

LHEES Phase 2 Pilots: Evaluation Report

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LHEES Phase 2 Pilots: Evaluation Report

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Executive Summary

Local Heat and Energy Efficiency Strategies (LHEES) aim to establish local authority area-wide plans and priorities for systematically improving the energy efficiency of buildings and decarbonising heat. This report presents an evaluation of the Phase 2 pilots focusing on the organisational and social aspects, as well as a review of the reports generated by the projects.

The Phase 2 LHEES pilots aimed to:

- test and develop new methods for creating LHEES;
- identify relevant sources of data and data gaps; and to
- gain a fuller understanding of the resources and capabilities required to develop LHEES.

The findings and lessons can be used to inform the future development of this programme, for Scottish Government, local authorities, and project partners.

Findings

1. Test and develop new methods for creating LHEES

Through the pilots, project teams were able to develop an understanding of the process of developing a LHEES, and create an 'evidence base' of the building stock. Project teams also tested the socio-economic assessment methodology. Hiring consultants with knowledge of the local area, and working in close partnerships helped to ensure a sense of local ownership of LHEES.

Key Lessons:

- Additional guidance would be useful for ensuring consistency and parity across different local authorities. It would be helpful for this to retain an open scope, but provide a clear definition of what an LHEES is and what it encompasses, including suitable technologies.
- The socio-economic assessment methodology could be updated to include carbon emissions and fuel poverty *alongside* factors that underpin council decision making, including the creation of jobs and financial returns. A specific suggestion is to attribute a weighting factor to the financial benefit of the ability to not have to retrofit buildings again in the future.

2. Identify relevant sources of data and data gaps

Detailed energy consumption and building information was available for council-owned public sector buildings. Although EPC and Home Analytics data is available for privately owned and rented domestic properties, it was much harder to establish an accurate picture of individual building condition and energy consumption for businesses. The biggest hindrance to progress was the sharing of data amongst different organisations.

Key Lessons:

- A single repository for relevant data would support the development of a timely and consistent LHEES. Developing this would need to explore how detailed data can be provided whilst adhering to GDPR. Clear guidelines in terms of when data sharing agreements are required, and the provision of templates for these, would also be helpful.

- If LHEES is to include large businesses, there may be a need to create or reinforce mechanisms to encourage large businesses to engage with LHEES.

3. Gain a fuller understanding of the resources and capabilities required to develop LHEES

The development of a LHEES is highly technical. Key skills for this include the collation and analysis of numerous datasets, and knowledge of buildings and building services. LHEES also requires significant expertise in project management and strategies for engaging different stakeholders.

Key Lessons:

- Supporting and upskilling and continual development of local authority officers is vital for enabling the delivery of LHEES over the next 15-20 years. A helpful focus for this would be capabilities for the management, interpretation and analysis of data.
- Local authorities and consultants would benefit from being able to share information about the methodologies and data used in the development of LHEES; this includes both face-to-face interactions and online information sharing platforms.
- All of the local authority officers and consultants interviewed were in favour of LHEES becoming a statutory duty. This would offer more leverage to existing council strategies, but would be most effective if developed alongside enforcement and additional resource for local authorities. A specific suggestion was for a dedicated person within each local authority to support the development and management of LHEES.

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1. Introduction: Local Heat and Energy Efficiency Strategies

Local Heat and Energy Efficiency Strategies (LHEES) are currently being piloted under the Energy Efficient Scotland programme¹. LHEES aim to establish local authority area-wide plans and priorities for systematically improving the energy efficiency of buildings, and decarbonising heat.

The Scottish Government have suggested that LHEES adopts a local authority area-wide approach and covers a long-term period (15-20 years). In line with the goals of Energy Efficient Scotland, LHEES should reflect and support local and national policies, frameworks, strategies and targets, and identify opportunities for energy efficiency improvements and heat decarbonisation. To do this, the Scottish Government have outlined LHEES as including the following stages²:

Stage 1: An assessment of existing local and national strategies and data availability.

Stage 2: Authority-wide assessment of existing building stock's energy performance and heat supply.

Stage 3: Authority-wide setting of aggregate targets for heat demand reduction and decarbonisation of buildings.

Stage 4: Conduct a socio-economic assessment of potential energy efficiency and heat decarbonisation solutions³.

Stage 5: Selection of areas/ prioritisation of opportunities for energy efficiency and/or heat decarbonisation, leading to the designation of zones.

Stage 6: Costing and phasing of delivery programmes

In its second consultation on LHEES, the Scottish Government suggested that LHEES will be developed in conjunction with members of local community planning partnerships, and in relation to their wider community planning duties. In developing LHEES, Scottish Government have suggested that local authorities should coordinate with information and expertise available through Government funded programmes including: Resource Efficient Scotland, the Energy Saving Trust and the Scottish Futures Trust.

2. The LHEES Phase 2 Pilots

The first phase of LHEES pilots, which involved 12 local authorities, was completed in March 2019; these have already been evaluated⁴. Under Phase 2 of the LHEES pilot programme, 11 local authorities around Scotland were awarded £30-60K to trial the development of an LHEES (see Figure 1). The funding was used to provide resource in the form of staff time, to procure consultancy services to carry out aspects of the work, and to conduct stakeholder engagement. The pilots ran from May 2018 to December 2019, with some extended to March 2020.

¹ See: <https://www.gov.scot/publications/energy-efficient-scotland-route-map/>

² See: <https://www.gov.scot/publications/scotlands-energy-efficiency-programme-second-consultation-local-heat-energy-efficiency/>

³ More detail on the proposed socio-economic assessment method is provided in Appendix 1.

⁴ See: <https://www.gov.scot/publications/local-heat-energy-efficiency-strategies-phase-1-pilots-social-evaluation/> and <https://www.gov.scot/publications/local-heat-energy-efficiency-strategies-phase-1-pilots-technical-evaluation-report/pages/3/>

The primary aims of the LHEES Phase 2 pilots were to test and develop methods for creating an LHEES, identify relevant sources of data (and any data gaps), and gain a fuller understanding of the resources and capabilities required to deliver an LHEES. This evaluation report will assess the pilots against these aims, specific questions include:

1. Did the pilot programme set out the aims laid out above (developing and testing methods; identifying relevant sources of data; understanding resources and capabilities)?
2. Did the development of the LHEES follow the 6 Stages laid out in the 2017 consultation?
3. Did the development of the LHEES include engagement with colleagues across the council, and wider engagement with community stakeholders?
4. Does the LHEES use the socio-economic assessment methodology developed by Carbon Trust?
 - Has the socio-economic assessment been used for the designation of zones?
 - How useful was the socio-economic methodology? Are there potential adjustments to be made?
5. What data was used in the development of LHEES? What gaps/ challenges remain?
6. What role did external consultants play in the development of LHEES? What further support is needed?

For the second phase of LHEES pilots, Scottish Government sought to understand the requirements for specific sectors, and requested that proposals focus on one of the following areas:

- Energy efficiency in the “able-to-pay” (both domestic/non-domestic sectors)
- Energy efficiency in the domestic private rented sector
- Energy efficiency in the Small and Medium Enterprise (SME) sector (both industrial and services)
- Energy efficiency in public sector buildings
- Identifying opportunities to establish or support energy efficiency and low carbon heat supply chains
- Identifying low regrets opportunities for the decarbonisation of heat supply⁵

Local authorities were able to specify whether they would consider these sectors on a local authority-wide basis, or in specific urban, suburban and remote rural settings. Each of the 11 local authorities involved developed their own specific aims for their pilot. In contrast with the area-based approach taken to the Phase 1 pilots, the sectoral approach suggested by Scottish Government for the Phase 2 pilots sought to align with focus of the broader Energy Efficient Scotland pilots. Whilst the Phase 2 pilots were in progress, both the Scottish Government and a number of local authorities declared a Climate Emergency. This resulted in some re-focusing of the

⁵ See: <https://www.gov.scot/publications/energy-efficient-scotland-transition-programme-application-forms/>

Phase 2 pilots towards a longer term, more strategic approach. A summary of the initial and updated aims and scope of each LHEES pilot is included in Table 1.

Table 1: Summary of Phase 2 LHEES activities for each local authority.

Local Authority	LHEES pilot initial and updated aims
Aberdeenshire	<ul style="list-style-type: none"> • Focus on SME businesses in off-gas areas. • Options appraisal of energy efficiency measures, energy and heat supply. • Shortlist to a realistic set of individual project options and integrated solutions. • Provide a cost/benefit analysis of best practice measures to refurbish these buildings to a high standard of energy efficiency with low carbon heating options.
Argyll and Bute	<ul style="list-style-type: none"> • Focus on: 1) energy efficiency in domestic private rental sector (across the whole local authority) and 2) low regrets opportunities for low carbon heat (on the Isle of Islay, Oban and Lochgilphead) • Develop a best practice framework document incorporating all elements of LHEES, with more detail on the project focus areas <p>Updated aims</p> <ul style="list-style-type: none"> • Stage 1) of the pilot was not completed due to resource constraints. • For Stage 2) the Isle of Islay was replaced with Cambeltown because of overlap with existing projects on Islay.
East Lothian	<ul style="list-style-type: none"> • Focus on the private rented housing sector across Dunbar, Haddington and North Berwick, with a specific emphasis on tenement / flatted buildings. • Identify opportunities to reduce energy demand, improve energy efficiency, promote decarbonisation of supply and improve engagement. Plan measures / feasibility studies accordingly, consult and engage on these, and develop proposed delivery programme. • Provide formal training in relation to technical skills. <p>Updated aims</p> <ul style="list-style-type: none"> • Scope expanded to include private rented sector across the whole of East Lothian, rather than just targeted zoned areas.
Falkirk	<ul style="list-style-type: none"> • Consider LHEES projects aimed at scoping the challenges of adopting low carbon heat and power opportunities within key parts of the council's public estate, for example developing strategic options for heat networks adjacent to industrial complexes (Grangemouth) and development of low carbon heat options for off gas grid areas. • Test low carbon energy opportunities within PPP/PFI High School built estate.
Fife	<ul style="list-style-type: none"> • Develop a stakeholder methodology to engage businesses in Levenmouth to inform LHEES.
Inverclyde	<ul style="list-style-type: none"> • Local Heat and Energy Efficiency Strategy focused on improving energy efficiency and decarbonisation of the public sector estate across Inverclyde

	<p>Updated aims</p> <ul style="list-style-type: none"> • Developed dashboard tool to explore how measures in different public sector buildings would contribute to overall LHEES targets.
Midlothian	<ul style="list-style-type: none"> • Focus on energy efficiency in able to pay (domestic and non-domestic) and domestic private rented sector across the whole local authority area. • Project will include: baseline data reporting, objectives and targeting, measures evaluation, stakeholder engagement, socio-economic analysis and an implementation plan.
North Lanarkshire	<ul style="list-style-type: none"> • Testing the socio-economic assessment methodology developed by the Scottish Government across the whole council area. <p>Updated aims</p> <ul style="list-style-type: none"> • Completed initial data collection on whole North Lanarkshire area. Used this to identify three intermediate zones (representative of urban, sub-urban and rural areas) • Identified potential interventions for each type of zone • The socio-economic analysis was then completed for the potential interventions in each of the three intermediate zones.
Orkney Islands	<ul style="list-style-type: none"> • The LHEES will have an Orkney wide focus, covering industry, the public sector and domestic households. • Bring together Orkney's Sustainable Energy and Fuel Poverty Strategies. • Provide statistical basis to develop actions and opportunities for enhancing the production and use of renewable/low carbon energy in Orkney. • Identify low regrets opportunities for decarbonising heat and electricity.
South Lanarkshire	<ul style="list-style-type: none"> • Focuses on energy efficiency in the domestic private rented sector (PRS) with particular focus on multi-tenure factored and tenement management scheme flatted blocks • Identify low regrets opportunities for the decarbonisation of heat supply within accessible rural and remote rural off-gas grid settlements. • Consider the particular “able to pay” features in relation to both the sectorial (PRS) and locational, rural Low and Zero Carbon (LZC) low regrets, aspects of the project. • Include socio-economic assessment, which will enable evaluation of the extent and nature of fuel poverty and the potential impacts and benefits of LZC options. <p>Updated aims</p> <ul style="list-style-type: none"> • Time and resource limitations resulted in detailed study of PRS, but less focus on off-gas settlements

West Lothian	<ul style="list-style-type: none"> • Focuses on energy efficiency in the SME sector (both industrial and services), and in public sector buildings • Identifying opportunities to establish or support energy efficiency and low regrets opportunities for the decarbonisation of heat supply. • The project will investigate the options in the town of Whitburn, due to the mixture of social and private housing, publicly owned buildings as well as both publicly and privately owned industrial units. <p>Updated aims</p> <ul style="list-style-type: none"> • Focused on four off-gas grid areas (Breich, Newton, Westfield, and Wilkieston), with more attention on the domestic than non-domestic
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Figure 1: Map illustrating the 11 local authorities that took part in the second phase of LHEES pilots

3. Method and analysis

The University of Edinburgh was appointed to carry out an independent evaluation of the LHEES pilots. The evaluation seeks to identify lessons from the 11 Phase 2 pilot projects to inform the future development of this programme, for Scottish Government, local authorities, and project partners. This evaluation focuses on the organisational and social aspects of the LHEES pilots, as well as a review of the reports and other outputs generated by the projects.

This evaluation draws on in-depth semi-structured interviews conducted with each of the pilot teams at towards the end of the pilot projects. These included

representatives from each local authority and external consultants that they partnered with for the pilots. In some cases, local authority officers and external consultants were interviewed together. Other interviews included just local authority officers (for example, where there was no consultant involved) or just consultants (for example, where consultants worked across several pilot projects). The interviews considered:

- Scope and content of the pilot LHEES
- Activities and processes involved in developing the LHEES
- Skills and resources required to develop the LHEES
- Perceptions of LHEES, and how this might effectively be rolled out as national policy.

All of the interviews lasted between 30 and 90 minutes and they were normally conducted in the local authority's offices or nearby. The interview data has been analysed according to emerging themes, including: pilot outcomes; the impact of available skills and resource on delivery; partnerships and consultancy; stakeholder engagement; and next steps. These are discussed in Section 4.

In addition, evaluating the projects included analysing each of the LHEES reports generated by the pilot teams. This analysis included consideration of the specifications provided by Scottish Government and the evaluation questions raised in the previous sections. A summary of all of the Phase 2 LHEES reports is provided in Appendices 2 and 3.

4. Results

4.1. LHEES Pilot Outcomes

Key Lessons

- Seven pilots collated data on the whole local authority area; the remaining four focused on specific regions.
- The majority of pilots selected one or two building sectors to focus on. These included: public sector buildings; local authority stock; small and medium enterprises; self-funding; and privately rented.
- Through the pilots, project teams were able to develop an understanding of the process of developing a LHEES and create an 'evidence base' of the building stock.
- This included greater understandings of just how difficult the process of doing a full LHEES would be, and the significant time and resource implications of this.
- Hiring consultants with prior knowledge of the local area, and working in close partnerships helped to ensure a sense of local ownership of LHEES.

4.1.1. Scope of the LHEES reports

Area focus

Seven of the pilots included the whole of the local authority area, whilst the remainder focused on specific regions. Gathering information on the whole area

allowed local authority officers to develop a broader understanding of the building stock and heat demand, in preparation for developing an authority-wide LHEES.

