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Local Heat and Energy Efficiency Strategy (LHEES): Technical Report

Methodology and Findings of the LHEES Pilot Project for **Moray Council**

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Report	Local Heat and Energy Efficiency Strategy (LHEES): Technical Report Methodology and Findings of the LHEES Pilot Project for Moray Council Version 1
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EXECUTIVE SUMMARY

The aim of a Local Heat and Energy Efficiency Strategy (LHEES) is to set a framework and delivery programme for how each local authority will reduce the energy demand and decarbonise the heat supply of buildings in their area. This project is a pilot to test the LHEES concept and build a knowledge base for local authorities, should the LHEES become a statutory duty.

This Technical Report outlines the work undertaken by Changeworks and Moray Council(the Council) to identify the tools, data, skills and resources required to develop and deliver an area based LHEES for Moray.

Policy Review

A rapid review was conducted of the strategies, plans and policies published on Moray Council's website. The aim of the review was to identify all targets, aims, outcomes and objectives which may be relevant to the development of the LHEES.

The key findings of the review were:

- Generally, all the Council's policies which relate to the LHEES lack measurable aims and targets.
- Within the domestic sector, the Council's targets focus on social housing. There is a lack of targets for private housing and the non-domestic sector.
- Moray Council has set the aim of becoming carbon neutral by 2030. However, no plans or measurable targets related to this were available. The LHEES should fit within this aim.
- Tackling fuel poverty is a priority. The Council aims for fuel poverty to be reduced, but targets have not been set.

Baseline Data Analysis

The baseline reporting provides an overview of the domestic housing stock, their energy efficiency and insulation status (average and range in variation), fuel types, present renewable heating used, and the heat demand of the area.

The analysis focuses on the entire council area of Moray and uses data from Home Analytics (version 3.5), Corporate Address Gazetteer data and EPC data.

Overall council area of Moray

- Moray has a representative tenure mix compared to the rest of Scotland.
- Moray holds a larger proportion of houses compared to the rest of Scotland.

- The average energy efficiency of the domestic properties is lower by five SAP points than the national average.
- Across domestic property types, pre-1919 houses are the least energy efficient.
- Across tenure types, privately rented properties are the least energy efficient.
- The proportion of domestic properties using mains gas as their main heating fuel (64%) is much lower than the national level (81%).
- The proportion of domestic properties using electricity as their main heating fuel (14%) is higher than the national level (10%).
- Proportionally, a lot more households are using oil as the main heating fuel (17%) compared to the national level (6%).
- The insulation levels of domestic cavity wall properties in the LHEES area (54%) are considerably lower than national levels (73%).
- Domestic loft insulation rates are similar to that of national levels.
- Two-fifths of non-domestic buildings with an EPC have the lowest band of G.
- A small proportion of non-domestic buildings have an EPC band C or greater.

The Burghead area

- A higher proportion of owner-occupied properties compared to the rest of Moray.
- A higher proportion of pre-1919 domestic properties compared to the rest of Moray.
- A higher proportion of houses compared to the rest of Moray.
- Average energy efficiency of the domestic properties is lower by seven SAP points than the rest of Moray.
- Predominant fuel types in domestic properties are oil (53%) and electricity (40%).
- A high proportion of walls in domestic properties are of a solid construction (45%).
- A small sample of non-domestic buildings (five buildings)
- Three-fifths of non-domestic buildings with an EPC have the lowest band of G.
- None of the five non-domestic buildings have an EPC band C or greater.

The Elgin area

- A lower proportion of owner-occupied properties compared to the rest of Moray.
- A lower proportion of houses compared to the rest of Moray.
- Average energy efficiency of the domestic properties is four SAP points higher than the rest of Moray.
- A higher proportion of mains gas heated properties (86%) than the rest of Moray (64%).

- Two-thirds of non-domestic buildings with an EPC have the lowest band of G.
  - A small proportion of non-domestic buildings have an EPC band C or greater.

Potential Energy Efficiency and Heat Decarbonisation Measures

The purpose of this section is to produce a shortlist of potentially suitable energy efficiency and heat decarbonisation measures for the LHEES area, based on the baseline data analysis. The main data source used in this analysis was the Energy Saving Trust's Home Analytics (v3.5). Census data was also used to provide information on demographics at the various geographic locations.

EPC data was provided for non-domestic properties; however, this does not account for the overall non-domestic property stock and it is unknown how representative the non-domestic data is for the whole stock.

Overall council area of Moray

- The LHEES area of Moray covers 46,901 domestic properties.
- 46% of domestic properties are suitable for wall insulation measures, mostly internal wall insulation (30%) and cavity wall insulation (13%-15%, 2% a risk of narrow cavities).
- From the 5,309 domestic properties with currently no 'off the shelf' suggested fabric or heating improvement, just under one-fifth (936) have an energy efficiency band D or worse.
- Given that many domestic properties have mains gas as their main fuel type, a small proportion of the stock was considered suitable for air source heat pumps (11%). This increases substantially (up to 38%) when loosening this criterium to include mains gas heated properties for heat pump suitability.

- Installing all possible domestic fabric upgrades is estimated to cost **£128m**, installing all identified domestic low carbon space heating upgrades would cost a further **£134m**.
- The average total household cost for installing fabric and heating measures is estimated to be **£9.2k**, ranging between **£200** (for a loft insulation measure) to**£36k** per property (deep retrofit with replacement low carbon heating system), with average fuel bill savings of **£256** per annum.
- Installing all the domestic measures is estimated to save 93 kilo-tonnes of CO_2 per year, which equates to 2.2 tonnes per household.
- EPC data was available for 650 non-domestic properties.
- Recommendations were provided for 97% of non-domestic properties.
- The most common recommendation for all non-domestic categories was double glazing, and/or secondary glazing.
- Wall insulation was recommended to 32% of the non-domestic properties with cavity wall insulation being the predominant.
- Half of the non-domestic properties were recommended heat pumps (either air source or ground source).

The Burghead area

- The LHEES area of Burghead covers 917 domestic properties, all of which are off-gas.
- Over one-third of domestic properties are recommended internal wall insulation.
- The potential for domestic low carbon space heating measures is much higher than the overall council area, with 37% of properties recommended air source heat pumps and 21% recommended biomass boilers.
- Installing all possible domestic fabric upgrades is estimated to cost **£2.7m**, installing all identified low carbon space heating upgrades would cost **£6.5m**.
- The average total household cost for installing fabric and heating measures is estimated to be **£13.8k**, with average fuel bill savings of **£356** per annum.
- Installing all the domestic measures is estimated to save 3.3 kilotonnes of CO_2 per year, which equates to 3.7 tonnes per household.
- EPC data was available for only five non-domestic properties.
- The most common recommendation for all non-domestic categories was double glazing, and/or secondary glazing.

- Wall insulation was recommended for three of the non-domestic properties, as was a loft/ roof measure.

The Elgin area

- The LHEES area of Elgin covers 10,832 domestic properties.
- 43% of domestic properties are suitable for wall insulation measures, mostly cavity wall insulation (22%) and internal wall insulation (20%).
- Given that many domestic properties have mains gas as their main fuel, a small proportion were considered suitable for air source heat pump (3%). This increases substantially (up to 38%) when loosening this criterium to include mains gas heated properties for heat pump suitability.
- Installing all possible domestic fabric upgrades is estimated to cost **£18.1m**, installing all identified low carbon space heating upgrades would cost **£6.6m**.
- The average total household cost for installing fabric and heating measures is estimated to be **£5.5k**, with average fuel bill savings of **£175** per annum.
- Installing all the domestic measures is estimated to save 7.8 kilo-tonnes of CO_2 per year, which equates to 0.8 tonnes per household.
- EPC data was available for 227 non-domestic properties.
- Recommendations were provided for 96% of non-domestic properties.
- The most common recommendation for all non-domestic categories was double glazing, and/or secondary glazing.
- Wall insulation was recommended to 30% of the non-domestic properties with cavity wall insulation being the predominant.
- Half of the non-domestic properties were recommended heat pumps (either air source or ground source).

Target Setting Workshop

The target setting workshop is a key stage in the development of the LHEES. It is an opportunity for the local authority to set out the level of ambition they wish to achieve with their LHEES. The aim of the workshop was to allow the Council to identify and set targets based on the initial baseline data report (BDR). Targets are non-binding and include priorities identified by individuals or departments within the project.

The workshop was structured in order to identify immediate priorities as well as medium-term and aspirational targets.

Socioeconomic Analysis and Workshop

Sweco was commissioned to provide a socioeconomic analysis in the form of a multi-criteria analysis and a workshop. In contrast to technical and financial analysis, socioeconomic analysis evaluates the wider impacts of projects and programmes not typically captured in business cases.

Appropriate criteria for the analysis were agreed which measure the net benefit to society of installing energy efficiency or low carbon heating measures across the whole of Moray, the Burghead area or the Elgin area. The net benefits include indicators such as carbon reduction, job creation, air quality, wellbeing and building the local supply chain.

- The analysis indicated that domestic energy efficiency measures across the whole council area are marked highest with regards to realising net benefits.
- The top six measures for net benefits all relate to measures targeting domestic improvements.
- The higher scores for the overall areas reflect the number of homes impacted, approx. 28.5 – 32 thousand homes.
- For non-domestic, scale of deployment was also prioritised to ensure that the potential for local economic growth is maximised.
- The emphasis on scale means that for both energy efficiency and heat decarbonisation measures, the overall area in Moray ranks highest in terms of socioeconomic benefit.

CONTENTS

1. INTRODUCTION AND CONTEXT

1.1 Policy and Strategy Context

The recently published Draft Heat in Buildings Strategy[1]outlines how the Scottish Government intend to reduce greenhouse gas emissions from Scotland's homes, workplaces and community buildings and to remove poor energy performance as a driver of fuel poverty. To meet these objectives the Scottish Government is supporting a place based, locally led and tailored approach to heat decarbonisation and energy efficiency.

The key element of the approach is targeted area-based schemes led by local authorities: Local Heat and Energy Efficiency Strategy (LHEES). The aim of an LHEES is to set a framework and delivery programme for how each local authority will support the reduction of the energy demand and decarbonisation of heat supply of buildings in their area.

LHEES will provide a long-term framework for taking an area-based approach to planning and delivery of the heat transition, including through zoning linked to regulation. LHEES will also form a basis for local public engagement and will be in place for all local authority areas by the end of 2023. LHEES have a wide-ranging scope that can be summarised as:

- Long-term (20 years) including targets covering all buildings (domestic and non-domestic).
- Reflective of, and dovetailing with, national and local targets and policies covering fuel poverty, carbon reduction, energy efficiency and heat at a local level.
- Understanding of current energy performance and heat use of buildings and identifying opportunities for reducing heat demand, increasing energy efficiency, low carbon heat sources and heat storage.
- Designating heat zones that take into consideration area based, local socio-economic assessment.
- Costed and phased planning and zoning for delivery including area-based energy efficiency improvements, installation of low carbon heat supplies and implementation of new low carbon energy supply infrastructure.
- Quantifying short term benefits and longer-term impacts on the local economy and employment.

[1] Scottish Government (2021) **Draft Heat in Buildings Strategy**

1.2 Local Context

Moray is a geographically varied region of Scotland, incorporating the Moray Firth coastline, lowlands, and mountainous areas which are part of the Cairngorms National Park. The area covers just over 2,200 square kms and has a low population density. Moray has higher percentages of people aged over 45 when compared with the Scottish average. In particular, the data indicates there are higher percentages of older people in more coastal and rural areas.

Moray is home to more than 45 distilleries, and its recent history has been inextricably linked with the Royal Air Force and the bases at Lossiemouth and nearby Kinloss (now barracks).

Moray Councils pilot LHEES project will focus predominately on carbon reduction potential, replicability and integration into longer term planning. The areas of Moray to be focused on include Burghead, area wide rural and a low carbon masterplan for Elgin.

2. POLICY REVIEW

To explore the current local policy context, this section summarises the existing targets and objectives relevant to the preparation of the LHEES contained in Moray Council's strategy and policy documents. Identifying existing targets will allow the LHEES to align with Moray Council's priorities and contribute towards achieving these targets.

Key findings

- Generally, all the Council's policies which relate to the LHEES lack measurable aims and targets.
- Within the domestic sector, the Council's targets for social housing are driven by the statutory requirement to meet EESSH/EESSH2. Private sector targets are linked to the availability and maximised use of grant funding sources such as EES:ABS. There is a lack of targets for the non-domestic sector out with public buildings.
- Moray Council has set the aim of becoming carbon neutral by 2030. However, no plans or measurable targets related to this were available. The LHEES should fit within this aim.
- Tackling fuel poverty is a priority. The council aims for fuel poverty to be reduced, but targets have not been set.

2.1 Methodology

A rapid review was conducted of the strategies, plans and policies published on Moray Council's website. The aim of the review was to identify all targets, aims, outcomes and objectives which may be relevant to the development of the LHEES.

During an initial screening process, the following documents were eliminated from the review:

- Integrated impact assessment documents.
- Documents titled as a 'status', 'register', 'profile' or 'assessment', as it was presumed these would not contain targets, objectives, aims or outcomes.
- Documents which had been superseded (documents which were out of date but had not been superseded were included in the review).

Documents were visually scanned for information on eight themes relevant to the development of an LHEES:

- Domestic energy efficiency
- Non-domestic energy efficiency

- Heat decarbonisation
- Carbon reduction
- Economic development (specific to a low-carbon economy)
- Planning/development for both domestic and non-domestic buildings
- Fuel poverty
- Community engagement.

During this preliminary scan, any documents which were referred to in relation to any of the eight themes were also included in the review.

Full list of the documents which were reviewed:

- Active Travel Strategy 2016-21
- Carbon Conscious Elgin Town Centre - Workshop 1 Summary
- Corporate Plan 2023
- Economic Strategy 2019-29
- Emergency Planning Policy and Procedures
- Energy Policy and Strategy –Non-Domestic Operational Properties
- Heating Policy
- LDP Supplementary Guidance: Climate Change
- Local Housing Strategy 2019-24
- Local Transport Strategy Part 1
- Local Transport Strategy Part 2
- Moray 2026 – A Plan for the Future
- Moray Home Energy Efficiency Programme (2017 Report to Cabinet)
- Poverty Strategy 2018-21
- ~~Proposed~~ Local Development Plan 2020
- Risk Management Policy
- Risk Management Strategy 2008
- Service Plan 19-20
- Single Equality Scheme

- Skills Investment Plan.

2.2 Results

2.2.1 Domestic Energy Efficiency

Targets relating to domestic energy efficiency largely focus on social housing, set by the Energy Efficiency Standard for Social Housing (EESSH). The Local Housing Strategy 2019 aims to:

- Improve the condition and energy efficiency of housing and minimise fuel poverty.
- Ensure that new housing is built to high standards of energy efficiency.

There is a commitment to spend all of the available Areas Based Scheme (ABS) funding through the Home Energy Efficiency Programme for Scotland (HEEPS), but no targets specified for impact.

No measurable targets regarding private housing were identified.

2.2.2 Non-Domestic Energy Efficiency

Targets aiming to increase the energy efficiency of the private non-domestic sector were not identified.

2.2.3 Heat Decarbonisation

The decarbonisation of space heating in Moray Council's area was briefly mentioned within the Local Housing Strategy.

- We will ensure that as many households as possible in Moray live in a warm, comfortable home they can afford to heat.
- We will seek to reduce energy consumption in homes and promote the use of renewable energy sources for heating.
- We will participate in programmes to de-carbonise the heating supply.

2.2.4 Carbon Reduction

Moray Council set the aim of becoming carbon neutral by 2030. However, no publicly available documents or interim targets were found alongside this goal.

During the LHEES pilot project the Climate Change Strategy was developed but was not included within the policy review.

Nevertheless, the Council refers to the national targets set by the Climate Change (Scotland) Act 2009: an 80% reduction in Scotland's carbon emissions by 2050, with an interim target of at least 42% reduction by 2020.

From the policy review it was clear that the Council are looking at reducing their own carbon impact, by targeting to reduce the Council's energy consumption by 2% per annum on a year-to-year basis.

2.2.5 Economic Development (specific to low carbon economy)

No targets/aims specifically relating to the low carbon economy were identified.

Through the Local Development Plan, the Council encourages the efficient use of land and promotes low carbon and sustainable development.

2.2.6 Planning/Development

No targets/aims specifically relating to planning and development were identified.

With regards to new developments, Policy DP1 (i)(j) of the Moray Local Development Plan 2020 requires that:

- All developments must be designed so as to ensure that all new buildings avoid a specified and rising proportion of the projected greenhouse gas emissions from their use (calculated on the basis of the approved design and plans for the specific development) through the installation and operation of low and zero-carbon generating technologies.

2.2.7 Fuel Poverty

Moray Council recognises the inequalities present within the council area with regards to fuel poverty. The Local Housing Strategy provides the most detail. However measurable targets are not present.

"The Council's strategic actions on fuel poverty will continue to focus on helping fuel poor households to reduce their energy consumption. This will be achieved by improving the energy efficiency of their homes and providing them with support and advice on ways to save on energy costs. We will seek to ensure that fuel poverty measures are targeted at households at highest risk of fuel poverty. This will include households in low incomes, living in hard-to-heat properties and vulnerable to cold. Many of these households will be living in remote and rural areas. By reducing energy in homes, our actions to address fuel poverty will also contribute to climate change carbon saving objectives. However, to meet these objectives, it is recognised that actions to improve the energy efficiency of dwellings will also need to be directed to non-fuel poor households" (LHS 2019-2024)

2.2.8 Community Engagement

Moray Council aims to increase public participation in the design and delivery of their services.

- We will promote community empowerment and support community participation and involvement.

- More of our activities, services and plans are influenced by the communities they serve.
- Our communities' ability to address their own needs and aspirations is improved.
- We are more successful in developing a shared understanding between the Council and communities that helps us to design the future together.

2.3 Summary

To conclude, while there is a wide-reaching strategic framework to guide interventions in Moray, much of this is high level and does not identify clear priorities and specific measurable actions.

It is also worth noting that the following documents were reviewed and contained no references to any of the eight LHEES themes:

- Emergency Planning Policy and Procedures
- Risk Management Policy
- Risk Management Strategy 2008
- Skills Investment Plan

However, during the LHEES pilot project the Council developed a Climate Change Strategy which was not covered within this policy review.

3. BASELINE DATA REPORT

The baseline reporting provides an overview of the domestic housing stock, their energy efficiency and insulation status (average and range in variation), fuel types, present renewable heating used, and the heat demand of the area.

This report focuses on the entire council area of Moray. To create the Baseline Data Report for Moray Council Local Heat and Energy Efficiency Strategy (LHEES), we used data from Home Analytics (version 3.5). Corporate Address Gazetteer data from Moray Council was also referred to. EPC data was provided for the non-domestic stock throughout Moray; however, this does not account for all non-domestic properties and it is unknown to what extent this data represents the overall non-domestic stock.

3.1 Key Findings

3.1.1 Domestic stock

Key findings for the overall council area of Moray

- Moray has a representative tenure mix compared to the rest of Scotland.
- Moray holds a larger proportion of houses compared to the rest of Scotland.
- The average energy efficiency of the domestic properties is lower by five SAP points than the national average.
- Across property types, pre-1919 houses are the least energy efficient.
- Across tenure types, privately rented properties are the least energy efficient.
- The proportion of properties using mains gas as their main heating fuel (64%) is much lower than the national level (81%).
- The proportion of properties using electricity as their main heating fuel (14%) is higher than the national level (10%).
- Proportionally a lot more households are using oil as the main heating fuel (17%) compared to the national level (6%).
- The insulation levels of cavity wall properties in the LHEES area (54%) are considerably lower than national levels (73%).
- Loft insulation rates (46% with 250mm or more in Moray) are similar to that of national levels (46% with 250mm or more in Scotland).

Key findings for the Burghead area

- A higher proportion of owner-occupied properties compared to the rest of Moray.
- A higher proportion of pre-1919 properties compared to the rest of Moray.
- A higher proportion of houses compared to the rest of Moray.
- Average energy efficiency of the domestic properties is lower by seven SAP points than the rest of Moray.
- Predominant fuel types are oil (53%) and electricity (40%).
- A high proportion of walls are of a solid construction (45%).

Key findings for the Elgin area

- A lower proportion of owner-occupied properties compared to the rest of Moray.
- A lower proportion of houses compared to the rest of Moray.
- Average energy efficiency of the domestic properties is four SAP points higher than the rest of Moray.
- A higher proportion of mains gas heated properties (86%) than the rest of Moray (64%).

3.1.2 Non-domestic stock

Key findings for the overall council area of Moray

- Two-fifths of buildings with an EPC have the lowest band of G.
- A small proportion have an EPC band C or greater.

Key findings for the Burghead area

- A small sample (five buildings).
- Three-fifths of buildings with an EPC have the lowest band of G.
- None of the five buildings have an EPC band C or greater.

Key findings for the Elgin area

- Two-thirds of buildings with an EPC have the lowest band of G.

- A small proportion have an EPC band C or greater.

3.2 Domestic Housing stock

This analysis covers the entire housing stock in the Moray Council area. Usable data was available for 46,901 properties in Home Analytics.

Analysis has also been carried out on two geographical areas:

- Burghead (917 properties) (2% of overall stock)
- Elgin (10,832 properties) (23% of overall stock)

From Home Analytics, there were 46,901 usable entries of domestic properties across the council area. Data on a further 346 properties was excluded, as no useful data was provided (i.e., Home Analytics showed 'unknown' for the relevant variables). The Home Analytics data on the 46,901 properties has formed the basis for the current analysis.

3.2.1 Tenure

Tenure (overall stock)

Moray has a similar tenure mix to the rest of the country. There is a slightly lower portion of social rented properties (23%) than the rest of the country (25%). The owner-occupied sector in Moray is also very similar to the national average, with 64 % of the domestic properties being owner occupied, compared with 65% of the properties in Scotland overall. There is a slightly larger proportion of privately rented properties (13%) compared to the national average of 10%[1].

