West Dunbartonshire COUNCIL

LOCAL HEAT AND ENERGY EFFICIENCY STRATEGY

2024–2029





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GLOSSARY

EPC	Energy Performance Certificate
DZ	Data Zone
LHEES	Local Heat and Energy Efficiency Strategy
LPG	Liquified Petroleum Gas
NAEI	National Atmospheric Emissions Inventory
OBC	Outline Business Case
PEAT	Portfolio Energy Analysis Tool
SIMD	Scottish Index of Multiple Deprivation
SSEN	Scottish and Southern Electricity Networks
SPEN	Scottish Power Energy Networks
SGN	Scottish Gas Networks
UPRN	Unique Property Reference Number

CHIEF OFFICER FOREWORD



Alan Douglas
Chief Officer:
Regulatory and Regeneration

I am delighted to introduce West Dunbartonshire Council's Local Heating and Energy Efficiency Strategy (LHEES).

The LHEES will underpin an area-based, local authority-wide approach to heat and energy efficiency planning and delivery and forms part of ambitious Scotland-wide targets set to tackle the climate emergency. Scottish Government targets aim to ensure our homes and buildings produce net zero carbon emissions and no longer contribute to climate change or fuel poverty by 2045. To meet these targets almost all homes, public buildings and businesses will need to increase energy efficiency and install zero direct emissions heating.

This strategy sets out how efficiency improvements and heat decarbonisation will be delivered across all sectors, with particular focus on understanding where poor energy efficiency contributes to fuel poverty so we can provide targeted support to those most affected.

We have much to be proud of in regard to the steps we have already taken, particularly through the West Dunbartonshire Energy Centre at Queens Quay, Clydebank, which is home to the UK's largest water source heat pump district heating network.

The pioneering system takes water from the Clyde to create green heat energy for homes, businesses and public buildings in its vicinity, as well as delivering circa 2000 tonnes of carbon reduction from the environment per year.

As well as the development and potential expansion of the West Dunbartonshire Energy Centre and feasibility of new heat networks in other areas, part of the strategy will involve progressing air source heat pump pilot projects to domestic properties and monitoring the financial costs and viability for future developments. This is in addition to energy efficiency programmes which are currently in use across the area including loft, cavity and wall insulation.

This is an ambitious but highly important strategy which involves working closely with local communities to deliver a local authority-wide approach. I look forward to seeing this programme progress over the coming years.

OVERVIEW OF LHEES

THE ROLE OF LOCAL HEAT AND ENERGY EFFICIENCY STRATEGIES

Local Heat and Energy Efficiency Strategies (LHEES) are at the heart of a place based, locally led and tailored approach to the heat transition. The LHEES Strategy for West Dunbartonshire will underpin an area-based approach to heat and energy efficiency planning and delivery.

The LHEES Strategy sets out the strategic framework for decarbonising heat and improving energy efficiency within buildings in West Dunbartonshire. This Strategy is the first for West Dunbartonshire and will be required to then be updated at intervals of no more than five years.

The strategic plan has been developed by following Scottish Government's LHEES methodology and is therefore framed around the following considerations:

- **Heat Networks**
- **Off Gas Buildings**
- **On Gas Buildings**
- **Poor Building Energy Efficiency / Poor Building Energy Efficiency as a Driver for Fuel Poverty**
- **Mixed Tenure, Mixed Use and Historic Buildings**

The full process of developing LHEES is outlined below. West Dunbartonshire has worked through the full process, from Policy and Strategy Review through to Finalisation of Delivery Areas. This document, the Strategy, is informed by the analysis and stakeholder engagement through the whole process, but specifically sets out the Strategic Zoning and Pathways. This sets the direction of travel for West Dunbartonshire, and sets out large-scale Strategic Zones in which focus will be given to developing and rolling out heat decarbonisation solutions. More detailed work, including the Building Level Pathway Assessment and Finalisation of Delivery Areas, will be published as part of the LHEES Delivery Plan.

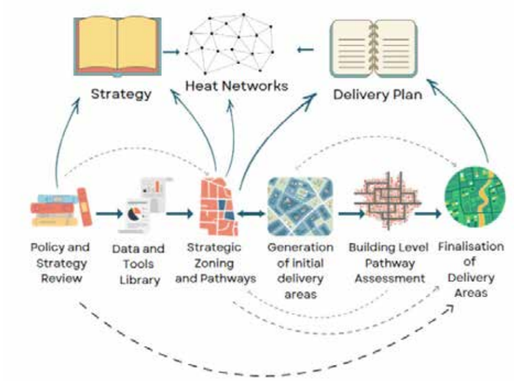


Figure 1–1 LHEES methodology (Scottish Government)

The aim of the LHEES Strategy document is to:

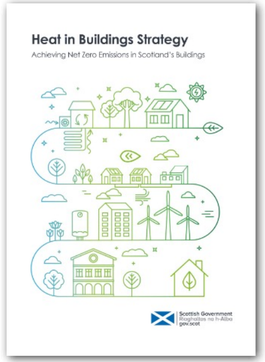
- **Set out how the building stock needs to change to meet national and local objectives, including achieving zero greenhouse gas emissions across all areas, and the removal of poor energy efficiency as a driver of fuel poverty;**
- **Identify strategic heat decarbonisation zones, and set out the principal measures for reducing buildings emissions within each zone; and**
- **prioritise areas for delivery, against national and local priorities.**

POLICY AND STRATEGY

Completion of an LHEES Strategy will support the Scottish Government to understand further the national landscape for the delivery of heat decarbonisation and ensure local authorities are delivering changes to help achieve Scotland's statutory targets as set out in the Heat in Buildings Strategy.

The Heat in Buildings Strategy (2021) sets the Scottish Government's vision for the future of heat in buildings, with targets for 2030 including:

- **Emissions from homes and non-domestic buildings to fall by 68% by 2030 (versus 2020).**
- **At least 22% of heat in buildings is to be directly supplied from renewable sources by 2030.**
- **Where technically and legally feasible, and cost-effective, a large majority of buildings should achieve a good level of energy efficiency.**
- **Over 50,000 non-domestic buildings are converted to zero emissions heat.**



Although predominantly dominated by the Heat in Buildings Strategy, an LHEES Strategy is also driven by Scotland's statutory targets for greenhouse gas emissions reduction and fuel poverty whose targets are:

- **Net zero emissions by 2045 and 75% reduction by 2030.**
- **In 2040, as far as reasonably possible, no household in Scotland is in fuel poverty.**

West Dunbartonshire Council's LHEES is further driven by local emissions and fuel poverty ambitions set out in Climate Change Strategy and Climate Change Action Plan. The Council aims to:

- **Achieve 'net-zero' by 2045, with interim carbon reduction targets of 61% by 2030-31 and 87% by 2040-41;**
- **Continue to take action to reduce energy consumption and improve energy and water efficiency in our buildings and across our operations;**
- **Continue to reduce energy demand and decarbonise heat supply in the Clydebank area and Queens Quay heat network; and**
- **Further reduce energy consumption and improve energy efficiency in our social housing and fuel poor households, ensuring fuel poverty and the decarbonisation of housing are key to achieving a net zero carbon future.**

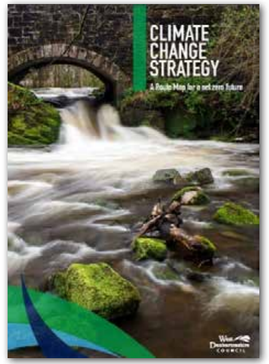








Table 1–1 Review of National and Local Strategies and Polices relating to LHEES

National Strategies and Policies

Policy/Strategy/Plan	Description	Targets/Actions
Climate Change (Emissions Reduction Targets) (Scotland) Act 2019	Targets to reduce Scotland's emissions of all greenhouse gas emissions to net-zero. LHEES will set out area based plan to deliver decarbonation of heating across all sectors.	75% reduction in emissions by 2030 and Net-zero by 2045
Heat in Buildings Strategy	Building on the policies and actions set out in the 2020 Climate Change Plan, this Strategy sets out a pathway to zero emissions buildings by 2045 and details a series of near-term actions, as well as a range of further, longer-term commitments to accelerate and further scale the transformation of the nation's building stock.	By 2030 over 1 million homes and 50,000 non-domestic buildings to convert to using zero or low emissions heating systems. LHEES will identify the pathways to converting these buildings to zero or low emissions heating.
Energy Efficient Scotland	Sets out two main objectives to remove poor energy efficiency as a driver for fuel poverty, and reduce greenhouse gas emissions through more energy efficient buildings and the decarbonisation of heat supply. LHEES will identify pathways to improving energy efficiency in homes across all tenures.	By 2040 all Scottish homes achieve an EPC C, where technically and financially feasible: • 15% domestic heat demand reduction by 2032; • 20% non-domestic heat demand reduction by 2032 • 35% domestic heat from low carbon sources by 2032 • 70% non-domestic heat from low carbon sources by 2032
Heat Networks (Scotland) Act 2021	Aims to accelerate the deployment of heat networks in Scotland through the introduction of a regulatory system aimed at boosting consumer confidence in the sector and providing greater certainty for investors. LHEES will identify potential Heat Network Zones to enable the setup and licensing.	Rules and regulations on heat networks, including: • making applications; • identifying exemptions; • granting licenses; and • setting up heat network zones.
National Planning Framework 4	The National Planning Framework (NPF) sets the context for development planning in Scotland and provides a framework for the spatial development of Scotland as a whole.	NPF4 requires Local Development Plans (LDPs) to consider LHEES delivery areas. The spatial strategy of the LDP should also consider areas of heat network potential and any designated Heat Network Zones. NPF4 Policy 19 - Heat and Cooling, encourages LDPs to promote and facilitate development that supports decarbonised solutions to heat and cooling demand and ensure adaptation to more extreme temperatures.
Tackling Child Poverty Delivery Plan 2022 - 2026	Sets out how Scotland will meet the interim targets set out in Keep the Promise and makes commitments which will affect delivery plans for retrofitting energy efficiency measures and heat decarbonisation.	Heat decarbonisation presents additional challenges for low-income households. Actions should only be taken where they will have no detrimental impact on fuel poverty rates. Progress to net zero emissions should not disproportionately impact on those least able to pay.

Local Strategies and Policies

Policy/Strategy/Plan	Description	Targets/Actions
Climate Change (Emissions Reduction Targets) (Scotland) Act 2019	Targets to reduce Scotland's emissions of all greenhouse gas emissions to net-zero. LHEES will set out area based plan to deliver decarbonation of heating across all sectors.	75% reduction in emissions by 2030 and Net-zero by 2045
Local Development Plan	Sets out the strategy and policies for the use of land and buildings within a planning authority area. It seeks to identify the most appropriate locations for new development while at the same time protecting the places people value or which are environmentally sensitive. It is the basis for assessing and determining applications for planning permission.	It is a requirement that LDPs are prepared to be consistent with National Planning Framework 4 (NPF4) which was adopted in February 2023. See NPF4 for alignment with LHEES. The development plan consists of the NPF4 and the adopted West Dunbartonshire Local Plan (2010).
Strategic Plan 2022-2027	A road map for the Council over the next five years, setting out our vision for the area. The strategic priorities explain how the Council will work to improve the lives of residents. As well as clearly defining a set of Council priorities which directly support and empower residents, the Council has set out organisational priorities to inform how services are run, with an aim to reduce inequality.	Four strategic outcomes: • Our communities – resilient and thriving; • Our environment – a greener future; • Our economy – strong and flourishing; and • Our Council – inclusive and adaptive.
Local Housing Strategy 2022-2027	Sets out how West Dunbartonshire Council and its partners plan to address the housing and housing related opportunities and challenges over the next five year period. Aims to build on the significant progress made on the issues identified in the previous LHS 2017-2022 and to address newly arising housing matters particularly in response to the Covid crisis.	Strategic approach to dealing with key housing related issues such as: • Delivering high quality housing and related services across all tenures; • Outlining its contribution to the effective integration of health and social care; and • Showing how the LHS is supporting the Scottish Government Targets, whilst reflecting the needs and priorities of the area.

ENGAGEMENT AND CONSULTATION

Developing West Dunbartonshire's LHEES has necessitated stakeholder engagement. This chapter details the engagement undertaken to date in the LHEES process, and highlights the future consultation, engagement and governance structures required through the five-year timescale of West Dunbartonshire's LHEES.

STAKEHOLDER IDENTIFICATION

Stakeholder mapping was carried out at the commencement of LHEES Stage 3 Strategic Zoning and Pathways. This resulted in lists of primary and secondary stakeholders to be developed, with whom to engage through the LHEES.

Primary stakeholders

Primary stakeholders are those that work within West Dunbartonshire Council, with an interest in LHEES. Key Council Service Areas are:



The Engagement plan for the LHEES included a workshop at the end of LHEES Stage 3-4, at which the primary stakeholders in the Council had an opportunity to input into the strategic direction of the project and the approach to shortlisting Strategic Zones.

Secondary stakeholders

The secondary stakeholders identified at the commencement of LHEES Stage 3 are outlined in the table below.

Table 2–1 LHEES secondary stakeholders

West Dunbartonshire Energy	
Energy networks	Scottish Water
	SSEN, SPEN
	SGN
	National Grid
	Heat network operators
Housing	Housing Associations
	Registered social landlords
	Housebuilders
Local and regional government	Neighbouring Local Authorities
	Glasgow City Region (including Clyde Mission)
Key heat network connections	NHS Greater Glasgow and Clyde
	West College Scotland
	Police Scotland
	Marine Technology Park
Key local employers	Aggreko
	Vale of Leven Industrial Park
	Chivas Brothers

Secondary stakeholders were invited to an engagement event at LHEES Stage 6 Finalisation of Delivery Areas. This enabled the Council to introduce the LHEES process, and for the stakeholders to provide more detailed local feedback about the Delivery Areas. Building and maintaining these relationships with external stakeholders is key to LHEES, as the Council will need to work together with external partners to deliver heat decarbonisation in West Dunbartonshire.

LHEES ENGAGEMENT

The LHEES process included two stakeholder engagement sessions, at which local stakeholders were able to provide input into the emerging Strategy.

Stage 3 – 4:

Strategic Zoning and Pathways, Generation of Initial Delivery Areas

An internal stakeholder engagement session was run between Stage 3 – 4 of the development of the LHEES, on 11th October 2023. The aim of this workshop was to introduce the LHEES process to primary stakeholders – those within the Council – and to ensure that feedback from various Council Service Areas informed the shortlisting of Strategic Zones and Delivery Areas.

For each LHEES Consideration, the attendees were introduced to the underlying data and options for selecting Strategic Zones and Delivery Areas.



Examples of the feedback are captured in Table 0—2 below.

Table 2—2 Stage 3-4 Stakeholder Engagement: Key themes

Consideration Area	Stakeholder Feedback	
Heat networks	• Flood risk needs to be considered – especially around Dumbarton town centre. • Potential for housing development around Sandpoint Marina. • General support for heat networks development in Dumbarton due to mix of typologies and alignment to fuel poverty alleviation targets.	
Off- and on-gas grid decarbonisation	Retrofit measures	• Kilbowie Court is owned by the Council and is an electrically heated building, which has already had retrofit of building fabric and smart controls installed. • Some types of retrofit measures have not been undertaken by the Council – including double glazing and cavity wall insulation. Historically, have had problems with water ingress causing construction damage in buildings with retrofit cavity insulation due to driving rain in the local climate. • Preferred retrofit approach to date has been external wall insulation with loft insulation.
	Low carbon heating systems	• Clydebank Housing Association have had discussions around a communal network and have applied for Scottish Government grant funding to extend the network to the community centre.
	Targets and priorities	• Targeting areas of high fuel poverty has always been, and will continue to be, the highest priority. • To date, the large rural intermediate zones have not been the first choice for funding due to low visibility, but decarbonisation does need to happen across the whole local authority area. • Current targets have been to meet Scottish Government targets for EESH and other funding streams – typically 450 houses per year, but have done up to 700 homes in a single year.
	Risks	• Availability of investment budget needs to keep up with inflation of construction costs.
Energy efficiency and fuel poverty	Strategic Zones	• Can have very deprived areas directly adjacent to more affluent areas – better able to pick these out at the Delivery Area level. • Selection of Strategic Zones needs to consider fuel poverty.
	Data issues	• Homes with poor EPCs already demolished in Dockfair, Wheatley, Mountblow – but still showing in Scotland Heat Map data. Every council house in Castlehill and Dalreoch has already been overclad.

Stage 6: Finalisation of Delivery Areas

On the 21st November 2023, a stakeholder engagement session was run for the secondary stakeholders. The aim of this workshop was to socialise the shortlisted Delivery Areas, gain a better understanding of external stakeholders' attitudes towards heat decarbonisation in West Dunbartonshire.

Heat networks

Heat networks was a strong focus of the session, driven by the Council's eagerness to develop heat network zones. Attendees included Council representatives as well as heat network operators and potential connections.

Barriers and strengths

The workshop encouraged participants to identify the barriers to achieving proliferation of heat networks in West Dunbartonshire. Table 0—3 details the key themes that were raised in this session.

Table 2—3 Heat networks: barriers and strengths

Barriers	Strengths	
Technical	• Fear of lock-in to one solution in a heat network • River and railway crossings • Longevity of the solution • Regulatory requirements for resilience at NHS sites • Grid capacity	• Mature technologies and examples of operational projects • Low-grade heat from the river • Local solar generation
Commercial	• Numbers of counterparties with whom to sign connection deals. • Cost of electricity and heat pumps.	• Existing partnership models and lessons learnt • Champions of heat networks are now present in West Dunbartonshire – both Council and external
Other	• Attractiveness of heat network zones outside of Queens Quay	• Planning heat networks to reduce both carbon emissions and fuel poverty

Heat Network Zones

The five shortlisted Heat Network Zones were sense-checked with local knowledge, to highlight any data issues or irregularities. For example significant heat sources, missing demands, or over-representations.

Table 2—4 Heat Network Zones: key outputs

Heat Network Zone	Potential Issues
Clydebank	• Wastewater treatment plant at Dalmuir • Potential for PV farms to generate electricity for heat pumps • Appetite to extend the network.
Dumbarton	• Wastewater treatment plant at Ardoch • Castlehill wastewater pumping station.
Alexandria	• Scottish Water sewer between Alexandria and River Leven • Scale of development could catalyse a new heat network.

Action planning

Participants were encouraged to develop an action plan to deliver heat networks in West Dunbartonshire.

- **Stakeholder engagement**
  - Appetite was strong for a Council-led Heat Network Zone Coordinator role as a contact to facilitate stakeholder engagement and to manage relationships in the zone.
  - Education is a key part of engagement with potential heat network connections, requiring a mixture of one-to-one conversations and webinars.
  - There is a need to better understand the existing

assets, including energy and other costs (for example carbon offsetting)

- **Zoning strategy**
  - Larger heat network zones were preferred, to benefit from the economies of scale – for example resulting in potentially lower heat costs, and being able to deliver greater social value through scale.

- **Technology**
  - Recovery and reuse of heat, for example recovering heat from cooling of buildings will be a key theme
  - Connecting to meters and the Building Management Systems and being able to operate the system with smart controls will enable more efficient heat networks

Building fabric retrofit

The LHEES Considerations for Energy Efficiency (in isolation, and as a driver of fuel poverty) were also discussed with external stakeholders – including the Housing Associations. The attendees were encouraged to consider actions that need to be carried out as part of the LHEES.

