor indoor air quality can be mitigated to make improved decisions on building level actions to implement.
Model heat efficiency in the context of changing workstyles now and moving forward.	Greater insight of heat demand.

Table 33: Policy Ask for Scottish Government

Policy Ask	Outcomes
Map policies/targets to evidence and tools to provide a timeline of anticipated improvements.	Improved awareness and accessibility to key policies.
Clarify the phrase "*as far as reasonably possible*" in the Heat in Buildings Strategy.	Improved understanding of targets.
Increase the number of green jobs (and supporting roles) to close the skills gap.	More green skilled jobs.
Incentivise and/or further regulate developers to ensure new builds are suitable for decarbonised heating.	New builds suitable for net zero.
Work with the Building Research Establishment on energy performance certificate reform to develop an improved metric.	An improved metric.
Agree a new Energy Efficiency Standard for Social Housing 2 target, aligned to net zero and supporting fuel poverty eradication.	A revised target.
Develop policy levers to support short-term mitigation to alleviate current grid capacity pressures. For example: revise battery storage definition; private wire for heat networks; surplus from private grids/renewables to power local buildings.	Alleviation of grid pressures improving capacity.
Continue to support National Planning Framework 4 Policy 19: *Development proposals within or adjacent to a Heat Network Zone identified in a Local Development Plan will only be supported where they are designed and constructed to connect to the existing heat network*.	Heat networks become standard consideration for developments.

8. Governance and Monitoring

8.1. Governance

The Local Heat and Energy Efficiency Strategy provides a framework for future capital and revenue spend. This will help move Fife's buildings towards meeting net zero targets by improving their energy efficiency and decarbonising heat. It provides projects to be implemented, monitors progress, identifies gaps and challenges and how these could be addressed.

This first iteration was developed by the Council's Planning Service. To ensure ongoing success we will continue partnership collaborating with other Council services, external partners, businesses, and communities. To achieve this a governance and delivery model has been developed (Figure 20). It describes the project, programme, and portfolio management approach for this work. This will require clear roles and responsibilities to enable ongoing successes. It has been developed to align with existing governance structures; understand cross-cutting opportunities, such as the Local Development Plan and Plan4Fife; and work with partners to take the strategy forward.