In some cases, the authority started with an area-wide overview and then selected a small number of focus areas to represent different levels of building density:

“We came up with the idea of looking at a few example intermediate zones. [Intermediate zones] are basically an area of our local authority... I think it's roughly 4,000 [properties] and you can typify those by either being rural, suburban or urban quite easily.” (consultant)

Through selecting a rural, a suburban and an urban area, the project team were able to generate scenarios that could apply to similar areas across the region. Another council commenced with an overview of SMEs in the local authority area; they used this initial data analysis to identify areas to subsequently focus the LHEES:

“They used GIS to overlay things, and you could see pockets of high heat demand. So ...we weren't going to focus solely on off-gas anymore. We had to focus on where these corridors were and have them do more linking together So they decided to focus on four areas... it's almost like a corridor, you could just see this line of dots going up.” (local authority officer)

In this case, the original plan to focus on off-gas grid areas was changed in response to early data analysis. Through overlaying data using GIS, the project team identified a 'corridor' of SMEs with high heat demand (spanning four areas), and they chose to focus on this for the remainder of the analysis. Similarly, in Falkirk's project focusing on the council's public sector building stock, initial analysis was used to identify suitable regions. The team identified the age and condition of buildings, and analysed this alongside the council's existing building review plans (for example, discounting buildings that were due to be sold). From there, the team identified two areas to focus on: an industrial area and the high street. Other project teams identified areas to focus on prior to the project commencing, for example choosing to prioritise off-gas grid areas (West Lothian).

Sector-focus

The majority of the Phase 2 pilots selected one or two building sectors (public, private, domestic and non-domestic) to focus on. For example, one local authority officer highlighted their focus on council owned buildings:

“It is an overview of public or council owned buildings and reviewing what state they're in presently. What things have to happen to get them to achieve their Scottish Government targets and then what we're able to do with the current budgetary constraints and other constraints that we have and then trying to bridge that gap. So that's a kind of overview of our entire study.” (local authority officer)

In this case, the team had been keen to explore how meeting Scottish Government targets for public sector buildings could be achieved within the council's anticipated budget over the next 15-20 years. In other projects, the pilot teams sought to gather information about sectors they were less familiar with (for example, Fife and Aberdeenshire focussed on SMEs, whilst Midlothian looked at the self funding and

private renting sectors). Councils knew less about the non-domestic sector, with SMEs being particularly difficult to define:

“The initial step was really just to try and define ‘what is the SME sector?’, in terms of its geographical location, the number and type and size of business, what sort of energy they’re using. It’s getting more and more hard to define as I go through this list what sort of energy and heat demands they have and what sort of measures they may have already implemented and there might still be scope to influence.” (consultant)

The projects focusing on the SME sector highlighted how difficult it was to define this group (Aberdeenshire and Fife had a particular focus on SMEs). A specific challenge is that many SMEs operate out of domestic buildings (their own homes) and so it can be difficult to categorise them for subsequent action. This includes how to approach them (for example, as a business or domestic resident) and identify suitable referral routes for support (for example, whether to direct them to HES and RES). This could present an opportunity in that supporting domestic sector retrofitting will incorporate a portion of the business sector. One project team highlighted how the majority of businesses in the selected pilot area were home-based. After working through different data sources, they arrived at 160 businesses *in business premises* (out of approximately 1,200 registered businesses in the council-wide area) to include in their pilot activities:

“We ended up properly engaging with the target of around about 160 businesses once we got it down to the important premises and then the ones that are in business, the ones that are in premises you would want to target as well.” (local authority officer)

Thus, based on contact details available to the council and the type of premises occupied, the team limited the number of businesses included in the pilot. Other sectors included in the LHEES pilots were domestic private rented and privately owned properties. In these cases, project teams drew on resources like the Private Landlords Register and Home Analytics databases to identify properties to include.

4.1.2. Lessons from the LHEES process

Several of the pilot project teams appreciated the resource made available for staff to dedicate time to develop the LHEES. Both Orkney and Argyll & Bute retained the resource within the council, and noted that having ‘somebody to look at it for 12 months’ was one of the biggest benefits of the pilot. Through such dedicated resource, and funding distributed for hiring external consultants, project teams explained that they had been **able to develop an understanding of the process of developing a LHEES**. This included **building an ‘evidence base’ of the building stock in the region**, particularly recognising the distinction in building condition between different tenures and thus informing future targeted action (South Lanarkshire). Such knowledge of the building stock was shared in across cases:

“we’ve got the data and we know how many private rented properties there are in [the region]. We know the measures that can be installed on the properties. We know that there’s a higher amount of private rented properties in the rural area...and they are mainly houses, like old style cottages that would require a lot of internal wall insulation, loft insulation and

we could probably do more in terms of decarbonisation of the heating systems. Whereas in the urban areas...there's a lot of flats which would be hard to treat properties" (local authority officer)

In this case, the local authority officer had gained a better understanding of the distribution of different property types across the region. Such understandings also extended to knowledge of the carbon intensity of the existing heating supply which, coupled with future projections of the carbon intensity of the grid electricity supply, allowed the project team to assess the suitability of future heat decarbonisation actions:

"Probably one of the main things that told us in terms of heat strategy and de-carbonisation, a lot of these sites and a major element of the sector is going to decarbonise because they're already on electricity. And as the grid decarbonises, that bit of the sector is going to be decarbonised as well. So all of this was very much pointing towards a conclusion that this is probably not the best place to be putting resources if you're looking to achieve big hits at the end of the day" (consultant)

Thus, through combining different layers of information, the team was able to de-prioritise businesses using electric heating. This is because the carbon intensity of the electricity grid is due to reduce as increasing levels of renewable energy supply are utilised. Future projections were also incorporated into a 'dashboard tool', developed by one consultant for use by Inverclyde Council in assessing actions for the public sector building stock:

"the dashboard is all of their sites with the current energy performances, a businesses as usual projection based on carbon emission factors and cost factors from BEIS. Then, if you do these things to different sites, what does that do going forward?" (local authority officer)

In the timeframe of the pilot, the dashboard tool could only be developed for a small number of public sector buildings; a lot more time and resource would be required to scale this up to the whole building stock. However, **the pilots helped to generate a greater knowledge of the building stock and the suitability of future actions.** These understandings also included knowledge of how to approach different sectors, particularly SMEs (Aberdeenshire and Fife both focused on strategies for engaging this group).

An additional output from the pilots was the identification of where gaps existed in the knowledge and skills available, particularly within local authorities:

"We've found that there's certainly scope for training and up-skilling in order for [local authorities] to understand the data and how to then use that data for building any level of strategy. I think it's been very positive as it's started to get some of the local authorities talking a little bit about that combination of data plus the social and looking at the barriers and the socioeconomic aspect and start thinking a little bit further ahead than what they currently do." (consultant)

Identifying where up-skilling needs to take place at this stage will be beneficial for the wider-scale development of LHEES.

This knowledge of both the building stock and potential future energy efficiency measures, and the skills needed also resulted in **greater understandings of just how difficult the process of doing a full LHEES would be** (East Lothian), **and the significant time and resource implications of this**. Where costings had been carried out (North Lanarkshire, Fife, Midlothian, West Lothian, Inverclyde) the scale of this challenge was particularly apparent:

“You’re looking at tens of millions for an area... It was a heat pump district heating network, so you had £34 million just for that. In the suburban area, there’s a bit of heating controls, bit of insulation, and better boilers, that’s £20 million. Then you go out to the rural one, you’re looking at more air source heat pumps and again, insulation - it’s £11 million. So just across those three, that’s £65 million across three areas. And we’ve got another 67 [areas] to go.” (local authority officer)

4.1.3. Local ownership of LHEES

Local ownership when working with consultants

Whilst two of the pilot project teams kept all resource within the council (Argyll & Bute and Orkney), the remaining nine all worked with external consultants for at least some aspect of the pilot. **Project teams reported feeling a sense of local ownership through working closely with consultants, and hiring consultants who had prior knowledge and experience of the local area** (for example, Aberdeenshire). This sense of local ownership included capturing the varied challenges that different local authorities experience:

“It does feel like it’s Aberdeenshire in the sense that we do not have a city. You know, we just have smaller towns. And different towns are represented quite nicely. It was coastal, there was more in the country... I did feel like the way [the consultants] selected them was quite a nice representation of the area.” (local authority officer)

In this case, the consultant had been able to identify a range of areas that reflected the broader variety within the local authority region. In addition, local ownership was achieved through using work produced by the consultant and combining this with internal priorities and processes:

“We’ve been quite good at making sure that we didn’t just take what [the consultants] were telling us as face value, we took it and changed the reports that they provided and what conversations we had with them and then put them into our own format. We took bits of that which we knew were relevant to us and what we wanted to find out as well.” (local authority officer)

This desire to ensure the work was locally tailored was shared by the consultants:

“It has to be driven by the local context and the local authority’s interpretation of the needs of the population and the context that they’re working in. So you do have to empower local authorities to make the decisions themselves within a framework.” (consultant)

Indeed, this process of empowerment and collaboration helped to make sure that the LHEES pilots were specific to local circumstances. There was only one case where the local authority had limited engagement with the consultant; this was related to a lack of time or resource available for local authority officers to participate, and a change of personnel in the course of the pilot:

“I think at this stage because we’ve had to rely so much on [the consultant to do this one and because of the resources and the resourcing issues that we’ve had... Does it feel locally owned? Probably not at the moment” (local authority officer)

This highlights the importance of ensuring that there is resource (in terms of staff time) available within local authorities to contribute to the LHEES process. It is only through this that LHEES specific to different local authority regions can be developed.

4.2. Developing a LHEES

Key Lessons

- There were varied levels of awareness of the ‘six stages’ across the different partners involved in the pilots.
- Stages 1, 2 had been completed by all of the pilot teams.
- Stages 4 and 5 had been completed by some of the pilot teams, although some had little awareness of Stage 4 (the socio-economic assessment).
- There was little evidence of Stages 3 (authority-wide target setting) or 6 (costing and phasing of delivery programmes) being completed across the pilots.
- The socio-economic assessment methodology could be updated to include carbon emissions and fuel poverty *alongside* factors that underpin council decision making, including the creation of jobs and financial returns. A specific suggestion is to attribute a weighting factor to the financial benefit of the ability to not have to go back and retrofit in the future.

4.2.1. Following the stages of LHEES

There were **varied levels of awareness of the ‘six stages’ across the different partners involved in the pilots.** For example, in some cases, the consultant was aware of the stages whilst members of the local authority were not:

“Interviewer: Did your process look to follow any of those steps particularly?”

Officer 1: I think we basically left that to [the consultant].

Officer 2: Absolutely. I wasn’t aware that there were six steps. I haven’t read anything, but there’s been a lot of documents that have come out recently at consultancy stage where we have just not got round to being able to delve into them.” (local authority officer)

The local authority officers in this case explained how resource constraints meant that they had to leave it to the consultant to follow the stages outlined by Scottish

Government. Conversely, other **local authority officers detailed a step by step process** that was followed:

“We took data from the heat map and we used that to identify the possibility of clustering for public sector buildings... The first step was really taking a look at the area as a whole, working out what areas we would be able to focus on... And then that was kind of run in tandem with performing an analysis on the condition of the building... And that followed similar lines to reviewing our strategic property. And from that point we were able to determine two particular areas that we wanted to focus on. ...It was [then] a case of looking at the condition of the buildings and working out what would need to be done to get them up to both the Scottish Government standard and our climate emergency and then the latter stage of that was looking at what technologies or energy efficiency measures could be put in place” (local authority officer)

Although not always following the ‘six stages’ presented by Scottish Government, similar descriptions were offered by several other pilot teams:

“we’ve been working on the policy side, the national, the local, the strategies that we have and how they fit in with LHEES or it fits in with them and to use the targets, to help with the modelling of the heat map. Also there has been some stakeholder engagement set around the heat map itself.” (local authority officer)

In most cases, the LHEES process included a general analysis of data available for the whole local authority in order to identify particular areas (for example streets, towns or villages) for more in-depth analysis. Within these more focused areas, project teams then explored specific building conditions, and heat density and analysed the feasibility of different technical solutions. Some of the LHEES reports included evaluations of different technological options (for example, low carbon heating technologies) and their suitability for the areas studied. Thus, potential options were prioritised and their viability for wider-scale roll-out was assessed. Through this, the majority of the pilots delivered an LHEES which made suggestions for how to improve energy efficiency and decarbonise heat for buildings in particular local authority areas.

How pilot teams approached specific stages

All of the pilot reports and interviews with the pilot teams demonstrated that they had each followed elements of the ‘six stages’ outlined by Scottish Government (see Section 1). However, some of the stages were more clearly delivered than others (see Appendix 2 for details of stages completed in each pilot).

Stage 1

All of the project teams completed an assessment of local and national strategies. Several local authority officers highlighted that their council had recently declared a Climate Emergency, and that the LHEES work could potentially contribute to activities around this. Other existing programmes and strategies referred to included: Local Development Plans, Carbon Management Plans, Housing Strategies, Fuel Poverty Strategies, and Economic Development and Regeneration

Strategies. Detail on which strategies were drawn on within the different LHEES reports is provided in Appendices 2 and 3. Local authority officers noted that the LHEES could contribute to these schemes in some way, but were not always clear on exactly how this would be done:

“It’s going to be our Climate Change Strategy, taking it right out to 2045, so Scottish Government’s target base. We will be carbon neutral by 2035 potentially. We’ve got an Adaptation Action Plan that’s coming forward, we’ll have a Carbon Management Plan which will be a kind of five-year document... The LHEES either sits as part of that or as part of the planning documentation, and that’s another one where I think there’s a bit of uncertainty.” (local authority officer)

“We’re developing a local development plan too. But there hasn’t been a definitive discussion of steer yet as to where the LHEES will sit. There has been several discussions because obviously there’s a climate change working group, will it sit in a climate change policy? Or will it be a policy in its own right?” (local authority officer)

Thus, local authority officers recognised that **although LHEES could align with existing activities within the council, there was uncertainty in where it would fit**. Where the LHEES sits amongst other local authority plans is significant for how it subsequently gets mobilised. For example, if LHEES forms a core part of a council’s energy strategy it could have a better chance of being implemented than if it remains a standalone document.

In evaluating different existing schemes, some pilot teams also sought to learn from activities taking place UK-wide. This included consultants drawing on their experience of working across other energy initiatives in the UK, but also local authority officers collaborating with their counterparts in England:

“Local Energy Hubs ... those were five regional based hubs that BEIS fund specifically to support energy projects. From the constituent authorities that I spoke to ... I think a lesson there is it is a really useful resource and it could be used to develop additional projects but there would need to be additionality to it. There’s no point supporting projects that are already going to happen.” (local authority officer)

To address their limited experience of engaging SMEs in energy activities, this local authority officer had attended events in England focused on the Local Energy Hubs⁶ being trialled there. In this way, teams were able to connect with a broader range of policies and programmes in order to develop their LHEES approach.

Stage 2

Although not always authority-wide, all of the project teams undertook an assessment of the existing building stock’s energy performance and heat supply. The data used for this is detailed more in Section 4.4; however, the majority of project teams provided a description of the analysis process followed, for example:

⁶ Local Energy Hubs were introduced by the UK Government’s Department for Business, Energy and Industrial Strategy to ‘unlock’ investment in local energy through aggregating projects to interest commercial investors.

“an initial spatial analytics piece for the whole of the local authority... an oversight of the whole local authority in terms of energy, land, and breakdown by typology and domestic, non-domestic etc ... we also looked into different technical solutions for different types of building and different contexts, so whether it will [be] passive design or technical solutions for different examples of typology for each building. And also at scale whether it's in a rural, suburban or urban setting.” (consultant)

Stage 3

Across all of the pilots, **there was little evidence of Stages 3 (authority-wide targets) being completed.** Stage 3 suggests that both short- and long- term targets should be set for the delivery of energy efficiency and heat decarbonisation across the local authority. Local authorities taking part in this phase of LHEES pilots did not *commit* to any targets in their reports, although potential targets were sometimes indicated.

Stage 4

Not all project teams applied the socio-economic assessment. Where this was used (Orkney, North Lanarkshire, Falkirk, West Lothian), the analysis was primarily completed by consultants working in partnership with the council. As one local authority officer highlighted, the socio-economic assessment model represented quite an **unfamiliar way of working**:

“We were struggling to get our head round what the socioeconomic analysis was going to entail and what it would actually look like in practice. The [consultants] did a really good job of making [it into] something we could actually do ourselves in the future to evaluate projects.” (local authority officer)

In this case, the consultants had organised a workshop to explain the socio-economic analysis to local authority officers. This had been particularly helpful for allowing local authority officers to conduct the analysis themselves in future.