Stakeholders identified:

- Archetype-based interventions are useful to run a pilot project and then roll out as a wider scheme – for example starting with sandstone tenements or pre-1919 housing stock.
- Appetite to set a "fabric-first" minimum energy efficiency target
- Potential to require building warrants to ensure that retrofit of heating systems is always "heat-pump ready", similar to what is already the case for new homes.
- Zone Partner, concession-based approach to enable an obligation to be placed to invest in energy efficiency within the Delivery Areas. This could also enable better identification of future heat network connection opportunities.

On-gas and off-gas grid

The on- and off-gas grid group discussed the Delivery Areas proposed for on- and off-gas grid decarbonisation. They identified a series of potential heat sources and constraints in the proposed Delivery Areas.

Project governance

A LHEES Working Group will be established, as part of the Climate Change Action Group, to support the LHEES delivery team. The Council will also establish a "Project Board" with involvement from Housing Management, Asset Management and Regulatory and Regeneration. The board will be responsible for the project outcomes, approving project direction and authorising use of resources including the Scottish Government grant funds.

Consultation and future engagement

A full public consultation was undertaken on the draft Local Heat and Energy Efficiency Strategy over a six week period, following West Dunbartonshire's processes and practices. A survey was available on West Dunbartonshire Council's website and shared through the Citizens Panel, Tenants and Residents Organisation, Community Council Forum, WD Youth Council, social media platforms, and with key external stakeholders. A total of 54 responses to the survey were received with many responders providing insight into how the Strategy may impact individuals, communities, businesses, and organisations. The findings from the survey have been addressed in the Strategy, where appropriate, and will be particularly valuable when developing the actions in the Delivery Plan.

The development of the Delivery Plan will involve greater stakeholder engagement, particularly focusing on those stakeholders within the identified potential Delivery Areas. As part of the Delivery Plan, a Monitoring and Engagement Plan will also be developed to set out how West Dunbartonshire Council will engage with local businesses and residents to deliver heat decarbonisation projects in the area.

WEST DUNBARTONSHIRE PROGRESS

The Council has made significant initial strides to increase energy efficiency, reduce fuel poverty and decarbonise heat sources across the local authority area. The Queens Quay District Heat Network is the largest Water Source Heat Pump of its kind in Scotland and has commenced the decarbonisation the former John Brown Shipyard in Clydebank. Heat pumps extract water from the River Clyde at the state of the art energy centre and transport the heat through district heating network to homes and businesses. At present, the Queen Quay network supplies: Aurora House, Titan Enterprise Centre, Clydebank Leisure Centre, Queens Quay House, Town Hall, Library, and 192 domestic properties. There is significant potential for further extension of the network to service a wider area of Clydebank, including the Golden Jubilee Hospital. Queens Quay District Heat Network reduces carbon emissions for domestic and non-domestic buildings and provides a viable renewable heat alternative to fossil.

The Council is also progressing some Air Source Heat Pump pilot projects to individual domestic properties and monitoring the financial costs and viability for future developments. Buildings should have high levels of energy efficiency to ensure an Air Source Heat Pump runs as efficiently as possible and does not have a negative impact on fuel costs in comparison to fossil fuel alternatives. The Council also has a number of energy efficiency programmes operating across the local authority area to increase energy efficiency through insulation interventions namely: loft, cavity wall, internal wall, and external wall insulation. These types of improvements to properties will aid to reduce fuel bills for those at risk of or living in fuel poverty, reduce carbon emissions and prepare for viable future low carbon heating connections. The analysis carried out in this Strategy will aid in the identification of areas of focus where energy efficiency improvements are most needed.









Photographs:
Queens Quay Energy Centre and air source pumps

CONSIDERATIONS, TARGETS AND INDICATORS

Data on the building stock of West Dunbartonshire has been analysed to inform the selection of Strategic Zones, which are large areas of focus for wide-scale delivery of heat decarbonisation solutions.

Considerations refers to the six LHEES considerations.

Targets refers to the specific thresholds to which buildings within Strategic Zones should be brought.

Indicators refers to the measurable characteristics that have been used to identify and rank Strategic Zones.

HEAT NETWORKS

The Heat Networks LHEES consideration aims to decarbonise buildings through the development of heat networks. The LHEES has developed a series of Heat Network Zones, within which a focus will be given to developing heat networks.

Targets

The Heat Networks (Scotland) Act 2021 sets a national target of heat supplied by heat networks to reach 2.6 TWh/year by 2027 and 6 TWh/year by 2030. This equates to 3% and 8% of current heat supply. For West Dunbartonshire, this means that a target of 67.5 GWh/year heat demand should be met by heat networks by 2030.

Indicators

Linear heat density

In order to identify Heat Network Zones, "heat-dense" areas have been identified – that is, areas in which a heat network would be able to deliver a lot of heat with a small length of pipework.

As an initial indication of heat network viability, a linear heat density threshold of 4 MWh/year/m is used, as recommended by Scottish Government's LHEES Methodology for rural areas.

Anchor loads

Anchor loads are buildings in heat networks with high heat demand and that would be simple to connect to – for example public sector buildings like leisure centres and schools. Therefore, Heat Network Zones with a higher number of anchor loads have been prioritised.

Fuel poverty

Through stakeholder engagement, fuel poverty has been identified as an ongoing focus for West Dunbartonshire. Therefore, indicators of fuel poverty and extreme fuel poverty have been used to identify Heat Network Zones within which there is a greater number of properties in fuel poverty.

Detailed summary

A detailed summary of the indicators used to assess the Heat Networks LHEES Consideration can be found in the Appendix 4.

OFF GAS GRID AND ON GAS GRID

The LHEES Off Gas Grid and On Gas Grid Considerations focus on how to decarbonise homes by installing heat pumps. The approach to categorisation of buildings for heat pump readiness and ranking of Strategic Zones by

Targets

Heat pumps operate most efficiently in buildings that are well insulated and therefore can operate heating systems at lower temperatures. For this reason, analysis of the impact of the Off Gas Grid and On Gas Grid Considerations include energy efficiency interventions that may need to be carried out to properties to be able to install heat pumps.

The target energy efficiency level for these preparatory retrofits has been aligned to Scottish Government's Heat in Buildings Strategy as follows:

- Public sector housing: EPC B
- Private sector housing: EPC C – based on the Heat in Buildings Strategy target for private rented properties, but also applied to owner-occupied properties as a target level of energy efficiency

Indicators

The analysis categorises buildings into four different categories depending on their "heat pump readiness" based on several different characteristics of the building fabric.

Heritage

Properties with Listed status or those in Conservation Areas can be more difficult places to install heat pumps due to limitations around affordable retrofit to bring systems to lower temperatures and the visual amenity of the heat pump unit itself.

Building fabric

Properties with insulated walls, loft insulation and double glazing already installed are more readily suitable for heat pump retrofit.

Current heating fuel

Properties that are already heated with low carbon systems are excluded from the analysis as they do not require heat pumps to be installed to decarbonise. The current heating fuel is then also used to identify properties in which heat pump retrofit should be prioritised. For example, those that currently use biomass, solid fuels, LPG or oil are brought into categories that indicate more immediate potential for heat pump retrofit.

Detailed summary

A detailed summary of the indicators used to assess the Heat Networks LHEES Consideration can be found in the Appendix 4.

POOR BUILDING ENERGY EFFICIENCY AND POOR BUILDING ENERGY EFFICIENCY AS A DRIVER OF FUEL POVERTY

These LHEES Considerations aim to tackle poor building energy efficiency in West Dunbartonshire by rolling out retrofit programmes that bring homes up to a higher standard. For properties in fuel poverty, additional consideration is given to how poor energy efficiency may be impacting the ability of occupants to afford heating their homes.

Targets

As for the targets for On and Off Gas Grid, these LHEES Considerations target the Heat in Buildings Strategy thresholds as follows:

- Public sector housing: EPC B
- Private sector housing: EPC C – based on the Heat in Buildings Strategy target for private rented properties, but also applied to owner-occupied properties as a target level of energy efficiency

Indicators

Energy efficiency

Some simple indicators of poor building energy efficiency have been used to identify properties with poor energy efficiency in West Dunbartonshire.

- Uninsulated walls
- Loft insulation <100mm

Fuel poverty

An indication of the likelihood of a property to be in fuel poverty is available for every home in West Dunbartonshire. This includes:

- Fuel poverty: estimated fuel bill is >10% of income after housing costs.
- Extreme fuel poverty estimated fuel bill is >20% of income after housing costs.

The Scottish Index of Multiple Deprivation is also used to identify areas with other causes of deprivation.

MIXED TENURE, MIXED USE AND BUILDINGS IN CONSERVATION AREAS

This LHEES Consideration targets properties in four main categories:

- Mixed tenure buildings
- Mixed use buildings
- Listed buildings
- Conservation areas

It aims to highlight areas in which heat decarbonisation may be difficult to deliver, due to ownership and tenure of the properties, or the potential heritage impacts of installing heat pumps and retrofitting buildings to higher levels of energy efficiency.

Targets

Buildings in this category will still be held to the same targets in the Heat in Buildings Strategy of:

- Public sector housing: EPC B
- Private sector housing: EPC C – based on the Heat in Buildings Strategy target for private rented properties, but also applied to owner-occupied properties as a target level of energy efficiency

Indicators

The indicators for this Consideration are limited to tenure, listed status and Conservation Area.

Detailed summary

A detailed summary of the indicators used to assess the Heat Networks LHEES Consideration can be found in the Appendix 4.



BASELINING OF BUILDING PERFORMANCE

The purpose of this section is to set out the baseline of West Dunbartonshire's current building stock in terms of its characteristics, energy efficiency and level of heat decarbonisation, split by domestic and non-domestic properties. This section uses outputs generated from following Scottish Government's LHEES Guidance to utilise the LHEES Stage 3 Baseline Tools for both the domestic and non-domestic stock.

DOMESTIC

The Energy Savings Trust's Home Analytics (v 3.8.1) dataset was used as the basis of the domestic baseline modelling.

Within West Dunbartonshire, the domestic building stock equates to a total of 93.6% of all the buildings within the local authority, with a total count of 46,252, and a heat demand of 517.4 GWh per year (80% of the local authority's total). The 46k domestic building stock within West Dunbartonshire has been summarised by various characteristics, providing percentage counts for each characteristic category:

- Property Characteristics
- Energy Efficiency and Heat Supply
- Property Tenure and Heritage/Historic Buildings

National averages are provided from either the:

- Scottish House Condition Survey 2021
- Technical Feasibility of Low Carbon Heating in Domestic Buildings - Report for Scottish Government's Directorate for Energy & Climate Change 2020

Property characteristics

Property Age

The majority of domestic properties in West Dunbartonshire fall within a construction age band of between 1950-1983 with 48% of domestic properties within this band (22k homes). Outside of this band, the building stock is very mixed.

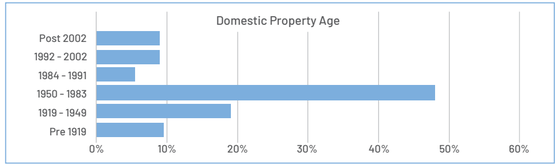


Figure 5–1 Property Age Domestic Baselining

The number of domestic properties within the pre-1919 age band is below the national average, with 19% of buildings in Scotland are reported to have been built before 1919.

Property Type

Variance is also identified in the domestic property type within West Dunbartonshire. The property type with the largest proportion of the stock are 'Small blocks of flats/dwellings converted into flats' with 23% of domestic properties within this band. 'Blocks of flats' were the second highest with 21% and 'Semi-detached' third with 18%.

In comparison to the national average, there is a far higher proportion of 'Small blocks of flats/dwellings converted into flats' in West Dunbartonshire - 23%, compared to 14% of the national domestic building stock.

[1] https://www.gov.scot/publications/scottish-house-condition-survey-2021-key-findings/pages/1-key-attributes-of-the-scottish-housing-stock/
[2] https://www.gov.scot/publications/technical-feasibility-low-carbon-heating-domestic-buildings-report-scottish-governments-directorate-energy-climate-change/
[3] Technical Feasibility of Low Carbon Heating in Domestic Buildings - Report for Scottish Government's Directorate for Energy & Climate Change (2020)

The national averages for each property type are below with their equivalent West Dunbartonshire percentage for comparison.

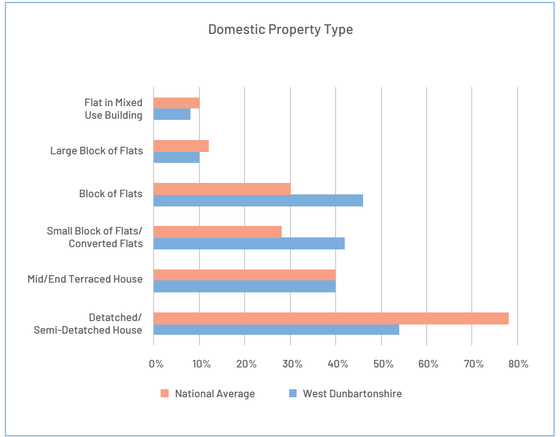


Figure 5–2 Domestic Property Type – West Dunbartonshire/National Average Comparison Baselining

Energy efficiency and heating

Domestic energy efficiency and heating characteristics summarised for baselining include EPC bandings, wall construction and insulation, off gas grid status, main fuel type, loft insulation level and window glazing.

EPC Bandings

The vast majority of domestic properties (83%) fall within an EPC band of either C or D. West Dunbartonshire has a lower-than-average proportion of properties at high EPC bands, with more properties falling into EPC bands C-D than the national average.

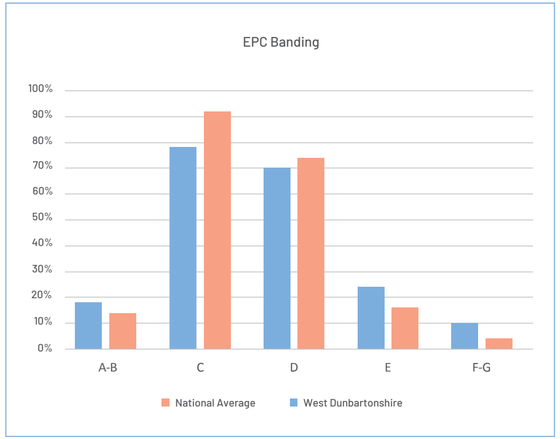


Figure 5–3 Domestic EPC Banding – West Dunbartonshire/National Average Comparison Baselining

Wall Construction and Insulation

The most prevalent wall construction type within West Dunbartonshire is Cavity Walls, at 50% of the domestic building stock. Overall, 60% of all walls are insulated, with 40% uninsulated.

Loft Insulation

If loft insulation has already been applied to homes, the majority will have done this to a good level - greater than 250mm. Only 8% of domestic properties have either no insulation, or less than 99mm.

Glazing

The prevalence of single glazed windows in West Dunbartonshire is low, with only 3% of domestic properties falling within this category and 97% having either double or triple glazing.

Off Gas Grid

In comparison to the Scottish House Condition Survey 2021, the number of off-gas grid domestic properties within West Dunbartonshire is below the Scottish average of 12%. Only 9% of the housing stock in West Dunbartonshire is off gas grid.

Main Fuel Type

As 91% of all domestic properties are on gas grid, the main fuel type within West Dunbartonshire is Natural Gas at also 91%. This is higher than the national average of 80%. Electricity is the second most common main heating fuel in West Dunbartonshire, supplying 8% of domestic heat, compared to 11% nationally. The remainder in order of proportion is met by Oil (0.70%), LPG (0.27%) and Biomass (0.10%). West Dunbartonshire has a much lower proportion of properties still using heating oil – 0.7%, compared to 6% nationally.

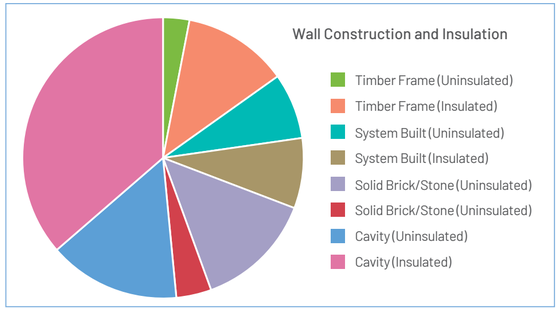


Figure 5–4 Wall Construction and Insulation Domestic Baselining

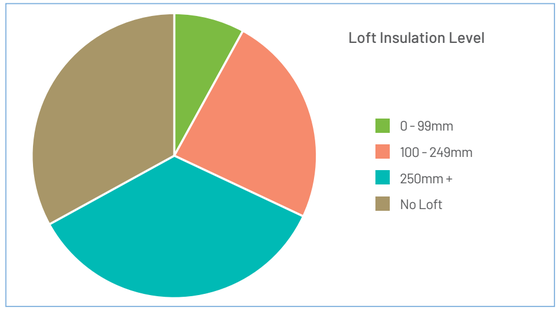


Figure 5–5 Loft Insulation Domestic Baselining

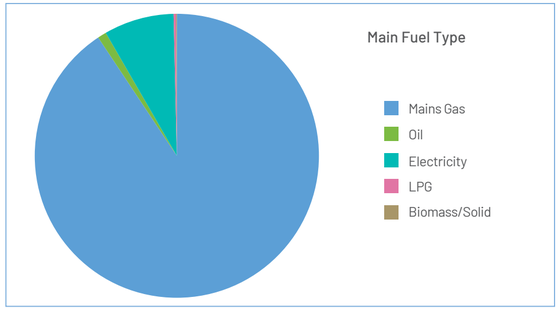


Figure 5–6 Main Heating Fuel Domestic Baselining

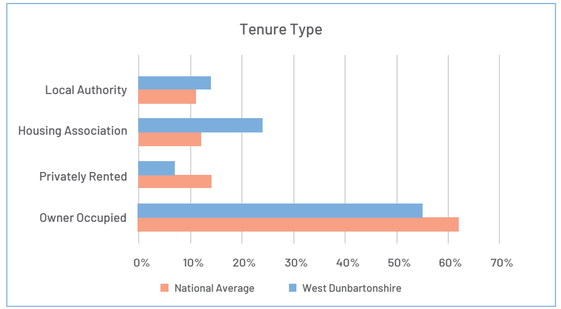


Figure 5–7 Tenure Type Domestic Baselining

Tenure and heritage

Tenure

The tenure most prevalent in West Dunbartonshire's housing stock is 'Owner Occupied' properties at 55% of homes. 'Privately Rented' homes account for 7% of the stock, meaning that 62% of domestic properties in West Dunbartonshire are of private tenure.

In comparison to the national average, West Dunbartonshire has a higher proportion of public tenure types, with both 'Local Authority' and 'Housing Association' above the national average. The national averages for each tenure type are below with their equivalent West Dunbartonshire rank and percentage for comparison.

Mixed Tenure and Heritage

25% of properties in West Dunbartonshire are classified as being 'Mixed Tenure' - defined as domestic units within a building of at least two different tenures, e.g. owner occupied and private rented.

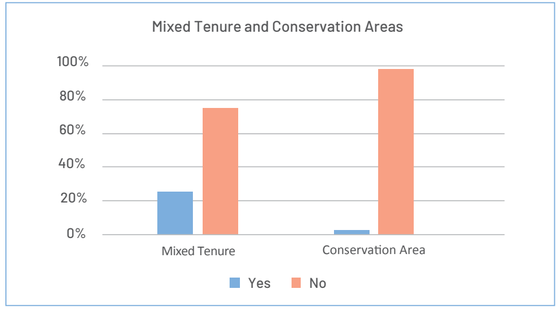


Figure 5–8 Mixed Tenure and Conservation Area Domestic Baselining

98% of domestic properties in West Dunbartonshire are not in Conservation Areas.