Table 1: Tenure for flats and houses (overall stock)

Housing type	Social rented	Owner Occupied	Privately rented	Totals
Flats total	3,708	2,862	1,399	**7,969**
Houses total	7,036	27,001	4,895	**38,932**
Total	**10,744**	**29,863**	**6,294**	**46,901**

As for property types, the majority of rented properties (both privately and social renting) are houses (70%), whereas nationally 42% of privately and social rented properties are houses[2]. This difference can be explained by the relatively low number of flats in this local authority (see section 2.2).Figure 1compares the property types and tenures against the national average.

[2] Scottish Housing Condition Survey: 2018 Key Findings: Scottish Government (2020)

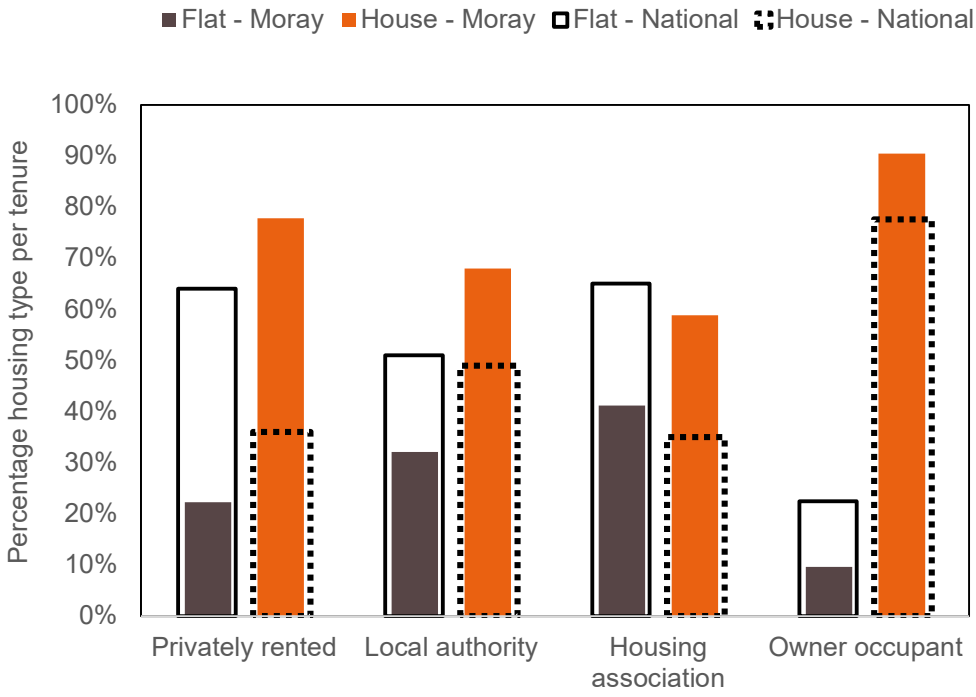

Figure 1: Flats and houses per tenure type for Moray Council area (filled bars) and the rest of Scotland (outlined bars)

Tenure (Burghead)

Almost three-quarters (72%) of the properties in the Burghead area are owner occupied, a higher proportion to the overall Moray council area (64%). Consequently, there are lower proportions of social (18%) and privately rented (9%) compared to the overall council area (23% and 13%, respectively).

Table 2: Tenure for flats and houses (Burghead)

Housing type	Social rented	Owner Occupied	Privately rented	Totals
Flats total	9	62	28	**99**
Houses total	158	602	58	**818**
Sub-total	**167**	**664**	**86**	**917**

As for property types, the majority of rented properties (both privately and social renting) are houses (85%), compared to 70% of the overall council area and double the national average of 42%[3].Figure 2compares the property types and tenures against the national average.

[3] Scottish Housing Condition Survey: 2018 Key Findings: Scottish Government (2020)

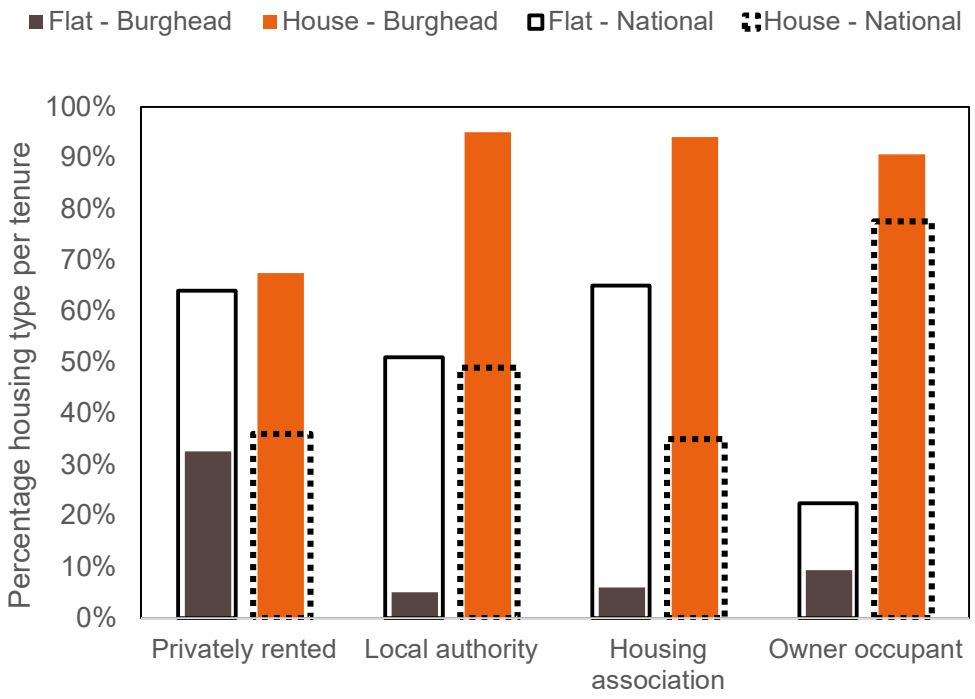

Figure 2: Flats and houses per tenure type for Burghead (filled bars) and the rest of Scotland (outlined bars)

Tenure (Elgin)

A lower proportion of properties in Elgin are owner occupied (57%), compared to the overall Moray council area (64%). As such, there are a higher proportion of social rented (29%) compared to 23% of the council area. A similar proportion of properties are privately rented (14%) compared to 13% of the council area.

Table 3: Tenure for flats and houses (Elgin)

Housing type	Social rented	Owner Occupied	Privately rented	Totals
Flats total	1,349	925	574	**2,848**
Houses total	1,760	5,293	931	**7,984**
Sub-total	**3,109**	**6,218**	**1,505**	**10,832**

As for property types, over half of rented out properties (both privately and social renting) are houses (58%), far less when compared to 70% of the overall council area. When compared to the national average (42%), this proportion is considerably higher[4]. Figure 3compares the property types and tenures against the national average.

[4] Scottish Housing Condition Survey: 2018 Key Findings: Scottish Government (2020)

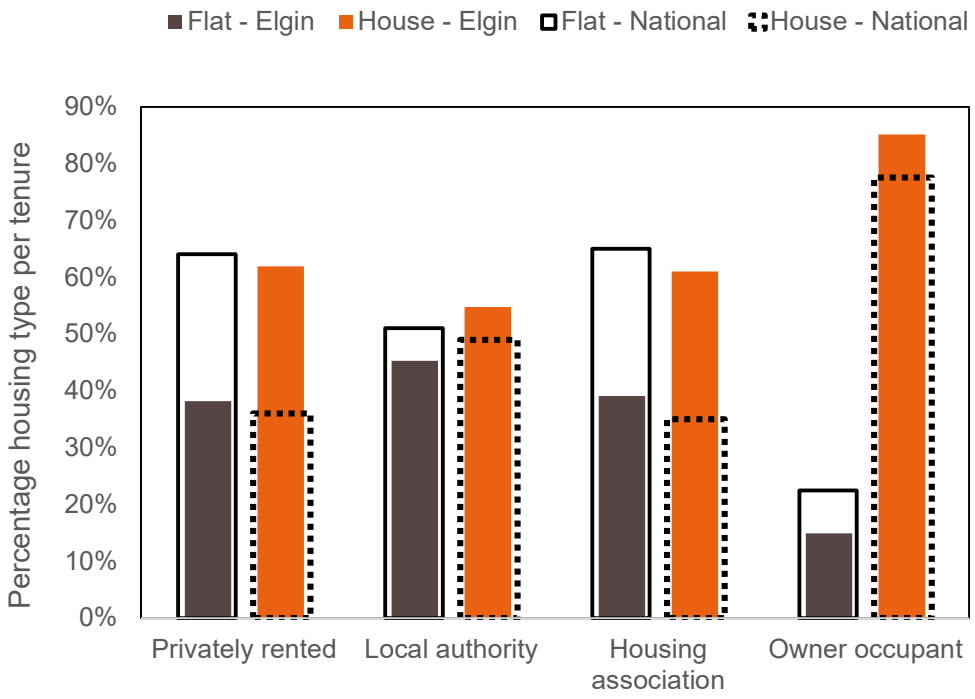

Figure 3: Flats and houses per tenure type for Elgin (filled bars) and the rest of Scotland (outlined bars)

3.2.2 Property types and age

Property types and age (overall stock)

Across all stock, over four-fifths of the properties are houses, and under one-fifth are flats, indicating the overall council area has more houses than the national average (63% houses, 37% flats)[5].

As for age bands and property types, the age bands in the baseline dataset differ slightly from those given by the Scottish Household Condition Survey (SHCS). The SHCS cut off point is pre- or post-1945, whereas one of the baseline data age bands is 1920-1949, hampering a strict 1:1 comparison to national figures. The data indicates that the LHEES area has a relatively large proportion of pre-1919 properties (25%) compared with the pre-1919 properties in Scotland (18%). The predominant age band is 1950-1983 (40%), which is almost on par with the national average (43%) built during the same period. With regards to properties built after 1983, the same proportion of properties nationally were built in this period (28%).

[5] Scottish Housing Condition Survey: 2018 Key Findings: Scottish Government (2020)

Table 4: Property types and age-bands of the domestic properties (overall stock)

Property type	Pre-1919	1919-1949	1950-1983	1984-1991	1992-2002	Post-2002	Totals
Flats (total)	4%	2%	6%	1%	2%	2%	**17%**
Houses (total)	21%	6%	34%	5%	8%	9%	**83%**
Detached house	12%	1%	10%	2%	4%	6%	**36%**
Semi-detached house	5%	3%	10%	1%	3%	3%	**25%**
End-terraced house	2%	1%	6%	<1%	<1%	<1%	**10%**
Mid-terraced house	2%	1%	7%	<1%	<1%	<1%	**11%**
Totals	**25%**	**8%**	**40%**	**6%**	**10%**	**12%**	

Property types and age (Burghead)

In the Burghead area, 89% of the properties are houses, and the remaining 11% are flats, indicating Burghead proportionally more houses than the overall council area (83%) and the national average (63% houses, 37% flats)[6].

The data indicates that one-third of the Burghead properties were built before 1919, a larger proportion when compared to the overall council area (25%) and national average (18%). Proportionally less properties were built in the 1950-1983 period (27%) compared the overall council area (40%), and the national average (43%).

Table 5: Property types and age-bands of the domestic properties (Burghead)

Property type	Pre-1919	1919-1949	1950-1983	1984-1991	1992-2002	Post-2002	Totals
Flats (total)	6%	<1%	1%	1%	1%	2%	**11%**
Houses (total)	28%	6%	26%	9%	9%	12%	**89%**
Detached house	9%	1%	8%	4%	6%	9%	**38%**
Semi-detached house	8%	3%	10%	4%	1%	2%	**28%**
End-terraced house	5%	<1%	4%	<1%	<1%	<1%	**11%**
Mid-terraced house	6%	1%	4%	<1%	<1%	1%	**12%**
Totals	**33%**	**6%**	**27%**	**9%**	**10%**	**15%**	

Property types and age (Elgin)

In the Elgin area, around three-quarters of the properties are houses, and the remaining one-quarter is flats, indicating Elgin has proportionally less houses than the overall council area (83%), but more than the national average (63% houses, 37% flats)[7].

The data indicates that almost one-half (47%) of properties in Elgin were built between 1950 and 1983, a higher proportion than the overall council area (40%), and

[6] Scottish Housing Condition Survey: 2018 Key Findings: Scottish Government (2020)
[7] Scottish Housing Condition Survey: 2018 Key Findings: Scottish Government (2020)

the national average (43%). A considerably smaller proportion of properties were built before 1919 (12%) compared to the overall area (25%) and national average (18%).

Table 6: Property types and age-bands of the domestic properties (Elgin)

Property type	Pre-1919	1919-1949	1950-1983	1984-1991	1992-2002	Post-2002	Totals
Flats (total)	4%	4%	9%	2%	4%	3%	**26%**
Houses (total)	8%	6%	38%	4%	9%	9%	**74%**
Detached house	3%	1%	7%	2%	4%	4%	**21%**
Semi-detached house	3%	2%	13%	2%	4%	4%	**28%**
End-terraced house	1%	1%	8%	<1%	<1%	<1%	**11%**
Mid-terraced house	1%	2%	10%	<1%	1%	<1%	**14%**
Totals	**12%**	**10%**	**47%**	**6%**	**12%**	**13%**	

3.3 Energy efficiency of domestic stock

3.3.1 Energy Efficiency ratings and heating costs

Energy Efficiency Ratings and heating costs (overall stock)

The average modelled heating costs across all properties is £1,138. For mains gas heated properties, the average is £998 and for electrically heated £1,123. For all other heating fuel types combined, the average is £1,505. These heating costs are generated from EPC results and do not take into account most appliance use. They are based on modelled heating and hot water usage, with the only appliance use considered being fixed lighting and ventilation.

It should be noted that whilst property size is not accounted for in the EE rating, it is accounted for in the overall fuel costs. Consequently, there are instances when fuel costs are higher for properties with lower EE ratings.

The average Energy Efficiency rating (EE rating) in the LHEES areas is 60, which is 5 points lower than the national average[8]. Overall, post-2002 built flats have the highest average EE rating with an average of 79, equivalent to a high EPC C-band. Pre-1919 buildings have the lowest EE ratings, with pre-1919 houses scoring an average 48 points, equivalent to an E-band, and pre-1919 flats scoring an average 54 points, equivalent to an E-band. These differences are reflected in the modelled energy bills, which are highest for pre-1919 houses.

Table 7 shows the average EE rating, EE band and heating costs[9] for each of the property types.

Table 7: EE rating/ band and estimated heating bills per housing type (overall stock)

Housing type		Pre-1919	1919-1949	1950-1983	1984-1991	1992-2002	Post-2002	Average
Flats	EE rating/ band	54 (E)	65 (D)	69 (C)	71 (C)	71 (C)	79 (C)	**67 (D)**
	Estimated energy bill (£/yr)	£1,214	£809	£659	£576	£612	£430	**£763**
Houses	EE rating/ band	48 (E)	54 (E)	59 (D)	62 (D)	66 (D)	76 (C)	**58 (D)**
	Estimated energy bill (£/yr)	£1,635	£1,243	£1,112	£1,095	£1,043	£811	**£1,215**
Overall averages	**EE rating/ band**	**49 (E)**	**57 (D)**	**60 (D)**	**64 (D)**	**67 (D)**	**77 (C)**	**60 (D)**
	Estimated energy bill (£/yr)	**£1,569**	**£1,138**	**£1,047**	**£971**	**£956**	**£740**	**£1,138**

[8] Scottish Housing Condition Survey: 2018 Key Findings: Scottish Government (2020)

[9] The heating costs generated from EPC results are based on modelled heating and hot water usage, with the only appliance use considered being fixed lighting and ventilation. As such these cannot be compared to the Scottish House Condition Survey average as the later includes appliance use.

Looking at the EE bands, proportionally there are more flats in the higher bands (A-C), whilst most houses are in the lower banding (D-E) (Figure 4). When compared to the national pattern, a lower proportion of flats and houses in the LHEES areas are in the A-C banding, a similar proportion are in the D-E banding and a higher proportion are in lowest banding (F-G).

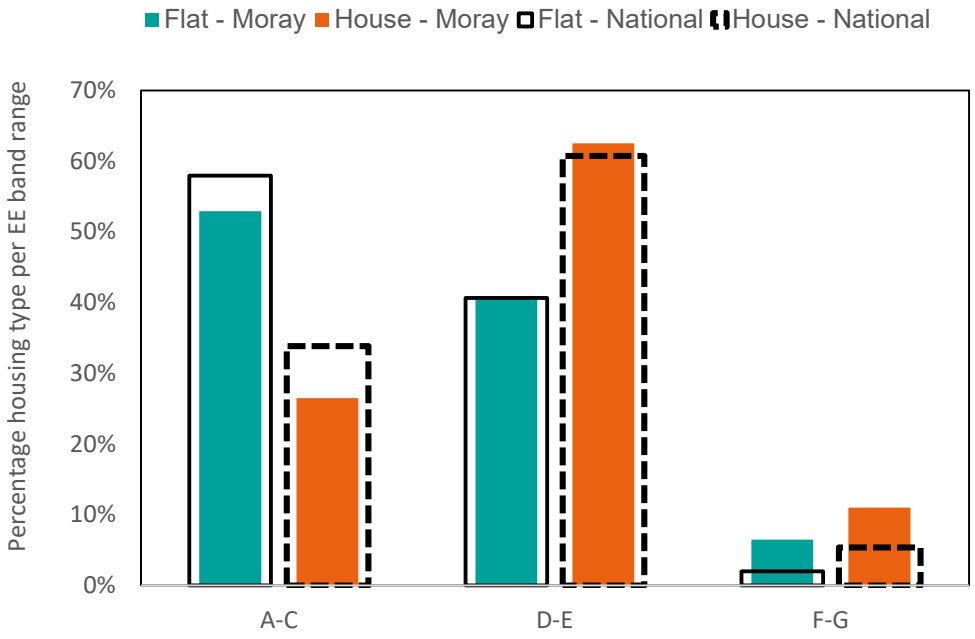

Figure 4:Spread of the EE banding of the flats and houses in the Moray Council area (filled bars) and in Scotland (outlined bars)

Social rented properties have the lowest modelled heating bills. Social housing needs to conform to the Energy Efficiency Standard for Social Housing (EESSH), which explains this (Table 8). The highest modelled heating bills are estimated for owner occupied houses, and the least efficient properties are privately rented houses.

Table 8: SAP rating and estimated heating bills per tenure type (overall stock)

Housing type		Social rented	Owner Occupied	Privately rented
Flats	EE rating/ band	71 (C)	63 (D)	62 (D)
	Estimated energy bill (£/yr)	£586	£939	£875
Houses	EE rating/ band	63 (D)	58 (D)	55 (D)
	Estimated energy bill (£/yr)	£900	£1,291	£1,249
Overall averages	**EE rating/ band**	**66 (E)**	**58 (D)**	**57 (D)**
	Estimated energy bill (£/yr)	**£791**	**£1,257**	**£1,166**

Energy Efficiency ratings and heating costs (Burghead)

The average modelled heating costs across all properties in Burghead is £1,255, which is higher than the overall council average (£1,138). This is likely resultant from

the heating fuel mix in Burghead, which has a higher proportion of expensive heating fuels (see Section 3.3.2).

The average Energy Efficiency rating (EE rating) of 53 is below the council average by 7 points and 12 points below the national average[10]. Overall, post-2002 built houses have the highest average EE rating with an average of 73 equivalent, to a high EPC C-band. Pre-1919 buildings have the lowest EE ratings, with pre-1919 houses scoring an average 43 points, equivalent to an E-band, and pre-1919 flats scoring an average 49 points, equivalent to an E-band. Modelled energy bills are highest for pre-1919 houses.

Table 9: EE rating/ band and estimated heating bills per housing type (Burghead)

Housing type		Pre-1919	1919-1949	1950-1983	1984-1991	1992-2002	Post-2002	Average
Flats	EE rating/ band	49 (E)	55 (D)	56 (D)	56 (D)	72 (C)	72 (C)	**57 (D)**
	Estimated energy bill (£/yr)	£1,166	£1,301	£1,002	£703	£523	£509	**£920**
Houses	EE rating/ band	43 (E)	50 (E)	52 (E)	55 (D)	61 (D)	73 (C)	**53 (E)**
	Estimated energy bill (£/yr)	£1,604	£1,279	£1,264	£1,209	£1,132	£850	**£1,296**
Overall averages	**EE rating/ band**	**44 (E)**	**50 (E)**	**52 (E)**	**55 (D)**	**62 (D)**	**72 (C)**	**53 (E)**
	Estimated energy bill (£/yr)	**£1,530**	**£1,280**	**£1,254**	**£1,173**	**£1,051**	**£801**	**£1,255**

Looking at the EE bands in the Burghead LHEES area, proportionally there are more flats than houses in the A-C band. There are a similar proportion of flats and houses sitting in the D-E band. A higher proportion of houses are in the lowest banding (F-G) than flats (Figure 5).

When compared to the national pattern, a lower proportion of both flats and houses in the Burghead LHEES area are in the higher band (A-C), with a similar proportion of houses and larger proportion of flats in the D-E banding. For all property types, a higher proportion are in lowest banding (F-G).