When applying the assessment framework, project teams noted that some of the metrics and weightings used were less appropriate for certain types of project or sector:

“The socioeconomic thing we couldn't quite work out how we could fit that into public sector buildings. It's so weighted. Basically it means it's all carbon because we take out the fuel poverty factor, so it's kind of... it was almost there's no point... we could put it in but we know what the answer is going to be. It's all going to be carbon, that's the only thing that produced the result. But I guess it's a little bit artificial in that you wouldn't do an LHEES for public sector buildings.” (local authority officer)

Within the current socio-economic assessment framework, 1/3 of the weighting is on carbon, and 1/3 on fuel poverty. The remaining 1/3 is split between financial, local economic, local environmental, social, and resilience factors. **This focus on fuel poverty means that the socio-economic assessment framework does not prioritise non-domestic projects.** The skewed weighting was also commented on by a consultant:

“One of the things that we drew out is that [the framework] was so heavily biased towards the energy indicators that a lot of the other ones had very little impact in the overall scoring.” (consultant)

In addition, it was highlighted that much of the technical analysis already delivered energy related indicators (for example, by analysing the energy consumption in kilowatt hours and carbon metrics of different heating solutions). Consequently, there is scope to **streamline the current socio-economic analysis framework and re-visit the weightings given to different factors.**

“The pitfalls that they were aware of because, I mean, you probably know anyway, I’m assuming you’ve had a chance to look through it too. But 60% of the marks are in two categories, so carbon emissions and fuel poverty and there’s a huge amount of indicators for the rest of the 40%. As he said, these are the ones that you could spend weeks debating and it’s 1%. So actually it’s really not going to make any difference at all.” (local authority officer)

Supporting council decision-making through the socio-economic framework

Critically, **any updates to the socio-economic framework should explore the roll of carbon and fuel poverty alongside factors that underpin council decision making** (for example, through appealing to delivering on other statutory duties). One example is that local authorities prioritise the creation of jobs and local employment when determining whether to undertake projects:

“The jobs, skills sector, it didn’t have strong weighting there as well. And given that local authorities.... Yeah, one of their primary focuses is kind of economic growth and providing jobs and improved skills and training for the population in their immediate area. Those things probably need a bit more strength.” (consultant)

The suggestion here is that the **creation of jobs** could be given a higher weighting within the socio-economic assessment framework. Through this, local authority officers may be better positioned for discussions with senior managers, where they have to make a case for projects to go ahead. A similar suggestion was made about the potential to **prioritise financial return:**

“[Scottish Government] really need to establish an appropriate weighting factor that can be attributed to the budgetary constraints and discussions in a council... I hand over [the socio-economic assessment] to senior management and the budgetary people and ...they may be budgeting on savings, capital expenditure, paybacks, and at no point are [Scottish Government] attributing a weighting factor financially to the possible benefit or the ability to not have to go back and retrofit things in the future.” (local authority officer)

In this case, the participant emphasised the need to demonstrate financial savings to those in senior management. Currently, finance has a weighting of 0.08 within the socio-economic assessment framework. Arguably, this could have a larger weighting, particularly where future savings are also being accounted for. The participant in this case emphasised that, because of restrictions on the Council’s

finances, it was unlikely that decisions would be made to go ahead with the energy efficiency and heat decarbonisation measures outlined in their LHEES report.

Stage 5

The selection of areas and prioritisation of opportunities for energy efficiency and heat decarbonisation was not a common feature of the Phase 2 pilots. This is likely to be because many of the pilots selected a small region, representative area, of specific sector to focus on.

Stage 6

There was evidence that Stage 6 (costing and phasing of delivery programmes) had been partially completed. In the pilots, some costing of potential works was completed; this was usually an overall cost to complete interventions in all of the properties listed. One pilot report (Falkirk) did include costs of different scenarios (for example, a 'full' decarbonisation approach, vs. a 'partial' decarbonisation approach combined with offsetting). Several other pilots included estimated costings. Some did not provide costings for their activities in the LHEES reports, but did demonstrate an awareness of the costs of different activities at interview:

"I think it wouldn't take us long to cost up and say, 'these are the houses that actually you could put a heat pump in' It's about £9,000, £10,000. Of course if you're looking at ground source you're looking at about £16-18,000." (local authority officer)

However, **none of the projects had established the phasing of delivery programmes by the end of the pilot period.**

4.3. Skills and resources for delivering LHEES

Key Lessons

- The development and management of LHEES within a local authority will require a dedicated person.
- Supporting and upskilling local authority officers will be crucial for enabling the delivery of LHEES over the next 15-20 years.
- The development of a LHEES is highly technical. Key skills include the collation and analysis of numerous datasets, and knowledge of buildings and building services.
- LHEES also requires significant expertise in project management and strategies for engaging different stakeholders.
- Within local authorities, there is a shortage of the skills necessary to support the development of LHEES.
- Consultants are well positioned to address skills gaps and cater to the multi-disciplinary nature of LHEES; it is important that consultants develop knowledge of the local area and can adapt to locally-specific circumstances.
- Data analysis, project management and stakeholder engagement are particularly resource intensive activities.

4.3.1. Skills for LHEES

The skills needed to develop a LHEES include:

- project management
- collating and analysing large datasets
- working with spatial data such as Geographical Information Systems (GIS)
- social engagement including designing surveys and hosting workshops
- business engagement skills
- knowledge of building engineering and energy auditing.

As a result, multiple people with a variety of expertise and skill sets were involved in each of the pilots. In some cases, an interdisciplinary team was coordinated. In others, specific individuals contributed their expertise for an aspect of the project (for example sharing data they held), but did not remain involved for the duration of the pilot. Project management was essential for the delivery of all of the pilots, which required the coordination of several individuals and organisations, and the collation of multiple datasets.

Technical skills

The development of a LHEES is highly technical. For all of the pilot projects, this included accessing and collating information from multiple databases. This required knowledge of different data sources (either from different council departments, or external to the council), and skills in liaising and, in most cases, managing data sharing agreements (see Section 4.4.4). For the majority of pilots, this information was then mapped onto the local area in order to build a picture of opportunities for implementing energy efficiency and heat decarbonisation. This collation and mapping is a particularly complex process:

“It was quite a lot of toing and froing around how we try to pull out different business categories...and which layers were in it, whether it was the OS address base or some of the other... a very, very good understanding of the heat map and how it was built up.” (consultant)

Cleaning and combining different datasets, and layering these onto the Scotland Heat Map, requires someone with expertise in data analysis and GIS.

A second technical skill set is **knowledge of buildings and building services**. In some cases, site visits and energy audits were completed in a sample of properties included in the LHEES pilot. These activities required an ability to quickly recognise the properties of a building, and explore different heating solutions for the space:

“building service experience was actually way more important. [For example], heat pumps seem to be all anyone is talking about... that is really a big part of the future and one of the main things is ‘could you possibly retrofit one of these things into an existing building?’, spending huge amount of money, without understanding where heating systems meet that judgement?” (local authority officer)

This information gathering could be quite complex when the results needed to be coordinated across the different aspects of LHEES:

“There was some quite clever thinking about how, when people were filling out the survey that would digitally just go straight back into the GIS database. Then there was all of the kind of more practical stuff in going out and doing the surveys and being able to quickly and reliably get information out of it. That was a kind of interpersonal thing.” (consultant)

Stakeholder engagement skills

Another significant skillset for developing LHEES was the **ability to work with different stakeholders**:

“There needs to be a focus on the social, which hasn’t necessarily been conveyed by Scottish Government. You can’t build strategy unless you know what you’ve got to overcome. And it’s all very good and well saying, ‘We’re going to do a heat network here and [External Wall Insulation] programme here’, if the people don’t want it or won’t go for it ... good luck getting them on side.” (consultant)

Local authority officers said that different skills were required for working with different sectors. For example, in one case the officers had worked with colleagues in Economic Development to build a strategy for engaging local SMEs:

“We found working with [Economic Development] really interesting as well because [they] know the people in the businesses and [they] know what they want to hear and [they] know when to shut up and let them make a decision. That kind of business relationship is a useful skill. And something that we drew on quite heavily.” (local authority officer)

Here, the knowledge of how businesses work (for example, their availability at different times of the day) helped in successfully communicating with local SMEs, and planning events to fit with their schedules. These engagement skills extended to developing social surveys and hosting workshops to gather views from private homeowners and landlords. It was also highlighted that some of **these skills would need to be enhanced further for the wider roll out of LHEES**. In particular, beyond gathering people’s views, this would need to include skills for encouraging the uptake of energy measures:

“We don’t have sales experience.” We’d just realised that we need the ability to sell energy and sell heat. How do we do it? If we’re going to have more heat networks, we want to expand the networks we’ve got. How do we sell to these people?” (local authority officer)

In this case, the participant noted working with a commercial sales department in the council (who sell commercial waste disposal services to businesses, for example) in order to learn more about how to sell services and encourage connection to things like a district heating network.

Availability of skills within local authorities

Crucially, one of the goals of LHEES is to tailor energy efficiency and heat decarbonisation to local areas. For this, an understanding of local authority context is crucial. This context includes understanding a particular Council’s ways of working

and strategic priorities, along with knowledge of the local area, work that has recently taken place and work that is planned. It is essential that this local knowledge is incorporated into the development of LHEES. **However, several local authority officers highlighted a shortage of the skills necessary to support the development of LHEES:**

“In terms of did we have the skillsets to provide the data and input it into the documents themselves then I think absolutely we do. And we know our subjects and we know what we’re doing with them. In terms of the skills and knowledge internally I think we have got it. What we didn’t have was enough of it. That’s the problem.” (local authority officer)

This local authority officer highlighted that, although many of the necessary skills are present within the council, there is an insufficient number of people available to do this work. Beyond availability, other officers highlighted specific skills for LHEES that the council did not have:

“I think we will need – or any council will need – some specific expertise from somebody like a [consultant] [...] around the construction and collation and the types of data that’s required and then the analysis of that data. That’s where, I think, we wouldn’t have the expertise in-house.” (local authority officer)

This participant noted that, although they had other skills in-house (for example, knowledge of different building sectors), these colleagues did not all have the capacity to support the development of LHEES. In other cases, participants suggested that the skills were not available in-house at all:

“I think a lot of it would be put out because in-house we just simply didn’t have the expertise. Again, going back to the district heating network, we’d never done one before. So you need to get a consultant in to actually design this.” (local authority officer)

“Some of the people we’ve been dealing with don’t have enough of a grasp on the data and what data has been available, how to use that data, how to clean that data and how to build a picture to then build a strategy from it. So we’ve had to kind of do that for them.” (consultant)

Here, a lack of skills for both data analysis and the planning and implementation of large scale infrastructure like district heating is identified. A final critical point is that, although a lot of useful work has been completed through the LHEES pilots, some local authority officers are unsure on how this can be taken forward amidst limited council resources:

“I think we have one person in this entire organisation who worked on GIS, so their time... so basically the GIS platform that this consultant has made for us with all the data on it has been passed to this person and this person is just sitting on it.” (local authority officer)

This highlights the need to think about resources for the planning *and implementation* of LHEES. This lack, or limited availability, of expertise within local authorities will be problematic for moving beyond the development of a planning

document. **Supporting and upskilling local authority officers will thus be crucial for enabling the delivery of LHEES over the next 15-20 years.**

4.3.2. Partnership working to address skills gaps

There were two LHEES projects that sought to deliver the projects in-house. In both cases, the local authorities hired an individual to complete the LHEES pilot, on the understanding that they wished to tailor the LHEES to local circumstances and retain expertise in-house.

“We wanted to actually get somebody in-house that is going to learn about... Orkney and how we do things from the projects that we’re doing. We thought if we do it in-house we get a better way of analysing the data.” (local authority officer)

“In-house we retain knowledge and there’s been a massive amount of learning in there around the heat map and I think that’s the main thing, to retain that knowledge because when we go further beyond the pilot we have already got a platform to work from.” (local authority officer)

Thus, building expertise in-house was thought to be useful for building the wider LHEES at a later date. The people hired had a background in energy, and an awareness of tools like GIS. However, at interview, one of these individuals explained that, although they had existing knowledge of GIS, it wasn’t to the level required for the LHEES. Through the course of the pilot they undertook additional training to address this. In addition, one of the pilots received additional support from external consultants later in the project.

The remaining nine pilots were led by local authorities who procured consultants to complete aspects of the work. Some officers expressed uncertainty in how to proceed with procurement when the process of completing an LHEES was so unfamiliar to them:

“Officer 1: We didn’t really have any idea or a real steer how we would engage a consultant. Well, how do we procure it?”

Officer 2: And it’s a chicken and egg. When you’re looking to procure something then you put quite a detailed brief in terms of what it is you actually want. But really what we’re saying is—

Officer 1: We don’t know.” (local authority officer)

This limited understanding of *what to procure for* could result in limitations to the work that takes place, and potential mis-matches in understandings between different partners. In another case, a local authority officer discussed their decision to prioritise local knowledge when procuring a consultant:

“One of the reasons why we chose [the consultant] was that they had an office in [the local area], they sent the CVs and names of who they were going to subcontract, they were all local and it was very much that they need someone who understands [the local area]. So that was one of the reasons why they were chosen above others.” (local authority officer)

Later in the interview, this officer highlighted that **the consultant's knowledge of the local area had helped in completing the LHEES**; the officer felt very positive about having worked with this consultant. One of the consultants included workshops with council officers early in the process; this was an opportunity to discuss council targets and strategy. For three of the four pilots that this consultant worked on, the workshops were well attended by local authority officers and presented an opportunity to ensure that local priorities were addressed:

“we host the workshop. Instead of having a template for it we will say to the local authority, ‘OK, do you have a strategy template document now? Let’s use that.’ And we will input a lot of the [findings from] the workshop into that strategy document.” (consultant)

Several local authority officers reported meeting regularly with consultant partners, and noted that they felt well updated on progress, and involved in the development of the LHEES. However, some were unaware of some of the processes that consultants actually used:

“we’re still unaware of how [the consultant] came up with the data that then led us to the outcomes of the actual pilot. We just got a bunch of data, they combined it with their own data then sent it back to us so we still don’t know how that actually worked.” (local authority officer)

This indicates that there may be scope for ensuring that information about the analysis and processes behind generating an LHEES report is clearly shared, for example, specifying this in initial tender documents.

Local authority officers generally viewed the involvement of consultants as beneficial. In particular, they highlighted that consultants hold a wealth of expertise that is not available within local authorities. In addition, consultants often work across multiple local authorities and are thus able to share practices and thinking from elsewhere:

“[The consultants] have also been quite good in giving us advice on what other people are doing, which has been quite useful for us to see how we’re getting on compared to other local authorities and then they’ve mentioned a couple of ideas that other people have taken on that we’ve then carried on ourselves.” (local authority officer)

In this way, the consultant was able to act as a ‘critical friend’ who could point out relevant information that the council may not be aware of, and offer guidance in terms of how the LHEES process is developing across councils.

Creating multi-disciplinary teams

Finally, **consultants are well positioned to address skills gaps and cater to the multi-disciplinary nature of LHEES.** The consultants taking part in the Phase 2 LHEES pilots discussed putting together teams of people with multiple types of expertise:

“We’re a multidisciplinary consultant. So beyond engineering, we have environment team, we have economics, etc.” (consultant)

“I’m [managing the project and contributing to the technical report]...And then we have two data analysts who will process all of the data and produce sections of the report...We then have researchers who will do all of the engagement interviews and so on.” (consultant)

Thus, consultants are able to bring multiple sets of expertise into teams that work on LHEES. The nature of consultancy means that these individuals can work on the aspect within their area of expertise and then move onto a different project, as per demand. This means that consultants are well set up to deliver something as multi-disciplinary as LHEES. This is quite different to the way that local authorities are structured, where people tend to focus on one area of service delivery.