Only 1% of the domestic stock are in Listed buildings- those defined as buildings of special architectural or historic interest and are protected under the Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997.

The number of Listed domestic properties is below the national average, with 3% of domestic buildings in Scotland are reported to have either a listed building category of A, B or C as reported within the Technical Feasibility of Low Carbon Heating in Domestic Buildings - Report for Scottish Government's Directorate for Energy & Climate Change (2020).

NON-DOMESTIC

The Energy Savings Trust's Non-Domestic Analytics (v 1.1) dataset was used as the basis of the non-domestic baseline modelling.

Within West Dunbartonshire the non-domestic building stock equates to a total of 6.4% of all the buildings within the local authority, with a total count of 3,147, and a heat demand of 144.5 GWh per year (20% of the local authority's total).

The 3k non-domestic building stock within West Dunbartonshire have been summarized by various characteristics, providing counts and heating demand for each characteristic category:

- Typology
- Floor Area
- Property Age
- Main Fuel Type

National Averages are provided from the:

- Scotland's non-domestic energy efficiency baseline: report (2018)[4]

Typology

The non-domestic building stock of West Dunbartonshire is varied. The majority of properties (by count) fall within the typology of 'Retail' with 30% of properties, followed by 'Offices' (19%) and 'Light Manufacturing' (19%). 68% of non-domestic properties within West Dunbartonshire fall within one of these three typology categories. This is a similar composition to the national non-domestic stock.



[4] https://www.gov.scot/publications/scotlands-non-domestic-energy-efficiency-baseline/

Main Typology	Property Count	Property Count (%)	Heat Demand (MWh/yr)	Heat Demand (%)
General sports & leisure	93	3%	7,620	5%
Clubs and community centres	96	3%	6,464	4%
Museums, art galleries, libraries, law courts	16	1%	1,280	1%
Large entertainment sites (e.g. theatres, cinemas, conference centres)	5	<1%	356	<1%
Places of worship	59	2%	4,469	3%
Education	46	1%	6,735	5%
Emergency services	10	<1%	847	1%
Health	37	1%	4,436	3%
Hotels	59	2%	9,105	6%
Cafes, pubs, restaurants and takeaways	125	4%	5,731	4%
Light manufacturing / industry / workshop	612	19%	28,497	20%
Heavy manufacturing / industry	58	2%	3,794	3%
Offices	594	19%	20,112	14%
Retail	933	30%	24,444	17%
Storage / distribution	87	3%	4,115	3%
Residential	182	6%	9,731	7%
Military and prison	0	0%	0	0%
Other	56	2%	2,733	2%
Screened out	37	1%	1,777	1%
Total	**3,147**	**100%**	**144,481**	**100%**

Table 5—1 Non-Domestic Baselining

Floor area
The majority of non-domestic buildings within West Dunbartonshire are classified as having floor areas below 500 m2, with 34% having 0 - 100 m2 and 46% 100 - 500 m2.

However, although 0 - 100 m2 has the highest floor area count, this category has the lowest cumulative heat demand of 11,374 MWh (8%), and building with a floor area category above 1,000 m2 a cumulative heat demand of 59,356 MWh/yr (44%).

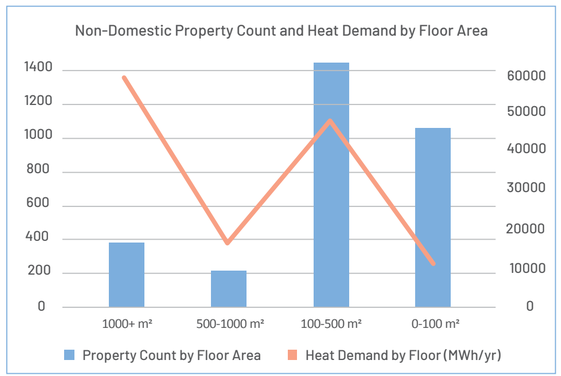


Figure 5—9 Non-Domestic Property Count and Heat Demand by Floor Area Baselining

Property age
The construction age band with the highest count of non-domestic properties is '1950-1983', which is the same as for domestic stock. The 'Pre-1919' band also has a similar number of non-domestic properties.

A quarter of non-domestic buildings in West Dunbartonshire were constructed since 1983.

The non-domestic heating demand for the different property age bands align to similar proportions to that of the count of properties within each age band.

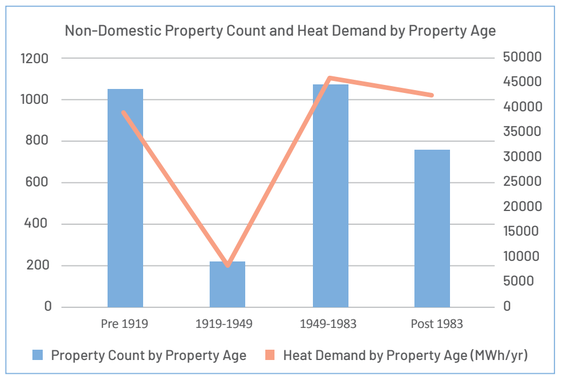


Figure 5—10 Non-Domestic Property Count and Heat Demand by Property Age Baselinging

The 'Post-1983' non-domestic property age band cumulative heat demand is significantly contributed by five major typologies: 'Residential', 'Light Manufacturing', 'Offices', 'Retail' and 'Hotels'.

Fuel type
The highest proportion of fuel for non-domestic properties is 'Electricity' for 1,824 properties (59%), followed by 'Mains Gas' (32%), 'Oil' (8%) and 'Other' (1%).
Relating counts of properties to heat demands, 'Mains Gas' has the highest supplied heat to non-domestic properties within West Dunbartonshire, with 'Electricity' coming second.

Comparing Fuel Type statistics to the national average for Scotland, West Dunbartonshire has a higher-than-average proportion of 'Electrically' heated non domestic properties with 58% versus the national average of 42%. With this higher proportion of 'Electric' fuel, the proportion of 'Mains Gas' is below the national average at 32% in West Dunbartonshire compared to 50% nationally. 'Oil' is also higher than the national average at 8% compared to 5% nationally[5].

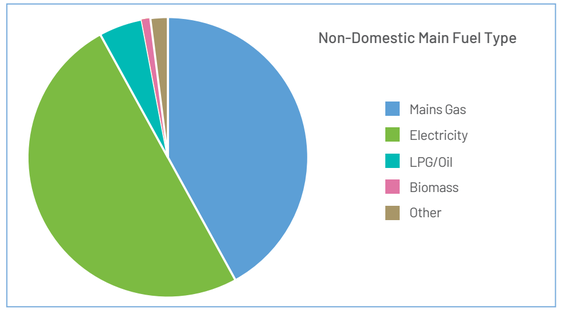


Figure 5–11 Non-Domestic Main Fuel Type Count Baselining

[5] Scotland's non-domestic energy efficiency baseline: report (2018).

GENERATION OF STRATEGIC ZONES AND PATHWAYS

Strategic Zones are useful to understand the baseline performance, the scale of potential and initial areas of focus, which could be used to inform the identification of Delivery Areas and follow-on engagement.

Strategic Zone Ranking
For West Dunbartonshire, Strategic Zones are at a Data Zone level. The top five Strategic Zones have been selected for each LHEES Consideration, following the weighted scoring methodology outlined in the Considerations, Targets and Indicators section. Heat Networks will however be summarised at the level of individual Heat Network Zones instead of Data Zones.

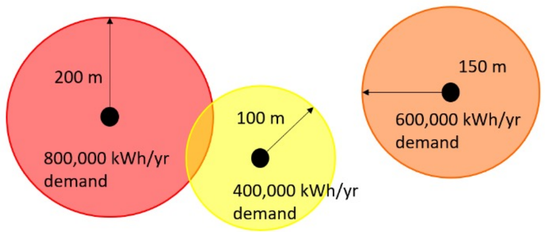
HEAT NETWORKS

Screening methodology
The analysis uses the Scotland Heat Map (2019) and West Dunbartonshire Local Development Plan (LDP) information to model potential 4th generation heat network zones. 4th generation heat networks are typically heat only 65-45°C (flow-return) network usually low-carbon via a central plant.

Each property has a Unique Property Reference Number (UPRN), however properties are grouped under a Parent UPRN if they share the same building structure e.g. units in a block of flats. Heat demands were aggregated from UPRN to building level based on Parent UPRN to aid in heat zoning analysis.

The analysis to identify heat network opportunities uses a linear heat density (LHD) approach. LHD an industry standard metric that relates heat to distance, for a heat network it is heat demand per meter of pipe. LHD is used to identify a notional network length for each property based on the property's heat demand. A matrix of this is used within this methodology, three standard linear heat densities exist:

- 4,000 kWh/m/year – More rural local authority areas
- 8,000 kWh/m/year – More urban local authority areas
- 16,000 kWh/m/year – Dense urban areas such as major cities



A LHD level of 8,000 kWh/m/year was selected for West Dunbartonshire. The distances are mapped in GIS for each location and if these distances overlap a potential heat network opportunity is identified. Potential Zones are identified where heat networks present a decarbonisation pathway that could be of strategic significance or might warrant further investigation.

Potential heat network zones generated using the LHD methodology above are then screened further using an anchor load criteria. Anchor loads are high heat demand buildings which usually drive the economics of a network. Several factors are normally considered when defining anchor loads but for

this high level study a demand of at least 500 MWh/year is the determining factor (the standard threshold within LHEES Guidance).

A standard threshold of a minimum two anchor loads per zone was selected as per the default criterion. In addition manual screening of zones was undertaken to ensure the anchor loads within each identified zone still existed and if not, delete them, and re-calculating the counts of anchor load per zone, then removing any zones with less than two anchor loads. Following this 12 potential heat network zones were identified with a total of 253 GWh/year heat demand.

These zones were interrogated analysing factors such as constraints and heat resources and ranked based on these factors to identify the top five ranking Potential Heat Network Zones from these 12.

Ranking
To enable the identification of the top five Potential Heat Network Zones for integration and further interrogation within an LHEES Delivery Plan, all 12 identified Potential Heat Network Zones have been ranked based upon different indicators, with a weighting per indicator rank also applied to generate an overall ranking. The four indicators based upon which these ranking have been generated are:

- **Opportunity Category** – An opportunity category is user-defined to each potential heat network zone as either a High / Medium / Low, incorporating results following considerations into each zone's heat resources, constraints and zone potential.

- **Count of Anchor Loads** – Anchor loads (500 MWh+) aid in driving the economics of heat networks by being potential key clients/ customers, thus a higher count provides a higher driver and aids feasibility of installation.

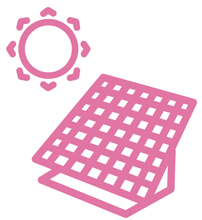
- **Total Heat Demand** – Similar to anchor loads, the higher the demand and thus supply of heat via a heat network also aids in driving economic feasibility.

- **Count of Households in Fuel Poverty** – Connecting to a low carbon heat network source may result in lower customer heat rates, aiding households currently within fuel poverty.

The indicator weightings used within the zone ranking are as follows:

	Opportunity Category	Count of Anchor Loads	Total Heat Demand	Count of Fuel Poverty Households
Weighting (%)	60%	10%	10%	20%

Table 6–1 Heat Networks Zone Indicator Weightings



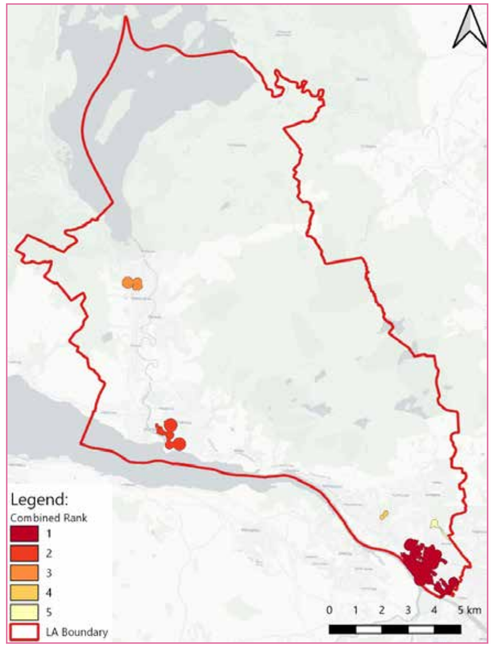


Figure 6–2 Heat Networks Top 5 Ranking Zones

Following these weighted rankings, the top five ranking Heat Network Zones are as follows:

1. Clydebank
2. Dumbarton
3. Alexandria
4. Littleholm
5. Kilbowie

The locations of these zones are presented in Figure 6–2.

Finalised Strategic Zones
Through feedback from stakeholder consultation, the three most southerly networks of the five top ranking zones (Clydebank, Littleholm and Kilbowie) were combined into a larger Combined Heat Network Zone. This provides a larger area in the vicinity of the existing Queens Quay heat network in which new heat networks, or extensions of existing, may be delivered.

In addition to the three Zones identified through the LHEES analysis and ranking exercise, the stakeholder consultation recommended the addition of two other Heat Network Zones within the Combined Heat Network Zone. These are the Golden Jubilee (highlighted in analysis but ranked below top five) and Dalmuir Flats (highlighted as part of the Queens Quay OBC). Radnor Park Kilbowie (also highlighted as part of the Queens Quay OBC) is also highlighted within the Combined Heat Network Zone as a potential area of expansion.

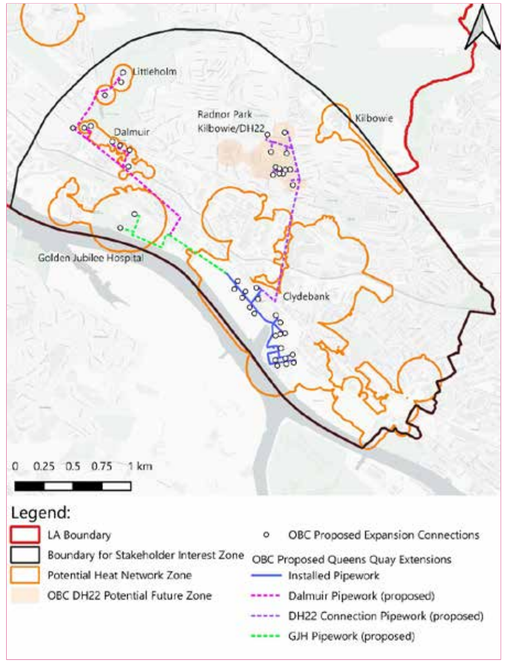


Figure 6–3 Combined Clydebank Heat Network Zone

Clydebank (Combined Heat Network Zone)

Due to the proximity of three of the five heat network Strategic Zones to each other, a larger zone encompassing these networks should be considered as a zone of stakeholder interest. This will encompass Clydebank, Golden Jubilee Hospital, Dalmuir, Littleholm and Kilbowie.

Expansion options for the existing Queens Quay heat network were assessed in an Outline Business Case (OBC) in 2022, which indicated initial economic viability of a potential for expansion of the network from Clydebank to the Golden Jubilee Hospital and Dalmuir Flats. Radnor Park Kilbowie (DH22) was also identified in this study as a potential future expansion area for the network, although not a priority.

A heat network in this Combined Heat Network Zone could be supplied by the existing Queens Quay Energy Centre, which currently houses two Water Source Heat Pumps with a heating capacity of 2.65 MW each, and two backup boilers (7 MW each), supplying flow temperatures of approximately 75°C, and return temperatures of 45°C.

A possible cross-boundary extension of heat networks eastwards into Glasgow is a further possibility following engagement with Glasgow City Council. The case is strengthened by the presence of West Dunbartonshire's large area of interest for heat networks north of Clydebank, on the local authority boundary.

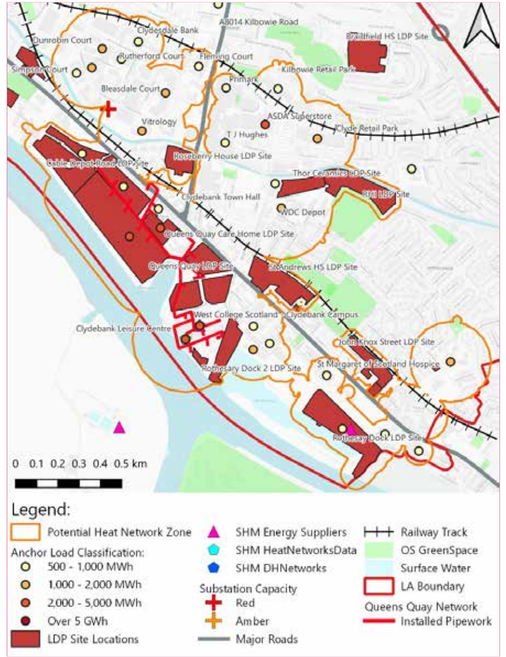


Figure 6–4 Clydebank Heat Network Zone

Clydebank (part of the Clydebank Combined Heat Network Zone)

Heat demand: 85.3 GWh/year within identified potential zone, of which 36.3 GWh/year is from the 31 anchor loads (500 MWh/year+).

Zone area: 214 hectares (39.8 kWh/m2)

Count of anchor loads (>500 MWh/year heat demand): 31

Key anchor loads: Queens Quay Care Home LDP Site; Queens Quay LDP Sites; West College Scotland Clydebank Campus; ASDA Superstore; Clydebank Leisure Centre; WDC Depot; Vitrology; Simpson Retail Court; Dunrobin Retail Court; St Margaret of Scotland Hospice

LDP sites: 20 LDP Sites total, inside or within 250m. Key sites include, Queens Quay = 1,045 resi units, Queens Quay Care Home = 1000 resi units, Rothesary Dock = 13,637 m2 Storage, Cable Depot Road = 200 resi units, John Knox Street = 4,976 m2 Workshop and RHI Site = 120 resi units.

Heat sources: The River Clyde provides river source Water Source Heat Pump opportunities, with a Water Source Heat Pump already installed at the Clydebank Leisure Centre. An Anaerobic Digestion Plant awaiting construction on the Rothesay Dock LDP Site. A Combined Heat and Power Network is present within the West College site.

Fuel poverty: 564 dwellings are estimated to be experiencing fuel poverty, which equates to 33% of domestic properties within the Zone, with 326 estimated to be experiencing extreme fuel poverty (19%).

Constraints: The A8014 and A814 A-Roads and the Railway all intersect the zone, isolating various anchor loads.

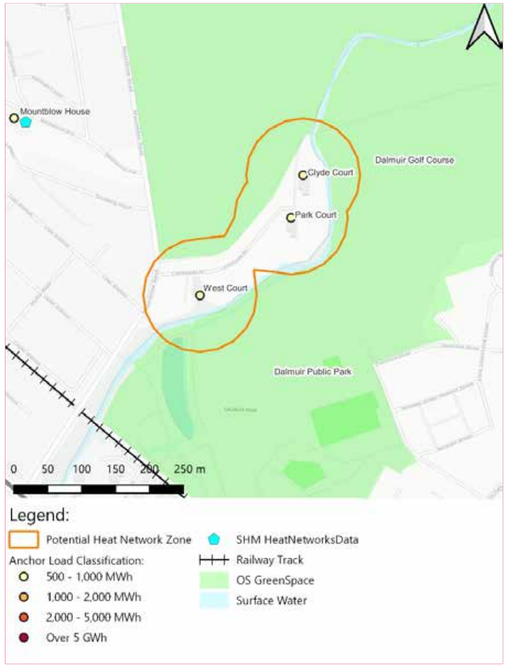


Figure 6–5 Littleholm Heat Network Zone

Littleholm (part of the Clydebank Combined Heat Network Zone)

Opportunity description: The potential heat network zone opportunity in Dalmuir focuses on Clyde, Park and West Courts, all of which are large residential tower blocks of public tenure. Zone is surrounded by vast green space for potential Ground Source Heat Pumps.