[10] Scottish Housing Condition Survey: 2018 Key Findings: Scottish Government (2020)

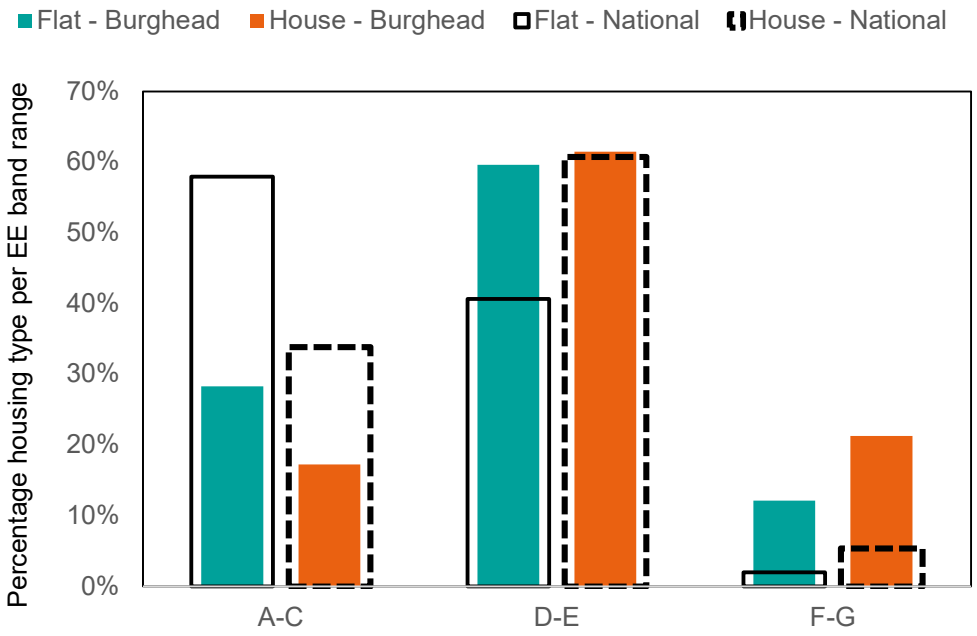

Figure 5: Spread of the EE banding of the flats and houses in Burghead (filled bars) and in Scotland (outlined bars)

Socially rented properties are estimated to have the lowest heating bills. The highest modelled heating bills are estimated for owner occupied houses. The most efficient are privately rented flats (Table 10). This is unlike the overall council area where social rented are the most efficient and privately rented the least. It is worth noting that there is a small sample of privately rented properties in Burghead (86 properties which equates to 9 % of the stock).

Table 10: SAP rating and estimated heating bills per tenure type (Burghead)

Housing type		Social rented	Owner Occupied	Privately rented
Flats	EE rating/ band	60 (D)	53 (E)	65 (D)
	Estimated energy bill (£/yr)	£691	£1,032	£746
Houses	EE rating/ band	54 (E)	53 (E)	52 (E)
	Estimated energy bill (£/yr)	£1,142	£1,339	£1,262
Overall averages	**EE rating/ band**	**54 (E)**	**53 (E)**	**56 (E)**
	Estimated energy bill (£/yr)	**£1,118**	**£1,310**	**£1,094**

Energy Efficiency ratings and heating costs (Elgin)

The average modelled heating costs across all properties is £951, which is considerably lower than the overall council average (£1,138). This is likely resultant from the heating mix in Elgin having a higher proportion of cheaper heating fuels (see Section 3.3.2).

The average Energy Efficiency rating (EE rating) is 64, which is higher than the Council average by 4 points and 1 point below the national average[11]. Overall, post-2002 built houses have the highest average EE rating with an average of 73, equivalent to a high EPC C-band. Pre-1919 buildings have the lowest EE ratings, with pre-1919 houses scoring an average 50 points, equivalent to an E-band, and pre-1919 flats scoring an average 54 points, equivalent to an E-band. These differences are reflected in the modelled energy bills, which are highest for pre-1919 houses.

Table 11: EE rating/ band and estimated heating bills per housing type (Elgin)

Housing type		Pre-1919	1919-1949	1950-1983	1984-1991	1992-2002	Post-2002	Average
Flats	EE rating/ band	54 (E)	64 (D)	65 (D)	70 (C)	73 (C)	80 (C)	**67 (D)**
	Estimated energy bill (£/yr)	£1,055	£780	£695	£586	£545	£397	**£697**
Houses	EE rating/ band	50 (E)	57 (D)	61 (D)	65 (D)	69 (C)	77 (C)	**63 (D)**
	Estimated energy bill (£/yr)	£1,559	£1,118	£1,043	£1,033	£895	£681	**£1,042**
Overall averages	**EE rating/ band**	**52 (E)**	**60 (D)**	**62 (D)**	**67 (D)**	**70 (C)**	**78 (C)**	**64 (D)**
	Estimated energy bill (£/yr)	**£1,388**	**£973**	**£976**	**£894**	**£795**	**£602**	**£951**

Looking at the EE bands, proportionally there are more flats than houses in the higher band (A-C), and more houses in the D-E band. A similar proportion of flats and houses are in the lowest banding (F-G) (Figure 6). When compared to the national pattern, a lower proportion of flats in Elgin are in the A-C banding, and a larger proportion of flats are in the D-E banding. The proportion of houses across all bandings is very similar to the national pattern.

[11] Scottish Housing Condition Survey: 2018 Key Findings: Scottish Government (2020)

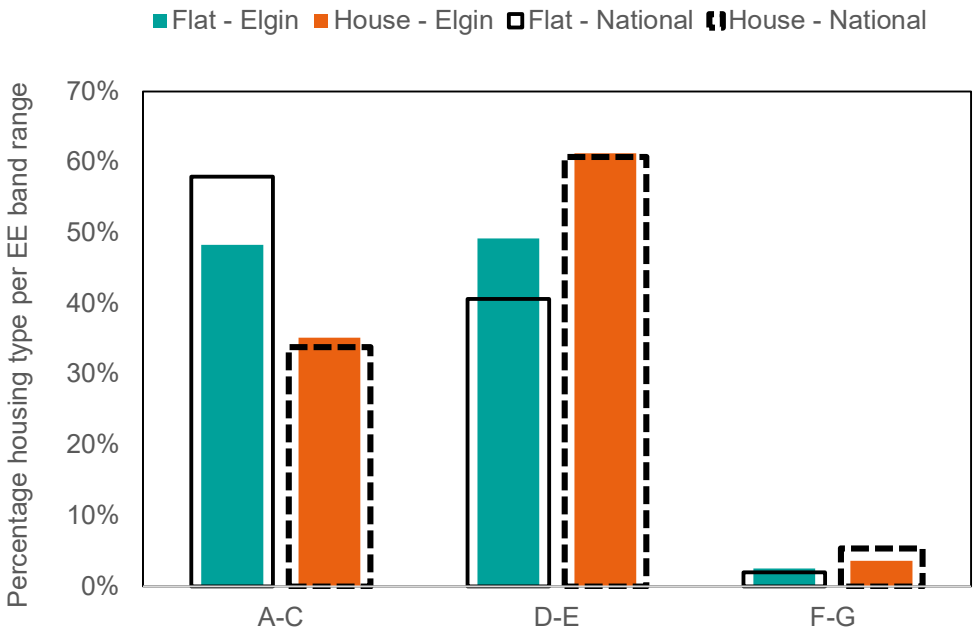

Figure 6: Spread of the EE banding of the flats and houses in Elgin (filled bars) and in Scotland (outlined bars)

Like the overall council area, social rented properties have the lowest modelled heating bills. The highest modelled heating bills and least efficient properties are owner occupied houses. Social housing needs to conform to the Energy Efficiency Standard for Social Housing (EESSH), which explains this difference (Table 12).

Table 12: SAP rating and estimated heating bills per tenure type (Elgin)

Housing type		Social rented	Owner Occupied	Privately rented
Flats	EE rating/ band	69 (C)	64 (D)	65 (D)
	Estimated energy bill (£/yr)	£609	£797	£745
Houses	EE rating/ band	66 (D)	61 (D)	64 (D)
	Estimated energy bill (£/yr)	£799	£1,132	£986
Overall averages	**EE rating/ band**	**67 (E)**	**62 (D)**	**64 (D)**
	Estimated energy bill (£/yr)	**£716**	**£1,083**	**£894**

3.3.2 Heating fuel types

Heating fuel types (overall stock)

Mains gas is the main heating fuel for 64% of the households in the overall council area (Table 13), which is considerably lower than the national average of 81%. Oil as the main off-gas heating fuel (17%) is substantially higher than the national proportion of 6%. Electric heating accounts for 14% of the properties, compared to 10% nationally. Proportionally more households are using solid fuel (2%), compared

the national levels of 1%. The proportion of properties heated by LPG and communal heating is on par with the national averages.

Table 13: Main heating fuel type per property type (overall stock)

Housing type	Mains gas	Electricity	LPG	Oil	Biomass/Solid	Communal
Flats	12%	4%	<1%	<1%	<1%	<1%
Houses	53%	10%	1%	17%	2%	<1%
Total	**64%**	**14%**	**1%**	**17%**	**2%**	**1%**

Heating fuel types (Burghead)

Oil is the main heating fuel type for 53% of the households in the Burghead area (Table 14), which is considerably higher than the overall council area (17%) and the national average of 6%. Electric heating accounts for 40% of the properties, compared to 14% in Moray overall and 10% nationally. There are no properties heated by mains gas.

Table 14: Main heating fuel type per property type (Burghead)

Housing type	Mains gas	Electricity	LPG	Oil	Biomass/Solid	Communal
Flats	0%	8%	0%	2%	<1%	0%
Houses	0%	32%	2%	50%	5%	0%
Total	**0%**	**40%**	**2%**	**53%**	**5%**	**0%**

Fuel types (Elgin)

Mains gas is the main fuel type for 86% of households (Table 15), which is higher than the main council area (64%) and the national average (81%). Electricity as the main off-gas fuel (11%) is lower than the overall council area (14%) and slightly higher than the national average (10%). A very small proportion (3%) use heating fuels other than mains gas and electricity compared to the main council area (22%) and nationally (9%).

Table 15: Main fuel type per property type (Elgin)

Housing type	Mains gas	Electricity	LPG	Oil	Biomass/Solid	Communal
Flats	20%	5%	<1%	<1%	<1%	1%
Houses	66%	6%	<1%	1%	<1%	<1%
Total	86%	11%	<1%	1%	<1%	1%

3.3.3 Off gas areas

The proportion of off-gas properties across Moray is 36%. The distribution of data zones, showing the proportion of off-gas properties is shown in Figure 7.

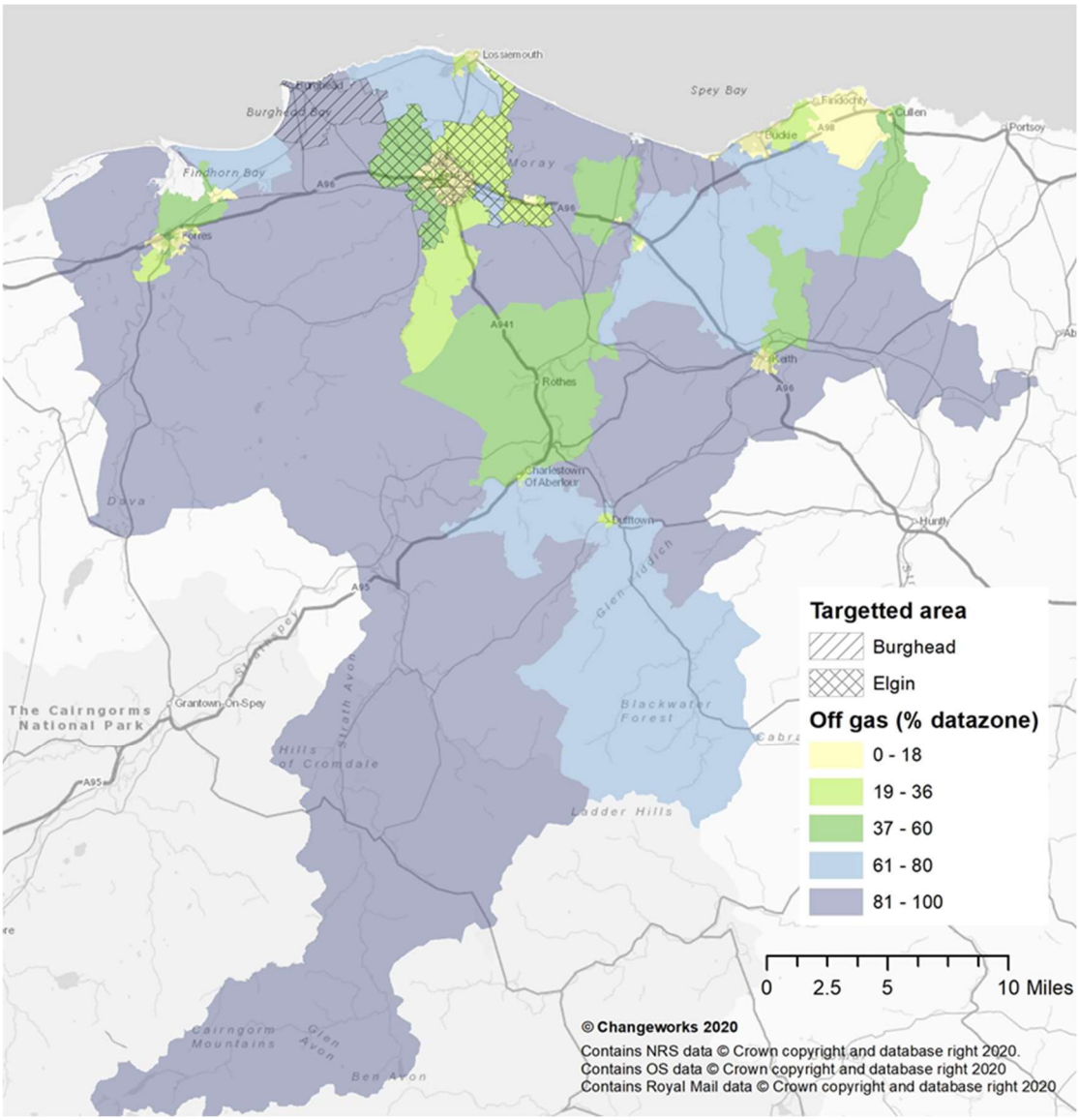

Figure 7: Spread of off-gas areas across Moray.

The areas of Burghead and Elgin are highlighted below in Figure 8, showing the proportion of off-gas properties in the data zones. As shown previously, the Burghead area is off-gas.

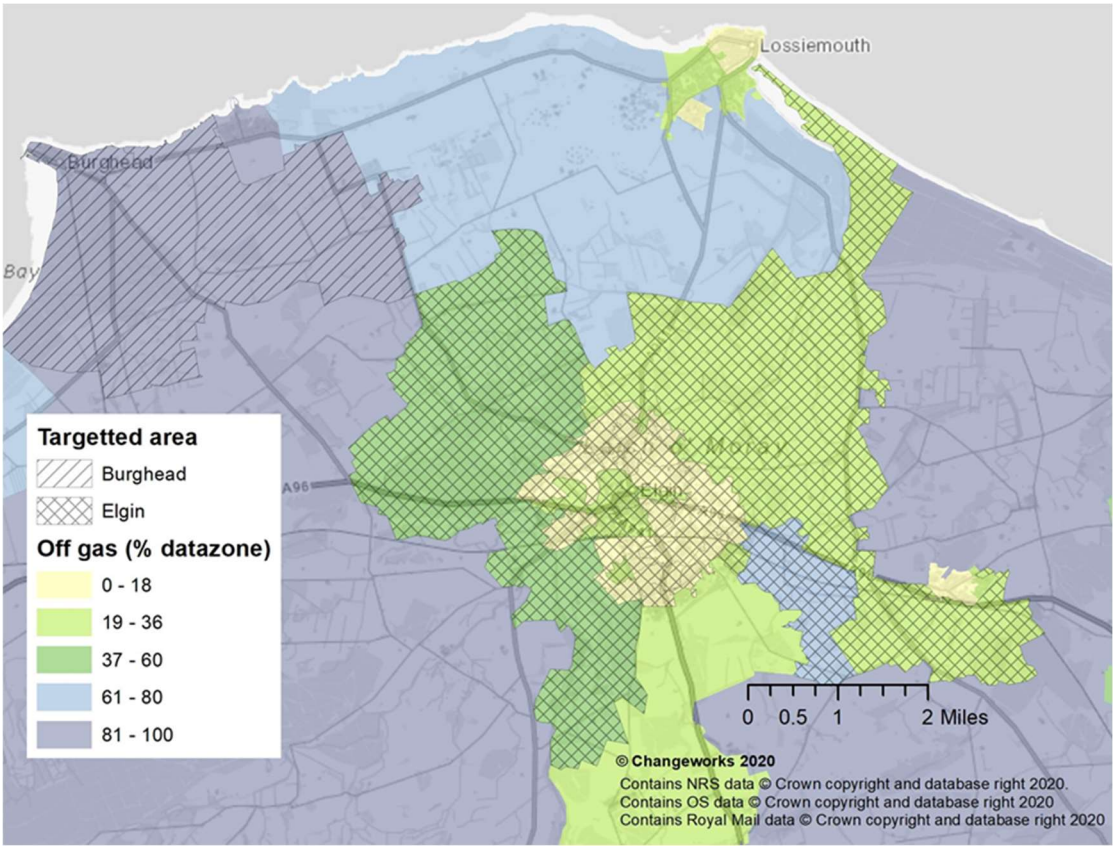

Figure 8: Spread of off-gas properties across Burghead and Elgin.

3.3.4 Loft and wall insulation status

Wall insulation (overall stock)

Similar amounts of properties in the overall council area have cavity walls and solid wall (37% and 36% respectively). The insulation levels of the cavity wall properties are considerably lower than the national average (54% in Moray, 73% in Scotland). Social rented properties in Moray are more likely to have cavity wall insulation (70%).

Most solid stone or brick properties have uninsulated walls (84%), which is slightly higher than the national average (81%). Modern timber frame properties are assumed to have insulated walls from when they were built, however 21% in Home Analytics are recorded as being uninsulated. It is worth noting that it is common for non-traditional pre- and post-war timber houses to be recorded as timber frame (e.g., Swedish timber, Weir timber) when they should be recorded as “system-built”. From the system-built properties, 60% have received external wall insulation over the past years.

Table 16: Wall construction and insulation status of tenures (overall stock)

Tenure type	Cavity Construction	Solid Brick or Stone	System Built	Timber Frame
Privately rented	1,598	3,035	86	1,575
Uninsulated walls	828	2,644	41	225
Uninsulated walls (%)	52%	87%	48%	14%
Social rented	5,855	1,644	580	2,665
Uninsulated walls	1,774	1,391	245	482
Uninsulated walls (%)	30%	85%	42%	18%
Owner Occupied	9,783	12,310	761	7,009
Uninsulated walls	5,287	10,241	288	1,705
Uninsulated walls (%)	54%	83%	38%	24%
Totals	**17,236**	**16,989**	**1,427**	**11,249**
Uninsulated walls	**7,889**	**14,276**	**574**	**2,412**
Uninsulated walls (%)	**46%**	**84%**	**40%**	**21%**

Wall insulation (Burghead)

The predominant wall construction in Burghead is solid wall (45%), resultant from the high proportion of properties built before 1919.

The insulation levels of the cavity wall properties (46%) are less than for Moray overall (54%) and the national average (73%). Proportionally, socially rented properties are more likely to have cavity wall insulation (53%).

Most Burghead solid stone or brick properties have uninsulated walls (81%), which is slightly lower than the overall council area (84%), and on par with the national average.

Table 17: Wall construction and insulation status of tenures (Burghead)

Tenure type	Cavity Construction	Solid Brick or Stone	System Built	Timber Frame
Privately rented	8	55	0	23
Uninsulated walls	5	46	0	5
Uninsulated walls (%)	63%	84%	0%	22%
Social rented	96	33	5	33
Uninsulated walls	45	22	4	13
Uninsulated walls (%)	47%	67%	80%	39%
Owner Occupied	120	322	13	209
Uninsulated walls	70	263	9	53
Uninsulated walls (%)	58%	82%	69%	25%
Totals	**224**	**410**	**18**	**265**
Uninsulated walls	**120**	**331**	**13**	**71**
Uninsulated walls (%)	**54%**	**81%**	**72%**	**27%**

Wall insulation (Elgin)

Half of the properties in Elgin are of a cavity wall construction, with solid stone and timber frame walls having an almost equal share of the remaining properties (24% and 25% of the stock, respectively). There is a very small proportion (1%) of system-built properties.

The insulation levels of the cavity wall properties (52%) are less than for Moray overall (54%) and the national average (73%). Social rented properties are more likely to have cavity wall insulation (67%) than other tenures.

Most solid stone or brick properties have uninsulated walls (85%), which is only slightly higher than for Moray overall (84%) and higher than the national average (81%).

Table 18: Wall construction and insulation status of tenures (Elgin)

Tenure type	Cavity Construction	Solid Brick or Stone	System Built	Timber Frame
Privately rented	480	441	9	575
Uninsulated walls	234	376	6	48
Uninsulated walls (%)	49%	85%	67%	8%
Social rented	1,870	525	24	690
Uninsulated walls	614	479	6	91
Uninsulated walls (%)	33%	91%	25%	13%
Owner Occupied	3,046	1,633	105	1,434
Uninsulated walls	1751	1355	48	342
Uninsulated walls (%)	57%	83%	46%	24%
Totals	**5,396**	**2,599**	**138**	**2,699**
Uninsulated walls	**2,599**	**2,210**	**60**	**481**
Uninsulated walls (%)	**48%**	**85%**	**43%**	**18%**

Loft insulation (overall stock)

There are no lofts in properties such as ground and mid-floor flats, and in Moray this covers 9% of the stock. Less than half of the properties with lofts have loft insulation over 250mm (46%), which is on par with the national average of 46% of the properties with a loft having insulation levels over 250mm[12]. As for tenure, privately rented properties have the lowest loft insulation rates for plus 250mm.

[12] Scottish Housing Condition Survey: 2018 Key Findings: Scottish Government (2020) Derived from adding the number of lofts in SHCS with insulation levels at 300mm or more and halving those in SHCS with levels between 200mm and 299mm. This allows a comparison to the category in Home Analytics for 250mm+.