4.3.3. Resource required to develop LHEES

All of the project teams reported that developing an LHEES was a labour intensive process. **Two aspects were particularly challenging: the management of data and engaging different stakeholders.**

Firstly, several different databases were compiled for use in LHEES. Collating and cleaning these datasets to ensure that the data was as accurate as possible was usually a manual process:

“We literally just went into the database and started further eliminating everything that we knew that wasn’t an SME. So all the big companies, all the big oil companies, the banks, the retail sites, all that kind of stuff. So it was pretty laborious but what it meant was at the end of the day we were pretty confident that what we had left was, if not exclusively, then predominantly SMEs.” (consultant)

In this case, the LHEES focused on understanding local SMEs, and the data available covered a much broader range of buildings. The team had to work through each point in their database to establish information about buildings occupied by SMEs. A similarly time-consuming data collation and cleaning process was highlighted during another interview:

“We take local authority data, compare it with home analytics. It’s time consuming. Even once you’ve got the data, cleaning up that data is maybe five, six, days worth of work for someone to go through it. And it is quite specialist because you see something that doesn’t quite seem right and you Google the street [e.g. to corroborate building type with what the data says] and you have someone who knows a lot about building archetypes.” (consultant)

At interview, it was suggested that this type of process could potentially be standardised and streamlined as understandings about data processing develop. This is likely to be a crucial factor in scaling up LHEES to cover whole local authority areas, and the whole of Scotland.

Secondly, engaging stakeholders, especially businesses and SMEs, required a high level of resource. Surveys were not a feasible way to engage these groups (see

Section 4.5), and so engagement usually took the form of door-to-door visits, organising events, or manually contacting individual business via telephone or email. These activities will necessarily 'ramp up' ahead of an event or campaign and then reduce:

“Interviewer: So in terms of the resource for doing that... how much of each of your time was involved in that over the course of the pilot and also the consultants?”

Officer 1: When we were setting up I think mine was maybe two days a week. And then when the pilot started progressing I was able to drop to a day, day and a half, a week. And that was just purely business engagement and engaging with stakeholders to try and make them aware of the projects. But then when we had an event that would then increase again to prepare for the event.” (local authority officer)

This project had involvement from four different officers within the council, who managed the business engagement work, and additional support from a consultant for data analysis activities. The four officers were not working on the project full time, but they did report each spending between 1-2 days per week on the pilot. This amounts to more than one person working at full time equivalent, and only covers one sector in a small region of the local authority area. It is likely that this will need to be scaled up for LHEES taking place in a wider area.

Some local authority officers reported that they were not in roles dedicated to LHEES. Instead, working on the pilot was described as “a part-time bolt-on” (East Lothian). Consequently, **it was suggested that the development and management of LHEES within a local authority will require a dedicated person** (Aberdeenshire; East Lothian). Aspects including engagement work are likely to require additional resource if done at scale:

“There wasn't a huge amount of money available to actually engage with businesses and because of the very heterogeneous nature of what businesses do and how they use energy, that engagement piece is really, really, important. So actually I think there's probably a need for a bit more resource in that element” (consultant)

In one region, it was estimated that there are 18,000 SMEs, and evidence from this evaluation (see Section 4.5) shows that engagement is most successful when done on a personal or individual level. Consequently, **additional resource is likely to be needed to support engagement work.**

4.4. Data

Key Lessons

- Detailed energy consumption and building information was available for council-owned public sector buildings; it was harder to establish an accurate picture for privately owned and rented domestic properties and businesses.
- The Scotland Heat Map and Energy Performance Certificate databases have significant gaps and inaccuracies for all sectors, but inaccuracies are most prevalent for private non-domestic buildings.
- Additional data was collected during the pilots; mainly through site visits to a small sample of properties, to verify building information. Site visits to SMEs were most successful if organised on an ad hoc basis.
- Data sharing was the most straight forward where partnerships were established, or where the data was owned by the council and publicly available.
- The most significant hindrance to progress was the sharing of data amongst different organisations.
- Concerns about data protection meant that general reports were made available to project teams, rather than detailed building-level data. There is a need to explore how detailed data can be provided whilst adhering to GDPR.
- Accurate and detailed datasets need to be made equally available across all 32 local authorities, for example through a central data repository.
- The future roll-out of LHEES would benefit from clear guidelines in terms of when data sharing agreements are required, and the provision of templates for these.

4.4.1. Datasets used for developing an LHEES

The Scotland Heat Map and Energy Performance Certificate databases were common starting points for the majority of the pilots. These publicly available datasets were supplemented with a variety of data from local authorities and other sources, as detailed in Table 2. The datasets most commonly used by each of the pilot projects are listed in Appendix 2.

The most accessible datasets were those that are made publicly available, or owned by the local authority. In particular, **a large amount of information was available for council-owned public sector buildings**, which often had automated gas and electricity readings:

“We gave [the consultants] access to the web portals for... electricity data and automatic heater reading and gas data... But also we delivered 18/19 energy data which was the last full year’s data that we had.” (local authority officer)

Although EPC and Home Analytics data is available for privately owned and rented domestic properties, **it was much harder to establish an accurate picture of individual building condition and energy consumption for businesses**. In these cases, project teams combined information from across several data sources

“The NOMIS datasets from the Office of National Statistics...allowed them to identify the size of the businesses and what [type of] business according to the classification. And then they cross referenced that dataset with the heat map dataset, [which] includes census data and that allowed us to actually identify which businesses were in domestic properties” (local authority officer)

In this case, it was only through combining datasets that the project team were able to identify that a large proportion (approximately 1/3) of businesses in the area were operating out of domestic properties. The large proportion of businesses operating out of domestic properties was also identified in another pilot focusing on SMEs (Aberdeenshire). This was significant for the development of their LHEES and any subsequent interventions because these businesses would not be eligible for business support; instead, they would have to be included in strategies to target domestic properties. However, across all of the pilot projects, interviewees identified limitations in the data available, as discussed in the following section.

Table 2: Datasets used across the LHEES pilots

Dataset	Content	Scope	Private/ public	Observations (from interview discussions)
Scotland Heat Map	Heat demand; energy supply; geothermal potential; property tenure; existing district heating schemes	Scotland-wide	Public (detailed datasets available to local authorities)	Reports that some of the data is out of date. The Heat Map was updated once in 2016 and twice in 2017. There are gaps in the data available. Over-estimates of non-domestic heat load.
Home Analytics	Domestic only: address-level data on Scottish housing stock	Scotland – wide	Central and local government, and organisations contracted by them to complete energy efficiency projects	Delays in accessing due to data sharing agreements. Could do more to build in future projections of carbon (for example, factoring in decarbonisation of the grid for recommending heat pumps)
Scottish Energy Performance Certificate register	Energy Performance Certificate and Display Energy Certificate by postcode or report reference number	Scotland-wide	Publicly available	Also built into the Scotland Heat Map as separate layers
Estimates of Households and Dwellings in Scotland, 2017 -	Statistics on occupied and vacant dwellings, second homes, and trends in household types	Scotland-wide	Publicly available	Data from 2017.

National Records of Scotland				
Corporate Address Gazetteer	Land and property records; UPRN for each geographic location	Scotland-wide	Local and national governments	Base identifier that links all building data.
Scottish House Condition Survey	Physical condition of Scotland's homes, including SAP rating	Scotland-wide [2018 version included 2,964 households]	Some datasets available publicly, micro-level data available through special request	
Ordnance Survey	Geographic Data	Great Britain	Public sector licensing available through the One Scotland Mapping Agreement in place between Scottish Government and Ordnance Survey	Required for sharing spatial data as commonly used within public sector data.
BEIS Sub-national gas consumption data	Gas consumption at local authority, postcode and Lower and Middle Support Output Area level (LSOA and MSOA)	Great Britain	Publicly available	
NOMIS from the Office for National Statistics	Official labour market statistics (based on census data)	United Kingdom	2011 data Publicly available	Both SME and SIC ⁷ data.
Exoserve gas Postcode	Data relating to Supply Meter Points associated with particular properties	United Kingdom	Available to authorised users (suppliers; networks operators; meter asset managers)	
Scottish Assessors Association	Non-domestic business rates at postcode level	Scotland-wide	Publicly available	

⁷ SIC is the UK Standard Industrial Classification of Economic Activities (see: <https://www.siccode.co.uk>). This gives high level industry categorisation that can be analysed.

4.4.2. Suitability of available data

The Scotland Heat Map and Energy Performance Certificate databases were used extensively by project teams. The Heat Map uses assumptions to estimate heat demand data for all buildings in Scotland. This is designed for strategic evaluation of heat demand of an area and opportunity assessment. Some project teams reported that there were inaccuracies at an individual building level. Although the Heat Map data should be sufficient for strategic planning within LHEES, it is likely that **analysis at individual project or building level would require access to more accurate data**. Data inaccuracies were most prevalent for private non-domestic buildings. It was noted that having access to accurate data would be “*vital*” (East Lothian) for ensuring that the analysis could translate into action in terms of energy efficiency and heat decarbonisation. For example, one officer highlighted that EPC’s offer a metric for understanding the efficiency of the building, but they do not take into account the use of buildings.

“With a non-domestic EPC you’re not looking at how the building is going to be used. As I said, this building has gone from having 600 staff to having 900 staff. That changes the consumption and the pattern of how a building is used and EPC doesn’t really capture that at all.” (local authority officer)

This concern that **EPCs did not capture accurate enough information** was shared by another local authority officer, who highlighted that because of similar inaccuracies in domestic EPCs, colleagues will manually check the properties of potential buildings to be included in other council schemes:

“It’s not 100% accurate...there’s a lot of desktop work that’s carried out rather than physically going out to the property. In doing the HEEPS works, [a colleague] has actually gone out and physically looked at all these properties to establish which ones are best suited for the HEEPS projects. We would need to do that for this in order to do it well and to do it good, you know, to reach the targets that the Scottish Government are looking for.” (local authority officer)

HEEPS (Home Energy Efficiency Programme for Scotland) is a domestic area-based retrofitting scheme focussed on fuel poor regions. To identify buildings to include in HEEPS programmes, this council visits individual properties. The suggestion here is that, in order to gain an accurate account of domestic buildings’ energy performance for inclusion in LHEES, additional resource would be needed for ‘on-the-ground’ checking. Thus, participants identified shortcomings in the data available for both domestic and non-domestic buildings within EPC databases. Specific inaccuracies were also identified in the Heat Map and NOMIS databases:

“It’s good for pointing you to where things are but once you actually start drilling into it and looking at it, it became very apparent that it was just way off the mark... I think we came to the conclusion that somewhere between a third and a half of the sites that were on the heat map and were showing as having quite substantial heat demands probably didn’t have any heating at all.” (consultant)

This project focused on SMEs in the region, and through close interrogation of the Heat Map data the consultants identified that **a large proportion of non-domestic**

properties were likely to have a much lower heat demand than listed in the database. In particular, they identified that bigger non-domestic properties attributed with high heat demands were likely to be large un-heated farm sheds. This emphasises the value of the Heat Map for high-level strategic planning, but also the need for more accurate data if carrying through to projects on individual buildings or specific areas.

4.4.3. Collecting new data

To fill in gaps and confirm the accuracy of existing datasets, some project teams also completed a small amount of their own data collection during the pilot:

“We took a multi-pronged approach, if you like. We gather and assimilate and use all the existing available data and we’d also try and augment that with this online survey. And then the final part of that data jigsaw was to point go out and try and do some actual surveys ourselves as well.”
(consultant)

Additional data collection primarily took the form of site visits to a small sample of properties, with a view to verifying building information and suitable interventions for low carbon heating. These site visits only happened in projects which focused on public-sector buildings and SMEs (for example, no site visits were carried out in domestic privately-owned properties). In the case of public sector buildings, access was granted via the council and so these were more straightforward:

“We were given a shortlist of sites that we ... went out and visited. A light touch energy audit...so we’d walk around the sites trying to identify where there might be opportunity for savings, getting things like age of plant, other pertinent data related to energy. And then developing a shortlist of options to be able to implemented at each site.” (local authority officer)

This pilot incorporated a relatively small number of public sector buildings in the area, and so identifying and visiting a sample of these was achievable within the pilot. However, if scaling-up the LHEES, it may be less feasible to include visits to individual properties. In addition, public sector buildings are the most easily accessible. Similar strategies were attempted within projects that sought to develop more information on SMEs. In this case, the most effective method teams identified was an informal door-to-door strategy:

“They basically went to [Peterhead] high street and just looked at who was in, who can we talk to, what sort of lighting have you got in place, what sort of heating do you use, how often do you use it? They had all conversations to try and capture what is going on.” (local authority officer)

The challenges of engaging SMEs are discussed in Section 4.5. **For data collection with SMEs, un-scheduled visits and brief questions to business owners were found to be useful.** In this case, business owners were given notice via letter from the council that visits to the area would be taking place; however, formal meeting times were not scheduled. Additional stakeholder engagement surveys were also carried out with residents and SMEs; these sought general information about energy

awareness and willingness to adopt measures, and are discussed more in Section 4.5.

There was one project where a larger amount of primary data collection took place. In Orkney, the project team sent a survey to every household in Orkney. Of the 11,000 surveys distributed, 930 were returned. This information was combined with EPC data for the subsequent development of the LHEES.

4.4.4. Sharing data across organisations

Data sharing was the most straight forward where partnerships were established, or where the data was owned by the council, and publicly available. For example:

“We had worked with the consultants previously, so a lot of the data that they used they had actually gained from previous studies conducted with us. We had a lot of data sharing agreements already in place.

...And for that reason we decided to keep our focus on public buildings because we had access to data and we could give it over freely.” (local authority officer)

In this case, the LHEES pilot focused on council-owned buildings, and the local authority officer highlights that it was the availability of data that led them to select this project. A similar justification was cited by another of the officers that focused on the public sector, who noted that *“it’s public sector...we were happy to give [the consultant] that data”* (Inverclyde). The consultant (who worked on both of these projects) highlighted that they were already involved in the Non-Domestic Energy Efficiency (NDEE) framework, making access to additional data much more straightforward:

“We hold, through the NDEE framework, we hold a significant amount of data on public sector. But we hold that because we run that programme, that’s not available to the wider public sector and it’s actually a very useful data set for starting to look at different things.” (consultant)

Thus, prior engagement in energy efficiency and heat decarbonisation could lead to additional data being available. However, certain organisations being privilege to information that others cannot access could lead to a lack of parity in what local authorities are able to incorporate into their LHEES. Arguably, **accurate and detailed datasets need to be made equally available across all 32 local authorities.**

Establishing new data sharing agreements

Beyond these established relationships, **the most significant challenge and hindrance to progress was the sharing of data amongst the different organisations involved in delivering the LHEES pilots.** The challenge here was two-fold. First, data held within local authorities needed to be made available to partner organisations. This often meant that the officers managing the LHEES pilots had to coordinate across council departments to secure the relevant information. In

these cases, officers reported having to justify the use of the data and reassure colleagues:

“I would say we struggled internally with some of our services to get engaged to get the data to a reasonable time and in a reasonable state. There was almost like a lot of anxiety about passing that over: “Well what are the consultants using it for? Why do they need to see it?” ... In some cases it almost felt like there was a fear that what they had was not good enough.” (local authority officer)

“We obviously have a list of registered properties that we understand as being privately rented. And then to get that information shared to an external organisation was quite a challenge through legal. ...we went back to the data in relation to what you can identify and it was owning or residing in a particular property.” (local authority officer)

Specific concerns here were that the data held by local authorities was ‘*not good enough*’ or that data shared by the council could be used to identify individuals and thus contravene the General Data Protection Regulations (GDPR). These challenges were amplified when project teams sought to secure data from organisations outside of the immediate pilot partnerships:

“I had great faith when we started the project that a lot of the data would be already available but [the council] weren’t experienced in dealing with the licensing, particularly the GDPR issues. And also EST who hold the Home Analytics database weren’t particularly quick to resolve some of those issues.” (consultant)

Thus, a lack of readiness at the outset of the project resulted in delays when organisations requested data. **A lack of consistency in data sharing requirements across organisations was also reported:**

“Our legal team said they don’t really think we need a data sharing agreement, it’s anonymous, there’s no address details. [The consultant’s] feeling on it was that in isolation that data was anonymised, but if you put that data in combination with other information then in theory you could start to narrow that down as households and demographics. They would have been more comfortable with a data sharing agreement and it was legal advisor saying we don’t want it, we don’t need it, we’re not going to put anything together, you’re saying you want something so where do we go from here?” (local authority officer)

Negotiation over the requirement for a data sharing agreement is an activity that can be time and resource intensive. **The future roll-out of LHEES would benefit from clear guidelines in terms of when data sharing agreements are required, and the provision of templates for these.**

Limited access to available data

Whilst project teams worked hard to identify and secure access to available data, there were limitations in the information that was shared with them. In particular,

several project teams were disappointed by engagement with Resource Efficient Scotland that did not yield as much information as they had hoped:

“Resource Efficient Scotland have done so many audits on SMEs, in far more detail than just going around with a tick box. If we had just been given access to that it would have probably influenced LHEES even more but all they were able to do was give us a general, ‘We’ve seen this many buildings.’ There was a very general piece that they felt that that’s what they could legally give us (local authority officer)

“We couldn’t get access to the detailed information and what they provided us with was a very kind of high level analysis of the types of things that were found, but we couldn’t tie that back to individual types of business... it was of limited value to us.” (consultant)

Resource Efficient Scotland (RES) have an established remit of engaging with SMEs to help them save energy. A significant part of this is completing energy audits for businesses across Scotland. The LHEES pilots that focused on SMEs thought that RES would be able to share this energy audit data for use in the pilot. However, **concerns about data protection meant that the data was combined into a more general report about overall energy consumption.** One project team noted that RES were able to clarify that when undertaking an energy survey this did not include asking the business to be able to share the data, thus preventing sharing. A changed approach was discussed where RES included a request to be able to share the data collected in the future. Another suggestion was to find a way to make the data ‘non-personal and non-attributable’ in order to develop a database that could be incorporated into future LHEES development. However, it was also noted that, although RES have close contact with businesses, the focus of the audit is on specific energy saving interventions, rather than a database of individual building properties. It may be useful in future for RES to collect more comprehensive information when completing energy audits.