Opportunity category: High – High density of anchor loads under WDC control.

Heat demand*: 2.2 GWh/year within identified potential zone, with 2.1 GWh/year of the heat demand from the three anchor loads.

Zone area: 5 hectares (40.5 kWh/m2)

Count of anchor loads* *(>500 MWh/year heat demand)*: 3

Anchor loads: Clyde Court; Park Court , West Court

LDP sites: No LDP sites are located within, or 250m of the Zone.

Heat sources: The zone is surrounded by Dalmuir Municipal Golf Course and Dalmuir Public Park which may provide opportunities for Ground Source Heat Pump boreholes. The Duntocher Burn intersects the zone, further assessment on the burn is required, but this may provide Water Source Heat Pump potential. Mountblow House to the Northwest already utilises a gas boiler fed heat network which could be expanded.

Fuel poverty*: 105 dwellings are estimated to be experiencing fuel poverty, which is 39% of domestic properties within the Zone, with 66 estimated to be experiencing extreme fuel poverty (24%).

**The heat demand and fuel poverty statistics do not take into account changes since these properties have been externally overclad thus the actual number of fuel poverty dwellings and heat demand is likely smaller than that presented here.*

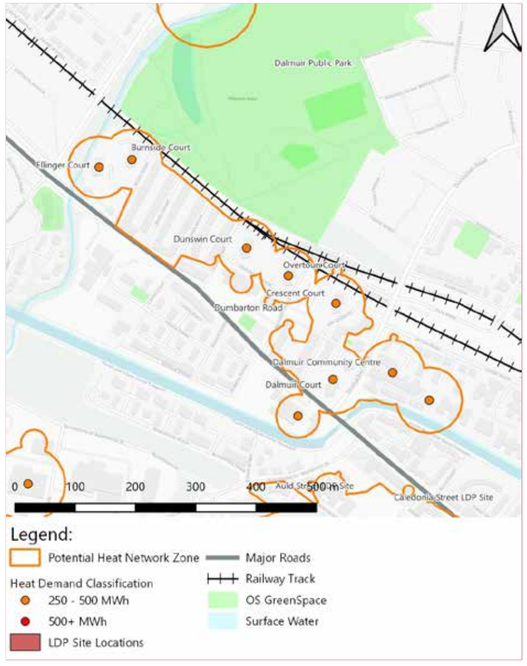


Figure 6–6 Dalmuir Flats Heat Network Zone

Dalmuir (part of the Clydebank Combined Heat Network Zone)

Opportunity description: Although initially not identified due to no anchor loads within, and highlighted during stakeholder engagement, this potential heat network zone opportunity in Dalmuir focuses on the six large residential tower blocks of public tenure.

Opportunity category: Medium – Although no anchor loads are identified within the zone, there is high density of loads under WDC control.

Heat demand: 9.3 GWh/year within identified potential zone.

Zone area: 9 hectares (103 kWh/m2)

Count of anchor loads: *(>500 MWh/year heat demand)*: 0

Anchor loads: N/A

LDP sites: Within 250m of the Zone, Auld Street = 20 resi units, Auld Street Phase 2 = 16 resi units and Caledonia Street = 18 resi units.

Heat sources: The canal to the south presents a potential opportunity for a Water Source Heat Pump or the Dalmuir Public Park which may provide opportunities for Ground Source Heat Pump boreholes.

Fuel poverty: 442 dwellings are estimated to be experiencing fuel poverty, equating to 44% of domestic properties within the Zone, with 367 estimated to be experiencing extreme fuel poverty (36%).

Constraints: No major constraints are located within the Zone.

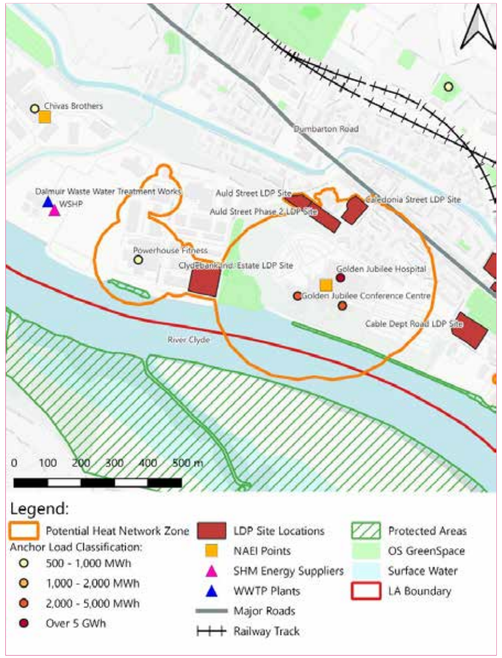


Figure 6–7 Golden Jubilee Hospital Heat Network Zone

Golden Jubilee Hospital (part of the Clydebank Combined Heat Network Zone)

Opportunity description: The main opportunity from existing demand focuses on the Golden Jubilee Hospital and Conference Centre Hotel. The Local Development Plan sites to the North (54 resi units) and West (1,781 m2 Workshop) within the zone could be a viable connections.

Opportunity category: Medium – High density of heat from the hospital, although localised. A connection from Queens Quay network and hospital is a potential solution, and is being actively pursued.

Heat demand: 30.5 GWh/year within identified potential zone. 24 GWh/year of the heat demand was from the four anchor loads.

Zone area: 37 hectares (81.8 kWh/m2)

Count of anchor loads: *(>500 MWh/year heat demand)*: 4

Anchor loads: Golden Jubilee Hospital (Block 1 and Block 2); Golden Jubilee Hospital Conference Hotel; Powerhouse Fitness

LDP sites: Clydebank Ind. Estate = 1,781 m2 workshop, Auld Street = 20 resi units, Auld Street Phase 2 = 16 resi units and Caledonia Street = 18 resi units. Heat sources: There is potential for extension of Water Source Heat Pump at Queens Quay District Heat Network. The adjacent Wastewater Treatment Works also utilise a Water Source Heat Pump from the River Clyde. The Waste Water Treatment Works as well as the primary hospital site (being an NAEI point emitter) are both potentially useful heat sources.

Fuel poverty: 69 dwellings are estimated to be experiencing fuel poverty, equating to 27% of domestic properties within the Zone, with 19 estimated to be experiencing extreme fuel poverty (7%).

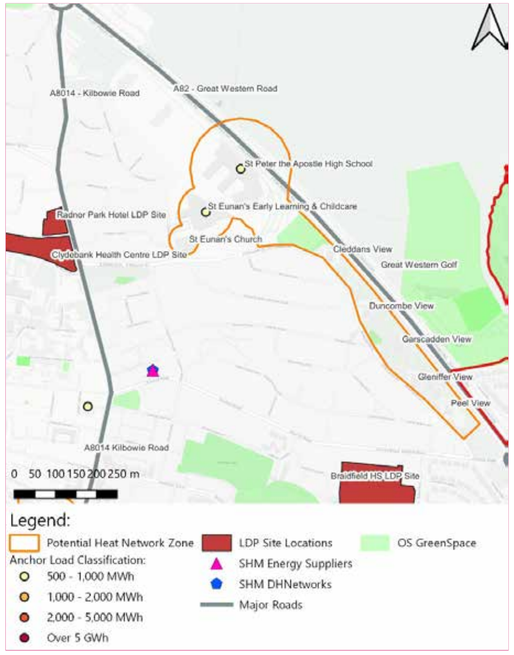


Figure 6–8 Kilbowie Heat Network Zone

Kilbowie (part of the Combined Clydebank Heat Network Zone)

Opportunity description: The potential heat network zone opportunity in Kilbowie has an opportunity category as high due to a high demand of likely public heat demands, no major constraints within and various heat resources nearby. This Zone's demands are all densely located aiding feasibility.

Opportunity category: High – High density of publicly owned loads. Heat demand: 3.4 GWh/year within identified potential zone, with 1.5 GWh/year of the heat demand from the two anchor loads.

Zone area: 11.5 hectares (29.5 kWh/m2)

Count of anchor loads *(>500 MWh/year heat demand)*: 2

Anchor loads: St Peter the Apostle High School (expansion may not be viable); St Eunan's Early Learning & Childcare Centre

LDP sites: Three LDP sites are located within 250m of the Zone, being Radnor Park Hotel Site = 28 residential units, Clydebank Health Centre LDP = 40 residential units and Braidfield HS LDP Site = 100 residential units.

Heat sources: Two heat networks already exist within a close proximity to the zone, with a Natural Gas Boiler District Heat Network located 300m South and Gas Combined Heat and Power Heat Network 450m West. The Radnor Park Primary Substation to the West is also a potential heat resource and the substation is categorised as 'Red' in regard to capacity.

Fuel poverty: 98 dwellings are estimated to be experiencing fuel poverty, which equates to 43% of domestic properties within the Zone, with 100 estimated to be experiencing extreme fuel poverty (43%).

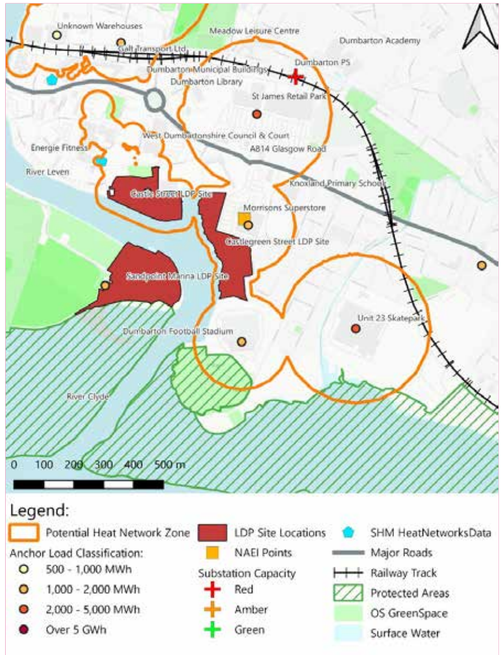


Figure 6–9 Dumbarton Heat Network Zone

Dumbarton Heat Network Zone

Opportunity description: High – High count of demands with various typologies and public loads included within.

Heat demand: 23.1 GWh/year within identified potential zone, with 10.2 GWh/year of the heat demand from the five identified anchor loads.

Zone area: 66 hectares (35.1 kWh/m2)

Count of anchor loads *(>500 MWh/year heat demand)*: 5

Anchor loads: St James Retail Park; Morrisons Superstore; Dumbarton Football Stadium; Unit 23 Skatepark; Castle Street LDP Site

LDP sites: Two LDP sites are located within the Zone, being Castlegreen Street = 110 resi units and Castle Street = 195 resi units. Another LDP site is within 250m of the zone, being Sandpoint Marina = 87 resi units.

Heat sources: The River Clyde and Leven both flow adjacent to the Zone providing potential for river source Water Source Heat Pumps. The Morrisons Superstore is an NAEI emitter and central to the zone which aids delivery. A gas boiler network exists at the Energie Fitness Dumbarton Centre, with Dumbarton Primary Substation also a potential heat resource.

Fuel poverty: 237 dwellings are estimated to be experiencing fuel poverty, which equates to 29% of domestic properties within the Zone, with 93 estimated to be experiencing extreme fuel poverty (11%).

Constraints: The A814 Glasgow Road is a potential major constraint isolating the St James Retail Park from the other four Anchor Loads and limiting any expansion North.

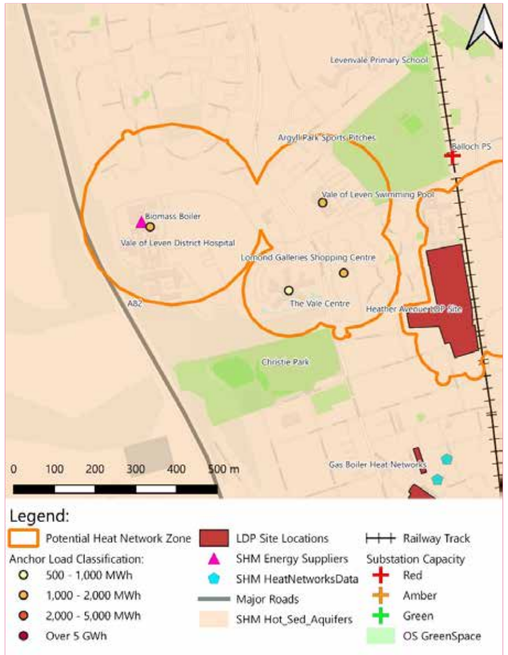


Figure 6–10 Alexandria Heat Network Zone

Alexandria Heat Network Zone

Opportunity category: High – High proportion of publicly owned anchor loads, with the District Hospital a potential waste heat opportunity utilising the current system and/or core for a new low carbon network.

Heat demand: 8.8 GWh/year within identified potential zone, with 5.1 GWh/year of the heat demand from the four identified anchor loads.

Zone area: 30 hectares (29.3 kWh/m2)

Count of anchor loads *(>500 MWh/year heat demand)*: 4

Anchor loads: Vale of Leven District Hospital; The Vale Centre GP Practice; Vale of Leven Swimming Pool; Lomond Galleries Shopping Centre.

LDP sites: The Heather Avenue LDP Site is located within 250m of the zone and consists of 84 resi units.

Heat sources: A Biomass Boiler is present within the Vale of Leven District Hospital with greenspace South in Christie Park potential for Ground Source Heat Pump boreholes. The zone is within an area of "Hot Sedimentary Aquifers", which are potential good sources of geothermal energy. The Balloch Primary Substation is also a potential heat resource.

Fuel poverty: 106 dwellings are estimated to be experiencing fuel poverty, which equates to 29% of domestic properties within the Zone, with 40 estimated to be experiencing extreme fuel poverty (11%).

Constraints: No major constraints which impact heat network deployment are located within the Zone.

OFF GAS GRID

Screening methodology
The analysis uses the domestic Home Analytics (v 3.8.1) dataset and the Scotland Heat Map 2019 "Geographic Boundaries" dataset to model off-gas grid properties within West Dunbartonshire to aid in generating initial Delivery Areas for low-regrets heat decarbonisation in off-gas grid areas. This approach focuses wholly on domestic properties.

Off-gas grid properties are properties which are not connected to the main gas network and therefore utilise a different fuel to supply their heating.

Off-gas grid domestic buildings are categorised into four principal categories for heat decarbonisation:

- **Category 0** - Already have a low carbon heating system (heat pumps or communal heating).
- **Category 1** - Immediate potential for heat pump retrofit (i.e. well insulated properties with a wet heating system).
- **Category 2** - Secondary potential for heat pump retrofit (i.e. in need of moderate fabric / heat distribution system upgrade to be heat pump ready).
- **Category 3** - Tertiary potential for heat pump retrofit (i.e. properties in need of significant fabric / heat distribution system upgrade to be heat pump ready) or those not suited to heat pump technology, with electric (storage or direct) or biomass likely to be the most viable decarbonisation technology.

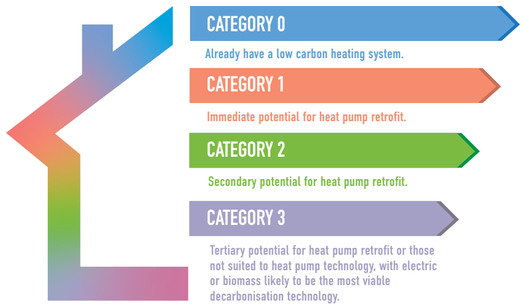
Categorisation of domestic off gas grid properties based on existing building fabric, heritage status and heating systems can be found in the Appendix 4.

Ranking
To enable the identification of the top five ranking low-regrets off-gas grid Data Zones for retrofit of low carbon heating within West Dunbartonshire, all Data Zones were ranked based upon aggregated counts of properties within each category and then weighted to generate an overall ranking.

The indicator weightings used within the zone ranking are as follows:

	Category 1	Category 2	Category 3
Weighting (%)	60%	35%	5%

Table 6–2 Off- Gas Grid DZ Indicator Weightings



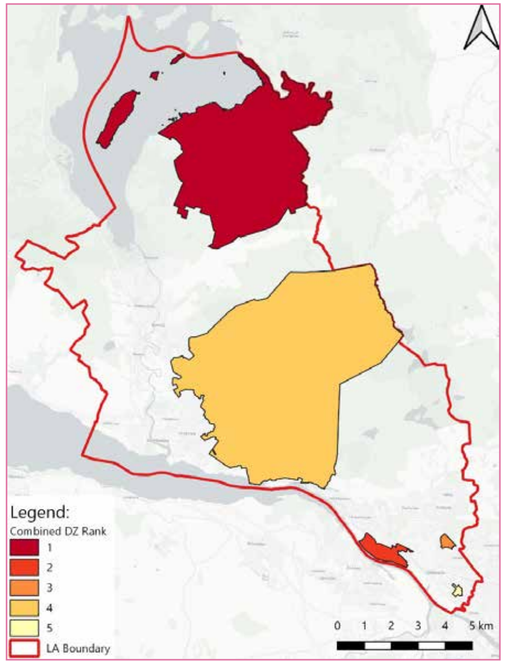


Figure 6–11 Off Gas Grid Top 5 Ranking Zones

Category 1 has a higher weighting because these properties have an immediate potential for heat pump installation and decarbonisation, followed by Category 2 and Category 3 which have secondary and tertiary potential respectively. Category 0 properties however have not been given a weighting of as these are already classified as having a low carbon heating system (heat pumps or communal heating).

Following these weighted rankings, the top five ranking Data Zones were the following:

1. Lomond – 06
2. Singer and Clydebank South – 06
3. Drumry – 07
4. Bowling – 02
5. Whitecrook - 03

The locations of these zones are presented in Figure 6-11.

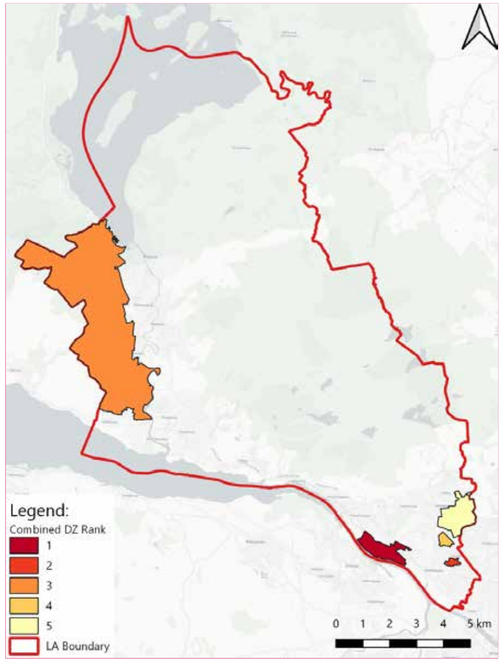


Figure 6–12 Off Gas Grid Final Strategic Zones

Finalised Strategic Zones

Unlike the Heat Networks Consideration, each Data Zone undergoes a second weighted ranking process encompassing additional indicators not specifically related to 'Off Gas' properties but relating to Fuel Poverty and the Scottish Index of Multiple Deprivation (SIMD) which impact West Dunbartonshire's roll-out of retrofitting within the local authority.