Table 19: Loft insulation status of domestic properties and of tenures (overall)

Housing type	0-99mm	100-249mm	250mm+	No Loft	Total lofts
Privately rented	1,040	2,570	2,030	654	5,640
(%) of lofts	18%	46%	36%		
Social rented	343	4,206	4,038	2,157	8,587
(%) of lofts	4%	49%	47%		
Owner Occupied	4,201	10,908	13,514	1,240	28,623
(%) of lofts	15%	38%	47%		
All	**5,584**	**17,684**	**19,582**	**4,051**	**42,850**
(%) of lofts	**13%**	**41%**	**46%**	***(9% of stock)***	***(91% of stock)***

Loft insulation (Burghead)

Less than half of properties with lofts in Burghead have loft insulation over 250mm (47%), similar to the overall stock in Moray and the national average of 46%[13]. As for tenure, privately rented properties have the least percentage of lofts with insulation over 250 mm. There are no lofts in 5% of Burghead's stock.

Table 20: Loft insulation status of domestic properties and of tenures (Burghead)

Housing type	0-99mm	100-249mm	250mm+	No Loft	Total lofts
Privately rented	15	28	25	18	68
(%) of lofts	22%	41%	37%		
Social rented	7	88	68	4	163
(%) of lofts	4%	54%	42%		
Owner Occupied	99	228	317	20	644
(%) of lofts	15%	35%	49%		
All	**121**	**344**	**410**	**42**	**875**
(%) of lofts	**14%**	**39%**	**47%**	***(5% of stock)***	***(95% of stock)***

[13] Scottish Housing Condition Survey: 2018 Key Findings: Scottish Government (2020) Derived from adding the number of lofts in SHCS with insulation levels at 300mm or more and halving those in SHCS with levels between 200mm and 299mm. This allows a comparison to the category in Home Analytics for 250mm+.

Loft insulation (Elgin)

Less than half of properties with lofts in Elgin have loft insulation over 250mm (46%), on par with the overall council area and national average[13]. As for tenure, privately rented properties have the lowest percentage of lofts with insulation over 250 mm (42%). There are no lofts in 13% of Elgin's stock.

Table 21: Loft insulation status of domestic properties and of tenures (Elgin)

Housing type	0-99mm	100-249mm	250mm+	No Loft	Total lofts
Privately rented	147	551	515	292	1,213
(%) of lofts	12%	45%	42%		
Social rented	64	1,350	1,002	693	2,416
(%) of lofts	3%	56%	41%		
Owner Occupied	599	2,396	2,816	407	5,811
(%) of lofts	10%	41%	48%		
All	**810**	**4,297**	**4,333**	**1,392**	**9,440**
(%) of lofts	**9%**	**46%**	**46%**	***(13% of stock)***	***(87% of stock)***

3.4 Non-Domestic Stock

There is currently no equivalent stock list like Home Analytics for non-domestic properties that models property variables for those without an EPC or other data available. As such, there is no definitive number of non-domestic buildings to report on, only those for which EPC data was provided.

According to the Council's available data there are approximately 5900 non-domestic records, but this number covers a large range of classifications which some may or may not have a building.

For 650 non-domestic properties in Moray an EPC record was provided and analysed. It is not possible to give an indication of how representative these are for the entire stock.

3.4.1 Non-domestic EPC results

Non-domestic EPC results (overall stock)

An EPC record was provided for 650 properties, although it should be noted that unlike for domestic EPCs, this data does not come with information on wall construction and/or insulation status.

For Moray, 40% of the non-domestic properties with an EPC have an EE-band G, 45% have an EE-band between D and F and the remaining16% have an EE-band of C or higher (Table 22). From the properties scoring G, 60% of the EPCs (155 out of 258) do not indicate a potential higher band after suggested improvements. By comparison40% of all properties do not show a potential increase in EE-band after suggested improvements.

Table 22: Representation of the Energy Efficiency bands in the non-domestic EPC data (Council area)

EE band	No.	% EPCs
Carbon Neutral	3	<1%
A/ A+	13	2%
B/ B+	32	5%
C/ C+	54	8%
D/ D+	83	13%
E/ E+	108	17%
F/ F+	99	15%
G	258	40%

Non-domestic EPC results (Burghead)

There are only 5 non-residential EPC records provided for Burghead, for which the majority had a G-band (Table 23).

Table 23: Representation of the Energy Efficiency bands in the non-domestic EPC data (Burghead)

EE band	No.	% EPCs
D/ D+	1	20%
F/ F+	1	20%
G	3	60%

Non-domestic EPC results (Elgin)

There are227 non-residential EPCs provided for Elgin, accounting for 35% of Moray's overall non-domestic EPC records.

For Elgin, 36% of the non-domestic properties have an EE-band G, compared to 40% of the overall council area. Around half of the non-domestic EPCs have an EE-band between D and F, compared to 45% of the overall stock. The remaining13% have an EE-band of C or higher (Table 24), compared to 16%of the overall stock. From the properties scoring G, 62% of the EPCs (50 out of 81) do not indicate a potential higher band after suggested improvements, whereas overall 39% of properties do not show a potential increase in EE-band.

Table 24: Representation of the Energy Efficiency bands in the non-domestic EPC data (Elgin)

EE band	No.	% EPCs
A/ A+	5	2%
B/ B+	8	4%
C/ C+	16	7%
D/ D+	33	15%
E/ E+	44	19%
F/ F+	40	18%
G	81	36%

3.4.2 Non-domestic heating and energy use

Non-domestic heating and energy use (overall stock)

The majority of the non-domestic properties are heated either by electricity (48%) or mains gas (38%). This is considerably different from domestic properties in the LHEES areas with 64% heated by mains gas and 14% by electricity. A breakdown of the fuel mix is provided in Table 25.

Table 25: Main heating fuel from EPC sample (Moray)

Main heating fuel	No.	%

		EPCs
Biomass	10	2%
Grid Supplied Electricity	313	48%
LPG	13	2%
Natural Gas	246	38%
Oil	44	7%
Waste Heat	2	0%
Other	22	3%

The average estimated energy use (expressed as global performance on the EPC) across the non-domestic stock is 65,100kWh/year. The spread of annual usage across all non-domestic EPCs is provided in Figure 9(NB: Global Performance includes heating, cooling, and lighting).

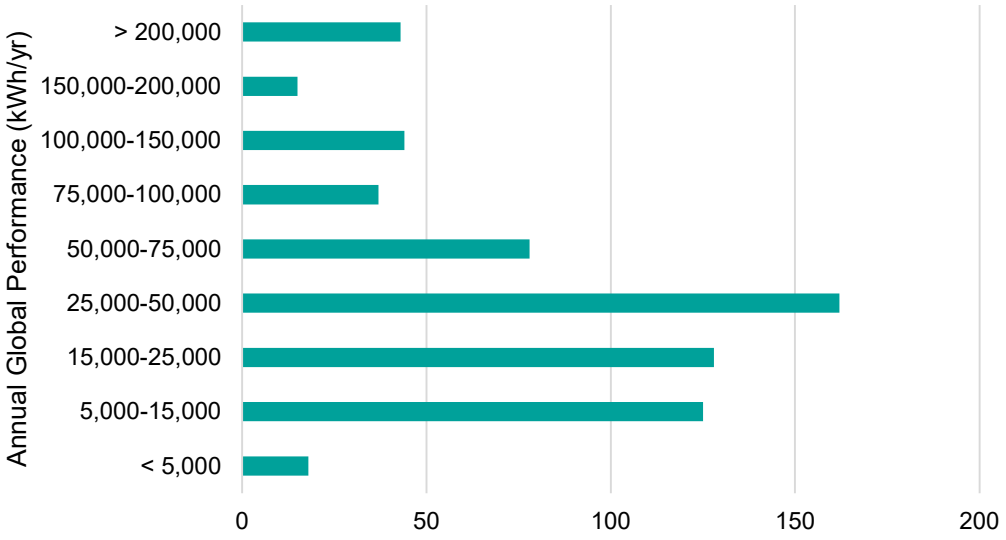

Figure 9: Annual global performance of non-domestic properties in the EPC dataset (Moray)

Non-domestic property types

The most common use of buildings across all EPCs is for retail/ financial (33% of buildings). Table 26 lists all the property types as per the EPC categorisation. It shows that the most energy efficient of buildings (average band D/D+) are those used for education, secure residential purposes (one property) and storage/distribution. As for annual global performance, it is estimated that hotels and leisure halls consume the most energy with an average of 131,729 kWh/year and 129,530kWh/year, respectively.

Table 26: Energy performance and use by property type.

Property type	No.	% EPCs	Average EE band	Average Annual Global Performance (kWh/yr)	Median Annual Global Performance (kWh/yr)
Community/Day Centre	23	4%	F/ F+	97,711	28,970
Education	48	7%	D/ D+	124,925	64,165
Emergency service	4	1%	G	89,174	102,703
General Assembly/Leisure	19	3%	G	131,729	52,873
General Industrial	31	5%	E/ E+	69,062	49,172
Hospitals/Care Home	11	2%	F/ F+	66,246	65,833
Hotel	38	6%	G	129,530	64,064
Library/Museum/Gallery	8	1%	E/ E+	82,333	41,177
Office/Workshop	140	22%	E/ E+	34,649	20,993
Passenger terminal	1	<1%	E/ E+	5,714	5,714
Primary Healthcare Building	12	2%	F/ F+	36,976	22,769
Residential space	5	1%	G	30,877	14,341
Restaurant/Cafes/takeaway	66	10%	G	47,033	33,448
Retail/Financial	217	33%	G	52,996	23,903
Secure Residential Institution	1	<1%	D/ D+	25,065	25,065
Standalone utility block	1	<1%	G	20,947	20,947
Storage/Distribution	24	4%	D/ D+	107,082	27,824
Universities/college	1	<1%	E/ E+	86,412	86,412
Totals/ average	**650**		**G**	**65,100**	**30,031**

Non-domestic heating and energy use (Burghead)

According to the EPC certificates, there are only 5 non-residential EPC records provided for Burghead, 2 are heated by electricity, 1 by oil, 2 by mains gas. However, given that Burghead is on off-gas area, it is likely the latter are heated by LPG rather than mains gas.

Table 27: Main heating fuel from EPC sample (Burghead)

Main heating fuel	No.	% EPCs
Grid Supplied Electricity	2	40%
Natural Gas	2	40%
Oil	1	20%

Non-domestic heating and energy use (Elgin)

The majority of the non-domestic properties in Elgin are heated either by electricity (54%) or mains gas (43%), compared to the overall council area (48% and 38% respectively).

Table 28: Main heating fuel from EPC sample (Elgin)

Main heating fuel	No.	% EPCs
Biomass	1	<1%
Grid Supplied Electricity	123	54%
LPG	2	1%
Natural Gas	97	43%
Oil	3	1%
Other	1	<1%

The average estimated energy use (expressed as global performance on the EPC) across the non-domestic stock in Elgin is 70,234, which is higher than the council area average (65,100kWh/year). The spread of annual usage across all non-domestic EPCs is provided in Figure 10(NB: Global Performance includes heating, cooling, and lighting).

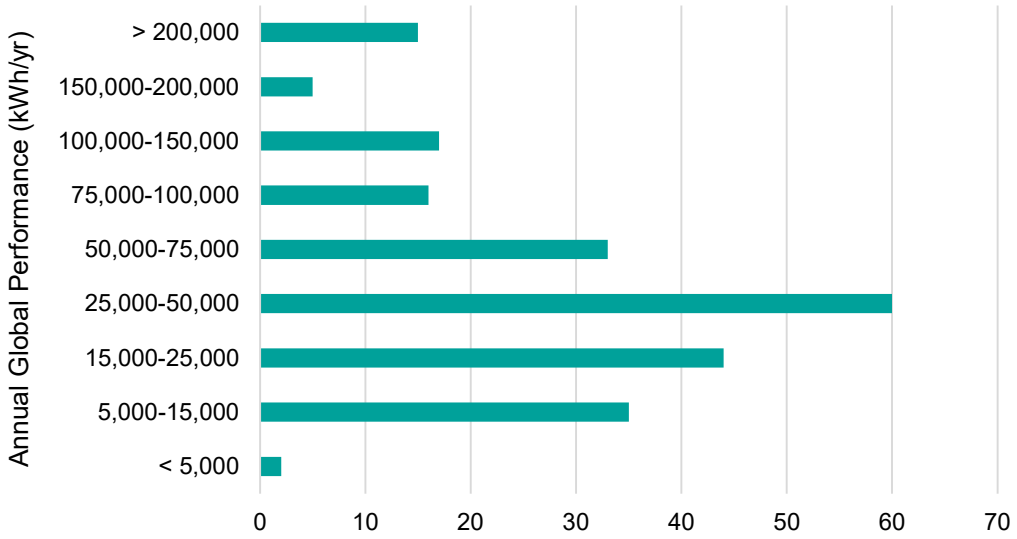

Figure 10: Annual global performance of non-domestic properties in the EPC dataset (Elgin)

4. POTENTIAL ENERGY EFFICIENCY AND HEAT DECARBONISATION MEASURES WITHIN THE DOMESTIC SECTOR IN MORAY

The purpose of this section is to produce a shortlist of potentially suitable energy efficiency and heat decarbonisation measures for the LHEES area, based on the baseline data analysis.

4.1 Summary and Key Points

A full address list with insulation and heating upgrades, as well as summaries of potential installations at town/ settlement, output area and data zone level are provided in separate files. This document provides an overview of the most important findings.

The main data source used in this analysis was the Energy Saving Trust's Home Analytics (v3.5). Census data was also used to provide information on demographics at the various geographic locations.

EPC data was provided for non-domestic properties; however, this does not account for the overall non-domestic property stock and it is unknown how representative the non-domestic data is for the whole stock.

4.1.1 Domestic stock

Key findings for the overall council area of Moray

- The LHEES area of Moray covers 46,901 domestic properties.
- 46% of properties are suitable for wall insulation measures, mostly internal wall insulation (30%) and cavity wall insulation (13%-15%, 2% a risk of narrow cavities).
- From the 5,309 properties with currently no suggested fabric or heating improvement, just under one-fifth (936) have an EE band D or worse.
- Given that many properties have mains gas as their main fuel type, a small proportion of the stock was considered suitable for air source heat pumps (11%). This increases substantially (up to 38%) when loosening this criterium for heat pump suitability to include properties heated by mains gas.
- Installing all possible fabric upgrades is estimated to cost **£128m**, installing all identified low carbon space heating upgrades would cost **£134m**.
- The average total household cost for installing fabric and heating measures is estimated to be **£9.2k**, ranging between **£200** (for a loft insulation measure) to **£36k** per property (deep retrofit with replacement low carbon heating system), with average fuel bill savings of **£256** per annum.

- Installing all the measures is estimated to save 93 kilo-tonnes of CO_2 per year, which equates to 2.2 tonnes per household.

Key findings for the Burghead area

- The LHEES area of Burghead covers 917 domestic properties, all of which are off-gas.
- Over one-third of properties are recommended internal wall insulation.
- The potential for low carbon space heating measures is much higher than the overall council area, with 37% of properties recommended air source heat pumps and 21% recommended biomass boilers.
- Installing all possible fabric upgrades is estimated to cost **£2.7m**, installing all identified low carbon space heating upgrades would cost **£6.5m**.
- The average total household cost for installing fabric and heating measures is estimated to be **£13.8k**, with average fuel bill savings of **£356** per annum.
- Installing all the measures is estimated to save 3.3 kilotonnes of CO_2 per year, which equates to 3.7 tonnes per household.

Key findings for the Elgin area

- The LHEES area of Elgin covers 10,832 domestic properties.
- 43% of properties are suitable for wall insulation measures, mostly cavity wall insulation (22%) and internal wall insulation (20%).
- Given that many properties have mains gas as their main fuel, a small proportion were considered suitable for air source heat pump (3%). This increases substantially (up to 38%) when loosening this criterium for heat pump suitability.
- Installing all possible fabric upgrades is estimated to cost **£18.1m**, installing all identified low carbon space heating upgrades would cost **£6.6m**.
- The average total household cost for installing fabric and heating measures is estimated to be **£5.5k**, with average fuel bill savings of **£175** per annum.
- Installing all the measures is estimated to save 7.8 kilo-tonnes of CO_2 per year, which equates to 0.8 tonnes per household.

4.1.1 Non-domestic stock

Key findings for the overall council area of Moray

- EPC data was available for 650 non-domestic properties.
- Recommendations were provided for 97% of these properties.
- The most common recommendation for all categories was double glazing, and/or secondary glazing.
- Wall insulation was recommended to 32% of the properties with cavity wall insulation being the predominant.
- Half of the properties were recommended heat pumps (either air source or ground source).

Key findings for the Burghead area

- EPC data was available for only five non-domestic properties.
- The most common recommendation for all categories was double glazing, and/or secondary glazing.
- Wall insulation was recommended for three of the properties, as was a loft/ roof measure.

Key findings for the Elgin area

- EPC data was available for 227 non-domestic properties.
- Recommendations were provided for 96% of these properties.
- The most common recommendation for all categories was double glazing, and/or secondary glazing.
- Wall insulation was recommended to 30% of the properties with cavity wall insulation being the predominant.
- Half of the properties were recommended heat pumps (either air source or ground source).

4.2 Fabric improvement and heating upgrades

The overall LHEES area baseline data reporting contains 46,901 domestic properties. This report first summarizes the overall potential fabric and heating upgrades and subsequently presents the findings for the specific areas of this LHEES. It should be noted that currently there is no additional data available for the 'system built' properties, which can vary in the type of construction and the suitability for external wall insulation.

4.2.1 Potential fabric upgrades

Potential fabric upgrades (overall stock)

For 68% of the properties in Moray, loft and wall insulation opportunities were identified (31,996 properties), with the majority of measures being top-ups of loft insulation (Table 29). For 14,905 of the domestic properties, representing 32% of the domestic housing stock, no wall or loft insulation measures were identified.

Wall insulation measures are suitable for almost half of domestic properties, mostly internal wall insulation (30%) and cavity wall insulation (15%).

Table 29: Total potential fabric upgrades (overall stock)

Measure	Number of suitable properties	% of domestic housing stock
Loft insulation virgin	5,584	12%
Loft insulation top-up	17,684	38%
Cavity wall insulation	7,182*	15%
External wall insulation	565	1%
Internal wall insulation	13,995	30%
Households requiring at least one fabric upgrade measure	**31,996**	**68%**
Households requiring both a loft and wall insulation measure	**13,014**	**28%**

**For 675 of these properties a risk of narrow cavities was identified.*

Potential fabric upgrades (Burghead)

For 69% of the properties in Burghead, loft and wall insulation opportunities were identified (637), with the majority of measures being top-ups of loft insulation (Table 30). For 280 properties no wall or loft insulation measures were identified.

Wall insulation measures are suitable for 46% of properties, with the prevailing measure being internal wall insulation (35%). Given the proportion of pre-1919 properties in Burghead (one-third), this is to be expected.

Table 30: Total potential fabric upgrades (Burghead)

Measure	Number of suitable properties	% of domestic housing stock
Loft insulation virgin	121	13%
Loft insulation top-up	344	38%
Cavity wall insulation	87	9%
External wall insulation	13	1%
Internal wall insulation	320	35%
Households requiring at least 1 fabric upgrade measure	**637**	**69%**
Households requiring both a loft and wall insulation measure	**248**	**27%**

These improvements are mapped in Figure 11. Please note that each point can represent a cluster of properties as opposed to a single property. Please also note that because of the amount of data points representing different measures, not all data points are shown in the map.

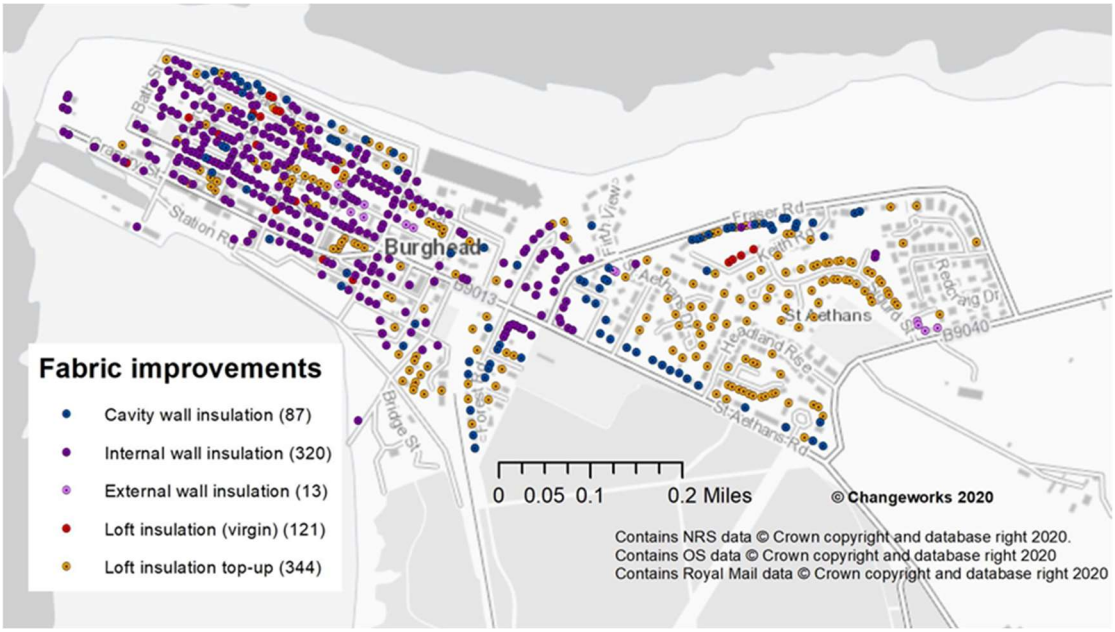

Figure 11: Fabric improvement opportunities (Burghead)

Potential fabric upgrades (Elgin)

For 67% of the properties in Elgin, potential loft and wall insulation opportunities were identified (7,282), with the majority of measures being top-ups of loft insulation (Table 31). For 3,550 properties no wall or loft insulation measures were identified.

Wall insulation measures are suitable for 43% of properties, mostly cavity wall insulation (22%) and internal wall insulation (20%).