A similar problem was identified when accessing data through Scottish Assessors:

“What was difficult for me was although we’re using Scottish Assessors, I’m having to physically go in and out of [the data for] individual properties to find the information. I did approach the assessors and ask: ‘is there any way we can get a report just for these areas? only for non-domestic.’ In theory, yes, they agreed. But under GDPR they said no. At this moment in time they’re not comfortable pursuing that. So that has been quite a laborious task to do that.” (local authority officer)

Thus, the generalised data protection regulations (GDPR) led to aggregate information being provided, rather than on a property-by-property basis. GDPR also resulted in limited information being shared from the Home Analytics database, managed by EST:

“If we’d said in the application it was area-wide then they would have been quite happy to share the area-wide data with us but they were very specific

and said 'If you've only said that the project is for these areas, then we can only give you the data for these areas.'" (local authority officer)

In this case, the council officer highlighted that data was only made available for the area stipulated in the pilot proposal. Whilst this is an understandable approach, it limited the project team's ability to situate the LHEES analysis within an area-wide scope. This is problematic given that a core ambition of LHEES is to provide a strategy for a whole local authority area. **There is consequently a clear need to explore how detailed data can be shared whilst adhering to the requirements of GDPR.** This could take the form of guidelines for the development of data sharing agreements between organisations, or Scottish Government overseeing the availability and management of different datasets.

4.5. Stakeholder engagement

Key Lessons

- Participants felt that it was too early in the LHEES programme to engage the general public.
- High levels of engagement took place when trying to target specific sectors, for example activities with landlords in the private rented sector.
- Engagement with other public sector organisations (NHS, Fire and Rescue) was challenging due to their limited time availability.
- It was especially difficult to engage with businesses, particularly SMEs. Most project teams experienced extremely low rates of engagement from these groups.
- Working with colleagues in Business Development was helpful for creating a strategy to engage SMEs.
- Door-to-door visits, with notification via letter but without prior formal appointment, proved to be the most successful way to engage SMEs.
- Private landlords did attend events organised for them, suggesting an interest in energy efficiency amongst this group.

The level of stakeholder engagement undertaken varied across the pilot projects. Some projects took a broader, area-wide approach to LHEES development. This remained a largely desk-based exercise and resulted in little stakeholder engagement:

"...we had a brief discussion with a group of people up in [the local area] which are developing a smart sustainable action plan. They're doing a lot on the commercial and industrial side. Trying to tie up and perhaps install a district heating system...so we had a bit of a discussion with them about it but it wasn't really widely publicised, it was just, "We're doing a pilot. We'll let you know how it goes when the statutory duty comes in and you'll probably hear about it a bit more." (local authority officer)

Reflecting comments during the Phase 1 LHEES pilots, and that above, several local authority officers noted that they had undertaken limited stakeholder engagement on the basis that LHEES was not yet a statutory duty. They generally felt that it was **still too early in the LHEES programme to engage the broader public:**

“I’m not sure because it still seems a bit kind of up in the air...it’s almost like I’m waiting for someone to tell me, “You can share this, you know,” And then I will. (local authority officer)

Thus, there was a reluctance to engage a broad audience in the LHEES process. However, **high levels of engagement took place where project teams were trying to target specific sectors**, for example: public sector buildings, SMEs and the private rented sector. In all of these cases, engagement activities were carefully tailored to different stakeholders; these had varied results and are each discussed in turn below.

Other public sector organisations

Two pilot projects focused on public sector buildings. This meant engaging with local authority colleagues, but also broader public sector organisations. For one of the pilots, this included the NHS, Scottish Fire and Rescue, and Police Scotland. The project team had been able to establish contact with all of these stakeholders and coordinate the sharing of energy consumption data for the buildings they owned. This engagement often took the form of one-to-one meetings between members of the project team and individuals from these organisations who were responsible for building management. However, one participant highlighted that this engagement work was not always straightforward:

“We engaged [the local] NHS, met with them, took a long time to agree even to the meeting, they wanted to know, “What do you want this for?” So we then met them, told them, and they promised to give us data. We chased and chased and chased and it wasn’t... It wasn’t that they didn’t want to give us it, it was just everybody was busy with other things.” (local authority officer)

This chasing of data proved to be unsuccessful and the project team eventually sought data via Health Facilities Scotland who manage a central repository of NHS data. This is representative of the challenge that local authorities have in engaging with different sectors. The project team emphasised that, **although they could develop an LHEES, it would be difficult for them to influence organisations that they are not responsible for.**

Small and medium enterprises

Challenges in engaging stakeholders were particularly acute for those project teams seeking to work with businesses. Several projects focused on Small and Medium Enterprises (SMEs), which are businesses of under 250 employees⁸. In all of these cases, multiple different engagement strategies were trialed:

“The engagement with non-domestic buildings is very difficult. We promoted a survey through an event with the Chamber of Commerce, Facebook campaign and support from the Transition Pilot knocking on doors and only received two responses from SME’s” (Consultant)

⁸ https://ec.europa.eu/growth/smes/business-friendly-environment/sme-definition_en

Despite the use of targeted surveys, advertising via Facebook, mail drops, and door knocking, both of the projects referred to by this consultant struggled to engage local businesses. Orkney also attempted a survey with local businesses, but didn't get any responses. Another pilot project focused solely on developing a strategy for engaging SMEs. Similarly, they used several different approaches (including surveys, mail drops, and door knocking), but they also worked closely with locally established business support with the council:

"It was working with the Supplier Development Programme...to share information about energy efficiency. When they have events, they're not necessarily for businesses just in the area that the event's held. So they get a lot of [Council] wide but also Scotland wide local authorities coming to their events.

...We also had the Business Gateway and [Council] Chamber, to see if we could tap into any of their existing channels to promote. That included them putting it on their e-zines and social media." (local authority officer)

The project team worked closely with the Council's Supplier Development Programme, Business Gateway, Chamber of Commerce, and Economic Development department to identify and attempt to communicate with local SMEs. Within Economic Development, Business Relationship Managers were able to use existing contacts with local businesses to approach them about energy efficiency; however, this also had limitations:

"To comply with GDPR you can post or phone but not leave a voicemail. And so we did that. The first round of postal I got lots of undeliverable back because I used the data from the economic development database, which as you would imagine was out of date pretty quick. And then I was able to use my existing contacts that had an email address. But I could only email them because I had an existing relationship. I couldn't then pass the email on to people to give out. It could only come from me." (local authority officer)

In order to comply with GDPR, this officer within Economic Development was unable to share their existing contacts with colleagues. This meant that **establishing and maintaining relationships with local businesses (with a view to encouraging them to take up energy activities) was reliant on one individual within the council**. Although this delivered some results for the project, this is an unsustainable model for the national roll-out of LHEES. **There is a need to facilitate the sharing of data, for example through a centralised council resource, to enable wider communications with businesses.**

Door-to-door visits without prior appointment proved to be the most successful way to engage SMEs. Efforts to make prior appointments failed (Fife) and use of surveys yielded very few responses:

"But the door-to-door was the way to get the information. We also did a survey and I think we sent it out to over 800 I think it was. And we got like 27 responses." (local authority officer)

In this case, the door-to-door visits were relatively informal. Local businesses were informed that visits would take place via a letter from the Council, but the project

team simply engaged with businesses who were present and available on the day, rather than attempting to schedule appointments. These projects have delivered stronger understandings of how to engage with businesses, particularly SMEs. Despite this, it is worth noting that, once businesses are engaged, there is still a low rate of conversion to them undertaking energy efficiency interventions:

“From the 160 we got... was it 36 we got referrals. And then in terms of actually going from the referral to taking some sort of action, I think that was round about sort of four we got.” (local authority officer)

Private rented sector

Only one pilot project focused on the private rented sector (East Lothian). In this case, two workshops were organised and a register of private landlords was used to identify invitees. Each of the workshops attracted approximately 30 attendees.

Attendance at these events suggests an interest in energy efficiency amongst private landlords in the region. However, work may be required to ensure that private landlords are aware of the reasons for taking energy efficiency measures, and upcoming changes to the regulations. In addition, this project included sending a questionnaire to tenants, which attracted approximately 21 responses.

4.6. Supporting the roll-out of LHEES

Key Lessons

- Additional guidance is required for ensuring some consistency and parity across different local authorities. This should retain an open scope, but needs to provide a clear definition of what LHEES is, and what it should encompass, including suitable technologies.
- A single repository for relevant data would support the development of a timely and consistent LHEES.
- Scottish Government needs to create longer-term mechanisms for local authorities and consultants to share information about the development of LHEES; this includes both face-to-face interactions and online information sharing platforms.
- It would be helpful if Scottish Government created or reinforced mechanisms to encourage large businesses to engage with LHEES.
- All of the local authority officers and consultants interviewed were in favour of LHEES becoming a statutory duty. This would offer more leverage to existing council strategies, but needs to come with enforcement and additional resource for local authorities.

4.6.1. Create guidance and support skills development

Local authorities felt that the breadth of the call for the Phase 2 pilots was helpful in allowing them to develop strategies suited to the specificities of their region:

“So the fact it’s been very open has actually been very helpful because we’ve been allowed to come and say, ‘Well, this is what fits.’ Rather than, ‘this is how we’ve had to twist it and jam it into your square peg to make it

sort of work here and provide the objectives that you wanted’.” (local authority officer)

This case shows that **having an open scope can be helpful for ensuring that LHEES are tailored to different areas**. However, there is a careful balance to strike here. A lack of guidance was also highlighted:

“For me, with LHEES there’s a lot of missing guidance. Standardisation, methodologies, it’s a bit of a head scratch, ‘What do we do here?’ So you start with your action plans and you start with what should be in the LHEES stages, how does that work? How does it work with what we’re doing? There is nothing to say, ‘Here is the work flow and events, here’s what you need to do.’ That’s been difficult.” (local authority officer)

Thus, some authorities found that the lack of guidance made it difficult to structure and progress the project with certainty that the result would be in line with Scottish Government’s expectations. **Additional guidance is important for ensuring some consistency and parity across the different local authorities:**

“it could be having five authorities all touching each other and all having completely different approaches to LHEES. The major difficulty there is if a developer comes to us and wants to build houses and we say, ‘You can’t do them unless you put in heat pumps and unless you do this and that’ And if they say, ‘I’ll go build them in [a neighbouring local authority] because they’re not going to make me do all that.’ I think that we need to be pretty consistent across the board ... But at least with neighbouring authorities there has to be a wee bit of a joined up approach to say, ‘What are you guys actually doing?’” (local authority officer)

Clear guidance (coupled with a clear legal framework and encouragement across sectors – see Sections 4.6.4 and 4.6.5) will help to ensure that activities within one local authority do not have a detrimental impact in another, and vice versa. **This guidance needs to provide a clearer definition of what LHEES is, and what a LHEES should include**. One recurring theme during the interviews was the focus on district heating. Several local authorities felt that LHEES was a mechanism for supporting district heating, but this technology was not suited to their area. This was particularly true where local authorities had remote and rural areas within their remit. As such, **there needs to be more clarity around which technologies are included in LHEES**. In addition, guidance should include fixed targets for councils to work towards. The shift in national climate targets for net zero emissions by 2045 happened during the Phase 2 pilots; this meant that project teams had to adjust their expectations when the pilot was already underway. Further, the lack of clear targets for public sector and non-domestic buildings were mentioned several times by interviewees. It is important to provide clear and consistent long-term targets for local authorities to work towards when developing LHEES.

Some suggestions for how to develop the LHEES process include following the models used in similar schemes; the Non-Domestic Energy Efficiency framework was cited as one example:

“the way that they’ve developed the non-domestic framework means that we can be very much engaged but the process is very well managed.

LHEES needs that kind of framework structure where there's clear reporting, there's clear guidelines, of exactly what it is that LHEES needs to contain. And how it expects you to include SMEs, how it expects you to include industry, how it expects you to include private housing, rental housing, so that it's very clear about the structure and then what's available with regards to grants and loans.” (local authority officer)

Thus, there are existing schemes in operation that Scottish Government could use as a template to structure the LHEES development process.

4.6.2. Support data availability

Access to data was one of the biggest challenges, and most time consuming aspects, of the LHEES Phase 2 pilots. Several project teams suggested that a central data repository would be helpful:

“if it can be somewhere that the Scottish Government has that information then all the stuff is signed off in a way that it can then be shared. That would be so much easier than each local authority having to go to them and go through the process” (local authority officer)

In this way, Scottish Government could develop a central bank of data, with the necessary data sharing permissions in place for local authorities and their partners to access. An example cited by Inverclyde was the work of Health Facilities Scotland, who are an overarching NHS body. They store information centrally, rather than it being held by individual NHS boards:

“if you want to know how public sectors should organise their data, you look at the NHS platform that they have because they've sorted this. All their data is automatically updated from the utility company to a portal and everybody can see everybody's site” (local authority officer)

A single repository for relevant data would support the development of timely and consistent LHEES. This would mean that individual project teams did not have to approach organisations (such as EST) on an individual basis to request data, and reduce the overall resource requirement for sourcing relevant information. In addition, to develop a full picture of the building stock for LHEES, there is a need to encourage and possibly enforce data sharing amongst organisations in the private sector:

“We will not be able to conduct effectively what they want us to achieve unless there's a regulatory stipulation placed onto the industrial partners to share data and to work with us. It's key.” (local authority officer)

4.6.3. Develop mechanisms for sharing information across councils

Several project teams emphasised their appreciation for the support received from individuals at Scottish Government throughout the Phase 2 pilots. Participants highlighted that they would like to retain this level of one-to-one contact for quickly resolving queries and ensuring that the LHEES is progressing in the right direction. However, they also mentioned that a change in personnel during the pilots had been quite disruptive. One solution to this would be to split the liaising role between two

people, who each spend part of their time working on this – this would help to distribute knowledge about the pilots and ensure continuity for project teams if Scottish Government roles were to change in future.