The additional indicator weightings used to define the final zone rankings are as follows:

	Off Gas Rank (above)	Fuel Poverty Rank	SIMD Rank
Weighting (%)	66%	17%	17%

Table 6–3 Off Gas Grid Final Strategic Zone Indicator Weightings

Following these additional weighted rankings, the top five ranking Data Zones were the following:

1. Singer and Clydebank South – 06
2. Drumry – 02
3. Leven – 01
4. Drumry – 07
5. Clydebank East – 03

The locations of these zones are presented below (fig. 6-12). For a detailed overview of the top ranking Off Gas Strategic Zones and potential Delivery Areas please refer to Appendix 1.

	No. Off-gas grid Category 1	No. Off-gas grid Category 2	No. Off-gas grid Category 3	No. Fuel Poverty	SIMD Decile	Combined Ranking
Singer and Clydebank South - 06	1	210	11	190	2	1
Drumry - 02	1	47	4	186	1	2
Leven – 01	3	11	42	186	2	3
Drumry – 07	1	90	15	119	1	4
Clydebank East - 03	1	16	7	156	3	5

Table 6–4 Off Gas Grid Final Strategic Zone Indicator Weightings

ON GAS GRID

Screening methodology

The analysis uses the domestic Home Analytics (v 3.8.1) dataset and the Scotland Heat Map 2019 "Geographic Boundaries" dataset to model on-gas grid properties within West Dunbartonshire to aid in generating initial Delivery Areas for low regrets heat decarbonisation in off-gas grid areas. This approach focuses wholly on the domestic sector.

On-gas grid properties are properties which are connected to the main gas network and therefore utilise natural gas as the fuel to supply their heating.

On-gas grid domestic buildings are categorised into four principal categories for heat decarbonisation:

Category	Description
Category 0	Already have a low carbon heating system (communal heating).
Category 1	Immediate potential for heat pump retrofit (i.e. well insulated properties)
Category 2	Secondary potential for heat pump retrofit (i.e. in need of moderate fabric / heat distribution system upgrade to be heat pump ready).
Category 3	Tertiary potential for heat pump retrofit (i.e. properties in need of significant fabric / heat distribution system upgrade to be heat pump ready).

Categorisation of domestic on-gas grid properties is based on existing building fabric and heritage statuses can be found in the Appendix 4.

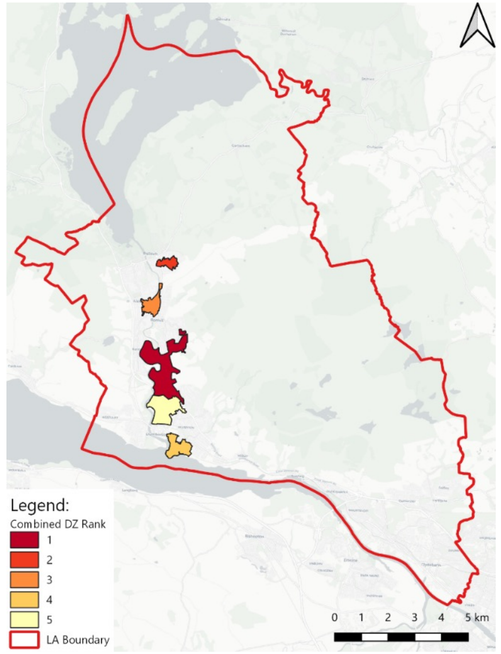


Figure 6–13 On Gas Grid Top 5 Ranking Zones

Ranking

To enable the identification of the top five ranking low regrets on-gas grid Data Zones for retrofit of low carbon heating within West Dunbartonshire, all Data Zones were ranked based upon aggregated counts of properties within each category and then weighted to generate an overall ranking.

The indicator weightings used within the zone ranking are as follows:

	Category 1	Category 2	Category 3
Weighting (%)	60%	35%	5%

Table 6–5 On Gas Grid DZ Indicator Weightings

Category 1 has a higher weighting because these properties have an immediate potential for heat pump installation and decarbonisation, followed by Category 2 and Category 3 which have secondary and tertiary potential respectively. Category 0 properties however have not been given a weighting of as these are already classified as having a low carbon heating system (communal heating).

Following these weighted rankings, the top five ranking Data Zones were the following:

1. Bonhill – 02
2. Lomond – 02
3. Alexandria – 01
4. Dumbarton – 03
5. Dumbarton - 08

The locations of these zones are presented in Figure 6-13.

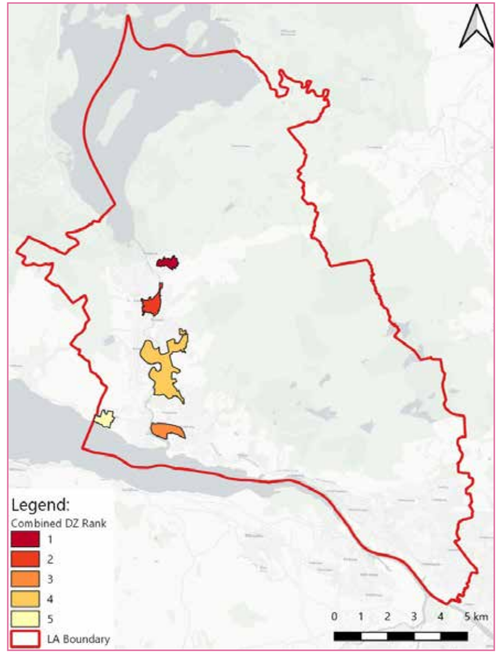


Figure 6–14 On Gas Grid Final Strategic Zones

Finalised Strategic Zones

Similar to the Off-Gas Grid Consideration, each Data Zone has undergone a second weighted ranking process encompassing additional indicators not specifically related to 'On Gas' properties but relating to Fuel Poverty and the Scottish Index of Multiple Deprivation (SIMD) which impact West Dunbartonshire's roll-out of retrofitting within the local authority.

The additional indicator weightings used to define the final zone rankings are as follows:

	Off Gas Rank (above)	Fuel Poverty Rank	SIMD Rank
Weighting (%)	66%	17%	17%

Table 6–6 On Gas Grid Final Strategic Zone Indicator Weightings

Following these additional weighted rankings, the top five ranking Data Zones were the following:

1. Lomond – 02
2. Alexandria – 01
3. Dumbarton – 05
4. Bonhill – 02
5. Dalreoch – 05

The locations of these zones are presented below (fig. 6-14). For a detailed overview of the top ranking On Gas Strategic Zones and potential Delivery Areas please refer to Appendix 2.

	No. On-gas grid Category 1	No. On-gas grid Category 2	No. On-gas grid Category 3	No. Fuel Poverty	SIMD Decile	Combined Ranking
Lomond – 02	369	113	15	208	1	1
Alexandria – 01	295	98	240	224	2	2
Dumbarton – 05	323	72	289	289	3	3
Bonhill – 02	431	132	95	174	4	4
Dalreoch – 05	271	96	8	138	1	5

Table 6–7 On Gas Strategic Zones Summary Table

POOR BUILDING ENERGY EFFICIENCY AND POOR BUILDING ENERGY EFFICIENCY AS A DRIVER OF FUEL POVERTY

Screening methodology

The analysis uses the Home Analytics (v3.8.1) solely to model domestic properties within West Dunbartonshire for two LHEES Considerations surrounding property's building fabric and poor energy efficiency, these considerations are:

- **Poor Energy Efficiency:** Identify possible locations where poor building energy efficiency exists across the local authority.
- **Poor Energy Efficiency as a Driver for Fuel Poverty:** Identify possible locations where poor building energy efficiency acts as a driver for fuel poverty and/or extreme fuel poverty.

For reference, the Default Indicators for the "Poor Energy Efficiency" and "Poor Energy Efficiency as a Driver for Fuel Poverty" LHEES Considerations are, with those selected listed:

- Single Glazing (Not Selected)
- Uninsulated Walls **(Selected)**
- Loft Insulation <100 mm **(Selected)**
- Fuel Poverty Probability (fuel bill >10% of income after housing) **(Selected)**
- Extreme Fuel Poverty Probability (fuel bill >20% of income after housing) **(Selected)**

The selected indicators align with WDC's retrofit programme, whereby they have never included double glazing and focus on Enhanced Wall Insulation (EWI) (external) with loft insulation.

Poor building energy efficiency is a recognised factor that can contribute to fuel poverty, thus the removal of poor energy efficiency measures will impact and contribute to Scotland's statutory target of no households being in fuel poverty as far as reasonably possible by 2040.

LHEES analysis identifies that West Dunbartonshire's fuel poverty rates (2023) are as follows:

- Fuel Poverty Rate = **29%**
- Extreme Fuel Poverty Rate = **12%**

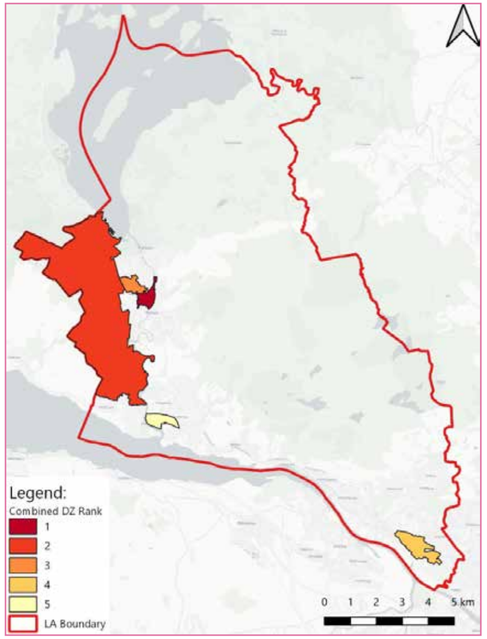


Figure 6–15 Poor Building Energy Efficiency as a Driver for Fuel Poverty Top 5 Ranking Zones

Ranking

To enable the identification of the top five ranking low regrets Poor Building Energy Efficiency as a Driver for Fuel Poverty Data Zones for retrofit within West Dunbartonshire, all Data Zones were ranked based upon aggregated counts of properties within each category and then weighted to generate an overall ranking.

The indicator weightings used within the zone ranking are as follows:

	<100mm Loft Insulation	Uninsulated Wall	Combined Poor Energy Efficiency (left)	Fuel Poverty	SIMD
Weighting (%)	50%	50%	50%	25%	25%

Table 6–8 Poor Building Energy Efficiency DZ Indicator Weightings

For reference, the default weightings within the LHEES Practitioner Guidance for the Poor Building Energy Efficiency Consideration are, "Single Glazing = 33%", "Uninsulated Walls = 33%" and "<100mm Loft Insulation", however as follows to align with WDCs existing building energy efficiency retrofit schemes, 'Single Glazing' has been removed from the consideration.

Following these weighted rankings, the top five ranking Data Zones were the following:

1. Alexandria – 01
2. Leven – 01
3. Balloch – 01
4. Singer and Clydebank South – 02
5. Dumbarton - 05

The locations of these zones are presented in Figure 6-15.

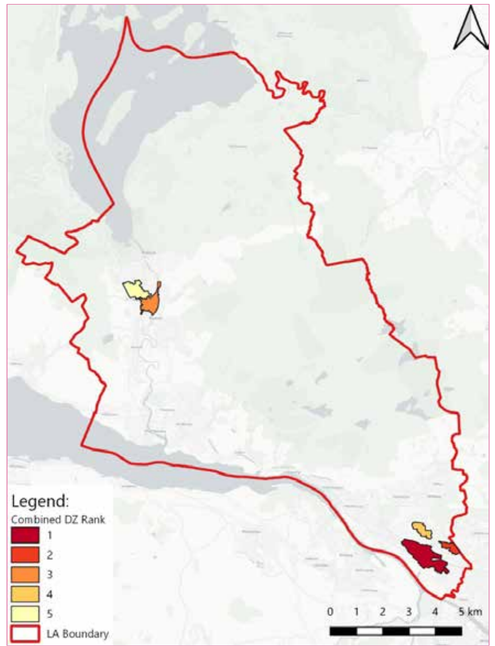


Figure 6–16 Poor Building Energy Efficiency as a Driver for Fuel Poverty Final Strategic Zones

Finalised Strategic Zones

Each Data Zone has undergone a second weighted ranking process encompassing additional indicators. These are as follows:

- Poor Building EE and FP – The combined ranking as presented above.
- Poor Building EE and EFP – A ranking generated from the same process as presented above however the Extreme Fuel poverty was ranked.
- Category 3 Properties – Due to these properties being classified as requiring significant building fabric retrofit for heat pumps for both off and on gas considerations.
- Heritage Buildings – A ranking based on low number of heritage buildings within (listed or within conservation areas) as planning implications make retrofitting these properties more difficult.

The additional indicator weightings used to define the final zone rankings are as follows:

	Poor Building EE and FP (above)	Poor Building EE and EFP	Category 3 Properties	Heritage Buildings
Weighting (%)	30%	30%	20%	20%

Table 6–9 Poor Building Energy Efficiency as a Driver for Fuel Poverty Final Strategic Zone Indicator Weightings

Following these additional weighted rankings, the top five ranking Data Zones were the following:

1. Singer and Clydebank South – 02
2. Drumry – 05
3. Alexandria – 01
4. Clydebank – 01
5. Balloch – 01

The locations of these zones are presented below *(fig. 6-16)*. For a detailed overview of the top ranking Poor Building Energy Efficiency as a Driver of Fuel Poverty Strategic Zone please refer to Appendix 3.

	No. <100mm Loft Insulation	No. Unin sulated Walls	No. Fuel Poverty	No. Extreme Fuel Poverty	SIMD Decile (of 10)	No. Cat. 3 Properties	No. Heritage Buildings	Combined Ranking
Singer and Clydebank South – 02	69	247	174	74	2	219	0	1
Drumry – 05	8	240	166	99	1	227	0	2
Alexandria – 01	103	325	224	66	2	244	5	3
Clydebank – 01	27	237	161	71	2	183	0	4
Balloch – 01	112	355	153	65	2	332	6	5

Table 6–10 Poor Building Energy Efficiency as a Driver for Fuel Poverty Final Strategic Zones summary table

MIXED TENURE AND MIXED USE

Screening methodology

The analysis uses the Home Analytics (v3.8.1) dataset and the Non-Domestic Analytics (v1.1) datasets to model properties within West Dunbartonshire where there are buildings of mixed-tenure, mixed-use and historic buildings (covering Listed buildings and Conservation Areas). Currently, this is covered by four focus areas:

- Mixed-tenure buildings
- Mixed-use buildings
- Listed buildings
- Conservation areas

For reference, Indicators for the mixed-tenure, mixed-use LHEES Consideration are:

- Mixed-tenure Flag (Mixed-tenure) – Domestic only (due to no data for non-domestic)
- Dwellings within buildings >1 (Mixed-use) – Domestic (a proxy used for domestic data for mixed-use is for where more then one unit is in the same building, e.g. a block of flats.
- Mixed-use Flag (Mixed-use) – Non-Domestic (more then one typology present within building, e.g. residential and café.

The analysis also focuses on properties located within Conservation Areas or those that have a Listed building status, for which the Indicators are:

- Within a Conservation Area – Domestic and Non-Domestic
- Listed buildings – Domestic only (due no data for non-domestic)

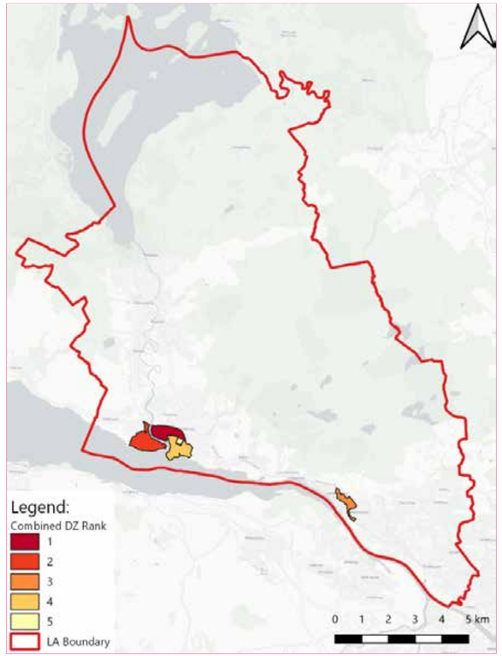


Figure 6–17 Mixed Tenure Mixed Use Top 5 Ranking Data Zones

Ranking

To enable the identification of the top five Data Zones for integration and further interrogation within an LHEES Delivery Plan, all 121 Data Zones within West Dunbartonshire have been ranked based upon aggregated counts of properties within each indicators, with a weighting per indicator rank also applied to generate an overall ranking.

The indicator weightings used within the zone ranking are as follows:

	Domestic Mixed Use	Domestic Mixed Tenure	Domestic Listed
Weighting (%)	10%	30%	20%
	Domestic Conservation	**Non-Dom Mixed Use**	**Non-Dom Conservation Area**
Weighting (%)	15%	10%	15%

Table 6–11 Mixed Tenure Mixed Use Indicator Weightings

Following these weighted rankings, the top five ranking Data Zones were located in and are as follows:

1. Dumbarton – 05
2. Dalreoch – 01
3. Kilpatrick – 06
4. Dumbarton – 03
5. Dumbarton – 04

The locations of these zones are presented in Figure 6–17.

	Domestic Mixed Use	Domestic Mixed Tenure	Domestic Listed	Domestic Conservation	Non-Dom Mixed Use	Non-Dom Conservation Area	Combined Ranking	Combined Ranking
Dumbarton – 05	784	503	30	312	67	177	1	1
Dalreoch – 01	412	264	20	277	13	11	2	2
Kilpatrick – 06	300	154	3	60	9	2	3	3
Dumbarton – 03	427	246	0	77	4	4	4	4
Dumbarton – 04	268	258	0	332	12	14	5	5

Table 6–12 Mixed Tenure and Mixed Use Strategic Zones summary table

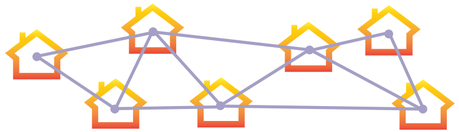
SUMMARY OF STRATEGY AND NEXT STEPS

The LHEES for West Dunbartonshire has identified a series of Strategic Zones within which action will be taken to deliver heat decarbonisation projects. The Strategic Zones selected provide high-level focus areas for further development.

Table 7–1 Strategic Zones summary table

Theme	Strategic Zone		Notes
Heat Networks	Clydebank	Clydebank Littleholm Dalmuir Kilbowie Golden Jubilee Hospital	Developing the existing Queen Quay network into the wider Combined Heat Network Zone
	Dumbarton		New heat networks to deliver low carbon heat to homes and businesses in Dumbarton
	Alexandria		New heat networks to deliver low carbon heat to homes and businesses in Alexandria
Heat pump installation and energy efficiency interventions	On gas grid decarbonisation	Lomond 02 Alexandria 01 Dumbarton 05 Bonhill 02 Dalreoch 05	
	Off gas grid	Singer and Clydebank South 06 Drumry 02 Leven 01 Drumry 07 Clydebank East 03	
	Poor building energy efficiency as a driver of fuel poverty	Singer and Clydebank South 02 Drumry 05 Alexandria 01 Clydebank 01 Balloch 01	
Innovative project delivery mechanisms	Mixed tenure and mixed use buildings	Dumbarton 05 Dalreoch 01 Kilpatrick 06 Dumbarton 03 Dumbarton 04	This LHEES Consideration highlights Strategic Zones in which novel ways of delivering heat decarbonisation may need to be tested - for example funding heat pumps and retrofits to buildings with a mixture of public and private tenure, and domestic and non-domestic usage

HEAT NETWORKS



The LHEES has identified a total of 7 Heat Network Strategic Zones, with a combined heat demand of 162.6 GWh/year.