Table 31: Total potential fabric upgrades (Elgin)

Measure	Number of suitable properties	% of domestic housing stock
Loft insulation virgin	810	7%
Loft insulation top-up	4,297	40%
Cavity wall insulation	2,386	22%
External wall insulation	57	1%
Internal wall insulation	2,177	20%
Households requiring at least 1 fabric upgrade measure	**7,282**	**67%**
Households requiring both a loft and wall insulation measure	**2,445**	**23%**

These improvements are mapped in Figure 12. Please note that each point can represent a cluster of properties as opposed to a single property. Please also note that because of the amount of data points representing different measures, not all data points are shown in the map.

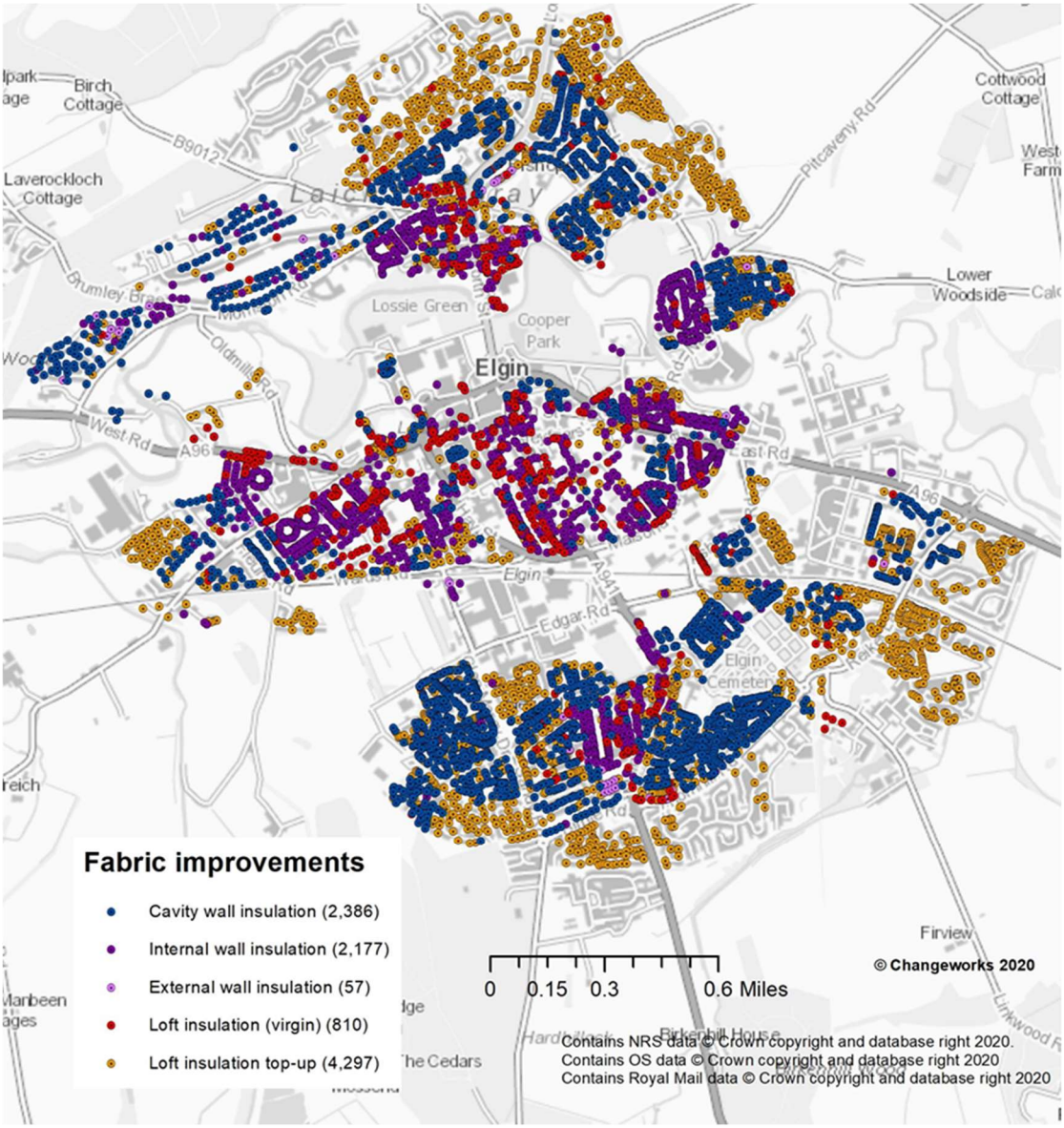

Figure 12: Fabric improvement opportunities (Elgin)

4.2.2 Potential low carbon heating upgrades

Potential low carbon heating upgrades (overall stock)

A range of low carbon space heating and hot water provision upgrades were considered, including solar thermal. Solar thermal is unlikely to provide heat in properties directly, these installs would result in direct savings for domestic hot water provision, which is why they are included here. In Moray, 57% of the domestic properties are suitable for solar thermal installation (Table 32).

Currently there is a relatively small number of properties suitable for air source heat pump (12%)[14], though this percentage increases when we include properties that are currently connected to the gas grid (38%). The latter are currently considered unsuitable for householders as householders with gas fuelled heating would not benefit economically from a heat pump. Biomass is suitable for 11% of the stock[15]. In addition, 4% of the housing stock is potentially appropriate for high heat retention storage heaters (i.e., Quantum heaters). Note that for the high heat retention (HHR) heaters (i.e., 'Quantum heaters' or 'smart storage heaters'), we assumed that currently all electric heating on dual meters are traditional storage heaters as there was no data available on HHR heaters install in the area.

Table 32: Total potential domestic low carbon heating upgrades (overall)

Measure	Number of suitable properties	% of domestic housing stock
Air source heat pump	5,562	12%
Biomass	5,165	11%
High heat retention heaters	2,051	4%
Solar thermal	26,585	57%
Households requiring at least 1 low carbon heating measure	**32,136**	**69%**
Households requiring both low carbon space heating and solar measures	**5,033**	**11%**

No suitable upgrade (for either fabric upgrades or heating upgrades) was applicable for 11% of the domestic housing stock (5,309 properties). From these 5,309 properties with currently no suggested improvement, 936 properties (18%) have an energy efficiency band D or worse.

Potential low carbon heating upgrades (Burghead)

As Burghead is an off-gas area, there is a much higher proportion of properties suitable for air source heat pumps (37%) and biomass (21%) when compared to the overall council area (12% and 11%, respectively). In addition, 14% of the housing stock is potentially appropriate for high heat retention (HHR) storage heaters (Table 33andFigure 13).

Please note that each point on the map can represent a cluster of properties as opposed to a single property. Please also note that because of the amount of data points representing different measures, not all data points are shown in the map.

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[14] Suitability for the air source heat pump measure is limited to houses and bungalows with a heating source other than mains gas, with insulated walls and which are not listed buildings.
[15] Suitability for biomass measure is limited to detached/ semi-detached houses and bungalows with a heating source other than mains gas, which have more than four habitable rooms.

Table 33: Total potential domestic low carbon heating upgrades (Burghead)

Measure	Number of suitable properties	% of domestic housing stock
Air source heat pump	341	37%
Biomass	193	21%
High heat retention heaters	124	14%
Solar thermal	727	79%
Households requiring at least 1 low carbon heating measure	**858**	**94%**
Households requiring both low carbon space heating and solar measures	**400**	**44%**

Figure 13: Low carbon space heating upgrades (Burghead)

For a very small proportion of the housing stock in Burghead, no suitable upgrade (for either fabric upgrades or heating upgrades) was identified (2%). From these 15 properties with currently no suggested improvement, 7 properties have an energy efficiency band D or worse.

Potential low carbon heating upgrades (Elgin)

Currently there is a small number of properties suitable for air source heat pump (3%), which is lower than the overall council area (12%). This proportion would be much higher when we include properties that are currently connected to the gas grid (38%). Biomass is suitable for 1% of the stock, which is again a much smaller proportion than the overall council area (11%). In addition, 4% of the housing stock is potentially appropriate for HHR storage heaters (Table 34and Figure 14).

Please note that each point on the map can represent a cluster of properties as opposed to a single property. Please also note that because of the amount of data points representing different measure, not all data points are shown in the map.

Table 34: Total potential domestic low carbon heating upgrades (Elgin)

Measure	Number of suitable properties	% of domestic housing stock
Air source heat pump	336	3%
Biomass	144	1%
High heat retention heaters	471	4%
Solar thermal	5,997	55%
Households requiring at least 1 low carbon heating measure	**6,529**	**60%**
Households requiring both low carbon space heating and solar measures	**379**	**3%**

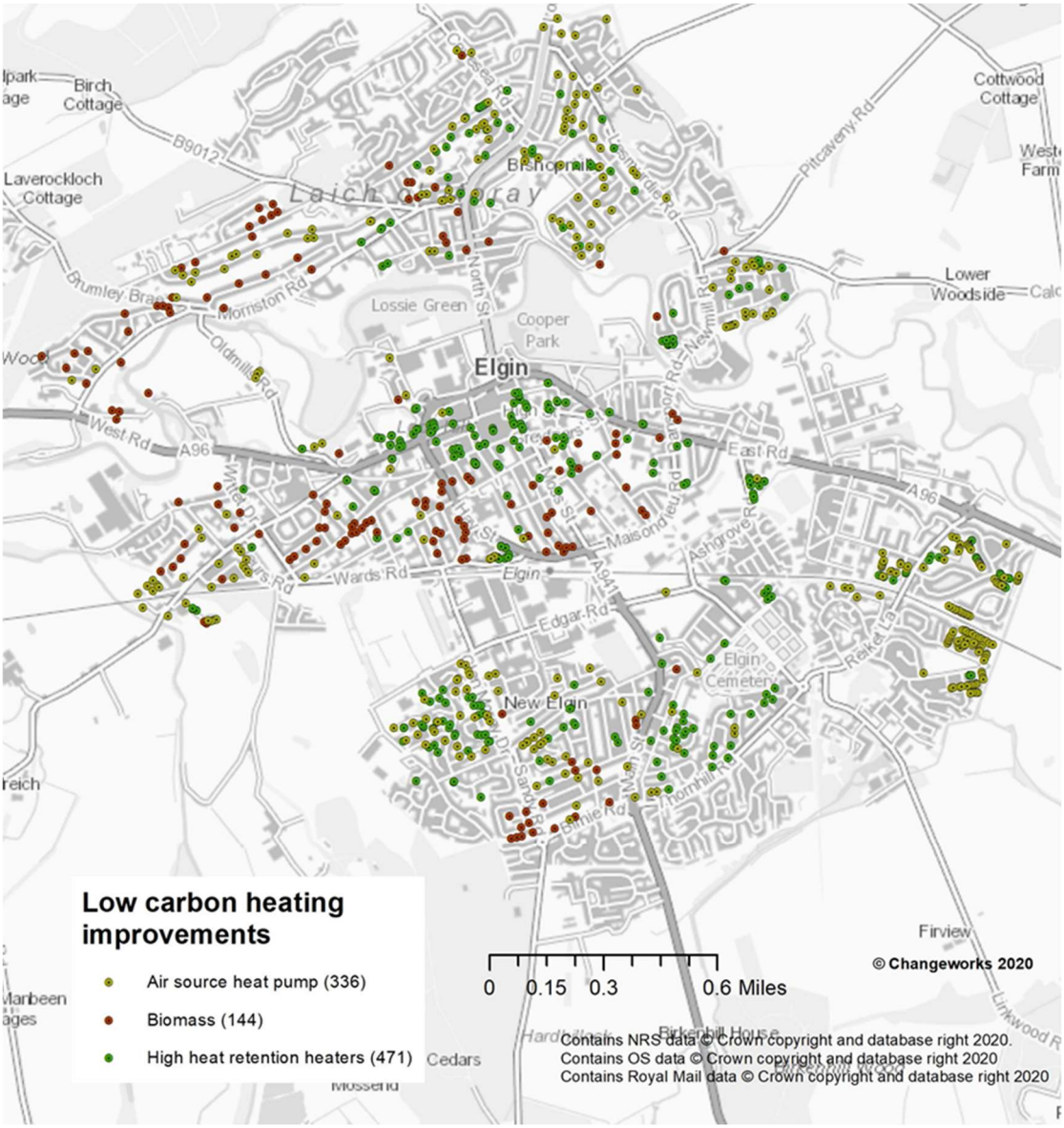


Figure 14: Low carbon space heating upgrades (Elgin)

No suitable upgrades (for either fabric upgrades or heating upgrades) were identified for 13% of Elgin's domestic housing stock (1,459 properties). From these properties with currently no suggested improvement, 313 properties (21%) have an energy efficiency band D or worse.

4.3 Running cost and carbon savings

The Scottish Government Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 set legally binding targets to achieve net zero greenhouse gas emissions by 2045, with interim targets requiring a 75% reduction by 2030, and 90% by 2040. Given these interim targets, a significant amount of the change required by 2045 must be delivered in the 2020s. Achieving significant carbon emission reductions from heating will therefore be a requirement.

For all running cost and CO_2 savings, standard estimates from the Energy Saving Trust[16] were used, apart from savings from HHR heaters. Looking at the absolute estimated savings in carbon emissions and running costs, most savings can be achieved with internal wall insulation, as there seems to be most potential for this measure and it has a high savings potential (Table 38and Table 43).

It should be noted that the estimated costs and calculated payback periods do not consider potential purchase cost savings that can be made through a bulk purchase scheme or area-based scheme, i.e., options were buying measures collectively or in a large quantity lowers the unit price. According to BEIS, savings up to 10% can be made through economies of scale[17]. This is similar to the experience of the Project Management team at Changeworks, who have been responsible for area-based schemes across multiple local authority areas and report savings of 10-20% on capital costs for wall insulation schemes through area-based schemes.

[16] Energy Saving Trust

[17] Department for Business, Energy and Industrial Strategy (2017) What does it cost to retrofit homes?

4.3.1 Installation costs and savings

Installation costs and savings (overall stock)

Table 35 shows for each measure the potential costs. It shows that insulation measures would cost **£127.7m** across all the housing stock, with the majority of these costs attributed to internal wall insulation (86%). Considering properties that would benefit from solar thermal, adding this to all suitable properties would cost **£119.6m**. Low carbon space heating measures are estimated to cost **£133.6m**. The average total costs to upgrade per property is estimated to be **£9,160.**

Table 35: Total modelled costs for fabric and low carbon heating measures (overall).

Measure	Number of suitable properties	Total potential costs	Potential costs per household
Loft insulation virgin	5,584	£1,837,016	£252 - £395
Loft insulation top-up	17,684	£4,481,387	£203 - £290
Cavity wall insulation	7,182	£3,465,915	£345 - £610
External wall insulation	565	£7,675,126	£10,674 - £16,695
Internal wall insulation	13,995	£110,285,549	£5,375 - £9,503
Air source heat pump	5,562	£55,620,000	£10,000
Biomass	5,165	£72,310,000	£14,000
High heat retention heaters	2,051	£5,667,790	£2,650 - £2,970
Solar thermal	26,585	£119,632,500	£4,500
Total/ average	**41,592 (properties with at least 1 measure)** **28,696 (properties with multiple measures)**	**£380,975,284**	**£9,160 (average total cost)**

* Note that these are individual purchase costs, they can be lower when applied in larger quantities through area-based schemes or through bulk-purchasing schemes.

Installation costs by tenure

Breaking down the costs by property tenure, Table 36 shows for each measure the potential costs for social housing, and Table 37 for private sector housing. For the social housing sector, it would cost the local authority **£41m**[18] to upgrade their stock, and housing associations **£12.3m**. For the private sector housing it would cost the owners-occupants overall **£270.8m**, whereas for the owners of privately rented properties it would cost **£56.8m**.

[18]As noted above, these costs can be reduced with 10-20% through bulk purchasing and economies of scale.

Table 36: Total modelled costs for fabric and low carbon heating measures (social housing).

Measure	Local Authority		Housing Association	
	Number of suitable properties	Total potential costs	Number of suitable properties	Total potential costs
Loft insulation virgin	291	£83,871	52	£15,082
Loft insulation top-up	3,310	£766,435	896	£209,711
Cavity wall insulation	1,388	£572,340	137	£57,670
External wall insulation	213	£2,592,226	30	£356,847
Internal wall insulation	1,209	£7,705,347	156	£1,069,105
Air source heat pump	1,005	£10,050,000	394	£3,940,000
Biomass	68	£952,000	41	£574,000
High heat retention heaters	381	£1,031,730	298	£800,260
Solar thermal	3,842	£17,289,000	1,179	£5,305,500
Total/Average	**6,481 (properties with at least 1 measure)**	**£41,042,949**	**2,096 (properties with at least 1 measure)**	**£12,328,175**
Total/Average	**3,807(properties with multiple measures)**	**£41,042,949**	**895 (properties with multiple measures)**	**£12,328,175**

Table 37: Total modelled costs for fabric and low carbon heating measures (private sector housing).

Measure	Privately rented		Owner Occupied	
	Number of suitable properties	Total potential costs	Number of suitable properties	Total potential costs
Loft insulation virgin	4,201	£1,390,585	1,040	£347,479
Loft insulation top-up	10,908	£2,841,846	2,570	£663,395
Cavity wall insulation	4,888	£2,454,835	769	£381,070
External wall insulation	282	£4,142,137	40	£583,916
Internal wall insulation	10,036	£80,996,427	2,594	£20,514,669
Air source heat pump	3,591	£35,910,000	572	£5,720,000
Biomass	4,101	£57,414,000	955	£13,370,000
High heat retention heaters	990	£2,776,780	382	£1,059,020
Solar thermal	18,408	£82,836,000	3,156	£14,202,000
Total/Average	**27,351 (properties with at least 1 measure)**	**£270,762,610**	**5,664 (properties with at least 1 measure)**	**£56,841,549**
	19,917 (properties with multiple measures)		**4,077 (properties with multiple measures)**	

Running costs savings

Table 38 shows the potential annual savings and payback period to recoup the purchase costs through running cost savings. It shows that the average annual household savings when all the measures are installed are estimated to be **£256**.

Recouping the costs for loft insulation (virgin) and cavity wall insulation measures would take a relatively short time period (2 to 4 years), whilst more expensive measures such as the solar thermal have a longer payback period (between 45 and 110 years). Low carbon heating measures can take long periods to payback, e.g., biomass is estimated to take between 26 and several hundred years to recoup, depending on the fuel type that is replaced. For example, replacing an oil boiler with a biomass boiler currently results in no running cost savings. However, decisions on upgrading heating should not be made solely on payback periods.

Table 38: Total modelled running costs savings for fabric and low carbon heating measures (overall).

Measure	Number of suitable properties	Total	Potential savings per household	Payback period (years)[19]
Loft insulation virgin	5,584	£1,015,538	£109 - £250	2 yrs
Loft insulation top-up	17,684	£307,358	£10 - £25	12 - 21 yrs
Cavity wall insulation	7,182	£1,274,760	£85 - £280	2 - 4 yrs
External wall insulation	565	£138,045	£105 - £375	45 - 110 yrs
Internal wall insulation	13,995	£3,702,595	£105 - £375	25 - 51 yrs
Air source heat pump	5,562	£1,997,864	£88 - £840	12 - 113 yrs
Biomass	5,165	£178,002	£-70 - £543	26 - 528 yrs
High heat retention heaters	2,051	£369,830	£175 - £190	15 - 16 yrs
Solar thermal	26,585	£1,668,890	£60 - £100	45 - 75 yrs
Total	**41,592 (properties with at least 1 measure)**	**£10,652,882**	**£256 (average total savings)**	**36 yrs**

Installation costs and savings (Burghead)

Table 39 shows for each measure the potential costs and Table 40 shows the potential annual savings and payback period to recoup the purchase costs through running cost savings. It shows that all insulation measures combined would cost **£2.7m** across all the stock, with most of these costs attributed to internal wall insulation (87%). Installing solar thermal on all appropriate properties is estimated to cost **£3.3m**. Low carbon space heating measures are estimated to cost **£6.5m**. The average total cost to a household is estimated at **£13,791**, which is considerably higher than the overall council area average (£9,160). However, the average annual

[19]If insulation costs through area-based schemes or economies of scale are reduced with 10-20%, payback periods are reduced proportionally (i.e. with 10%-20%) as well.

household savings if all the measures were installed is estimated to be **£356,** which is higher than the overall council area average (£256).

Table 39: Total modelled costs for fabric and low carbon heating measures (Burghead).

Measure	Number of suitable properties	Total potential costs	Potential costs per household
Loft insulation virgin	121	£38,038	£252 - £395
Loft insulation top-up	344	£86,587	£203 - £290
Cavity wall insulation	87	£46,100	£345 - £610
External wall insulation	13	£185,147	£10,674 - £16,695
Internal wall insulation	320	£2,357,484	£5,375 - £9,503
Air source heat pump	341	£3,410,000	£10,000
Biomass	193	£2,702,000	£14,000
High heat retention heaters	124	£342,680	£2,650 - £2,970
Solar thermal	727	£3,271,500	£4,500
Total	**902 (properties with at least 1 measure)**	**£12,439,536**	**£13,791 (average total cost)**

* Note that these are individual purchase costs, they can be lower when applied in larger quantities through area-based schemes or through bulk-purchasing schemes.

Table 40: Total modelled running costs savings for fabric and low carbon heating measures (Burghead).

Measure	Number of suitable properties	Total	Potential savings per household	Payback period (years)[20]
Loft insulation virgin	121	£20,172	£109 - £250	2 yrs
Loft insulation top-up	344	£5,805	£10 - £25	12 - 21 yrs
Cavity wall insulation	87	£18,565	£85 - £280	2 - 4 yrs
External wall insulation	13	£3,595	£145 - £375	45 - 74 yrs
Internal wall insulation	320	£73,320	£105 - £375	25 - 51 yrs
Air source heat pump	341	£119,208	£88 - £840	12 - 113 yrs
Biomass	193	£8,751	£-70 - £543	26 - 528 yrs
High heat retention heaters	124	£22,360	£175 - £190	15 - 16 yrs
Solar thermal	727	£49,260	£60 - £100	45 - 75 yrs
Total	**902 (properties with at least 1 measure)**	**£321,036**	**£356 (average total savings)**	**39 yrs**

[20]If insulation costs through area-based schemes or economies of scale are reduced with 10-20%, payback periods are reduced proportionally (i.e. with 10%-20%) as well.