More broadly, project teams emphasised that they would appreciate more opportunities to share information regularly, and learn from one another. In some cases, authority officers noted that they had established ways of working with other local authorities which had been useful for the Phase 2 pilots:

“when they first brought out the heat strategy, I think that was about five years ago, we formed a collective to effectively try and understand what was going on and how we would implement that within the councils and that then morphed into the local LHEES group. ... some of us specialise in data, some of us specialise in policy and we all effectively meet up either over the phone or in person and we each give updates on where we are, what we need help with and we work together to try and overcome any challenges that we’ve got.” (local authority officer)

This local LHEES group was useful for sharing information about the pilots, and suggests that such sub-regional partnerships could be effective in the development of LHEES. However, it was not replicated across all local authorities. In another example, an officer explained that they had good awareness of what a nearby local authority was doing for their pilot, but only because an existing relationship was already in place from a previous project collaboration. However, these successful information sharing activities were formed on an ad hoc basis and not all authorities were part of them. The workshops that were set up and run by Scottish Government were recognised as beneficial for knowledge sharing:

“we learnt more about other LHEES in that few hours than anything else that we’ve done...from having sat there and listened, I think it was Glasgow talk about theirs, Highlands talked about theirs, I think it would have been really useful from our perspective. ... But that gave a really good insight into what seemed to be what the Scottish Government were thinking in terms of what an LHEES looked like” (local authority officer)

Thus, the LHEES workshops hosted by Scottish Government were a helpful way to establish what is expected from the LHEES process, and understand what other pilot teams were doing. Indeed, local authorities and consultants highlighted that they would appreciate more ways to share lessons from the pilots (for example, through additional workshops). This included regular progress check-ins:

“An idea would have been to have Government to coordinate it together. Once a month, ‘Where are you? What are you doing? How are things going?’” (local authority officer)

In addition, the use of collaborative software and online tools was also recommended:

“The opportunity for Microsoft Teams. Particularly with the rural island councils. If it comes to, ‘actually you need to do this statutorily by a certain date,’ I think there’s much better chance of everybody going, ‘OK, let’s compare notes and let’s get this done.’ And things like Microsoft Teams

might be a really good way of doing that because the rural councils could then get together and say, 'Well actually, let's do some Skypes quarterly, let's catch up.' (local authority officer)

It is important to **create consistent mechanisms for local authorities and consultants to share information about the development of LHEES**; this includes both face-to-face interactions and online information sharing platforms.

4.6.4. Engage larger businesses

All of the project teams taking part in the Phase 2 pilots recognised the importance of LHEES. However, they highlighted that action within many of the properties to be included in an LHEES was beyond their control. This is particularly true for privately owned properties and businesses. As a result, **pilot teams recognised the significance of support from Scottish Government for engaging large companies**:

"It's so difficult to engage at a local level with larger companies. ...And the same for the kind of shopping centre that's owned by... is it an asset management company that's funded by a pensions fund that's national. So again, they're managing it locally but they're not doing the structure and the heat supply and that sort of thing. (local authority officer)

In this case, the project team emphasised that it was difficult to engage with large businesses, like supermarkets, at a local level. This is primarily because the energy strategy of a supermarket chain (or equivalent chain of stores) will be determined at a national level. As a result, if LHEES is intended to include large businesses, **it would be helpful if Scottish Government created or reinforced mechanisms to encourage large businesses to engage with LHEES**, or work to reduce their greenhouse gas emissions in line with broader targets. Potential actions include encouraging or requiring businesses to connect to heat networks:

"If you're next to a heat network then you should connect to it or you should have to at least give a good reason why you don't connect to it...there's stuff that could be done to very, very, strongly encourage and enforce good practice. It has to happen through LHEES." (consultant)

"if you're looking for them to participate, then generally speaking there needs to be some form of incentive involved in that. So that would be either by the form of grant funding or avoiding some form of tax or... You have renewable heat incentives and there used to be feed in tariffs. In terms of district heating, I'm not sure there's anything specifically there. But if there was a promotion of district heating then it will enable this to kick start that effectively, then I think there needs to be some grants available for that." (local authority officer)

Scottish Government can thus support in securing participation from large businesses and organisations outside of the local authority's remit, using mechanisms including legislation to enforce compliance, tax incentives and grant funding. This will be crucial for supporting local authorities as they develop council-wide strategies that include all sectors.

4.6.5. Make LHEES a statutory duty

All of the local authority officers and consultants interviewed were in favour of LHEES becoming a statutory duty. This is in line with the findings of the Phase 1 pilots evaluation, where all project teams were also in favour of LHEES becoming a statutory duty⁹. Some participants emphasised that LHEES would have to be made statutory for councils to go ahead with it:

“if they do not make it a statutory obligation, it will not happen ... we will say the things you need us to say and... but it won't actually mean anything.”
(local authority officer)

“there has to be an acceleration in development because we have a climate emergency, we need to achieve this. Let's just do this. This is what you now have to do: legislate in order to make it happen” (consultant)

Local authority officers and consultants emphasised that LHEES needed to be made a statutory duty to be prioritised for action by local authorities. In addition, participants noted that **if LHEES were made statutory, there would be more leverage for it to feed into existing and upcoming council strategies.** For example, one local authority officer said that the LHEES would go ‘*hand-in-hand*’ with their Climate Change Strategy (East Lothian). In relation to this, making LHEES statutory would also support local authorities in encouraging action from necessary stakeholders:

“without it being statutory, there's not an enormous amount we can do externally with it. We can make sure it's out there and people are aware that it exists. But again, it's not a statutory requirement and there's no enforcement. And it's only guidance and advice and new developers can quite easily come back to us and say, ‘No, we're not doing that’. If it becomes statutory I think we've got a much clearer path at that point in terms of how we would use this.” (local authority officer)

Thus, if LHEES is a statutory duty, it can underpin potential terms of procurement and activities from developers. In addition, making LHEES statutory is essential for ensuring parity across different local authorities:

“for the government to say, ‘it would be nice if you did an LHEES’ ... people who have got the resources and want the kudos will say: ‘Right, we're definitely going for it’. It would then tail off as you went down the rankings. So it wouldn't have national coverage” (local authority officer)

Some participants went further in highlighting that action would vary amongst different local authorities. For example, one suggested that penalties would be needed to ensure that the statutory duty was delivered:

“Participant: Effectively, unless there's regulation or unless there are penalties attributed to failure to comply, we as officers are not able to implement action. It will continue to stagnate.”

⁹ <https://www.gov.scot/publications/local-heat-energy-efficiency-strategies-phase-1-pilots-social-evaluation/>

Interviewer: What would a penalty look like?

Participant: I think it would have to be financial.

Interviewer: So less money allocated to the council in future budgets type thing.

Participant: Yeah. And it would have to also inform some form of public recognition of failure.” (local authority officer)

This participant felt that **a strong element of enforcement would need to be included for ensuring that LHEES got delivered**. Similar points were made about the need for supporting regulation and ‘pushes’ to encourage different groups to participate:

“making it statutory is fine but there’s not enough policy instruments in place to actually allow you to progress with it at the moment, I don’t think. [The district heating regulations] might give a bit more confidence that people are going to be treated fairly regarding heat price and things like that. But can you really force a solution on somebody? In the current climate? I’m not sure you can. I’m all for it, I just don’t think there’s policy instruments in place at the moment to enact it.” (consultant)

In this case, the Heat Networks Bill¹⁰ was discussed because of its potential to facilitate the delivery of LHEES. However, it was highlighted that this policy instrument is not strong enough, for example, in requiring groups to connect to heat networks. As a result, the Bill only goes some way to supporting the delivery of LHEES.

In addition to potential penalties and stronger regulatory support, **more resource needs to be provided to local authorities to deliver LHEES**:

“ ‘OK, you’re placing this upon us as a duty, how are you going to help resource it?’ is really going to be the biggest challenge.” (local authority officer)

“I think we would also maybe look at extra resources and possibly take on an LHEES team as such, because I think there is a vast project to undertake...It’s over such a long period of time too. We’re talking 20, 30 years in order to get all the properties up to a certain level. It’s not just a year project. Obviously the data gathering aspect of it and the engagement aspect of it, the technologies, it’s a long-term project, definitely.” (local authority officer)

¹⁰ <https://www.parliament.scot/parliamentarybusiness/Bills/114590.aspx>

5. Conclusion

This report has presented an evaluation of the Phase 2 pilots for Local Heat and Energy Efficiency Strategies (LHEES). LHEES aim to establish local authority area-wide plans and priorities for systematically improving the energy efficiency of buildings, and decarbonising heat. The Phase 2 pilots, coordinated by Scottish Government, took place between May 2018 to December 2019. The Phase 2 LHEES pilots sought to understand the requirements for specific sectors, and requested that proposals focus on one of the following areas:

- Energy efficiency in the:
 - “able-to-pay” (both domestic and non-domestic) sector
 - domestic private rented sector
 - Small and Medium Enterprise (SME) sector (both industrial and services)
 - public sector
- Identifying opportunities to establish or support energy efficiency and low carbon heat supply chains
- Identifying low regrets opportunities for the decarbonisation of heat supply

The approach adopted for the pilots allowed project teams to develop detailed understandings of different sectors. This included detail on the make up and quality of the building stock in a particular sector (for example, the private rented sector), and also develop strategies for engaging particular groups (for example, SMEs). This knowledge will be invaluable for working across sectors within the broader LHEES programme. However, the sector-based focus of the Phase 2 pilots does not reflect the broader aim of LHEES, which is to establish an area-wide plan for energy efficiency and heat decarbonisation across all building types. In several cases, the sector focus removed the ability to explore opportunities for district heating, which would rely on connections from buildings across different sectors. The primary aims of the LHEES Phase 2 pilots were to: test and develop methods for creating an LHEES; identify relevant sources of data (and any data gaps); and gain a fuller understanding of the resources and capabilities required to deliver an LHEES. It is against these aims that the conclusions will be considered:

Testing and developing new methods for creating LHEES

Seven of the Phase 2 pilots collated data on the whole local authority area; the remaining four focused on specific regions. The majority of pilots selected one or two building sectors to focus on; these sectors were in line with those requested by Scottish Government. Through the pilots, project teams were able to develop an understanding of the process of developing a LHEES and create an ‘evidence base’ of the building stock. This included greater understandings of just how difficult the process of doing a full LHEES would be, and the significant time and resource implications of this. Hiring consultants with prior knowledge of the local area, and working in close partnerships helped to ensure a sense of local ownership of LHEES.

In terms of developing a LHEES, there were varied levels of awareness of the 'six stages' across the different partners involved in the pilots. Stages 1 and 2 had been completed by all of the pilot teams. Stages 4 and 5 had been completed by some of the pilot teams, although some had little awareness of Stage 4 (the socio-economic assessment). There was little evidence of Stages 3 (authority-wide target setting) or 6 (costing and phasing of delivery programmes) being completed across the pilots. In particular, none of the pilots created a fully *costed and phased* delivery programme.

Identify relevant sources of data and any data gaps

All of the project teams utilised a variety of relevant sources of data. Detailed energy consumption and building information was available for council-owned public sector buildings; it was harder to establish an accurate picture for privately owned and rented domestic properties and businesses. The Scotland Heat Map and Energy Performance Certificate databases were used by all of the project teams. Although useful for high-level strategic review, more accurate data will be needed for pursuing specific projects at individual building level. Data inaccuracies are most prevalent for private non-domestic buildings. The most significant hindrance to progress was the sharing of data amongst different organisations. Concerns about data protection meant that general reports were made available to project teams, rather than detailed building-level data.

Additional data was collected during the pilots; mainly through site visits to a small sample of properties to verify building information. Some of these site visits included SMEs; these were most successful if businesses were notified in advance via letter, but the meetings themselves were organised on an ad hoc basis.

Gain a fuller understanding of the resources and capabilities required to develop LHEES

The development of a LHEES is highly technical. Key skills for this include the collation and analysis of numerous datasets, and knowledge of buildings and building services. LHEES also requires significant expertise in project management and strategies for engaging different stakeholders. Within local authorities, there is a shortage of the skills necessary to support the development of LHEES, particularly in data management and analysis. Consultants are well positioned to address skills gaps and cater to the multi-disciplinary nature of LHEES; it is important that consultants develop knowledge of the local area and can adapt to locally-specific circumstances. Throughout the Phase 2 pilots, data analysis, project management and stakeholder engagement were particularly resource intensive activities.

High levels of stakeholder engagement took place when trying to target specific sectors. Engagement with other public sector organisations (NHS, Fire and Rescue) was challenging due to their limited time availability. It was especially difficult to engage with businesses, particularly SMEs. Most project teams experienced extremely low rates of engagement from these groups. Working with colleagues in Business Development was helpful for creating a strategy to engage SMEs. Private landlords did attend events organised for them, suggesting an interest in energy efficiency amongst this group.

Key Lessons:

- Supporting and upskilling local authority officers would be useful for enabling the delivery of LHEES over the next 15-20 years. A helpful focus for this would be capabilities for the management, interpretation and analysis of data.
- Local authorities and consultants would benefit from being able to share information about the development of LHEES; this includes both face-to-face interactions and online information sharing platforms.
- All of the local authority officers and consultants interviewed were in favour of LHEES becoming a statutory duty. This would offer more leverage to existing council strategies, but would be most effective if developed alongside enforcement and additional resource for local authorities. A specific suggestion was funding for a dedicated person in each local authority to support the development and management of LHEES.
- Additional guidance is essential for ensuring consistency and parity across different local authorities. It would be helpful for this to retain an open scope, but provide a clear definition of what an LHEES is and what it encompasses, including suitable technologies.
- The socio-economic assessment methodology could be updated to include carbon emissions and fuel poverty *alongside* factors that underpin council decision making, including the creation of jobs and financial returns. A specific suggestion is to attribute a weighting factor to the financial benefit of the ability to not have to retrofit buildings again in the future.
- A single repository for relevant data would support the development of a timely and consistent LHEES. Developing this would need to explore how detailed data can be provided whilst adhering to GDPR. Clear guidelines in terms of when data sharing agreements are required, and the provision of templates for these, would also be helpful.
- If LHEES is to include large businesses, there may be a need to enforce this through legislation, create or reinforce mechanisms to encourage large businesses to engage with LHEES.

6. Appendix 1: Socio-economic assessment methodology

Scottish Government have proposed that the socio-economic assessment recommended for **Stage 4** (see LHEES stages listed in Section 1) would be a statutory requirement at three levels: of LHEES (strategy level), of district heating developments (project level) and for use during mediation for connecting individual buildings (heat users and surplus heat suppliers), with the ambition of demonstrating that:

“the zones have been designated appropriately according to national and local objectives, including fuel poverty, and are consistent with neighbouring local authorities.” (Scottish Government, 2017: 20 [see Footnote 4])

In support of this, Scottish Government have developed a socio-economic methodology¹¹, which follows 5 stages:

1. Define the problem, generate alternatives and establish criteria
2. Assign criteria weights
3. Construct the evaluation matrix
4. Apply scoring to assess projects
5. Rank the alternatives

Within the methodology, recommended criteria to consider and their weightings, have been provided (see Table 2). For a given project, each criterion then receives a score. The score is between 1-5 (between 1-3 = detrimental impact, 3 = no changes, between 3-5 = positive impact). Within this methodology, teams developing LHEES can then apportion their own scoring to different potential interventions. The aim of this exercise is to establish the suitability of energy efficiency and heat decarbonisation measures for achieving carbon targets alongside broader economic and social goals.