Delivering these heat networks could therefore deliver 19% of the total heat demand for West Dunbartonshire, exceeding the 8% target for heat networks set nationally in the Heat Networks (Scotland) Act.

The Queens Quay network is already operational, and this Strategy identifies options for extension and interconnection with future heat networks in the southern part of the local authority. Some work has already been undertaken to assess the business case for extension, however this Strategy identifies other options that may need further consideration. Further expansion potential of the network may be possible at Exxon and Carless industrial sites and will be reviewed as the sites progress.

For the new Heat Network Zones in Dumbarton and Alexandria, the first step will be to undertake preliminary feasibility studies to determine the potential financial viability of the schemes and to identify low carbon heat opportunities in the area.

HEAT PUMPS AND ENERGY EFFICIENCY

Delivering heat decarbonisation across the fifteen Strategic Zones under the On-Gas, Off-Gas and Energy Efficiency LHEES Considerations will aim to bring buildings in West Dunbartonshire up to the thresholds set by Scottish Government's Heat in Buildings Strategy.

All buildings in West Dunbartonshire will need to meet the relevant national targets, however the Strategic Zones inform the Council's activity and areas of focus and engagement as decarbonisation programmes are implemented.

The Delivery Areas, to be detailed as part of the LHEES Delivery Plan, set out at a granular level the streets and buildings that will be part of the first five years of the LHEES in West Dunbartonshire.

LHEES DELIVERY PLAN

The Local Heat and Energy Efficiency Strategy has identified a number of potential projects and opportunities, and the Delivery Plan will consider these opportunities at a more granular scale, which will include smaller clusters of buildings and streets, turning plans into actions.

Stakeholder engagement is a key theme through LHEES, and as part of the Delivery Plan a Monitoring and Evaluation Plan will be developed. This will set out how West Dunbartonshire Council will approach engagement with stakeholder groups – both those already consulted in developing the LHEES, and new stakeholders such as the Community Councils. This may also include more targeted awareness and engagement campaigns in the prioritised Strategic Zones and Delivery Areas. Through this engagement potential delivery mechanisms will be developed further: cross-authority collaboration; joint ventures; and commercialisation. The actions set out in the Delivery Plan will align with, and complement, existing plans, programmes and activity around heat decarbonisation and energy efficiency in the local authority and can draw on existing funding programmes and schemes.

1 Domestic Buildings

- Identify and develop heat decarbonisation projects in Delivery Areas
- Prioritise areas for fabric first energy efficiency improvements, and ensure tenure blind approach where feasible
- Explore deployment of ASHPs in conjunction with SPV and battery storage
- Identify Solar PV opportunities

2 Heat Networks

3 Energy Systems

- Engage with SPEN and SSEN Distribution Network Operators (DNO) to identify existing electricity grid capacity and grid constraints
- Regularly discuss planned and potential heat decarbonisation plans with DNOs to ensure grid expansion plans will meet requirements

4 Green Skills and Jobs

- Internal training on green technology types, suitability and options appraisal
- Engage with local Colleges to develop training facilities and courses
- Engage with local businesses and Scottish Enterprise to explore reskilling for clean heat technology production
- Develop supply chain through skills and qualifications specification at procurement stage

5 Knowledge and Awareness Raising

- Continue to raise awareness of the Local Heat and Energy Efficiency Strategy within West Dunbartonshire Council and with external stakeholders
- Increase knowledge sharing of retrofit and heat decarbonisation best practice with businesses and local housing providers
- Comparative study of neighbouring tenemental stock heated by District Heat Network/Direct electric/Gas, to contribute to fabric first/heat network connection conversation
- Develop behaviour change advice for new clean heating and cooling technologies that is accessible to all households

6 Funding

7 Businesses and Communities

- Identify non-domestic buildings, engage with owners/ community groups and facilitate the development of heat decarbonisation and energy efficiency improvements
- Identify potential funding availability for businesses and community groups
- Case studies of heat decarbonisation/energy efficiency improvements to highlight best practice and lessons learned

CHALLENGES FOR DELIVERY

The delivery of heat network zones and energy efficiency retrofit across the entire local authority area is a vast undertaking and there are many challenges that West Dunbartonshire Council and our businesses and communities will have to address:

1 Funding gap

Financing large scale infrastructure and energy efficiency interventions is expected to have colossal costs. Funding from Scottish Government and other public funding sources needs to be maximised, private sector funding needs to be leveraged in, and support is required for local businesses and communities to ensure they access available funding streams.

2 Viability

Heat networks require electricity for operation, irrespective of the renewable heat source, and many potential developments will only be viable if electricity can be supplied directly from a renewable source.

3 Retrofit

Progress is being made in the retrofit of energy efficiency measures, however a more holistic 'whole home' approach is needed to maximise available funding and ensure a no regrets delivery.

4 Skills gap

Both within the Council and across the market there is a significant gap in skills and knowledge. We need to consider training for staff internally to ensure concerns about renewable technologies and procedures for retrofit heat and energy efficiency measures are addressed. There is a significant lack of skilled workforce within the green jobs sector and this requires our influence to boost education and training in green industries within the local authority area.

5 Behaviour change

6 Just transition

When making evidence-based decisions on the delivery of LHEES, there needs to be an assurance that we do not adversely affect our communities and businesses; the cost to achieve net zero should not burden those least able to pay.

APPENDIX 1 OFF-GAS GRID

SINGER AND CLYDEBANK SOUTH – 06

Delivery Area Overview
This Delivery Area is within the Singer and Clydebank South 06 Data Zone. This DZ was the highest ranking DZ following weightings of the following:

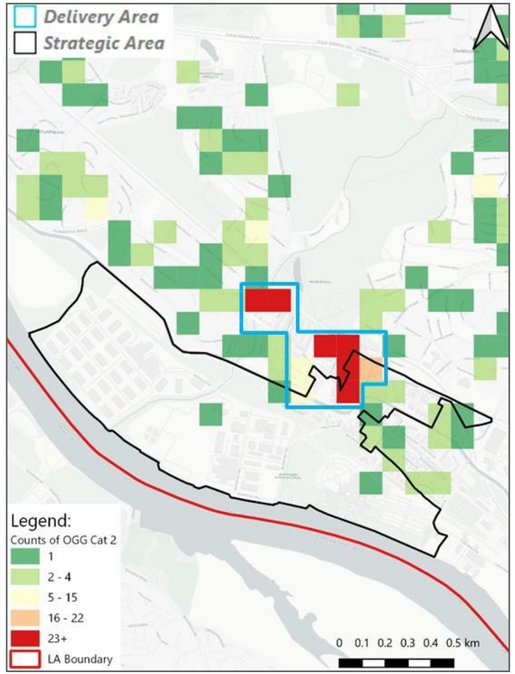
Off-gas Grid	Fuel Poverty	SIMD
Rank 2 (of 121)	Rank 8 (of 121)	Decile 2 (of 10)

Within the selected Delivery Area 590 off gas grid properties exist, 1 of these being Category 1, 558 are Category 2 and 31 as Category 3.

The Delivery Area is within an area of high-rise flats primarily built between 1950- 1983. The tenure of the off gas grid properties within this Delivery Area are majority of a public tenure (97%), with a mix of Housing Association and Local Authority public properties. These properties currently utilise electric heating primarily via storage heaters.







Drumry – 02

Delivery Area Overview
This Delivery Area is within the Drumry Intermediate Zone and Drumry 02 Data Zone. This DZ was the second highest ranking DZ following weightings of the following:

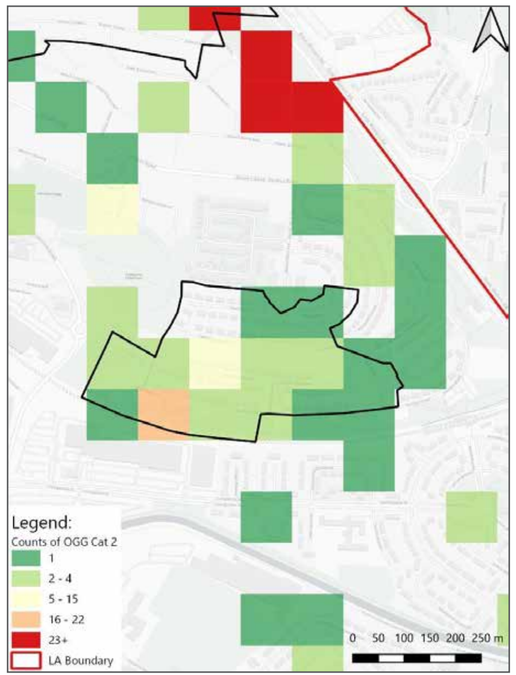
Off-gas Grid	Fuel Poverty	SIMD
Rank 6 (of 121)	Rank 10 (of 121)	Decile 1 (of 10)

Within the selected Delivery Area 46 off gas grid properties exist, 1 of these being Category 1, 43 are Category 2 and 2 as Category 3.

The Delivery Area is comprised primarily of mid-rise flats of 3 storeys, and primarily built between 1992-2002. The tenure of the off gas grid properties within this Delivery Area are majority of a public tenure (78%), with a mix of Housing Association and Local Authority public properties. These properties currently utilise electric heating primarily either via storage heaters or room heaters.







Leven – 01

Delivery Area Overview
This Delivery Area is within the Leven Intermediate Zone and Leven 01 Data Zone. This DZ was the third highest ranking DZ following weightings of the following:

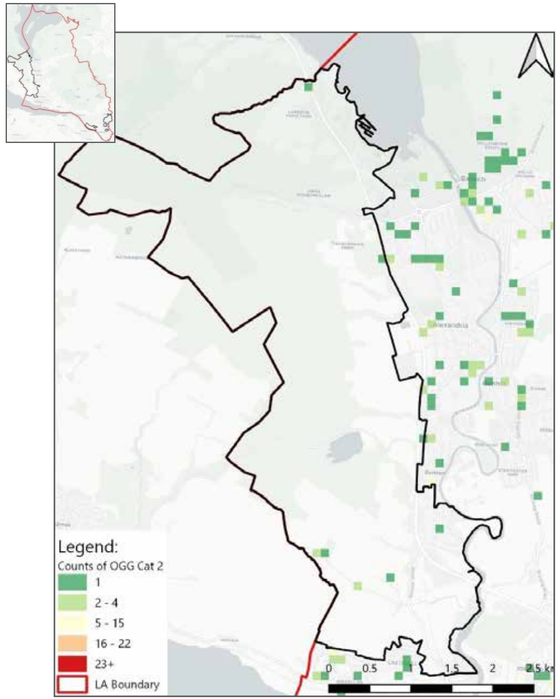
Off-gas Grid	Fuel Poverty	SIMD
Rank 8 (of 121)	Rank 11 (of 121)	Decile 2 (of 10)

Within the selected Delivery Area 14 off gas grid properties exist, 8 of these being Category 2 and 6 as Category 3.

The Delivery Area is within a rural area of Leven, with low density of housing. The properties within this Delivery Area are primarily semi-detached and primarily either aged Pre-1919 or between 1950-1983. All the off gas grid properties within this Delivery Area are of a private tenure, with two being Private Rented and 12 being Owner Occupied. The majority of these properties also utilise Oil as their main fuel type.



Private	
EPC Band	No. Properties
C+	0
D	3
E	4
F-G	7



Drumry – 07

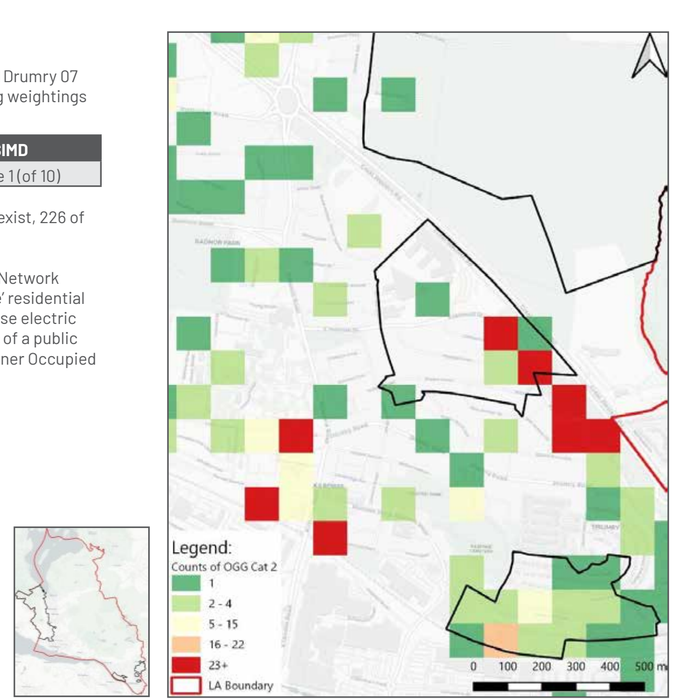
Delivery Area Overview
This Delivery Area is within the Drumry Intermediate Zone and Drumry 07 Data Zone. This DZ was the fourth highest ranking DZ following weightings of the following:

Off-gas Grid	Fuel Poverty	SIMD
Rank 3 (of 121)	Rank 44 (of 121)	Decile 1 (of 10)

Within the selected Delivery Area, 238 off gas grid properties exist, 226 of these being Category 2 and 11 as Category 3.

This Delivery Area is also noted as also being a Potential Heat Network Zone. The Delivery Area is within an area of primarily 'high-rise' residential blocks aged primarily between 1950-1983, which currently utilise electric heating via storage heaters or room heaters. 82% of these are of a public tenure (Local Authority) and 18% of a private tenure (either Owner Occupied or Private Rented Tenure).





Clydebank East – 03

Delivery Area Overview
This Delivery Area is within the Clydebank East Intermediate Zone and Clydebank East 03 Data Zone. This DZ was the fifth highest ranking DZ following weightings of the following:

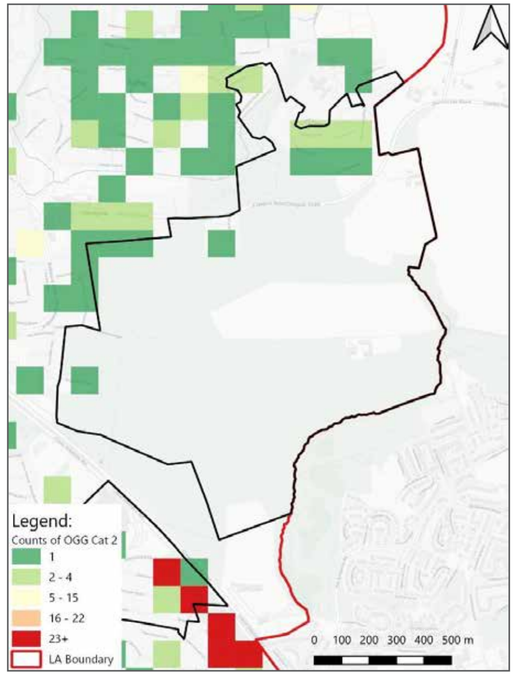
Off-gas Grid	Fuel Poverty	SIMD
Rank 14 (of 121)	Rank 21 (of 121)	Decile 3 (of 10)

Within the selected Delivery Area 15 off gas grid properties exist. 12 of these are Category 2, 3 are Category 3.

The Delivery Area is within an area of 'mid-rise' residential blocks aged between 1950-1983, some of which are on-gas with some properties being off-gas and utilising electric heating via storage heaters or room heaters. 53% of these are of Housing Association and 47% of an Owner-Occupied Tenure. The external stakeholder workshop did however highlight potential grid constraints within this area, thus further assessment into electric off-gas solutions are required before implementation.







APPENDIX 2 ON-GAS GRID

LOMOND – 02

Delivery Area Overview
This Delivery Area is within Lomond Intermediate Zone and Lomond 02 Data Zone. This DZ was the highest ranking DZ following weightings of the following:

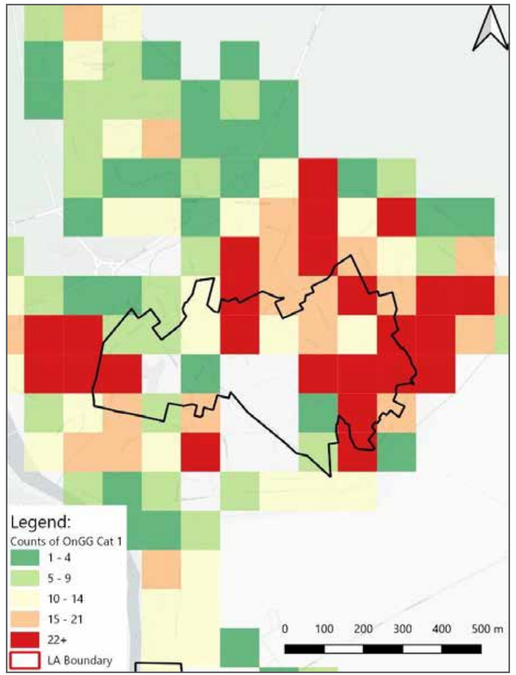
Off-gas Grid	Fuel Poverty	SIMD
Rank 2 (of 121)	Rank 5 (of 121)	Decile 1 (of 10)

Within the selected Delivery Area 1,053 on-gas grid properties exist, 800 of these being Category 1, 144 as Category 2 and 109 as Category 3.

The Delivery Area is within an area typically consisting of 'low-rise' housing types, with a range of ages mostly between 1919 to Post 2002. The tenure of properties within this area are almost even with 58% being of a public tenure and 42% being private. The external stakeholder workshop did highlight that Scottish Power are rolling out ground source heat pumps to smaller areas of housing within this region already.







Alexandria – 01

Delivery Area Overview
This Delivery Area is within Alexandria Intermediate Zone and Alexandria 01 Data Zone. This DZ was the second highest ranking DZ following weightings of the following:

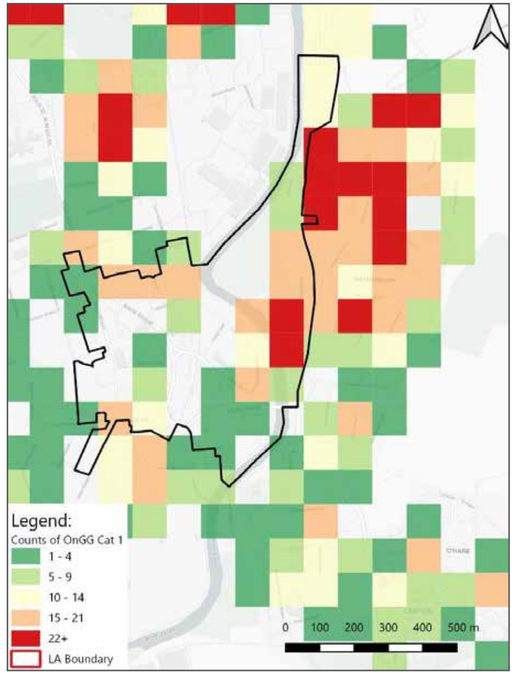
Off-gas Grid	Fuel Poverty	SIMD
Rank 4 (of 121)	Rank 4 (of 121)	Decile 2 (of 10)

Within the selected Delivery Area 810 on-gas grid properties exist, 674 of these being Category 1, 93 as Category 2 and 43 as Category 3.