Installation costs and savings (Elgin)

Table 41 shows for each measure the potential costs and Table 42 shows the potential annual savings and payback period to recoup the purchase costs through running cost savings. It shows that insulation measures would cost **£18.1m** across all the stock, with most of these costs attributed to internal wall insulation (82%). Installing solar thermal on all potential properties is estimated to cost **£27m**. Low carbon space heating measures are estimated to cost **£6.6m**. The average total cost to a household is estimated to be **£5,529**, which is considerably lower than the overall council area average (£9,160). However, the average annual household savings if all the measures were installed is estimated to be **£175,** which is lower than the overall council area average (£256).

Table 41: Total modelled costs for fabric and low carbon heating measures (Elgin).

Measure	Number of suitable properties	Total potential costs	Potential costs per household
Loft insulation virgin	810	£244,296	£252 - £395
Loft insulation top-up	4,297	£1,046,278	£203 - £290
Cavity wall insulation	2,386	£1,086,585	£345 - £610
External wall insulation	57	£816,279	£10,674 - £16,695
Internal wall insulation	2,177	£14,973,472	£5,375 - £9,503
Air source heat pump	336	£3,360,000	£10,000
Biomass	144	£2,016,000	£14,000
High heat retention heaters	471	£1,291,350	£2,650 - £2,970
Solar thermal	5,997	£26,986,500	£4,500
Total	**9,373 (properties with at least 1 measure)**	**£51,820,760**	**£5,529 (average total cost)**

* Note that these are individual purchase costs, they can be lower when applied in larger quantities through area-based schemes or through bulk-purchasing schemes.

Table 42: Total modelled running costs savings for fabric and low carbon heating measures (Elgin).

Measure	Number of suitable properties	Total	Potential savings per household	Payback period (years)[21]
Loft insulation virgin	810	£124,853	£109 - £250	2 yrs
Loft insulation top-up	4,297	£66,366	£10 - £25	12 - 21 yrs
Cavity wall insulation	2,386	£373,615	£85 - £280	2 - 4 yrs
External wall insulation	57	£15,805	£105 - £375	45 - 110 yrs
Internal wall insulation	2,177	£433,205	£105 - £375	25 - 51 yrs
Air source heat pump	336	£147,506	£88 - £840	12 - 113 yrs
Biomass	144	£29,453	£-70 - £543	26 - 528 yrs
High heat retention heaters	471	£84,450	£175 - £190	15 - 16 yrs
Solar thermal	5,997	£365,755	£60 - £100	45 - 75 yrs
Total	**9,373 (properties with at least 1 measure)**	**£1,641,008**	**£175 (average total savings)**	**32 yrs**

4.3.2 Carbon savings

Carbon savings (overall stock)

If all measures from Table 29 and Table 32 were installed, 93.1 kilo-tonnes of CO_2 per year could be saved given the current carbon intensity of heat, based on estimations from the Energy Saving Trust[22]. This equates to 2.24 tonnes per household. Despite the high install costs and long payback period of the two low carbon heating technologies (air source heat pump and biomass), these are estimated to save up to just over 10 tonnes of CO_2 per year. It should be noted that the carbon savings per measure will decrease in the future if heat itself becomes less carbon intense due to the use of renewables in electricity generation.

[21] If insulation costs through area-based schemes or economies of scale are reduced with 10-20%, payback periods are reduced proportionally (i.e. with 10%-20%) as well.

[22] Energy Saving Trust (assumptions for carbon intensities)

Table 43: Total CO_2 savings for fabric and low carbon heating measures (overall)

Measure	Number of suitable properties	Total potential CO_2 savings (tonnes/yr)	Potential CO_2 savings per household (tonnes/yr)	Cost per tonne of CO_2 saved
Loft insulation virgin	5,584	4,148	0.43 - 1.03	£443
Loft insulation top-up	17,684	1,195	0.04 - 0.1	£3,752
Cavity wall insulation	7,182	5,228	0.34 - 1.15	£663
External wall insulation	565	567	0.43 - 1.54	£13,526
Internal wall insulation	13,995	15,210	0.43 - 1.54	£7,251
Air source heat pump	5,562	21,595	1.15 - 10.15	£2,576
Biomass	5,165	35,224	1.29 - 10.45	£2,053
High heat retention heaters	2,051	1,610	0.76 - 0.83	£3,521
Solar thermal	26,585	8,349	0.21 - 0.66	£14,329
Total/Average	**41,592 (properties with at least 1 measure)**	**93,126**	**2.24 (average total savings)**	**£4,091(average cost per tonne CO_2 saved)**

Carbon savings (Burghead)

If all the measures in the Burghead area were installed, 3.3 kilo-tonnes of CO_2 per year could be saved given the current carbon intensity of heat. This equates to 3.65 tonnes per household, which is considerably higher than the overall council average (2.24 tonnes). This is resultant from the higher proportion of properties suitable for air source heat pumps and biomass, combined with the high estimated carbon savings for these measures.

Table 44: Total CO_2 savings for fabric and low carbon heating measures (Burghead)

Measure	Number of suitable properties	Total potential CO_2 savings (tonnes/yr)	Potential CO_2 savings per household (tonnes/yr)	Cost per tonne of CO_2 saved
Loft insulation virgin	121	82	0.43 - 1.03	£463
Loft insulation top-up	344	23	0.04 - 0.1	£3,830
Cavity wall insulation	87	76	0.34 - 1.15	£604
External wall insulation	13	15	0.59 - 1.54	£12,510
Internal wall insulation	320	301	0.43 - 1.54	£7,825
Air source heat pump	341	1,257	1.15 - 10.15	£2,712
Biomass	193	1,188	1.29 - 10.45	£2,274
High heat retention heaters	124	97	0.76 - 0.83	£3,521
Solar thermal	727	253	0.21 - 0.66	£12,931
Total/Average	**902 (properties with at least 1 measure)**	**3,293**	**3.65 (average total savings)**	**£3,778(average cost per tonne CO_2 saved)**

Carbon savings (Elgin)

If all the measures in the Elgin area were installed, 7.8 kilo-tonnes of CO_2 per year could be saved given the current carbon intensity of heat. This equates to 0.83 tonnes per household, which is considerably lower than the overall council average (2.24 tonnes). This is resultant from the lower proportion of properties suitable for low carbon heating measures.

Table 45: Total CO_2 savings for fabric and low carbon heating measures (Elgin)

Measure	Number of suitable properties	Total potential CO_2 savings (tonnes/yr)	Potential CO_2 savings per household (tonnes/yr)	Cost per tonne of CO_2 saved
Loft insulation virgin	121	507	0.43 - 1.03	£482
Loft insulation top-up	344	260	0.04 - 0.1	£4,023
Cavity wall insulation	87	1,530	0.34 - 1.15	£710
External wall insulation	13	65	0.43 - 1.54	£12,563
Internal wall insulation	320	1,776	0.43 - 1.54	£8,430
Air source heat pump	341	782	1.15 - 10.15	£4,298
Biomass	193	724	1.29 - 10.45	£2,784
High heat retention heaters	124	367	0.76 - 0.83	£3,515
Solar thermal	727	1,752	0.21 - 0.66	£15,402
Total/Average	**9,373 (properties with at least 1 measure)**	**7,763**	**0.83 (average total savings)**	**£6,675(average cost per tonne CO_2 saved)**

4.4 Non-domestic upgrades

In the Baseline Data Reporting we established there are at least 650 non-domestic properties in Moray, based on EPC records. From these properties, 619 (95%) EPC records contain recommendations for fabric and heating upgrades.

Most recommendations on the EPC certificates concerned upgrading the lights to more energy efficient options (76%). Measures associated with air tightness and ventilation accounted for 53% of the properties. Likewise, many of the EPC certificates included control upgrades to the existing heating system (58%). Below we specify the fabric upgrades and low carbon heating options more specifically.

For the two geographical areas of Burghead and Elgin:

- Only 5 non-domestic EPCs were available for Burghead.
- 227 non-domestics EPCs were available for Elgin, which accounts for just over one-third of all non-domestic EPCs in Moray.

4.4.1 Fabric upgrades

Non-domestic fabric upgrades (overall stock)

The most common recommendation for all categories was double glazing, and/or secondary glazing (Table 46). Wall insulation was recommended for 32% of the properties with cavity wall insulation being the predominant measure.

Table 46: Recommended fabric measures from the non-domestic EPC records (Moray)

Measure	No.	% EPCs
Loft insulation	23	10%
Roof insulation	27	12%
Floor insulation	14	6%
Cavity wall insulation	48	21%
Internal wall insulation	19	8%
Glazing	123	54%

Non-domestic fabric upgrades (Burghead)

Out of the five non-domestic EPCs for the Burghead area, the most common recommendation for all categories was double glazing, and/or secondary glazing (Table 47). Wall insulation was recommended for three of the properties, as was a loft/roof measure.

Table 47: Recommended fabric measures from the non-domestic EPC records (Burghead)

Measure	No.	% EPCs
Loft insulation	2	40%
Roof insulation	1	20%
Cavity wall insulation	2	40%
Internal wall insulation	1	20%
Glazing	4	80%

Non-domestic fabric upgrades (Elgin)

The most common recommendation for all categories was double glazing, and/or secondary glazing (Table 48). Wall insulation was recommended to 30% of the properties with cavity wall insulation being the predominant.

Table 48: Recommended fabric measures from the non-domestic EPC records (Elgin)

Measure	No.	% EPCs
Loft insulation	23	10%
Roof insulation	27	12%
Floor insulation	14	6%
Cavity wall insulation	48	21%
Internal wall insulation	19	8%
Glazing	123	54%

4.4.2 Low carbon heating measures

Non-domestic low carbon heating measures (overall stock)

Half of the properties have been recommended heat pumps (either air source or ground source) and half on the non-domestic properties have been recommended solar thermal.

Table 49: Recommended low carbon heating measures from the non-domestic EPC records (Moray)

Measure	No.	% EPCs
Air source heat pump	218	34%
Ground source heat pump	108	17%
Biomass	13	2%
Solar thermal	322	50%

If the EPC records are a representative sample of the non-domestic properties in the LHEES area, there is a substantial potential to improve the non-domestic stock through promoting glazing upgrades, cavity wall insulation, heat pumps (particularly ASHP) and solar thermal installs.

Non-domestic low carbon heating measures (Burghead)

Only three non-domestic properties in Burghead with an EPC were recommended solar thermal. There were no low carbon space heating measures recommended to any of the properties with an EPC.

Table 50: Recommended low carbon heating measures from the non-domestic EPC records (Burghead)

Measure	No.	% EPCs
Solar thermal	3	60%

Non-domestic low carbon heating measures (Elgin)

Half of the Elgin non-domestic properties have been recommended heat pumps (either air source or ground source) and 45% have been recommended solar thermal.

Table 51: Recommended low carbon heating measures from the non-domestic EPC records (Elgin)

Measure	No.	% EPCs
Air source heat pump	85	37%
Ground source heat pump	32	14%
Biomass	4	2%
Solar thermal	102	45%

5. ZONING USING HEAT MAP

This section presents the methodology and results of a desktop analysis exercise to identify potential heat network opportunities. The exercise assessed heat demand and density using BRE standards for heat networks, Scotland's Heat Map and Home Analytics. In particular, the analysis focussed on the potential of using the many distilleries in the local authority area and public buildings like schools, hospitals and local authority buildings as anchor loads.

5.1 Methodology

Scotland Heat Map

The data used in this analysis is drawn from the Scotland Heat Map developed by the Scottish Government. The Scotland Heat Map consists of a number of layers, combining heat demand and heat generation data[23].

For this analysis we use the shapefile with individual properties and their heat demand (the layer *Heat demand Points)*. A large portion of the heat demand data in this dataset is modelled data, including the property specific calculations based on Energy Performance Certificate (EPC) data, as well as statistically modelled heat demand data based on the property and location characteristics. Overall, there are 5 different confidence levels for the heat demand data, based on the source, with level 5, which is based on billing data, having the highest confidence level (Table 52). More background on the methodology of the Scotland Heat Map can be found at the Heat Map website[24].

Table 52: Confidence levels of heat demand data in Scotland Heat Map and representation in the national dataset

Confidence level Heat Demand	Data in Scotland Heat Map (%)
1.Ordnance Survey Benchmarking	7%
2. Scottish Assessor Data	2%
3. Home Analytics	48%
4. Energy Performance Certificates and Distillery Production	43%
5. Local Authority Billing and Procurement Data	0.3%

[23]Scotland Heat Map website: http://heatmap.scotland.gov.uk/ Note that local authorities have access to Heat Map layers with property specific data in addition to this openly available map

[24]Scottish Government (2020) Scotland Heat Map 2.0 User Guide

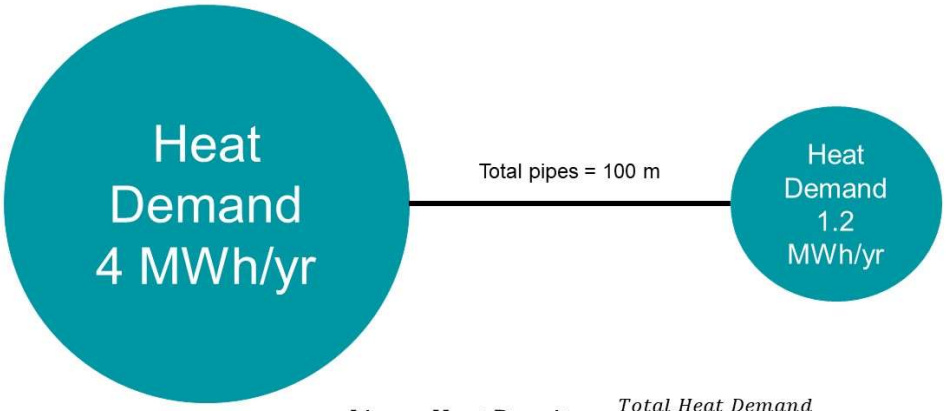
Identifying anchor loads

From the *Heat demand Poin*ts layer from the Heat Map, the *Source Type* field was used to select the non-domestic properties for the local authority. Although heat networks supplying domestic properties alone exist, for this analysis we identified non-domestic anchor loads first with a particular focus in public non-domestic buildings.

Anchor loads in heat networks are buildings with large, stable and constant heat demands. These large anchor loads are critical to ensure good performance in a heat network, securing economic and environmental viability.

The *heat demand* field of the layer with non-domestic heat demand points was subsequently used to calculate the **maximum viable pipe length** per non-domestic property if that property was an anchor load. This maximum viable pipe length is calculated assuming a viable **linear heat density** where, per length of pipe in the heat work, a certain heat demand is needed to make it financially viable[25].

For example, if a heat network has a heat demand of 520 MWh/yr, and 100 m of pipeline, the linear heat density of the heat network is 5.2 MWh/m/yr.



$$\text{Linear Heat Density} = \frac{Total\ Heat\ Demand}{Lenght\ of\ Network}$$

$$= \frac{520\ \text{MWh/yr}}{100\ \text{m}}$$

$$= 5.2\ \text{MWh/m/yr}$$

Figure 15: Example explaining Linear Heat Density and its relation to network pipe length and Heat demand.

The **maximum viable pipe length** from a potential anchor load can subsequently be calculated using a **standard linear heat density** and the **annual heat demand**.

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[25] Linear density of a heat network is the total heat demand, divided by the total length of pipe. A higher linear heat density generally indicates improved financial viability, because you 'get more heat for your meter pipe'. For scoping studies such as this LHEES analysis, the linear heat density is used to estimate the maximum length of pipe, using a linear heat density that is already deemed financially viable.

In this study we used two standard linear heat densities:

- 4 MWh/m/year – Linear Heat density as suggested by Heat Network Partnership for Scotland for being the typical lowest value for a network to be economically viable, as the heat sales over the lifetime period (20+ years) need to payback the CAPEX investment of the infrastructure.[26]
- 7 MWh/m/year - Linear Heat density of sites with a particular interest.

NB, it is possible to use other linear heat densities, but in this LHEES analysis we used 4 MWh/m/yr and 7 MWh/m/yr.

With the resulting maximum pipe lengths in metres, buffers were applied to the non-domestic properties in the *Heat demand Point*s layer. Areas where buffers overlap suggest opportunities for connecting multiple properties as part of a heat network.

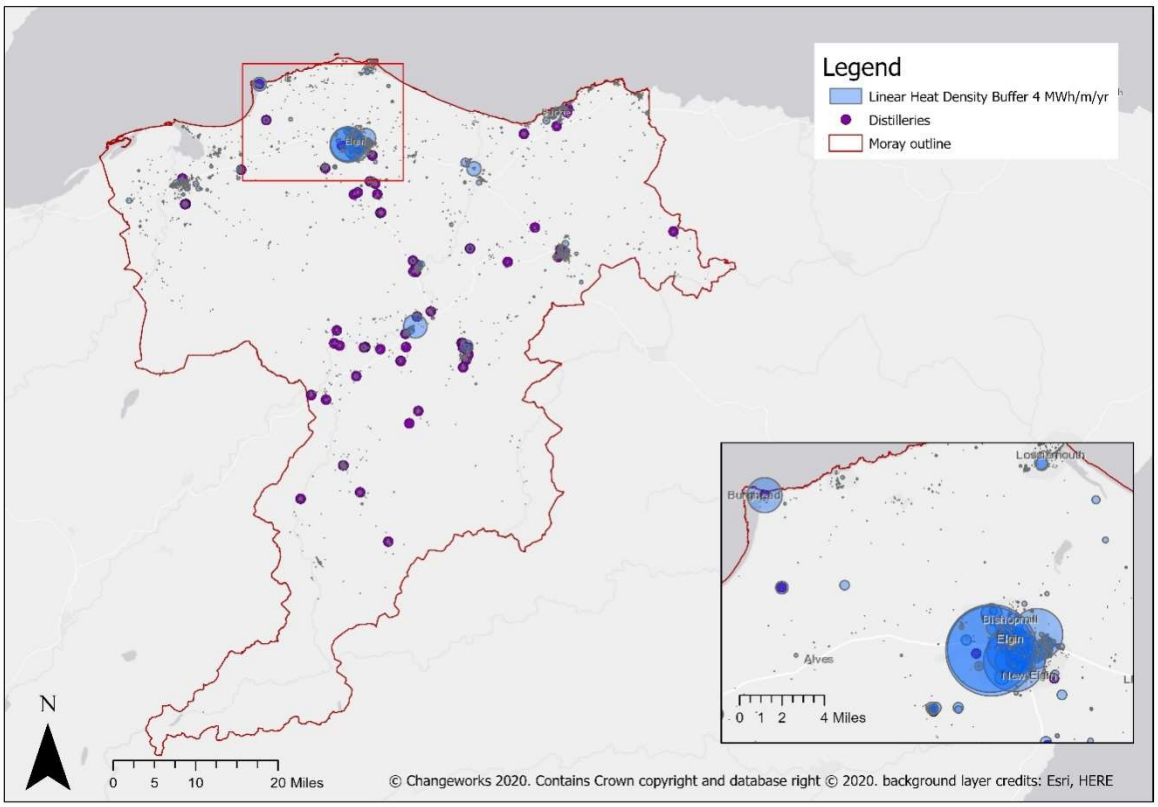

Figure 16: LHEES area with 4 MWh/m/yr buffer zones and locations of distilleries

The buffers can be merged when they overlap, and all the properties, both domestic and non-domestic within the boundary of the buffer can be counted and their heat demand aggregated to characterise the potential heat network further[27]. Maps that

[26] Heat Network Partnership for Scotland (2017) **District Heating Strategy Factsheet**

[27] Note that at this point the layer with green spaces as potential heat sources from **ParkPower** can also be added. The ParkPower project itself already analysed the heat demand from the buildings surrounding the greenspace and the fields in the layer indicate the suitability for a range of renewable heat sources.

contain layers with the 4 MWh/yr buffer and 7 MWh/yr buffer around their non-domestic properties are provided to Moray Council together with the other LHEES analysis results. Note that in the results below, the focus is on the 4 MWh/yr buffer to identify all the areas with potential for economic viability. The separate 7 MWh/yr buffer can be used to prioritise zones and connections.

For Moray Council, particular attention was given to:

1. The potential of using the many **distilleries** in the local authority area as an anchor load.
2. The potential of using **public buildings** like schools, hospitals and local authority buildings as an anchor load.

Distilleries

The distilleries in the Heat Map data were lifted out as a separate layer by selecting entries that had 'Distillery' in their building name. The 4MWh/m/yr linear heat density buffer layer was subsequently used to:

- Count the number of properties (domestic and non-domestic) within the buffer.
- The total heat demand.
- The area heat density of the cluster.

The top 10 entries were listed as potential stakeholders to engage with.

NB: some distilleries use waste heat as a resource to help heat surrounding properties. The heat map did not provide information on waste heat hence this possibility was not taken into account in the calculations and selection. However, where the heat density around the distillery is high enough, a recommendation would be made to engage with the distillery to determine potential waste heat.

Public buildings

A list of 281 public buildings was lifted out as a separate layer by selecting specific Basic Land and Property Unit (BLPU classes) that referred to non-domestic properties used for educational, community, worship, or medical purposes, or used for emergency services. For offices used by Moray Council, the field with the organisation name (*RM_ORGANISATION_NAME*) was used as well.

5.2 Results

Distilleries

58 Distilleries were identified in Moray, with heat demands varying from 0.47 GWh/yr to 2.84 MWh/yr. Table 53shows the top 10 distilleries in terms of the number of buildings identified in the buffer area using the minimum viable linear heat density of 4MWh/m/yr[28].