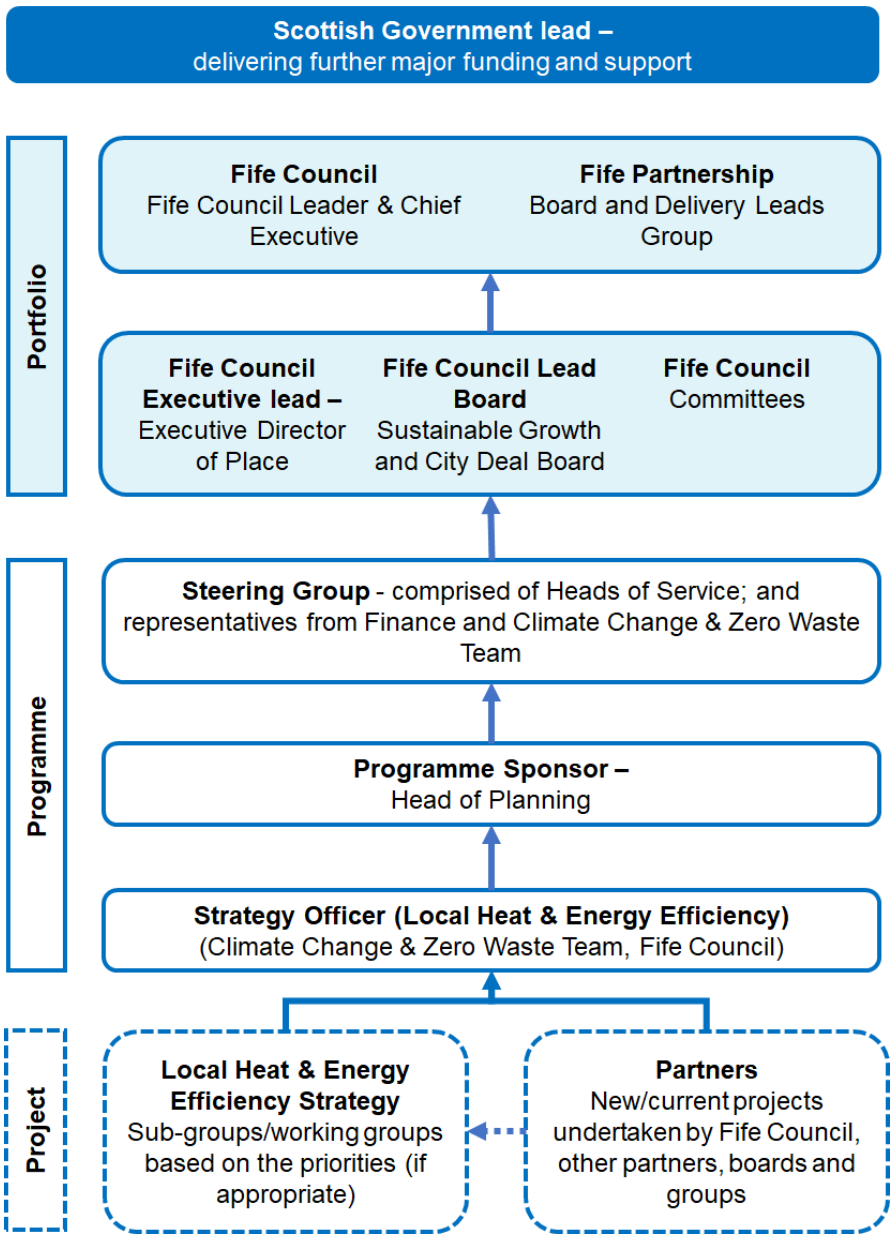

Figure 20: Governance and Delivery Model

8.2. Reporting and Monitoring

Ongoing monitoring will be critical for the success of this strategy and delivery plan. This will ensure key outcomes are achieved, allow for continuous improvements to meet changing requirements, and incorporate new information and data. It will also help guarantee Fife's Local Heat and Energy Efficiency Strategy and delivery plan are living, flexible documents. Reporting will occur for significant delivery risks, changes, and achievements. This will form part of the Council's Public Bodies Climate Change reporting duties.

Regular progress updates will be reported to the Local Heat and Energy Efficiency Strategy Steering Group on a quarterly basis. A more formal review will occur every two-years. This will include consideration on any new national or local policy and how these might influence this strategy and delivery plan. Furthermore, any new information and data will also be considered. Every 5 years the delivery plan will be reviewed and updated (if appropriate).

The process detailed above will ensure the Council meets the requirements of the Local Heat and Energy Efficiency Strategies (Scotland) Order 2022.

Significant achievements will be included in the Council's wider public-facing climate communications and via established partnerships including Climate Action Fife and Fife Environmental Partnership. Relevant priorities will also form part of these stakeholder communications, with lessons learned incorporated from previous engagements.

Where known, proposed indicators have been identified to measure success against each priority (Table 34). These indicators will be finalised alongside the development of the detailed delivery plan. Where suitable they will be aligned against the National Performance Framework outcomes and indicators[131].

[131] National Outcomes | National Performance Framework

Table 34: Proposed Priority Indicators

1		**Being Climate Friendly and Ready**	**1.1 Net Zero & Climate Emergency** • To be identified during development of the detailed delivery plan. **1.2 Adaptation** • To be identified during development of the detailed delivery plan.
2		**Tackling Fuel Poverty, Health, and the Just Transition**	**2.1 Tackling Fuel Poverty, Health, and the Just Transition** • % of fuel poor/extreme fuel poor households in Fife • % of households supported through fuel poverty
3		**Supporting an Inclusive Economy, Jobs, and Skills**	**3.1 Skills & Jobs** • Further indicators informed by development of skills baseline. **3.2 Community Wealth Building and 3.3 Finance** • To be identified during development of the detailed delivery plan.
4		**Maximising Knowledge & Awareness**	**4.1 Awareness & Knowledge** • Input into, and receive outputs from, Climate Action Fife – Climate Friendly Homes indicators. • Number/type of engagement activities and audience engaged by the Local Heat & Energy Efficiency Strategy Officer.
5		**Ensuring Certainty of Success**	**5.1 Ensuring Certainty** • Number/type of new high certainty building level actions identified and delivered. • Number/type of projects progressed or supported by the Local Heat & Energy Efficiency Strategy Officer aiming to increase certainty.
6		**Transitioning the Energy System**	**6.1 Energy System Opportunities & Constraints** • Levels of energy investment in Fife via engagement with SP Energy Networks and SGN.
7		**Energy Efficient Buildings**	**7.1 Domestic; 7.2 Social Housing; 7.3 Private Rented; 7.4 Mixed-Use, -Tenure & Historic** • Mean environmental impact and energy efficiency (Standard Assessment Procedure) ratings - including by tenure. • % of social housing by energy performance certificate band. • % of private housing by energy performance certificate band. • % of energy efficiency measures - including by tenure. • Number of homes improved by area-based projects. • Number/type of building level actions delivered. **7.5 Non-Domestic** • % of energy efficiency measures – including by typology. • Number/type of building level actions delivered.
8		**Decarbonising Heat Sources**	**8.1 On Gas and 8.2 Off-Gas** • % of zero/low direct emissions heating – including by tenure/typology. **8.3 Non-Domestic** • % of zero/low direct emissions heating – including by tenure/typology. **8.4 Heat Networks** • % of known buildings connected to a heat network – including from decarbonised sources. • Number of designated heat network zones.