The Delivery Area is within an area typically consist of a mix of low and mid-rise housing, with a range of ages. The tenure of properties within this area are primarily private (75%), with 93% of these being owner occupied.







Dumbarton – 05

Delivery Area Overview
This Delivery Area is within Dumbarton Intermediate Zone and Dumbarton 05 Data Zone. This DZ was the third highest ranking DZ following weightings of the following:

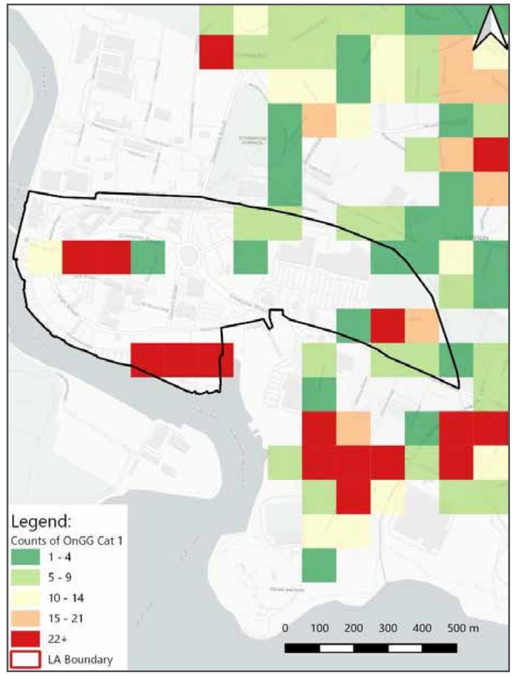
Off-gas Grid	Fuel Poverty	SIMD
Rank 6 (of 121)	Rank 1 (of 121)	Decile 3 (of 10)

Within the selected Delivery Area there are 877 on-gas grid dwellings, 657 of these being Category 1, 99 as Category 2 and 121 as Category 3.

The Delivery Area is within an area typically consisting of flats (81%), with a majority of these being newly built from 2002 onwards. The tenure of properties within this area are almost even with 46% being of a public tenure and 54% being private.







Bonhill – 02

Delivery Area Overview
This Delivery Area is within Bonhill Intermediate Zone and Bonhill 02 Data Zone. This DZ was the fourth highest ranking DZ following weightings of the following:

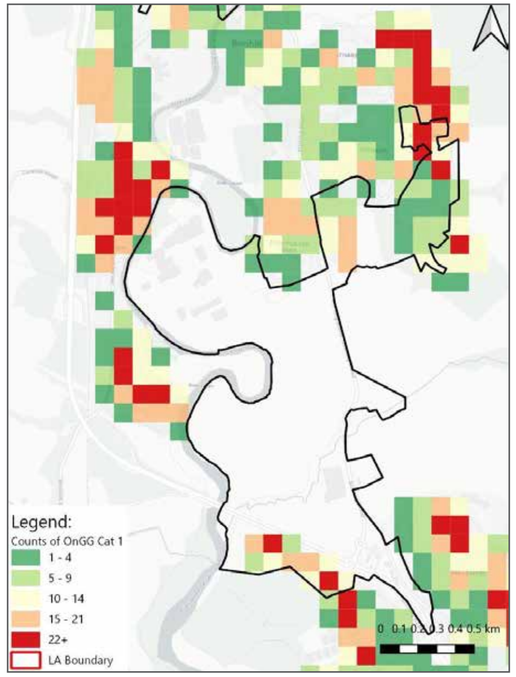
Off-gas Grid	Fuel Poverty	SIMD
Rank 1 (of 121)	Rank 16 (of 121)	Decile 4 (of 10)

- 1,073 of these being Category 1
- 230 as Category 2
- 243 as Category 3

The Delivery Area is within an area typically consisting of 'low-rise' housing types (80%), mostly built between 1950-1983. The tenure of properties within this area are primarily Private (71%), with most of these being Owner Occupied (90%).







Dalreoch – 05

Delivery Area Overview
This Delivery Area is within Dalreoch Intermediate Zone and Dalreoch 02 Data Zone. This DZ was the fifth highest ranking DZ following weightings of the following:

Off-gas Grid	Fuel Poverty	SIMD
Rank 11 (of 121)	Rank 30 (of 121)	Decile 4 (of 10)

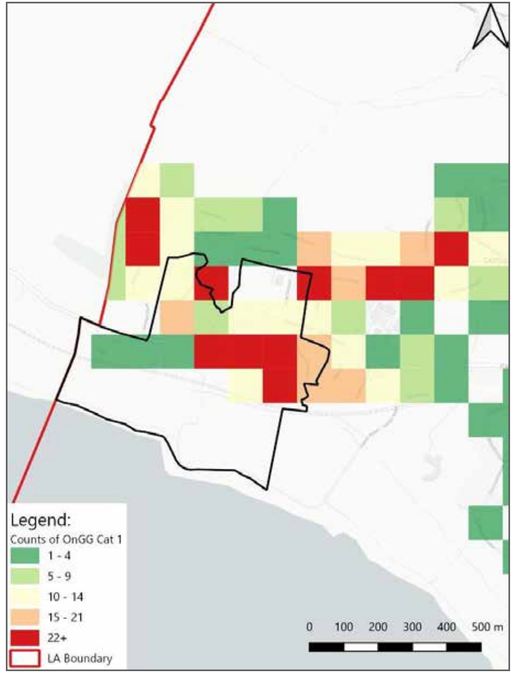
Within the selected Delivery Area, there are 830 on-gas grid dwellings:

- 617 of these being Category 1, 172 as Category 2 and 41 as Category 3.

The Delivery Area is within an area typically consisting of 'low and mid-rise' housing types, aged between 1950-1983. The tenure of properties within this area are almost even with 60% being of a public tenure and 40% being private.







APPENDIX 3 POOR BUILDING ENERGY EFFICIENCY

SINGER AND CLYDEBANK SOUTH – 02

Delivery Area Overview
The Delivery Area has been based upon density and concentrations of retrofit interventions within a Data Zone with a high rank of Poor Building Energy Efficiency and Fuel Poverty.

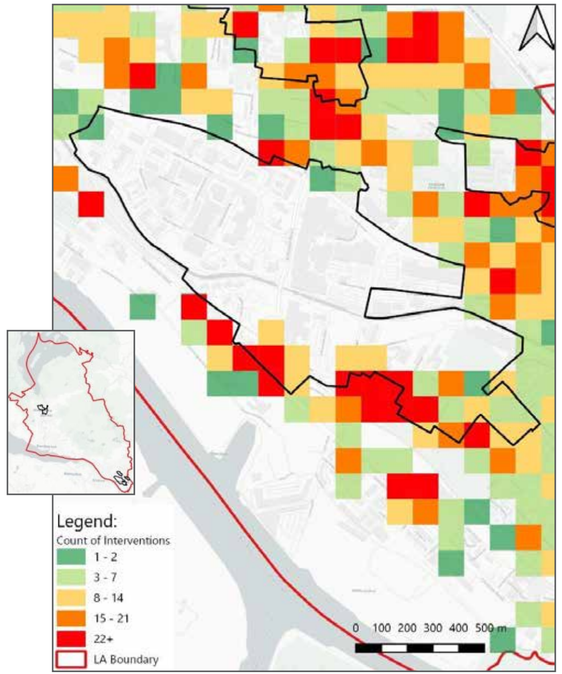
Within the selected Delivery Area, there are **374 households currently in fuel poverty**.

- **50** of these already achieve a building EPC rating compliant with the Heat in Buildings Strategy, and therefore deemed that building energy efficiency is not a driver for fuel poverty
- **324** are **not Heat in Buildings Strategy compliant** and will be assessed through PEAT for measures to achieve (if possible) a compliant EPC band.

All Properties	
EPC Achieving	No. Properties
Yes	50
No	324

Public	
EPC Band	No. Properties
C+	50
D	173
E	98
F-G	5

Private	
EPC Band	No. Properties
C+	0
D	7
E	33
F-G	8



DRUMRY – 05

Delivery Area Overview
The Delivery Area has been based upon density and concentrations of retrofit interventions within a Data Zone with a high rank of Poor Building Energy Efficiency and Fuel Poverty.

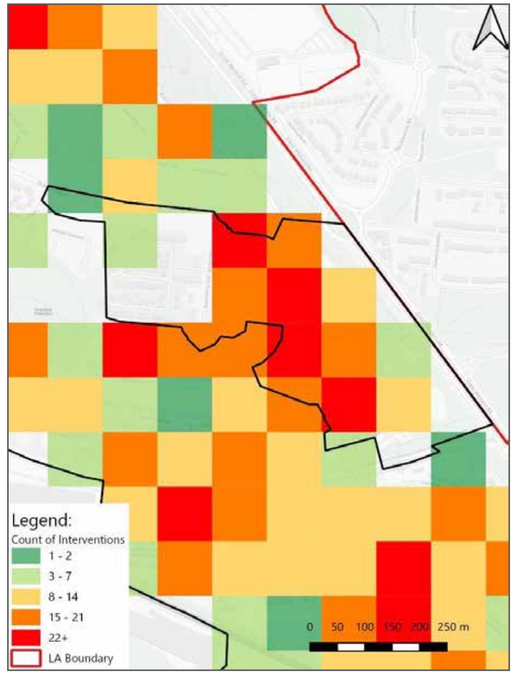
Within the selected Delivery Area there are 291 properties in fuel poverty. Only 1 of these already achieves a building EPC rating compliant with the Heat in Buildings Strategy, and therefore is deemed that "building energy efficiency is not a driver for fuel poverty".

290 of these are therefore not Heat in Buildings Strategy compliant and will be assessed for measures to achieve (if possible) a compliant EPC band.

All Properties	
EPC Achieving	No. Properties
Yes	1
No	290

Public	
EPC Band	No. Properties
C+	0
D	69
E	217
F-G	0

Private	
EPC Band	No. Properties
C+	1
D	3
E	1
F-G	0



ALEXANDRIA – 01

Delivery Area Overview
The Delivery Area has been based upon density and concentrations of retrofit interventions within a Data Zone with a high rank of Poor Building Energy Efficiency and Fuel Poverty.

Within the selected Delivery Area, there are currently 195 properties in fuel poverty.

39 of these already achieve a building EPC rating compliant with the Heat in Buildings Strategy, and therefore it is deemed that "building energy efficiency is not a driver for fuel poverty".

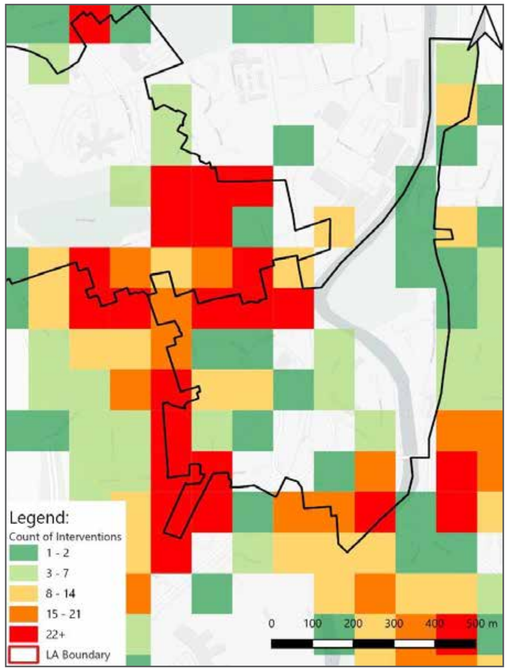
156 of these are therefore not Heat in Buildings Strategy compliant and will be assessed for measures to achieve (if possible) a compliant EPC band.

All Properties	
EPC Achieving	No. Properties
Yes	39
No	156

Public	
EPC Band	No. Properties
C+	39
D	57
E	96
F-G	1

Private	
EPC Band	No. Properties
C+	0
D	0
E	2
F-G	0





CLYDEBANK– 01

Delivery Area Overview
The Delivery Area has been based upon density and concentrations of retrofit interventions within a Data Zone with a high rank of Poor Building Energy Efficiency and Fuel Poverty.

Within the selected Delivery Area:

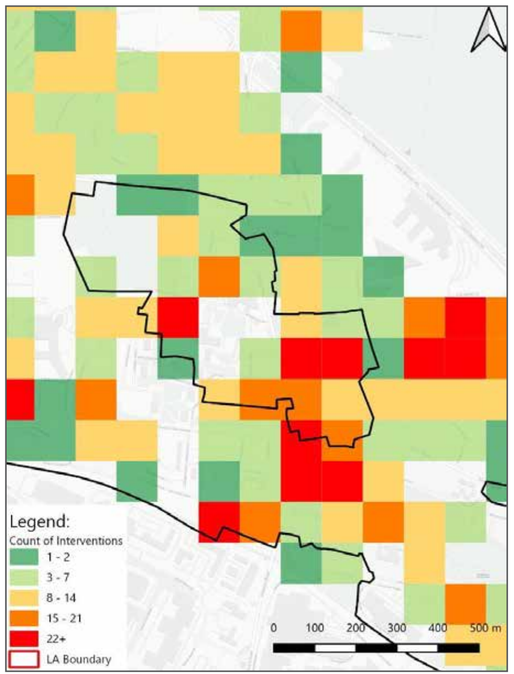
- 315 properties in fuel poverty currently exist,
- Four of these already achieve a building EPC rating compliant with the Heat in Buildings Strategy, and therefore for these buildings it is deemed that "building energy efficiency is not a driver for fuel poverty".
- 311 are therefore not Heat in Buildings Strategy compliant and will be assessed for measures to achieve (if possible) a compliant EPC band.

All Properties	
EPC Achieving	No. Properties
Yes	4
No	311

Public	
EPC Band	No. Properties
C+	4
D	145
E	120
F-G	10

Private	
EPC Band	No. Properties
C+	0
D	1
E	35
F-G	0





BALLOCH – 01

Delivery Area Overview
The Delivery Area has been based upon density and concentrations of retrofit interventions within a Data Zone with a high rank of Poor Building Energy Efficiency and Fuel Poverty.

Within the selected Delivery Area there are currently **90 properties in fuel poverty:**

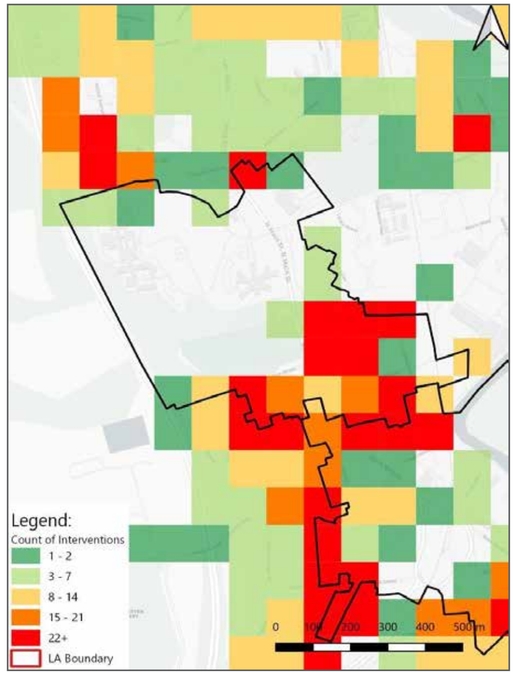
- **30** of these already achieve a building **EPC rating compliant** with the Heat in Buildings Strategy, and therefore deemed that "building energy efficiency is **not a driver for fuel poverty**"
- **60** are therefore **not Heat in Buildings Strategy compliant** and will be assessed for measures to achieve (if possible) a compliant EPC band.

All Properties	
EPC Achieving	No. Properties
Yes	30
No	60

Public	
EPC Band	No. Properties
C+	21
D	31
E	23
F-G	0

Private	
EPC Band	No. Properties
C+	9
D	3
E	3
F-G	0





APPENDIX 4 DETAILED SUMMARY OF INDICATORS AND CATEGORISATION

HEAT NETWORKS
Indicators

	Theme	Value	Additional Notes
Strategic Zoning and Pathways	Linear Heat Density (LHD)	8,000 kWh/yr/m	Benchmarks of 4,000 are typically used for very rural local authorities i.e. Highlands, and 16,000 for dense urban areas i.e. Glasgow, with 8,000 for local authorities with a mix of urban and rural geographies.
	Anchor Load Heat Demand Threshold	500 MWh/yr	Heating demands from Scotland Heat Map 2019
	Anchor Load Threshold per Potential Zone	2 or more	
	Maximum Zone Radius	250 m	Maximum connection buffer after LHD analysis set to 250m, due to large heat demand data points within the Scotland Heat Map creating LHDs of 10s of kilometres which is technically unfeasible.
	Opportunity Category	Either High, Medium or Low	Manual assessment of initial viability of each zone, based upon heat demand, typology and ownership of loads and constraints.
	Fuel Poverty Household	fuel bill >10% of income after housing	
	Extreme Fuel Poverty Household	fuel bill >20% of income after housing	
	Zone Opportunity Category Rank	60% Weight	Used to rank and prioritise Strategic Zones for Delivery Area analysis (top 5 ranking taken forward to DLA analysis) A ranking of 1 was applied to each Zone with e.g. the highest heat demand, and 12 the lowest (due to 12 zones).
	Zone Anchor Load Count Rank	10% Weight	
	Zone Heat Demand Rank	10% Weight	
	Zone Fuel Poverty Count Rank	20% Weight	
Finalisation of Delivery Areas	Heat Demand Category	Low: 73 – 250 MWh/yr Medium: 250 – 500 MWh/yr = High: >500 MWh/yr =	Heat demands from Scotland Heat Map 2019 Within BEIS 2nd National Comprehensive Assessment (NCA) threshold value of 73 MWh/year is considered the minimum for heat network connection 250-500 MWh/year is the middle threshold between the NCA and LHEES anchor load benchmarks 500 MWh/year is the LHEES threshold for anchor loads
	Heat Networks (Scotland) Act 2021 - national target of heat network supplied heat	2.6 TWh by 2027 6 TWh by 2030	
	Indicative heat network Linear Heat Density (LHD) viability threshold	4 MWh/year/m	