Only 2 distilleries form the 58 in Moray, the Maltings in Burghead and Glen Keith Distillery in Keith, would have more than 100 buildings near enough to include in a heat network, highlighting that although distilleries could be an attractive anchor load in terms of their own heat demand, it might be more challenging to find properties near enough to include in a heat network.

Table 53: Summary table of the top 10 distilleries from the heat network prioritization analysis

Distillery	Distillery heat demand (GWh/yr)	Total heat demand (GWh/yr)	Total domestic Heat demand (GWh/yr)	Buildings in footprint	Domestic properties in footprint	**Area in km^2**
Maltings Burghead	2.84	16.85	12.73	911	841	1.58
Glen Keith Distillery	0.97	3.26	1.60	103	92	0.19
Craigellachie Distillery	0.60	1.08	0.34	60	47	0.07
Parkmore Distillery	2.52	5.19	0.03	23	16	1.24
Longmorn Distillery	0.67	3.99	0.01	18	7	0.09
Dalmunach Distillery	0.93	1.33	0.18	11	6	0.17
Glenlivet Distillery	0.57	4.21	0.05	10	2	0.06
Knockando Distillery	0.38	0.46	0.08	9	8	0.03
Aberlour Distillery	0.59	0.72	0.11	9	7	0.07
Benromach Distillery	0.47	0.78	0.03	9	3	0.04

[28]Note that the Macallan distillery in Craigellachie was excluded from the analysis given it already uses waste heat from the Combined Heat and Power (CHP) plant near Craigellachie.

Public buildings

When the 4 MWh/yr minimum linear heat density buffer was applied to the public non-domestic properties in Moray Council, just under 15% of them (41 out of 281) included domestic properties in the buffer area. In other words, the remaining 85% of the public buildings have a heat demand that is not high enough to be economically viable to connect to their nearest domestic properties (or their heat demand is substantial, but there are no nearby domestic properties, similar to the distillery analysis).

Moreover, for only 14 non-domestic properties (5% of the selected public buildings) the 4 MWh/yr minimum linear heat density buffer contained over 100 domestic properties (Table 54). From this top 14, most buildings were schools, swimming pools, council buildings, or hospitals (for locations see Figure 17), and 12 of these buildings formed three potential clusters of anchor loads with partially overlapping buffers, in Elgin, Keith, and Buckie, respectively.

Table 54: Summary table of the top 14public buildings from the heat network prioritization analysis

Building	Building heat demand (GWh/yr)	Total heat demand (GWh/yr)	Total domestic heat demand (GWh/yr)	Buildings in footprint	Domestic properties in footprint	**Area in km^2**
1. Dr. Gray's Hospital, Elgin	7.43	181.38	86.93	7,491	6,379	10.82
2. Moray College, Elgin	3.94	121.60	40.20	3,743	2,869	3.05
3. Buckie High School	1.43	10.20	4.94	408	345	0.40
4. Spynie Hospital, Elgin	1.71	7.74	4.76	353	341	0.57
5. Elgin High School	1.19	4.30	2.69	301	259	0.28
6.Buckie Swimming Pool	1.19	8.05	3.30	225	193	0.28
7. Lossiemouth High School	0.99	4.52	2.27	222	217	0.19
8. Forres Swimming Pool	1.05	3.90	1.92	196	188	0.22
9. Keith Grammar School	1.06	6.35	2.79	181	154	0.22
10. Council Office, Elgin High Street	0.46	4.92	0.56	179	56	0.04
11. Keith Swimming Pool	1.06	5.70	2.15	151	127	0.22
12.Elgin Academy, Elgin	1.22	3.71	1.78	129	124	0.29
13.Keith Primary School	0.82	5.04	1.51	109	94	0.13
14. Elgin Library	0.61	2.66	0.51	106	87	0.07

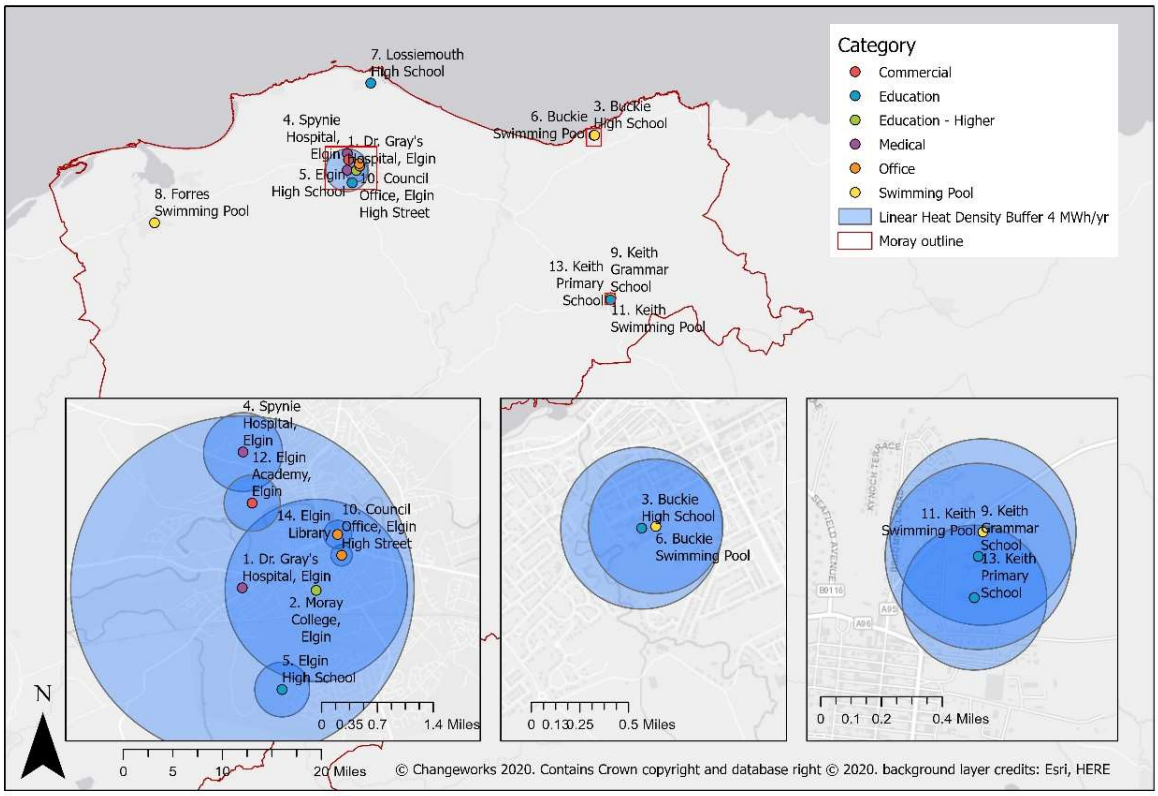

Figure 17: LHEES area with 4 MWh/m/yr buffer zones and locations of top 14 public buildings from the heat network prioritisation analysis, with insets of the clusters in Elgin, Buckie and Keith.

It should be emphasized that this prioritisation analysis is a first step, one that should lead to engagement with potential stakeholders in the identified clusters. For planning heat networks, more extensive feasibility studies and engagement should be undertaken to identify technical and economic viability and explore potential heat sources, including waste heat.

Burghead potential

Due to local interest and the potential for the distillery in Burghead to be connected to another facility to the South owned by the same company with a private gas connection, an analysis was undertaken to determine suitability for a heat network.

As can be seen in Figure 18 the heat demand of the distillery does highlight the potential for heat network development, with most of the village within the 4MWh/m/yr buffer zone. However as per Figure 17 above there are areas that have higher potential within the Local Authority area.

Although there are no figures on the waste heat from the distillery it should be considered when undertaking more detailed feasibility work for a heat network in Burghead.

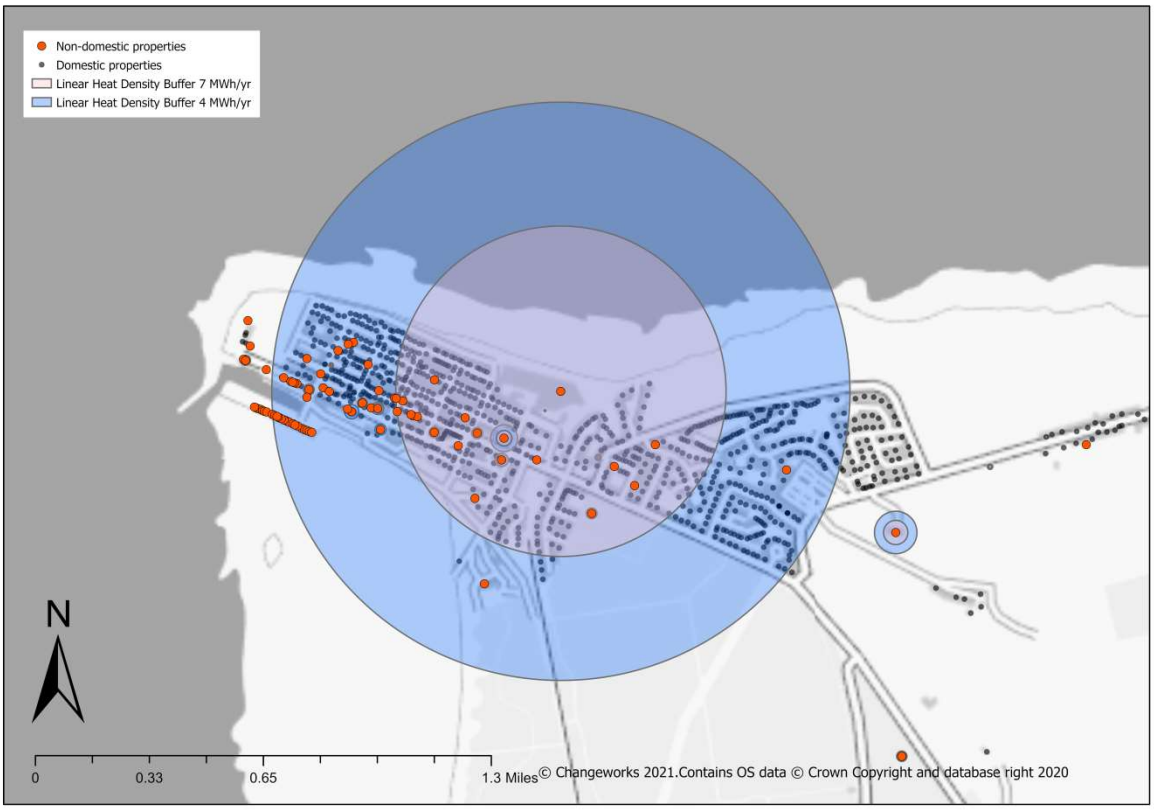

Figure 18: Linear heat demand buffers for Burghead

6. SHARING RESULTS IN MAP PACKAGES

The results of the data analysis for this LHEES are made available for further analysis and shared as two map packages (i.e., as **.mpkx** files) that can be used in ArcGIS Online[29] or ArcGIS Pro.

The two maps consist of:

1. MC_LHEES_EE_results – a map that combines layers with results of the domestic energy efficiency and low carbon measures with fuel poverty and deprivation statistics.
2. MC_LHEES_HeatMap– a map combining layers of heat demand points (domestic and non-domestic) with the buffers created in the prioritisation exercise, existing heat networks and layers focusing on public or council owned buildings only.

Zoning

An important part of LHEES development is identifying zones for developing energy efficiency and low carbon heating in the future, either for individual properties or planning heat networks[30]. Both maps can support this.

The map MC_LHEES_EE_results specifically shows the wall insulation potential per tenure, so it can be used to explore wall insulation options for area-based schemes such as EES:ABS (focusing on private tenure) or the Low Carbon Infrastructure Transition Programme (focusing on social housing).

The layers showing fuel poverty levels or deprivation levels per data zone can be used to select the most appropriate areas for such schemes, as for EES:ABS projects areas with fuel poverty levels higher than the average are prioritized. For example, Figure 19 shows map MC_LHEES_EE_results with an area highlighted in red for a potential EES:ABS project, as it identified potential for cavity wall insulation in privately owned properties in an area with a relatively high fuel poverty risk.

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[29]Changeworks produced the maps in Arc GIS Online, but for handing over it was packaged as an .mpkx file. Changeworks cannot continue to host the data from the maps online when the project ends, because it is not the owner of the Home Analytics or Scotland Heat Map data.

[30]The **Heat Networks (Scotland) Bill** stipulates local authorities will be provided the power to set up ‘heat network zones’ that will be prioritized for heat network development.

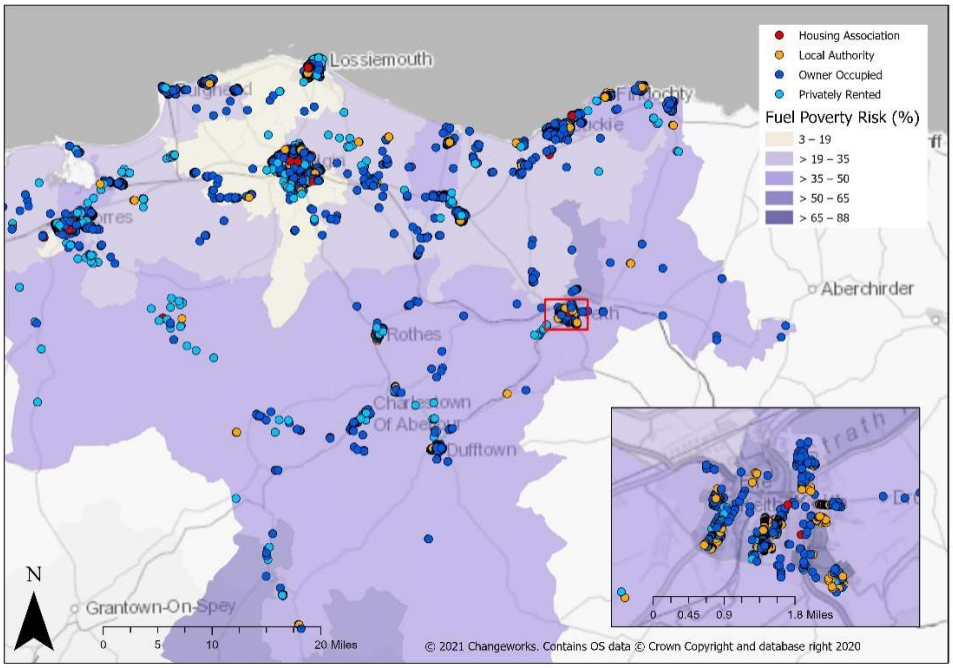

Figure 19: Example of the MC_LHEES_EE_results map being used to identify EES: ABS projects, with cavity wall insulation opportunities in areas with a relatively high fuel poverty risk (e.g., the area highlighted in the red square in Keith).

The layers in the two map packages are listed in Table 55 and Table 56:

Table 55: Layer names and description of the layers from the MC_LHEES_EE_results map.

MC_LHEES_EE_results	
Layer name	**Description layer content**
ASHP_potential_On-gas_included_MC	Potential for air source heat pumps for domestic properties, including the properties currently on gas
ASHP_potential_MC	Potential for air source heat pumps for domestic properties
HHR_potential_MC	Potential for High Heat Retention heaters (Quantums) for domestic properties
EWI_potential_MC	Potential for external wall insulation for domestic properties
IWI_potential_MC	Potential for internal wall insulation for domestic properties
CWI_potential_MC	Potential for cavity wall insulation for domestic properties
Fuel Poverty (from HA)	Data zone level fuel poverty risk levels from Home Analytics v3.5
SIMD 2020 Income deprivation (%)	Data zone level income deprivation form the Scottish Index of Multiple Deprivation 2020
Moray outline	Outline of the LHEES zone

Table 56: Layer names and description of the layers from the MC_LHEES_HeatMap_Analysis map.

MC_LHEES_HeatMap_Analaysis	
Layer name	**Description layer content**
Schools_Public_Medical_MC	Public buildings, schools, hospital and council owned offices, coloured per category
Distilleries	Heat demand points for the Distilleries in Moray, selected from the Properties_Domestic_and_Non-Domesticlayer
Buffer_4MW_MC	Buffer around non-domestic properties assuming a linear heat density of 4MWh per year per meter
Buffer_7MW_MC	Buffer around non-domestic properties assuming a linear heat density of 7MWh per year per meter
Moray__Buffer_School__Public_4MW_m	Buffer around properties from the Schools_Public_Medical_MC layer, assuming a linear heat density of 4MWh per year per meter
Domestic_Social_MC	Heat demand points for the social domestic properties, adapted layer form the Scotland Heat Map
Properties_Domestic_and_Non-Domestic	Heat demand points for the domestic and non-domestic properties, layer from the Scotland Heat Map
Moray outline	Outline of the LHEES zone

7. TARGET SETTING WORKSHOP

The target setting workshop is a key stage in the development of the LHEES. It is an opportunity for the local authority to set out the level of ambition they wish to achieve with their LHEES. The aim of the workshop was to allow the Council to identify and set targets for energy efficiency, heat decarbonisation, fuel poverty alleviation, as well as economic and policy objectives based on the initial baseline data report (BDR). Targets are non-binding and include priorities identified by individuals or departments within the project.

The workshop also ensures the data analysis, policy work and appraisal of energy efficiency and heat decarbonisation options are contextualised within the area and take into account previous, existing and future activity by the local authority. The workshop provides the opportunity to identify partners, opportunities, challenges and considerations which will influence the LHEES delivery.

To maximise the tangible benefits of the workshop to the Council, actions that can be undertaken or steps which may need to be put in place are also noted.

7.1 Workshop format

An interactive, virtual workshop was held on 12 November 2020, facilitated by two senior consultants from Changeworks. Staff from across the Council were invited to attend including representatives from Economic Growth and Development, Housing and Strategy, Property Resources, Energy Officers and those with direct involvement with the development of Moray Council's Climate Change Strategy.

The workshop incorporated facilitated group discussions as well as prompt questions to guide the conversation and explore all relevant experience and knowledge of attendees. Online whiteboard tools were used to capture points raised and provide an anchor to support conversations and development of useful and ambitious targets for the Council.

A three-phase approach was applied to support the Council to set out key priorities. These three phases were discussed iteratively to fill in gaps and make connections as the conversation developed.

- Firstly, long term targets were posited by attendees. These were couched as 'aspirational' to allow freedom from current challenges, constraints or contexts and in order to reflect the long-term approach of LHEES.
- Next, short-term actions and priorities (couched as 'immediate') were identified to ensure the LHEES has foundations in existing work and efforts by and within the Local Authority.
- Finally, medium-term priorities were discussed which would act to bridge immediate priorities with aspirational targets.

The outputs of the workshop are detailed in the following sections.

7.1.1 Immediate Priorities

Increasing uptake in HEEPS: ABS installs was identified as a key immediate priority which builds on existing activity and momentum within the Council and the local authority area.

There is currently a mismatch between targets and available resources - conventional boilers and systems for example are still being installed, which is at odds with long term carbon targets and ambitions. There is an opportunity to complete a horizon scanning activity to identify any available grant funding. However, it was noted that there are resource implications in completing such exercises which cannot currently be met.

The need to address the conflict of different priorities was also flagged. For example, tackling homelessness in the area or the energy efficiency of existing homes. More money is needed to develop new builds to a PassivHaus (or similar) standard, which could be used to build more affordable housing. This is an ethical challenge, not just resource focussed.

7.1.2 Immediate Actions

Some key (immediate and short term) actions were identified to progress achieving these targets:

- HEEPS: ABS - continue to achieve total spend. The budget for 2021/22 has been increased from existing budget.
- Lobby the Scottish Government for an increase in HEEPS: ABS grants. This could be done in conjunction with other local authorities, through the officers' groups or other forums.
- Continue to try and leverage funding from Scottish and UK Government grant schemes. This will include ensuring staff resource is available from the Council to support funding bids. Expressions of interest to the Decarbonisation Fund have been submitted – for new builds to PassivHaus standard.
- Engage with the Scottish Government to highlight the challenges of EESSH2 with the statutory obligation to tackle homelessness.
- Develop a clear vision of suitable measures for housing archetypes to provide clarity and guide the LHEES.

7.1.3 Connections and Partners

There was recognition of the need to work with and alongside existing low carbon focused local community groups in the local authority area. The Moray Council Climate Change Strategy (which was launched in early 2021) will support this partnership working.

The Community Climate Partnership also represents a key opportunity, though gaps currently exist which limit the full potential of this being realised. Additional support to bridge existing gaps will be required from the Scottish Government primarily, supported by increased prioritisation by Moray Council.

Home Energy Scotland North East (Managed by SCARF) were identified as a critical partner for delivering the Moray LHEES. They do not conduct home visits however, so while there is cross-referral to them, at times the impacts of this can be limited. The Warmer Homes Moray Group (which includes LEAP) are able to complete home visits. The Council has a good working relationship with this group which should be maintained and developed to support delivery of this strategy.

7.2 Medium-term priorities

There is a need to join up existing and future priorities, activities and strategies. A clear route map is needed to bring these together and draw out the means to reaching the longer-term goals. One such existing priority is achieving EESSH2 compliance.

One key area to focus on is pre-1919 properties and improving their fabric so that they are suited to low carbon heating systems.

Additionally, there should be an increased medium-term focus on the self-funding sector. This is not currently prioritised due to resource constraints.

7.2.1 Medium-term actions

There is a need to address the challenges which are currently hindering effective partnership working in the sector. Moray Council have identified that clarity is required from Scottish Government on personnel/ teams/ remits/ priorities.

There is also a need to develop clarity (at national and local authority level)on the available options for different types of housing stock when funding opportunities arise. This in turn will allows the Council to respond quickly and effectively.

7.3 Aspirations

One of the key ambitions identified was for Moray Council housing stock to be net zero by 2030. While there was caution that net zero may be difficult the achieve, there was agreement that the Council need to lead by example and be ambitious. Smart targets would be central to progressing this.