Criteria	Weighting
Carbon emissions	.30
Fuel poverty	.30
Financial	.08
Local economic	.08
Local environmental	.08
Social	.08
Resilience	.08
Total	1.00

Table 2: Criteria and weightings that feature in the socio-economic assessment

¹¹ See: <https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2019/02/guidance-strategy-level-socio-economic-assessments-draft-methodology/documents/00545759-pdf/00545759-pdf/govscot%3Adocument/00545759.pdf>

7. Appendix 2: Local Authority Reports Summary Table*

Council	Sector	Scope	Data sources	LHEES Stages Completed	Recommended measures	Cost	Carbon savings
Aberdeenshire	Small and Medium Enterprises	Focus on Peterhead and Inverurie	OS AddressBase Plus; Scotland Heat Map NOMIS; Off-gas postcodes (UK Government) Local Development Plan	Report focusses primarily on Stages 1 and 2 . Some effort was also made to consider Stage 3 , although data availability and quality issues meant that it was challenging. No socio-economic assessment carried out (Stage 4), and no costing for the different solutions provided (Stage 6). Instead, the focus is on the carbon savings of potential measures.	For retail zones and high street shops, lighting and air-source heat pumps (ASHP) were identified as potential interventions for carbon reduction. For council-owned workshops, suggestions with feasible payback periods include LEDs and ASHP, but also 7-day heating controls, solar PV and electric radiant heating systems	Not costed	Report suggests that potential carbon savings have been considered in analysis, but overall potential carbon savings are not detailed in the report itself.
Falkirk	Council-owned stock	Grangemouth, Falkirk Town Centre, and Falkirk-wide	Council data on building energy consumption; Site surveys for sample of buildings	All 6 stages incorporated; prioritisation of buildings rather than designation of zones.	Prioritise high emitting buildings for energy efficiency and heat decarbonisation measures (including heat pumps,	Capital investment of £2.2million per year (over next 25 years), and	Building emissions reduction of 63% by 2030, and 92% by 2045. Net

				<p>Scenarios explored were:</p> <ol style="list-style-type: none"> 1. An action plan for achieving reductions in line with SG targets, and Net Zero by 2030. 2. What would be achievable within existing council budgets 3. Bridging the gap between expectation (1) and what could be funded (2) 	<p>biomass, and hydrogen (anticipated from 2030-2045)). Include some carbon offsetting to meet net zero targets by 2030 (prior to hydrogen roll-out).</p>	<p>additional £28,000 per year invested in carbon offsetting (for next 8 years – to meet Falkirk’s Net Zero by 2030 target)</p>	<p>Zero by 2030.</p>
Fife	Businesses (SMEs)	Levenmouth (includes Leven, Methil and Buckhaven)	<p>Ordnance Survey; Scotland Heat Map; Spatial Data boundaries BEIS Sub-national MSOA Exoserve gas postcode NOMIS from the Office for National Statistics Business data (from internal</p>	<p>This LHEES focused on engaging businesses, and developed data collection and analysis to better understand and target businesses.</p> <p>Because of this, the pilot was less suited to socio-economic modelling carried out, and no prioritisation of areas/ zones for a</p>	<p>Recommendations to support future data collection and engagement with businesses, including:</p> <ul style="list-style-type: none"> • Skills in sales and energy efficiency • Effectives times of day and strategies for engaging businesses • Suggestions for developing the 	<p>Not costed</p>	<p>Not quantified</p>

			Economic Development team) Resource Efficient Scotland Business advice and support service	potential LHEES. There was no costing of potential future activities required under LHEES.	RES service and opportunities for data collection <ul style="list-style-type: none"> • A role for Scottish Government in developing Community Planning Partnerships and Business Improvement Districts to include energy 		
Inverclyde	Public sector buildings	Inverclyde-wide	Council provided data on consumption in their own buildings. Other public sector organisations were approached for information about their buildings.	The report outlines the 6 stages of LHEES as detailed in SG's 2017 consultation, but does not include any socio-economic assessment (Stage 4) because it focuses on public sector buildings. The setting of aggregate targets for heat demand reduction (Stage 3) is provided in Appendix B, along with the costing of potential measures	For council-owned buildings: Create Buildings Energy Efficiency and Renewable Heat Plan. Building-by-building measures are suggested in Appendix B. For council-owned buildings operated by third parties: Review the use of green leases; Ensure compliance with Building Regulations For non-council owned public	Human resource (ongoing): £45,000 for an Energy Manager and £40,000 for a Building Standards Officer). Capital works: £180,000 for automatic meter reading; £1 - £1.5 million for low carbon heating solutions; two	Estimated potential savings from the wide area heat network are 3,170 tonnes CO _{2e} and for the reduced area 1,770 tonnes CO _{2e} . Potential savings from measures on individual buildings is also provided in Appendix B.

				on a building-by-building basis.	buildings: Set up LHEES working group; Encourage sectors to develop carbon management plans; Share findings of heat network studies with public sector; Create supplementary guidance for Local Development Plans; Ensure compliance with Building Regulations	potential heat networks are costed, a wide area network for £11.5 million and a reduced area for £4 million. Costing for capital works on a per-building basis is also provided in Appendix B.	
Midlothian **	All buildings : privately owned; privately rented sector (PRS); social housing and non-domestic buildings	Midlothian-wide	Home Analytics; Scotland Heat Map; BEIS Sub-national MSOA; Corporate address gazetteer (from Midlothian Council)	Elements of all 6 stages are included. The setting of aggregate short and long term targets (Stage 3) is limited. The report includes costing but not phasing of delivery programmes (Stage 6).	31% domestic (private?) properties suitable for wall insulation 82% privately rented properties suitable for energy efficiency or low carbon heating	£59m and £11m for fabric and heating upgrades, respectively. In the PRS: £8.1m and £8.5m for fabric and heating upgrades In 'willing to fund' sector: £16m and £40m for	13% (overall) 17% (from PRS) 16% (from 'willing to fund')

						fabric and heating upgrades	
North Lanarkshire Council	Domestic and non-domestic buildings	North Lanarkshire – wide, with detailed socio-economic analysis of exemplar areas: urban (Craigneuk Wishaw); suburban - on gas grid (Birkenshaw); and rural - off gas grid (Allanton-Newmains).	Home Analytics Scotland; Scotland Heat Map; Energy Performance Certificate register; National Records of Scotland (methodology for spatial aggregation of data). For socio-economic analysis, used: Portfolio Energy Analysis Tool (PEAT); LHEES Cost Database; BSRIA Rules of Thumb; HM Treasury's Green Book (forecasting for utilities emissions and	Elements of all 6 stages are included, but the report focuses on stages 1-4. Stages 1 and 2 are extensively detailed. Stage 3 includes recommendations for heat demand reduction and decarbonisation, but does not establish authority-wide aggregate targets; instead targets are set to be in-line with SG goals. Stage 4 (socio-economic analysis) is detailed in a separate report. There is some indicative costing provided (Stage 6) but this is based on broader, estimated figures.	Taking the whole of North Lanarkshire's domestic sector into consideration, the report highlights semi-detached houses as a key focus area for energy retrofit; flats have the highest average EPC rating, and encouraging habitual behaviour change is recommended for this sector. The most common non-domestic building type in North Lanarkshire is retail/financial/professional services and these often use electric heating – so they are recommended for prioritisation.	Estimated for 3 exemplar areas. Urban: £18.9m for a DH network; £978,000 - £28.5m depending on insulation. Suburban: £920,500 - £29m depending on insulation; £2.1m for gas combi boilers; £8.1m for biomass boilers. Rural: £1.5m - £46.3m depending on insulation; £9.2m for ASHP and £4.2m for GSHP. No costing for	Domestic: 15% reduction through building fabric improvements; 35% reduction through decarbonised heat supply. Non-domestic: 20% reduction through building fabric; 70% reduction through decarbonising heat

			costs); Scottish Input-Output table (to estimate job creation)			non-domestic.	
Orkney	Domestic buildings	Orkney Islands Council - wide	Council Tax Register; Private Sector Landlord Registration Database; Orkney Housing Association Limited; Scottish House Condition Survey; Home Analytics Scotland; National Records of Scotland; EPC Database; BEIS Sub-national total final energy consumption.	Elements of all 6 stages were included. Stage 6 with the costing and phasing of delivery programmes was unclear. For example, although some costing of different heat technologies is included in the options appraisal, exactly how these could be phased out to properties in different areas of the Orkney Islands is not included.	Further research into the best ways to decarbonise heating for different property types; develop a strategy for engaging with the non-domestic sector; enhance provision of advice for households; ensure coordination of various energy efficiency programmes already underway in Orkney; collaborate with Scottish and Southern Energy Networks to ensure grid readiness for decarbonisation.	Estimated costing for individual technologies per property included, but costings not provided on an aggregate level.	Unclear
South Lanarkshire	Private rented sector (PRS); rural off-	Council-wide (PRS); specific off-gas areas	Corporate Address Gazetteer; Heat Map; Home Analytics; Local	Stages 1 and 2 completed. The authority-wide setting of aggregate targets (Stage 3) and socio-	63% of the PRS stock was identified as being suitable for energy efficiency or low carbon heating.	All potential upgrades within the PRS would cost £38 million.	Total CO ₂ savings of 7% and 10% Soth Lanarkshire's

	gas grid settlements		Development Plan; Fuel Poverty Map; domestic and non-domestic EPCs; Scottish Index of Multiple Deprivation; Census 2011 data; BEIS gas/ electricity use	economic assessment (Stage 4) have not been completed. There is some prioritisation of off-gas grid areas (Stage 5) and costing of delivery programmes (Stage 6).	25% of domestic properties in South Lanarkshire are off-gas – these are suitable for air source heat pumps and solar PV.	Some properties suitable for HEEPS:ABS and grant funding. Suggested improvements across all off-gas areas would cost £39 million	total domestic building emissions could be achieved from measures in the PRS and off-gas areas, respectively.
West Lothian Council**	SMEs, Public Sector Buildings and off-gas domestic properties	Four off-gas grid areas: Breich, Newton, Westfield, Wilkieston, along with the Breich Valley	Home Analytics; Postcode level energy use from BEIS; Corporate Address Gazetteer; Scottish House Condition Survey; Non-domestic EPC records	Elements of all 6 stages are included. The setting of aggregate short and long term targets (Stage 3) is limited; the report includes costing but not phasing of delivery programmes (Stage 6).	The report details potential energy efficiency improvements and low carbon heating for the four area considered. 27% domestic properties are suitable for wall insulation; 13% are suitable for air source heat pumps. Socio-economic analysis showed energy efficiency measures in Wilkieston as a priority.	£3.1 million for all possible fabric upgrades and £11.4 million for all low carbon heating upgrades. Costing only provided for domestic sector.	Estimated 13% savings if all domestic upgrades are completed. Potential emissions reductions only provided for the domestic sector.

*The LHEES reports for Argyll & Bute and East Lothian were unavailable at the time of writing.

**Reviewed LHEES Technical Report from Changeworks – data analysis and *all possible measures* that could be taken, but no clear strategic prioritisation of actions through discussion with Council.

8. Appendix 3: Local Authority Report Summaries

Aberdeenshire Council LHEES Report

Focus:

SME sector. Data analysis identified 13,825 SME businesses in the region; 12,595 fall into the micro-business category (0-9 employees). Once domestic and public sector sites had been removed there were 8,704 SMEs across Aberdeenshire (analysts took this to mean that a significant number of SMEs (5,000), were operating from domestic buildings (and could be targeted through domestic sector activities).

Analysts identified 2 zones to focus on: Peterhead and Inverurie

Data sources:

OS AddressBase Plus; Scotland Heat Map
NOMIS; Off-gas postcodes (UK Government)
Local Development Plan (Aberdeenshire Council)

Additional data collection:

Online survey sent to 400 businesses; received 28 responses – not statistically representative but results broadly reflected later findings from site surveys.

'Light touch' site surveys – visiting shops unannounced, and provided council-headed letter to industrial units. 30 minutes per site to establish opportunities for efficiency and decarbonisation; validity of existing data including whether sites were heated or unheated; and prevalence of different fuel types.

Recommendations made:

- For retail zones and high street shops, lighting and air-source heat pumps were identified as potential interventions for carbon reduction:
 - LEDs anticipated to payback within 4-6 years
 - ASHP potential payback in excess of 20 years
- For council-owned workshops. Suggestions with feasible payback periods include LEDs and ASHP (as per high street shops), but also:
 - 7-day heating controls – under 2 years
 - solar PV – 10-12 years
 - Electric radiant heating systems – payback 2-8 years.
- Feasibility of DH and Hydrogen also considered, but not feasible within SME sector alone – would need to be assessed as part of wider programme.
- Based on the findings of the study, it is recommended that the early pilots are developed to focus on LED lighting upgrades, solar PV on Council-owned industrial units, and switching to electric radiant heating for larger gas-heated SME sites.
- It is recommended that the development of solar PV systems on Council-owned industrial units be considered within the context of any wider plans to develop a Council-owned energy supply company (ESCo) as set out in the Council's Sustainable Energy Action Plan (SEAP).

Relation to existing programmes and Aberdeenshire council activities:

Report refers to Scottish Government targets, EES Routemap; EPCs and LHEES. Also relates to Aberdeenshire Council's Climate Change Policy, including North East Scotland Sustainable Energy Action Plan (NESSEAP), noting that: "the LHEES will provide the strategy for reducing emissions from buildings within the wider NESSEAP" (p.15); and Aberdeenshire Council's Regeneration Strategy – identifying that this could be an opportunity for energy efficiency improvements, but there is not much mention of this later in the report. Report also refers to Aberdeenshire's Smart Solar and Storage project (currently in the domestic sector, but could be extended to include SMEs where solar is a viable solution for decarbonisation).

Use of six stages framework:

*"This study report focusses primarily on **Stages 1 and 2** within the context of the local SME sector in Aberdeenshire. The majority of funding and study effort was focused on the establishment of an SME database to facilitate future development of a LHEES for the region. Some effort was also made to consider **Stage 3**, although data availability and quality issues meant that it was challenging to carry out any meaningful strategic assessment of specific improvement options."* (p.10)

No socio-economic assessment carried out (**Stage 4**), and no costing for the different solutions provided (**Stage 6**). Instead, the focus is on the carbon savings of potential measures.

Contribution to broader LHEES:

- No ability to assess feasibility of district heating when looking at single sector.

Key challenges/ findings:

- Heat Map data is unreliable
- Sharing of available information was challenging and needs to be addressed:
- Large proportion of SMEs work from home and could be targeted through domestic energy efficiency strategies.
- Broadly, 2 types of SME building ('workshops', and high street retail), with different associated challenges:
 - Even though the basic construction of the workshop buildings is very similar, there is a diverse range of businesses, building uses and occupancy patterns within these properties. The diversity in use makes it very difficult to define and assess any strategic approaches without using a site-by-site basis.
 - High Street Shops require little in the way of heating, and there is less scope for energy efficiency and heat decarbonisation improvements
- Proximity to the gas network is not a good predictor of whether SMEs are likely to have a gas connection and use gas for heating purposes.
- Critically, the report notes: *"We recommend that it is fundamentally reconsidered whether local authorities should be required to gather data on SMEs for the purpose of LHEES development. It does not seem reasonable to expect individual authorities to establish reliable baseline data for such a diverse sector without any mandatory powers to do so."* (p.41)

Falkirk Council LHEES Report

Focus:

Council-owned building stock, and public sector bodies, including:

- NHS Forth Valley
- Police Scotland
- Scottish Fire and Rescue
- Forth Valley College

Specific example strategies are developed for Grangemouth, Falkirk town centre and Falkirk-wide energy efficiency and decarbonisation of council-owned building stock.

Data sources:

Council data on consumption on council-owned stock (detail on this unclear).

Case study exemplar school building selected for in-depth analysis, identification of measures and costing

Additional data collection:

Site surveys were completed at a sample of buildings.

Recommendations made:

- LHEES flowchart and Heat Network Strategy both provided to support future council decision-making
- Prioritise high emitting buildings for energy efficiency and heat decarbonisation measures (including heat pumps, biomass, and hydrogen (anticipated from 2030-2045)). Include some carbon offsetting to meet net zero targets by 2030 (prior to hydrogen roll-out). [This is Scenario 4 – which is following Scenario 1 but including offsetting]. Scenario 1 is applying the 3 phases (outlined below) to the entire council estate. This will deliver:
 - o 59% emissions reduction by 2032
 - o 70% low carbon heat by 2032
 - o 20% heat demand reduction by 2032
 - o Net Zero by 2045
 - o EPC Band B.

Relation to existing programmes and Falkirk council activities:

Falkirk Council have announced a target for Net Zero by 2030 – this was the main target underpinning the LHEES pilot.