OFF GAS GRID
Indicators

	Theme	Value	Additional Notes
Strategic Zoning and Pathways	Off- gas grid properties	Off Gas = Yes	Home Analytics (v 3.8.1) dataset
	Off-gas grid Category 0	1. Off Gas = Yes 2. Heating System = Heat pump or communal	Home Analytics (v 3.8.1) dataset Category 0 - Already have a low carbon heating system (heat pumps or communal heating).
	Off-gas grid Category 1	1. Off Gas = Yes 2. Category 0 = No 3. Listed = No 4. Conservation = No 5. Insulated Wall = Yes 6. Glazing = Double or Triple 7. Loft Insulation = No Loft or 99 mm+ 8. Heating Fuel = Biomass, Solid, LPG or Oil	Home Analytics (v 3.8.1) dataset Category 1 - Immediate potential for heat pump retrofit (i.e. well insulated properties with a wet heating system).
	Off-gas grid Category 2	1. Off Gas = Yes 2. Category 0, 1 = No 3. Uninsulated Wall and type solid brick or stone, system built or timber = No 4. Risk to narrow hard to insulate cavity = No	Home Analytics (v 3.8.1) dataset Category 2 - Secondary potential for heat pump retrofit (i.e. in need of moderate fabric / heat distribution system upgrade to be heat pump ready).
	Off-gas grid Category 2 Weighting	1. Off Gas = Yes 2. Category 2 = Yes 3. Glazing = Double or Triple = +20% 4. Insulated Wall = Yes = +20% 5. Loft Insulation = No Loft or 99 mm+ = +20% 6. Tenure = Housing Association or Local Authority = +20% 7. Heating Fuel = Oil or LPG = +20%	Home Analytics (v 3.8.1) dataset
	Off-gas grid Category 3	1. Off Gas = Yes 2. Category 0, 1, 2 = No	Home Analytics (v 3.8.1) dataset Category 3 - Tertiary potential for heat pump retrofit (i.e. properties in need of significant fabric / heat distribution system upgrade to be heat pump ready) or those not suited to heat pump technology, with electric (storage or direct) or biomass likely to be the most viable decarbonisation technology.
	Off-gas grid Category 3 Heat pump	1. Off Gas = Yes 2. Category 3 = Yes 3. Heating Fuel = LPG or Oil	Home Analytics (v 3.8.1) dataset

	Theme	Value	Additional Notes
Strategic Zoning and Pathways (Continued)	Off-gas grid Category 3 Biomass or Electric	1. Off Gas = Yes 2. Category 3 = Yes 3. Heating Fuel <> LPG or Oil 4. Fuel = Electric = Electric 100% (ignore rest) 5. Fuel = Biomass or Solid = Biomass 100% (ignore rest) 6. Property Type = Detached = Biomass +20% 7. Property Type = Semi Detached = Biomass +15% 8. Wall = Solid brick or stone = Biomass +15% 9. Property Type = Flats = Electric +20% 10. Urban Classification = Electric +10% 11. Insulated Walls = Yes = Electric +10% 12. Glazing = Double or Triple = +20%	Home Analytics (v 3.8.1) dataset Category equals highest percentage weighting after exercise
	Prioritisation Value	2+ Standard Deviations	Used to identify 100m x 100m areas of high counts of the selected indicator.
	Category 0 DZ Rank	0% Weight	Used to rank Strategic Zones. A ranking of 1 was applied to each Strategic Zone with e.g. the highest count of Off-gas grid Category 1 properties, and inverted for the lowest. Combined weighting is DZ Off-gas grid Rank
	Category 1 DZ Rank	65% Weight	
	Category 2 DZ Rank	30% Weight	
	Category 3 DZ Rank	5% Weight	
Generation of Initial Delivery Areas	Scottish Index of Multiple Deprivation (SIMD)	Decile of 1 falls within the most deprived 10% of DZs nationally. While a decile of 10 means the DZ falls within the least deprived 10% of DZs nationally.	
	Fuel Poverty Indicator	Fuel Poverty Probability (fuel bill >10% of income after housing)	Home Analytics (v 3.8.1) dataset
	Off-gas grid DZ Rank	66% Weight	
	SIMD DZ Rank	17% Weight	Used to rank and prioritise Strategic Zones. Top 5 ranking taken forward to Delivery Level Area Analysis.
	Fuel Poverty DZ Rank	17% Weight	
	Public property EPC targets	EPC B (SAP Score >= 81)	Based upon the Scottish 2021 Heat in Buildings Strategy and Energy Efficiency Standard for Social Housing (EESSH) target of EPC band B for social housing by December 2032.
	Private property EPC targets	EPC C (SAP Score >= 69)	Based upon the Scottish 2021 Heat in Buildings Strategy of new regulations for private rented properties to achieve EPC C or above by 2028

	Theme	Value	Additional Notes
Building level pathway	Category 0	Exclude	Home Analytics (v 3.8.1) dataset Category equals highest percentage weighting after exercise
	Portfolio Energy Analysis Tool (PEAT) Key Details	Per property budget = Unlimited SAP Score = As above Target Heat Demand = N/A Target CO2 = N/A Costing Template = Standard EST costs 08/2023	
	PEAT Measures Automatic	Radiators and distribution system Underfloor Heating Storage heater distribution (No distribution system) Warm air distribution Modern storage heating controls Time and temperature zone control for radiator systems Time and temperature zone control for underfloor heating New hot water cylinder Solar hot water system Hot water from combi Electric immersion Hot water cylinder with electric immersion back-up Dual electric immersion	
	PEAT Measures Selected	Replace all low energy light bulbs Draught proofed windows Draught proofed external doors Loft insulation Cavity wall insulation Hard to treat cavity wall insulation Hard to treat cavity wall insulation - bead Loft insulation top-up Insulation for flat roofing Room in roof walls and sloping parts, 100mm insulation Internal wall insulation External wall insulation New insulated uPVC external doors A-rated glazing (uPVC) A-rated glazing (uPVC) for roof Solid floor insulation Suspended wooden floor insulation	

	Theme	Value	Additional Notes
Building level pathway (Continued)	PEAT Measures Selected (continued)	Air source heat pump Ground source heat pump Thermostatic radiator valves Thermostatic radiator valves, for use linked community system Thermostatic radiator valves, for flat rate community system Additional thermostatic controls, warm air systems Hot water cylinder insulation Hot water cylinder insulation and new hot water controls (cylinder stat and water heater timer) New hot water controls (cylinder stat and water heater timer) Insulating jacket, new hot water controls (cylinder stat and water heater timer) and pipework insulation Additional insulating jacket for existing foam insulated tank Additional insulating jacket for existing foam insulated tank and new hot water controls (cylinder stat and water heater timer) 2.5kW Solar panels (photovoltaic cells)	
	PEAT Measures Excluded	Replace last 10 percent with CFL Replace last 20 percent with CFL Replace last 30 percent with CFL Replace last 40 percent with CFL Replace 50 percent with CFL Replace 40 percent with CFL Replace 30 percent with CFL Replace 20 percent with CFL Replace 10 percent with CFL Mains gas combi-condensing boiler Mains gas condensing boiler Oil combi-condensing boiler Oil condensing boiler Oil combi-condensing boiler (plus oil storage tank) Oil condensing boiler (plus oil storage tank) LPG combi condensing boiler LPG condensing boiler Biomass boiler (wood pellets) Pellet stove with back boiler, with DHW Modern storage heaters Mains gas condensing warm air system LPG condensing warm air system Secondary heating log stove 5.5kW mast mounted wind turbine	

	Theme	Value	Additional Notes
	Flat – Manual External Wall Insulation	Manual EWI = (No. individual UPRNs within Parent UPRN) - PEAT EWI (for that parent UPRN)	
	Flat – Communal Heating	1 per Parent UPRN	Individual heat pump systems are not assigned to properties with a 'flat' tenure in PEAT.

CATEGORISATION

Category 0		
1	Heat pump or communal heating system	Already defined as low and zero emissions
Category 1		
1	Not Category 0	Avoids double counting
2	Not listed property	Additional considerations for planning
3	Not in a conservation area	Additional considerations for planning
4	Insulated walls	Thermal efficiencies needed for heat pumps
5	Double or triple glazing	Thermal efficiencies needed for heat pumps
6	Loft if present has 99 mm+ insulation	Thermal efficiencies needed for heat pumps
7	Wet system (biomass, solid, LPG or oil)	Significantly ease transition to heat pumps
Category 2		
1	Not Category 0 or 1	Avoids double counting
2	Not uninsulated solid brick or stone, system built or timber frame	Insulation is beyond a moderate upgrade
3	No risk of narrow hard-to-insulate cavity	Require more than a moderate upgrade to bring up to the required thermal efficiency
Category 3		
1	Not Category 0, 1 or 2	Avoids double counting properties

ON GAS GRID
Indicators

	Theme	Value	Additional Notes
Strategic Zoning and Pathways	On-gas grid properties	Off Gas = No	Home Analytics (v 3.8.1) dataset
	On-gas grid Category 0	1. Off Gas = No 2. Heating System = Communal	Home Analytics (v 3.8.1) dataset Category 0 - Already have a low or zero emissions heating system, properties that defined as on-gas and are connected to a heat network.
	On-gas grid Category 1	1. Off Gas = No 2. Category 0 = No 3. Listed = No 4. Conservation = No 5. Insulated Wall = Yes 6. Glazing = Double or Triple 7. Loft Insulation = No Loft or 99 mm+	Home Analytics (v 3.8.1) dataset Category 1 - Considered to be highly suited to a heat pump solution minimal fabric upgrade required prior to heat pump installation and they have a wet heating system.
	On-gas grid Category 2	1. Off Gas = No 2. Category 0, 1 = No 3. Uninsulated Wall and type solid brick or stone, system built or timber = No 4. Risk to narrow hard to insulate cavity = No	Home Analytics (v 3.8.1) dataset Category 2 - Secondary potential for heat pump retrofit (i.e. in need of moderate fabric / heat distribution system upgrade to be heat pump ready).
	On-gas grid Category 2 Weighting	1. Off Gas = No 2. Category 2 = Yes 3. Glazing = Double or Triple = +25% 4. Insulated Wall = Yes = +25% 5. Loft Insulation = No Loft or 99 mm+ = +25% 6. Tenure = Housing Association or Local Authority = +25%	Home Analytics (v 3.8.1) dataset
	On-gas grid Category 3	1. Off Gas = No 2. Category 0, 1, 2 = No	Home Analytics (v 3.8.1) dataset Category 3 - Tertiary potential for heat pump retrofit (i.e. properties in need of significant fabric / heat distribution system upgrade to be heat pump ready).
	Prioritisation Value	2+ Standard Deviations	Used to identify 100m x 100m areas of high counts of the selected indicator.
	Category 0 DZ Rank	0% Weight	Used to rank Strategic Zones. A ranking of 1 was applied to each Strategic Zone with e.g. the highest count of OnGG Category 1 properties, and inverted for the lowest. Combined weighting is DZ OnGG Rank
	Category 1 DZ Rank	60% Weight	
	Category 2 DZ Rank	35% Weight	
	Category 3 DZ Rank	5% Weight	

	Theme	Value	Additional Notes
Generation of Initial Delivery Areas	Scottish Index of Multiple Deprivation (SIMD)	Decile of 1 falls within the most deprived 10% of DZs nationally. While a decile of 10 means the DZ falls within the least deprived 10% of DZs nationally.	
	Fuel Poverty Indicator	Fuel Poverty Probability (fuel bill >10% of income after housing)	Home Analytics (v 3.8.1) dataset
	OnGG DZ Rank	66% Weight	
	SIMD DZ Rank	17% Weight	Used to rank and prioritise Strategic Zones. Top 5 ranking taken forward to Delivery Level Area Analysis.
	Fuel Poverty DZ Rank	17% Weight	
	Public property EPC targets	EPC B (SAP Score >= 81)	Based upon the Scottish 2021 Heat in Buildings Strategy and Energy Efficiency Standard for Social Housing (EESSH) target of EPC band B for social housing by December 2032.
	Private property EPC targets	EPC C (SAP Score >= 69)	Based upon the Scottish 2021 Heat in Buildings Strategy of new regulations for private rented properties to achieve EPC C or above by 2028
	Category 0	Exclude	
	Portfolio Energy Analysis Tool (PEAT) Key Details	Per property budget = Unlimited SAP Score = As above Target Heat Demand = N/A Target CO2 = N/A Costing Template = Standard EST costs 08/2023	
	PEAT Measures Automatic	Same as per Off-gas grid	
	PEAT Measures Selected	Same as per Off-gas grid	
	PEAT Measures Excluded	Same as per Off-gas grid	
	Flat – Manual External Wall Insulation	Manual EWI = (No. individual UPRNs within Parent UPRN) - PEAT EWI (for that parent UPRN)	
	Flat – Communal Heating	1 per Parent UPRN	Individual heat pump systems are not assigned to properties with a 'flat' tenure in PEAT.

CATEGORISATION

Category 0		
1	Communal heating system	Already defined as low and zero emissions
Category 1		
1	Not Category 0	Avoids double counting
2	Not listed property	Additional considerations for planning
3	Not in a conservation area	Additional considerations for planning
4	Insulated walls	Thermal efficiencies needed for heat pumps
5	Double or triple glazing	Thermal efficiencies needed for heat pumps
6	Loft if present has 99 mm+ insulation	Thermal efficiencies needed for heat pumps
Category 2		
1	Not Category 0 or 1	Avoids double counting
2	Not uninsulated solid brick or stone, system built or timber frame	Insulation is beyond a moderate upgrade
3	No risk of narrow hard-to-insulate cavity	Require more than a moderate upgrade to bring up to the required thermal efficiency
Category 3		
1	Not Category 0, 1 or 2	Avoids double counting properties

POOR BUILDING ENERGY EFFICIENCY

Theme	Value	Additional Notes
Strategic Zoning and Pathways		
Poor Building Energy Efficiency Indicator	Uninsulated Walls	Home Analytics (v 3.8.1) dataset
Poor Building Energy Efficiency Indicator	Loft Insulation <100 mm (with Room in Roof (RIR))	Home Analytics (v 3.8.1) dataset
Prioritisation Value	2+ Standard Deviations	Used to identify 100m x 100m areas of high counts of the selected indicator.
Poor Building Energy Efficiency Probability	Probability Weighting = Loft Insulation (RIR) (50%), Uninsulated Walls (50%)	
Strategic Zoning and Pathways - DZ Ranking		
<100mm Loft Insulation with RIR DZ Rank	50% Weight	Used to rank Strategic Zones. A ranking of 1 was applied to each Strategic Zone with e.g. the highest count of Uninsulated Walled properties, and inverted for the lowest. Combined weighting is DZ Poor Building Energy Efficiency Rank
Uninsulated Wall DZ Rank	50% Weight	

POOR BUILDING ENERGY EFFICIENCY AS A DRIVER OF FUEL POVERTY

Theme	Value	Additional Notes
West Dunbartonshire's fuel poverty rates (2023)	Fuel Poverty Rate = 29% Extreme Fuel Poverty Rate = 12%	
Fuel Poverty Indicator	Fuel Poverty Probability (fuel bill >10% of income after housing)	Home Analytics (v 3.8.1) dataset
Extreme Fuel Poverty Indicator	Extreme Fuel Poverty Probability (fuel bill >20% of income after housing)	Home Analytics (v 3.8.1) dataset
Scottish Index of Multiple Deprivation (SIMD)	Decile of 1 falls within the most deprived 10% of DZs nationally. While a decile of 10 means the DZ falls within the least deprived 10% of DZs nationally.	
Prioritisation Value	2+ Standard Deviations	Used to identify 100m x 100m areas of high counts of the selected indicator.
Poor Building Energy Efficiency as a Driver for Fuel Poverty Probability	Probability Weighting = Loft Insulation (RIR) (25%), Uninsulated Walls (25%), Fuel Poverty Probability (50%)	
Poor Building Energy Efficiency as a Driver for Extreme Fuel Poverty Probability	Probability Weighting = Loft Insulation (RIR) (25%), Uninsulated Walls (25%), Extreme Fuel Poverty Probability (50%)	
Combined Poor Building Energy Efficiency DZ Rank	50% Weight	Used to rank Strategic Zones Combined weighting is DZ Poor Building Energy Efficiency as a Driver for Fuel Poverty Rank
Fuel Poverty DZ Rank	25% Weight	
SIMD DZ Rank	25% Weight	
Combined Poor Building Energy Efficiency DZ Rank	50% Weight	Used to rank Strategic Zones Combined weighting is DZ Poor Building Energy Efficiency as a Driver for Extreme Fuel Poverty Rank
Extreme Fuel Poverty DZ Rank	25% Weight	
SIMD DZ Rank	25% Weight	

POOR BUILDING ENERGY EFFICIENCY AS A DRIVER OF FUEL POVERTY (continued)

Theme	Value	Additional Notes
Poor Building Energy Efficiency as a Driver for Fuel Poverty DZ Rank	30% Weight	Used to rank and prioritise Strategic Zones. Top 5 ranking taken forward to Delivery Level Area Analysis.
Poor Building Energy Efficiency as a Driver for Extreme Fuel Poverty DZ Rank	30% Weight	
Off-gas grid Category 3 DZ Rank	10% Weight	
OnGG Category 3 DZ Rank	10% Weight	
Domestic Listed DZ Rank **(Inverted Rank)**	10% Weight (inverted rank to identify areas with low counts)	
Domestic Conservation Area DZ Rank **(Inverted Rank)**	10% Weight (inverted rank to identify areas with low counts)	
Public property EPC targets	EPC B (SAP Score >= 81)	Based upon the Scottish 2021 Heat in Buildings Strategy and Energy Efficiency Standard for Social Housing (EESSH) target of EPC band B for social housing by December 2032.
Private property EPC targets	EPC C (SAP Score >= 69)	Based upon the Scottish 2021 Heat in Buildings Strategy of new regulations for private rented properties to achieve EPC C or above by 2028
Fuel Poverty	Not in Fuel Poverty = Exclude	
Energy efficiency is not a driver of fuel poverty	In Fuel Poverty and achieve EPC target = Exclude	
Portfolio Energy Analysis Tool (PEAT) Key Details	Per property budget = Unlimited SAP Score = As above Target Heat Demand = N/A Target CO2 = N/A Costing Template = Standard EST costs 08/2023	
PEAT Measures Automatic	Same as per Off-gas grid	
PEAT Measures Selected	Same as per Off-gas grid. However following removed: Air source heat pump Ground source heat pump	
PEAT Measures Excluded	Same as per Off-gas grid. However following added: Air source heat pump Ground source heat pump	
Flat – Manual External Wall Insulation	Manual EWI = (No. individual UPRNs within Parent UPRN) - PEAT EWI (for that parent UPRN)	

MIXED-TENURE, MIXED-USE AND BUILDINGS IN CONSERVATION AREAS

Theme	Value	Additional Notes
Strategic Zoning and Pathways		
Domestic Mixed-Tenure Indicator	Mixed Tenure = Yes	Home Analytics (v 3.8.1) dataset
Domestic Mixed-Use Indicator	Dwellings within buildings >1 = Yes	Home Analytics (v 3.8.1) dataset
Domestic Listed Property Indicator	Listed = A, B, C	Home Analytics (v 3.8.1) dataset
Domestic Conservation Area Indicator	Conservation Area = Yes	Home Analytics (v 3.8.1) dataset
Non-Domestic Conservation Area Indicator	Conservation Area = Yes	Non-Domestic Analytics (v 1.1) dataset
Non-Domestic Mixed-Use Indicator	1. Dwellings within buildings >1 = Yes 2. Typologies = >1	Non-Domestic Analytics (v 1.1) dataset
Prioritisation Value	2+ Standard Deviations	Used to identify 100m x 100m areas of high counts of the selected indicator.
Strategic Zoning and Pathways - DZ Ranking		
Domestic Mixed Use DZ Rank	10% Weight	Used to rank Strategic Zones Combined weighting is DZ Mixed-Tenure, Mixed-Use and Historic Buildings Rank.
Domestic Mixed Tenure DZ Rank	30% Weight	
Domestic Listed DZ Rank	20% Weight	
Domestic Conservation Area DZ Rank	15% Weight	
Non-Domestic Mixed-Use DZ Rank	10% Weight	
Non-Domestic Conservation Area DZ Rank	15% Weight	