Climate change is recognised as a primary driver, and it was noted that this should form the backdrop and specifics of the policy. The LHEES and associated targets should tie in with the wider strategy, relating to health, wellbeing and economy. It provides an opportunity to cohere existing policies rather than representing an additional stand-alone policy.

There was recognition that the final LHEES, or any long-term targets, need to be achieved in line with other priorities such as achieving a just transition for all Moray residents. In addition to fuel poverty, the wider issue of poverty needs to be factored into the conversation (part of the Local Area Improvement Plan). As rates of fuel poverty and extreme fuel poverty within the area are both significantly higher than the Scottish average, this needs to be a high priority. While eradicating fuel poverty is a desire of the Council, a more achievable target would be to reduce it to being more in line with the Scottish average.

Another priority was that the LHEES should support improvements for the local economy, including but not limited to job creation. Current procurement restrictions can deter a regional or local focus. Additionally, some frameworks currently enable monopolisation by suppliers. These are areas which may warrant consideration in the future.

Moray-specific characteristics including the rural/ urban mix, and level of off-gas properties is covered within current pilot. There is a desire for the final project to be more comprehensive, covering all properties, tenures and Moray residents. Better financial models which make upgrades more feasible for owner occupiers would be a welcome development to support these longer-term ambitions.

Council members' ambitions will be capped to an extent by what they can control. Gaps in resources or practicalities could have significant impacts on achieving targets, underscoring their need to be realistic.

8. SOCIOECONOMIC WORKSHOP

Sweco was commissioned to provide a socioeconomic analysis of the impacts of the potential energy efficiency and heat decarbonisation measures identified above. Based on the data from the initial baseline data report (BDR)Sweco undertook a multi-criteria analysis which is presented below. A socioeconomic workshop was also held with participants from Moray Council in November 2020 via Microsoft Teams.

8.1 What is socioeconomic analysis?

In contrast to technical and financial analysis, socioeconomic analysis evaluates the wider impacts of projects and programmes not typically captured in business cases. The underlying methodologies used to estimate these impacts are set by national and industry standards and, when followed, deliver rigorous assessments which capture benefits and costs to the wider society and provide a framework for assessing these impacts on a like-for-like basis with financial and technical impacts.

Wider impacts captured include:

- Carbon emissions – measuring impacts on the climate.
- Fuel poverty – impact on fuel poverty levels.
- Financial – break-even or revenue opportunities and technical risk and complexity.
- Local economic impacts – impact on local employment and skills.
- Local environmental impacts – impacts on air quality, biodiversity, noise, built heritage.
- Social impacts – impacts on health and well-being.
- Resilience – potential for future-proofing and implementation of circular economy.

There are three main methodologies used in socioeconomic analysis: Cost Benefit Analysis, Multi-criteria Analysis, and Cost Effectiveness Analysis.

8.1.1 Cost Benefit Analysis (CBA)

CBA summarises all direct and indirect costs and benefits from a proposed project or programme (intervention) against what would happen otherwise (baseline, also known as a counterfactual) into a single monetary figure (GBP). This single value, usually a Net Present Value, estimates whether the proposed intervention is better for society than its alternative.

This approach is generally most useful on a project-by-project basis when most of the impacts identified can be monetised. The methodology for this approach is extensively covered in HM Treasury's "Green Book" (2018) and in the "Guidance on

project level socio-economic assessment – draft methodology" tailored to LHEES and published by Scottish Government (2019).

8.1.2 Multi-criteria Analysis (MCA)

MCA quantifies all identified direct and indirect impacts from a project by applying user-defined weightings, which are related to the achievement of desired outcomes. Unlike CBA, this approach does not rely on monetisation but is instead a quantification approach which allows a like-for-like assessment across a portfolio of projects, which meet multiple different objectives simultaneously.

This approach is most useful when evaluating a programme of multiple projects which need to be easily compared and which have impacts which cannot easily be quantified. The methodology for this approach is covered in the Communities and Local Government's "Multi-criteria Analysis: a manual" (2009) and in the "Guidance on strategy level socio-economic assessment – draft methodology" published by Scottish Government (2019).

8.1.3 Cost Effectiveness Analysis (CEA)

CEA quantifies all expected impacts of an intervention against a baseline with a view to identifying the most cost-effective approach to delivering a single objective. This approach is the most useful when there are multiple options for delivering a single objective but is less appropriate when projects deliver multiple outcomes simultaneously (e.g., an energy efficiency improvement which supports decarbonisation through less fuel being burned and reduces fuel poverty by lowering the total cost of heat).

This methodology is covered in Annex IX of the European Commission's Guide to Cost-Benefit Analysis of Investment Projects (2014).

8.2 Application of socio-economic methodology to Moray LHEES

The analysis conducted for Moray Council involves identification of potential heat decarbonisation and energy efficiency measures which can be applied across buildings in the area considered. In total, 19 energy efficiency and local heat measures were identified:

- Domestic loft insulation virgin
- Domestic loft insulation top-up
- Domestic cavity wall insulation
- Domestic external wall insulation
- Domestic internal wall insulation
- Domestic air source heat pump
- Domestic biomass
- Domestic high heat retention heaters
- Domestic solar thermal
- Non-domestic loft insulation virgin

- Non-domestic loft insulation top-up
- Non-domestic roof insulation
- Non-domestic floor insulation
- Non-domestic cavity wall insulation
- Non-domestic internal wall insulation
- Non-domestic glazing
- Non-domestic air source heat pump
- Non-domestic ground source heat pump
- Non-domestic solar thermal

Due to the number of projects and measures identified, the MCA approach is considered the most appropriate socio-economic methodology to use for the Moray LHEES.

For ease of comparison across the three areas identified in the analysis (overall, Burghead and Elgin), the measures have been grouped as below:

- Domestic energy efficiency measures - overall
- Domestic energy efficiency measures - Burghead
- Domestic energy efficiency measures - Elgin
- Domestic heat decarbonisation measures - overall
- Domestic heat decarbonisation measures - Burghead
- Domestic heat decarbonisation measures - Elgin
- Non-domestic energy efficiency measures - overall
- Non-domestic energy efficiency measures - Burghead
- Non-domestic energy efficiency measures - Elgin
- Non-domestic heat decarbonisation measures - overall
- Non-domestic heat decarbonisation measures - Burghead
- Non-domestic heat decarbonisation measures - Elgin

In the Scottish Government Draft Guidance for MCA, a range of criteria and weightings have been proposed for use as extracted below. Note the weightings sum up to 1 (100%).

Table 57. Criteria and suggested weightings for MCA. Source: Scottish Government (2019); Guidance on strategy level socio-economic assessment - draft methodology

Criteria	Weighting
Carbon emissions	.3
Fuel poverty	.3
Financial	.08
Local economic	.08
Local environmental	.08
Social	.08
Resilience	.08
Total	1

These overarching criteria can be broken down into sub-criteria appropriate for use across the Local Authorities. These were discussed and tentatively agreed at the Council workshop in November 2020. Note that it is highly recommended that the Council reviews and agrees these sub-criteria and associated rankings internally as they should be uniformly applied across all projects for at least a five-year period. The initial criteria and weightings agreed with Moray Council at the workshop are provided in the Table 58.

Table 58. Moray MCA criteria and weightings

Criteria	Indicator	Weighting
Carbon emissions	reduction in tonnes of carbon	20%
	cost per tonne of carbon (cost effectiveness with respect to carbon)	10%
Fuel poverty	homes impacted	20%
	energy bill savings	10%
Financial	financial viability/payback over 20 years	8%
Economic	jobs, training and apprenticeships	4%
	skills and supply chain	4%
Local environmental impacts	air quality	2%
	noise	1%
	built environment	1.0%
	local heritage	2.0%
	impact on biodiversity	2%
Social	physical health and wellbeing	4%
	mental health and wellbeing	4%
Resilience	future-proofing	8%

8.2.1 Project opportunities

Assessment of the criteria and indicators against each of the 12 groups of measures has been conducted in a separate Excel document which has been submitted alongside this summary report. This enables a ranking of the projects considered.

8.2.2 Scoring

Each indicator is scored on a scale of 1 to 5. Scores of 3 indicate no change against the baseline, which was identified in the Changeworks Summary Baseline Data report as part of this study.

Scores of 1 or 2 reflect that the proposed project will have an adverse effect for the specific criteria. For example, external wall cladding to improve energy efficiency may affect the built environment/local heritage of older terraced houses. Scores of 4 or 5 reflect improvements against the baseline, such as improvements to health and well-being from living in better insulated homes.

Each of the 12 measures has been scored against the available criteria independently by the two Sweco socio-economic delivery partners and then compared and combined following discussion of how values were assigned.

The results of this scoring exercise are presented in the Results section below.

8.2.3 Results

An initial ranking exercise of the 12 measures against the identified criteria and weightings has been performed. It is recommended that the Council reviews these internally in the accompanying model, which captures notes and comments to justify the rankings provided.

Initial results are provided in the table below. The final score captures the combined scores across the weighted indicators. Final scores above 3 indicate that the proposed grouping of measures results in a net benefit to society. The various groupings are ranked based on their final score, which is displayed using a red-to-blue colour scale (high rank to low rank).

Table 59. Initial results from socio-economic analysis

Project name	Total score	Ranking
Domestic energy efficiency measures - overall	**4.25**	1
Domestic heat decarbonisation measures - overall	**4.12**	2
Domestic energy efficiency measures - Elgin	**3.92**	3
Domestic heat decarbonisation measures - Elgin	**3.92**	4
Domestic energy efficiency measures - Burghead	**3.78**	5
Domestic heat decarbonisation measures - Burghead	**3.76**	6
Non-domestic energy efficiency measures - overall	**3.66**	7
Non-domestic heat decarbonisation measures - overall	**3.65**	8
Non-domestic heat decarbonisation measures - Elgin	**3.60**	9
Non-domestic energy efficiency measures - Burghead	**3.54**	10
Non-domestic energy efficiency measures - Elgin	**3.54**	10
Non-domestic heat decarbonisation measures - Burghead	**3.29**	12

This initial socioeconomic analysis has indicated that project grouping P1, domestic energy efficiency measures - overall, is the highest rank option. Note that all projects indicate an improvement against the baseline, i.e., values above a 3, with a mix of rankings across energy efficiency or heat decarbonisation measures.

Note that the top six measures all relate to measures targeting domestic improvements, with measures targeting the overall area ranked #1 (P1) and #2 (P4) for energy efficiency measures and heat decarbonisation measures, respectively. The higher scores for the overall areas reflect the number of homes impacted, approx. 28.5 – 32 thousand homes. This both maximises the fuel poverty impact and supports a substantial economic pipeline with opportunities for training and apprenticeships and improving skills in the local supply chain.

For the non-domestic measures, scale of deployment has also been prioritised, with the grouping for the overall area in Moray for both energy efficiency and heat decarbonisation measures ranking highest out of the non-domestic groupings.

The emphasis on scale to boost the local supply chain is a reflection of the Council emphasis on economic growth as a priority for the Moray area in conjunction with dealing with the climate emergency and targeting fuel poverty. To ensure that the potential for local economic growth is maximised, the Council should prioritise large-scale deployment.

These scores may change after internal assessment by the Council of the scoring and weighting criteria. It is recommended that the internal assessment by the Council follows a similar approach to a standard procurement exercise with assessments initially conducted individually and then jointly to agree on scores for each criterion.

9. KEY CONSIDERATIONS

9.1 Programme of Review

Given the current rate of fabric improvements and low carbon heat upgrades, the housing stock data does not change very frequently. Therefore, an update of the BDR every five years with significant changes leading to the EE and heat decarbonisation options appraisal being re-done, should suffice for identifying opportunities for energy efficiency upgrades and low carbon heating. More importantly will be relevant recalculations of costs and potential carbon and running cost savings. Changes to the carbon density of different heating types, particularly the carbon intensity of electricity or a switch to a hydrogen gas system, will require a recalculation of the carbon and running costs savings. Likewise, large changes in the costs for certain measures justify a recalculation of those as well. As the market matures, costs might be expected to fall as was noted with the cost of solar PV as take up ramped up. In addition, any changes to the Scottish Government's climate change and fuel poverty policies, could be a reason to recalculate or reanalyse parts of the LHEES if relevant changes to definitions and aims have been made.

Where the updated data may impact the zoning or prioritisation of areas, there will be a requirement to update the Arc GIS mapping to reflect.

9.2 Data

The process of an LHEES is data led, with the BDR, EE and Heat Decarbonisation Options Appraisal based on local authority and national data sets.

Since this work concerns identifying and/or reaching households or properties suitable for energy efficiency or low carbon heating upgrades, analyses of the housing stock (as provided by **Home Analytics** and corrected by comparing and cross-referencing with **data on privately rented properties** and **social housing stock data**) and the estimated heat demand (**Scotland Heat Map**) form the backbone of the work. In addition, since there is currently no national non-domestic property database, the **EPC register** for non-domestic properties (provided through the Energy Saving Trust) has been important in identifying upgrades for non-domestic properties.

Accessing the data mentioned above comes with a number of challenges, which are summarised below.

Timely response. A process for access to the data required for third party consultants needs to be refined as time delays can be attributed to:

- **Data access.** Although the Scottish Government is working on this, it was unclear if and how access to EPC data would be arranged.
- **Data 'awareness'.** It is critical that the officer/managers in charge of LHEES development at Moray Council are aware of:
    - The existence and knowledge of access to requested datasets such as Home Analytics and Scotland's Heat Map.

- The legalities regarding the datasets, knowledge of(contract variations on) data sharing agreements between local authorities and Energy Saving Trust or OS.
- The location of the requested datasets or what colleague is responsible for the data.
- The level of data literacy required to understand what the requested data needs to contain and in what format.

Further Council-held data on privately rented properties and local development plans are also required for an LHEES, and this can be held between different departments, so as part of the data access procedure, cross-departmental communication is key.

10. APPENDICES

10.1 Appendix A: Matrix of Moray Council policy documents and the eight LHEES themes

Document	Domestic Energy Efficiency	Non-Domestic Energy Efficiency	Heat Decarbonisation	Carbon Reduction	Economic Development (specific to low-carbon economy)	Planning/Development (both domestic and non-domestic)	Fuel Poverty	Community Engagement
Active Travel Strategy 2016-21				References Scotland's low carbon targets				
Carbon Conscious Elgin Town Centre - Workshop 1				Moray Council set the aim of becoming carbon neutral by 2030				
Corporate Plan 2023			Energy from Waste Project		Promote economic development and growth, and maintain, and promote, Moray's landscape and biodiversity	Promoting and regulating spatial planning and a built environment which delivers sustainable economic development and an attractive environment	We will tailor our services to tackle inequalities in our communities	We will promote community empowerment and support community participation and involvement; More of our activities, services and plans are influenced by the communities they serve; Our communities' ability to address their own needs and aspirations is improved; We are more successful in developing a shared understanding between the Council and communities that helps us to design the future together.
Economic Strategy 2019-29					No specific reference to low carbon		Estimated 32% of households in fuel poverty. We need to address all these issues to realise our vision for Moray -as a thriving, successful place for everyone.	Commitment to community empowerment will be a cornerstone of our action planning, and support for the social enterprise sector will help to deliver the economic and social impact we want to see.
Emergency Planning Policy and Procedures								
Energy Policy and Strategy – Non-Domestic				Energy management is fully integrated				

Document	Domestic Energy Efficiency	Non-Domestic Energy Efficiency	Heat Decarbonisation	Carbon Reduction	Economic Development (specific to low-carbon economy)	Planning/Development (both domestic and non-domestic)	Fuel Poverty	Community Engagement
Operational Properties				across all relevant decision making to reduce energy consumption, costs and carbon emissions in all buildings it occupies or operates Energy awareness of all staff is raised and maintained within the Council. Reduce the Council's energy consumption by 2% per annum on a year-to-year basis				
Heating Policy		Heating schedules designed to conserve energy and avoid waste						
LDP Supplementary Guidance: Climate Change	Traditional built structures need to improve energy efficiency and reduce fuel consumption. Insulation and air tightness in buildings should be maximised.		Micro-renewable installations must be designed and planned to maintain the historic character of each site and make best use of available energy sources. Passive solar design principles incorporated into development. Installation of onsite renewable technologies			All developments should be designed in accordance with the energy hierarchy. Developments of 10 or more houses and buildings more than 500 sq. m should, where practical, meet heat and energy requirements through decentralised and local renewable or low carbon sources of heat and power and where practical, install low and zero carbon generating technologies		
Local Housing Strategy 2019-24	**Priority 4:** To improve the condition and energy efficiency of housing and	Deliver initiatives under SEEP	We will ensure that as many households as possible in Moray	We will seek to reduce energy consumption in			Significant numbers experiencing fuel poverty, despite investment in	

Document	Domestic Energy Efficiency	Non-Domestic Energy Efficiency	Heat Decarbonisation	Carbon Reduction	Economic Development (specific to low-carbon economy)	Planning/Development (both domestic and non-domestic)	Fuel Poverty	Community Engagement
	minimise fuel poverty. Improving the energy efficiency of the housing stock to remove poor energy efficiency as a driver of fuel poverty. Ensuring that new housing is built to high standards of energy efficiency. **Outcomes:** People live in energy efficient homes. Continue to participate in HEEPS: ABS. Seek to maximise the funding opportunities available under SEEP to deliver home energy efficiency programmes and related initiatives. This will require a holistic approach to improving the energy efficiency of buildings across both the domestic and non-domestic services	using a holistic approach to improving the energy efficiency of buildings across both the domestic and non-domestic services	live in a warm, comfortable home they can afford to heat. We will seek to reduce energy consumption in homes and promote the use of renewable energy sources for heating Participating in programmes to de-carbonise the heating supply.	homes and promote the use of renewable energy sources for heating. By reducing energy in homes, our actions to address fuel poverty will also contribute to climate change carbon saving objectives. However, to meet these objectives, it is recognised that actions to improve the energy efficiency of dwellings will also need to be directed to non-fuel poor households			insulation **Priority 4:** improve the condition and energy efficiency of housing and minimise fuel poverty. Ensure as many households as possible in Moray live in a warm, comfortable home they can afford to heat. Seek to reduce energy consumption in homes and promote the use of renewable energy sources for heating. Improve the energy efficiency of the housing stock in order to remove poor energy efficiency as a driver of fuel poverty. Ensure investment in home energy efficiency energy and energy advice and support is directed to the most vulnerable to fuel poverty (in low incomes, living in hard-to-heat properties and vulnerable to cold – many will be in remote rural areas) **Outcomes:** People live in homes that they can afford to heat. The Council's strategic actions focus on helping fuel poor households to reduce their energy consumption, by improving home energy and providing support and advice on saving on energy costs. Seek to maximise ECO funding for households at high risk of fuel poverty and vulnerable to cold. This will	

Document	Domestic Energy Efficiency	Non-Domestic Energy Efficiency	Heat Decarbonisation	Carbon Reduction	Economic Development (specific to low-carbon economy)	Planning/Development (both domestic and non-domestic)	Fuel Poverty	Community Engagement
							be achieved through participating in the UK Government's Flexible Eligibility Scheme. Continue to work with partners in the Warmer Moray Group to ensure that fuel poor and vulnerable households in Moray have access to a full range of energy advice and income maximisation services, including a locally based home visit service. The Council will also consider ways it can help non-fuel poor households to reduce their energy usage	
Local Transport Strategy Part 1								
Local Transport Strategy Part 2				see Carbon Management Plan				
Moray 2026 – A Plan for the Future							Reduce the number of households in fuel poverty.	
Moray Home Energy Efficiency Programme (2017 Report to Cabinet)	The programme contributes towards carbon reduction targets by helping reduce energy consumption from domestic buildings.			The programme contributes towards carbon reduction targets by helping reduce energy consumption from domestic buildings			The HEEPS programme contributes to Moray 2026 priorities in relation to reducing fuel poverty in Moray. Recognises statutory requirements on local authorities to address fuel poverty and contribute to the achievement of climate change targets.	
Poverty Strategy 2018-21	Improving the condition and energy efficiency of housing						Nearly half of households in Moray are experiencing fuel poverty, with one in ten experiencing 'extreme fuel poverty'. **Priorities:** "energy efficient homes" and "Affordable energy." The identified leads will work	

Document	Domestic Energy Efficiency	Non-Domestic Energy Efficiency	Heat Decarbonisation	Carbon Reduction	Economic Development (specific to low-carbon economy)	Planning/Development (both domestic and non-domestic)	Fuel Poverty	Community Engagement
							together to review the way in which support is currently provided to families experiencing fuel poverty (b) the identified leads will develop an action plan to improve coordination and reach/uptake of support. Improving the condition and energy efficiency of housing and minimising fuel poverty.	
Proposed Local Development Plan 2020				EP16 development must minimise release of peat and other carbon rich soils.	Encourage efficient use of land and promote low carbon and sustainable development.	Apply a placemaking approach to development to create sustainable, welcoming, well connected and distinctive places that are safe, healthy and inclusive. DP9 - renewable energy VOL 2: Cabrach, low impact and modest scale proposals for regeneration of the community including housing, employment and low and zero carbon generating technologies will be supported in the open countryside.		
Risk Management Policy								
Risk Management Strategy 2008								
Service Plan 19-20				Environmental & Commercial Services: - Reduce carbon emissions from council fleet. - Reduce our carbon footprint in school meals	Strategic Outcome 4.2 - Support the Moray Growth Deal.			Strategic Outcome 4.3 Participatory Budgeting.

Document	Domestic Energy Efficiency	Non-Domestic Energy Efficiency	Heat Decarbonisation	Carbon Reduction	Economic Development (specific to low-carbon economy)	Planning/Development (both domestic and non-domestic)	Fuel Poverty	Community Engagement
				catering. - Reduce single use plastics (e.g., cutlery) from 100% to 10% by April 2020. - Eliminate all single use plastic usage by August 2020. Progress joint energy from waste project.				
Single Equality Scheme								Carry out consultation / involvement with equality groups on decisions that are likely to affect them.
Skills Investment Plan					No specific reference to low carbon skills / employment.			

Report written and produced by **Changeworks**