Specific council strategies also cited are:

- 2016 Falkirk Council DHN Outline Business Case (Atkins)
- Local Development Plan
- Falkirk Council Non-Domestic Energy Efficiency Project
- Callander Park Heat Network Development.

Use of six stages framework:

All 6 stages of the framework are used in this LHEES.

1. The report is framed around delivering Falkirk's Net Zero by 2030 target.
2. The assessment of the existing stock's energy performance included Council data on building consumption, and site visits to a sample of buildings.
3. Targets were set for 2030 and 2045.

4. Socio-economic assessment was completed for the different scenarios. This was completed only for the public buildings included in the LHEES, and each time, the different decarbonisation options being compared revealed the same score. The similar scores were used to, for example, eliminate a heat network on the basis that specific low carbon heat options could deliver an equivalent outcome.
5. The 74 highest emitting buildings were prioritized for measures. There was no designation of zones; the LHEES focused only on one sector and sought to establish suitable measures for that sector, rather than on an area-basis.
6. The costing and phasing of delivery programmes were both completed for the 4 scenarios explored. 3 phases for action were identified:
 - **Phase 1** (2020-2030): Full upgrades for buildings where heat pumps or biomass are the preferred option, prioritizing buildings based on age and economic life of existing heating system
 - **Phase 2** (2025 – 2035): Energy efficiency upgrades for buildings where hydrogen is the preferred option (depending on developing decisions at government level), prioritizing buildings by age
 - **Phase 3** (2030 – 2045): Roll-out of hydrogen heating to buildings where this is the preferred option, prioritizing buildings by size and lifespan of existing heating system. Should hydrogen prove not to be a viable option for wide application to the existing natural gas network, alternative low carbon heating systems can be deployed as shortlisted for each building.”
(p.11)

Contribution to broader LHEES:

The report contains clear account of the different scenarios, and appendices provide summary of assumptions made for costings.

This report focuses only on the council stock, so it does not provide a geographically zoned, area-wide strategy. Rather, the report prioritises ‘high emitting’ council-owned buildings, recognizing that 74 buildings account for 80% of all council carbon emissions.

Key challenges/ findings:

£2.2 million per year is above council’s current budget of £1 – 1.5 million per year for energy efficiency measures, and additional funds would be required for council offsetting. £1.5 million per year is not guaranteed going forward either, so there is a shortfall that would need to be addressed.

Fife Council LHEES Report

Focus:

- Identify and support businesses in the Levenmouth area with energy efficiency improvements.
- Test the council's functions that engage with businesses.
- Inform how Fife Council prepares for Scottish Government's proposed LHEES requirements.

Data sources:

Ordnance Survey

Scotland Heat Map

Spatial Data boundaries

BEIS Sub-national MSOA

Exoserve gas postcode

NOMIS from the Office for National Statistics

Business data (from internal Economic Development team)

Business advice service (from Zero Waste Scotland) – but limited opportunities to share data

Much of the data was quite high level, and efforts to focus on micro-level (e.g. individual businesses) demonstrated inaccuracies in the available data, and a lack of data available.

Additional data collection:

Survey with businesses was attempted, but received v. few returns. On-site survey completed for one business (with pre-agreement for the visit to take place). Trialled a number of different activities and events – including breakfast mornings and engaging with other organisations/ activities including: Supplier Development Programme; Business Improvement Districts; Local Enterprise Partnerships (England); Local Energy Hubs

Recommendations made:

Numerous recommendations made. Some specific ones for future LHEES rollout:

- Sales skills and energy expertise are required to sell energy improvements to businesses -> not currently in Economic Development or RES, so would need that resource
- Estimated 10 points of contact with RES between referral and implementing energy improvements -> needs to be streamlined
 - 12 month project duration not sufficient to see RES referrals through to completion – longer duration to test success rates
- Engagement with businesses effective before 9am; and without prior arrangement (e.g. popping in for quick f2f survey of property). Long time required to organize business events (upwards of 40 hours) – need to resource this for wider LHEES
- When choosing area boundaries for LHEES – best to use interzone or datazone as these are standard boundaries by which Scottish and UK Govts provide data at scale

- Need to improve the quality of data available for businesses: recommend some form of business focused annual survey similar to Scottish House Condition Survey.
- Data gathered by RES should include standard metrics and useful information for LHEES (e.g. floor area), and made available to inform area level strategies. Needs to be in standard format.
- Significant gap in availability of building-level data – this needs to be improved.
- Heat map data appropriate for wider level, but not at point data level.
- Potential to connect industrial growth and carbon emissions as per Local Enterprise Partnerships¹²: “National Planning and Community Planning Partnerships in Scotland are not currently required to account for their impact on energy demands or to deliver carbon neutral or low-carbon developments. This could be made a requirement across Scottish Government and all Scottish Government funded development to demonstrate delivery against Climate Emergency declaration.
- Scottish Government need to support further work in accommodating energy works with longer payback through Business Improvement Districts.

Relation to existing programmes and Fife council activities:

Report references the Plan for Fife, which focuses on tackling poverty and inequality in the mid-Fife area (including the Levenmouth area (Leven; Methil; Buckhaven)

Worked with Fife Council’s Economic Development team to identify businesses in the area and establish contacts with them.

Use of six stages framework:

The Fife LHEES included 3 broad activities:

1. Engaged businesses – learning how to efficiently engage them in tackling their energy [consumption]
2. Analysed how others have worked with businesses to reduce and decarbonize energy consumption
3. Tested and developed data collection and analysis to better understand and target business energy.

Because of this, the pilot was less suited socio-economic modelling, and prioritisation of areas/ zones for a potential LHEES. There was no costing of potential future activities required under LHEES.

Contribution to broader LHEES:

Good account of how to engage with businesses, with some positive experiences and strategies listed alongside those that did not work.

Key challenges/ findings:

Businesses (especially SMEs) lack the time to participate, and often work on a short-term financial basis. Engaging with businesses was a very resource intensive activity.

¹² <https://www.lepnetwork.net/>

Inverclyde Council LHEES Report:

Focus:

Improving energy efficiency and decarbonising heat in public sector buildings across the whole Inverclyde region. Including:

- Inverclyde leisure
- NHS Greater Glasgow and Clyde
- Police Scotland
- Scottish Fire and Rescue Service
- West College Scotland
- Scottish Courts Service
- Scottish Prison Service

Data sources:

The use of data for the report is unclear – but exploring energy consumption in council-owned buildings, so likely coming from council. Other public sector building data sourced from relevant public sector organisations.

Additional data collection:

Additional data collection was discussed at interview (see Appendix 2)

Recommendations made:

The report identifies 3 principles for prioritising sites for feasible energy efficiency interventions:

- Sites with high consumption, particularly by unit area are likely to have greater opportunity for cost-effective energy efficiency improvements – these are detailed on a building-by-building basis in Appendix B.
- In general, returns for energy efficiency measures will be better in sites with longer hours of use. For example, returns on a leisure centre are likely to be more attractive than in a primary school.
- An evaluation of out of hours use can be an effective check for poor controls, giving an indication of where savings can be made. In most cases, this can be facilitated by half-hourly or automatic meter reading (AMR) systems. (p.3)

The following ‘low regrets’ options for heat are identified:

- Heat pumps as and when heating generation plant needs replacing
- Woody biomass, where revenue positive and short payback
- Heat networks

Recommendations are made for action in different buildings: council owned and operated; council owned operated by 3rd parties; non-council owned public buildings.

For council-owned buildings, the report notes that: **As a core function of the LHEES, a Buildings Energy Efficiency and Renewable Heat Plan has been created which will restore many of the areas covered by the previous Carbon Management Plans** (*this represents a continuation of existing work, rather than a distinct change in delivery of energy efficiency and heat decarbonisation).

Activities for buildings operated by 3rd parties, and non-council owned public buildings mostly centre on ‘encouraging’ activities within particular buildings and

'forming an LHEES working group' to try to align activities across different public sector buildings.

For buildings operated by 3rd parties, the report notes that they will review the use of green leases and ensuring that buildings meet EPC standards required by law. For non-council owned public buildings, the report notes that they will: set up an LHEES working group; build on and encourage different sectors to develop carbon management plans; share findings of heat network studies with public sector organisations; create supplementary guidance for and Local Development Plans, use Building Standards officers to ensure compliance with building regulations.

Relation to existing programmes and Inverclyde council activities:

The report links to Scottish Government's broader targets, particularly referring to targets for: 59% reduction in emissions from non-domestic buildings by 2032 from 2015 levels; 70% of heat from low carbon sources by 2032; 20% reduction in non-domestic heat demand by 2032 from 2015 levels; the equivalent of 50% of the energy for Scotland's heat, transport and electricity consumption to be supplied from renewable sources by 2030

The report also cites Inverclyde Council's Carbon Management Plan which ran between 2007/08 and 2016/17.

Use of six stages framework:

The report outlines the 6 stages of LHEES as detailed in SG's 2017 consultation, but does not include any socio-economic assessment (**Stage 4**) because the pilot focused on public sector buildings. The setting of aggregate targets for heat demand reduction is included in Appendices B and C (**Stage 3**). This includes a building-by-building account of current condition and energy consumption, recommended short-medium term measures and potential carbon and financial savings through these. More general resources and costs are also noted in Section 9 on 'Resource Planning', which identifies the need for £45,000 for an energy manager, £40,000 for a Building Standards officer, and costs for the implementation of automatic meter reading across the council estate. A potential heat network is identified for the public sector buildings in the Greenock centre, and a costing is provided for different scales of network (wide area would cost £11.5 million; more limited area would cost £4 million).

Key challenges/ findings:

- Taking a sector-based approach appears to have limited opportunities for identifying area-wide interventions (for example, district heating)
- Use of data appears limited in this LHEES report; outcomes remain quite high level, particularly for buildings that council don't occupy or own.

Midlothian Council LHEES Report

Focus:

The report notes a sectoral approach focusing on:

1. Energy efficiency in the 'able-to-pay' (both domestic and non-domestic)
2. Energy efficiency in the private rented sector.

The technical report provides an area-wide analysis of Midlothian (including 39,606 domestic properties).

Data sources:

Home Analytics; Scotland Heat Map data

Postcode level energy use data from BEIS

Corporate address gazetteer data from Midlothian Council

EPC data for the non-domestic stock ; Scottish House Condition Survey

Additional data collection:

Stakeholder engagement was carried out with a variety of groups, including:

- Owner-occupiers
- Business representatives
- Private sector landlords

The engagement activities included a survey (publicised via Changeworks in Penicuik and Facebook) and attending business networking events hosted by Changeworks and East Lothian Chamber of Commerce.

Recommendations made:

All domestic properties:

- Given that many properties have mains gas as their main fuel, few properties were considered suitable for air source heat pump (4%). This increases substantially (up to 48%) when loosening this criterion for heat pump suitability.
- 31% of properties are suitable for wall insulation measures, mostly cavity wall insulation (15%) and internal wall insulation (12%).
- Installing all possible fabric upgrades is estimated to cost **£59m**, installing all identified low carbon heating upgrades would cost **£111m**.

Privately rented properties:

- The privately rented sector in Midlothian represents 8% of the total domestic stock. From this privately rented stock, 82% of the properties were identified as being suitable for an energy efficiency or low carbon heating upgrade.
- Installing all possible fabric upgrades in the privately rented sector would cost £8.1m installing all identified low carbon heating upgrades would cost £8.5m.

"Self-funded":

- One third of properties in Midlothian are in areas identified as 'willing to fund'
- Installing all possible fabric upgrades in the "willing to fund" households would cost **£16m**, installing all identified low carbon heating upgrades would cost **£40m**.

Carbon savings from measures

All households:

Domestic Fuel	Consumption (GWh/yr)	CO ₂ (kt/yr)	Potential saving CO ₂ (kt/yr)	Potential saving CO ₂ (% of fuel)
Gas consumption (BEIS 2017)	497	91.3	13.8	15 %
Electricity consumption (BEIS 2017)	277	52.6	4.5	9 %
Total (gas and electricity)	775	144	18	13 %

Private rented sector:

Domestic Fuel	Consumption (GWh/yr)	CO ₂ (kt/yr)	Potential saving CO ₂ (kt/yr)	Potential saving CO ₂ (% of fuel)
Gas consumption (BEIS 2017)	33	6.0	1.1	18 %
Electricity consumption (BEIS 2017)	16	2.9	0.5	15 %
Total (gas and electricity)	48	9.0	1.5	17%

Self-funded households

Domestic Fuel	Consumption (GWh/yr)	CO ₂ (kt/yr)	Potential saving CO ₂ (kt/yr)	Potential saving CO ₂ (% of fuel)
Gas consumption (BEIS 2017)	174	32.0	5.2	16 %
Electricity consumption (BEIS 2017)	53	10.1	1.4	14 %
Total (gas and electricity)	228	42.1	6.7	16 %

Relation to existing programmes and Midlothian Council activities:

The report includes a review of Midlothian Council policies which include information related to eight themes: domestic energy efficiency; non-domestic energy efficiency; heat decarbonisation; carbon reduction; economic development (specific to low-carbon economy); planning/ development for domestic/ non-domestic buildings; fuel poverty; community engagement. The review identified ambitions for energy efficiency and decarbonisation, but few clear targets from the council, noting: *“a review of Midlothian Council’s policies showed a clear lack of measurable aims and targets. Those targets that were identified, were mainly driven by Scottish Government’ national policies and targets. The Council has no measurable target for heat decarbonisation or energy efficiency, other than those outlined in the Energy Efficiency Standard for Social Housing (EESH).”* (p.12).

Use of six stages framework:

Elements of all 6 stages are included. The setting of aggregate short and long term targets (**Stage 3**) is limited. Although the report includes a review of existing local

and national strategies, the results of the LHEES are not linked back to those strategies. The report includes costing but not phasing of delivery programmes (**Stage 6**). The calculation of costing is not clear from the report (but this may be included in supplementary guidance shared with the local authority).

Contribution to broader LHEES:

The Technical Report identified that:

“no suitable upgrade (for either fabric upgrades or heating upgrades) was applicable for one-fifth off the domestic housing stock (8,098 properties). From these 8098 properties with currently no suggested improvements 2,285 properties (28%) have an energy efficiency band D or worse.” (p.32) – this is significant for efforts to reach net zero as it indicates that a quarter of properties with and EPC D or below have no suggested improvements.

Key challenges/ findings:

The Corporate Address Gazetteer listed 397 commercial buildings in Midlothian, but also includes a large number of official addresses as ‘unclassified’, so there is no definitive number of non-domestic buildings. EPC results were available for 570 non-domestic properties, 348 of these could be cross-referenced with the Gazetteer entries – only 56 of these cross-referenced entries are recorded as being non-domestic, the rest remain ‘unclassified’.

North Lanarkshire Council LHEES Report

Sector:

Domestic and non-domestic buildings

Scope:

North Lanarkshire – wide, with detailed socio-economic analysis of exemplar areas: urban (Craigneuk Wishaw); suburban - on gas grid (Birkenshaw); and rural - off gas grid (Allanton-Newmains).

Data sources:

Home Analytics Scotland; Scotland Heat Map; Energy Performance Certificate register; National Records of Scotland (methodology for spatial aggregation of data).

For socio-economic analysis, used: Portfolio Energy Analysis Tool (PEAT); LHEES Cost Database; BSRIA Rules of Thumb; HM Treasury's Green Book (forecasting for utilities emissions and costs); Scottish Input-Output table (to estimate job creation)

Additional data collection:

No additional data collected.

Recommendations made:

Domestic:

Detached houses are most likely to have double- or triple-glazing however, there are still opportunities within this typology for building fabric efficiency improvements relating to wall insulation – especially in older properties.

It is recommended that semi-detached houses are a key focus area for energy retrofit in North Lanarkshire, which will require careful consideration of the support available for private owner-occupiers and private landlords in the area.

There is an indication that older terraced houses are performing poorly, with only 0.4% of those built between 1919 and 1949 achieving EPC bands A/B. Older terraced houses are also unlikely to have wall insulation – this will be a disruptive measure for such properties and needs to be considered in combination with any heritage concerns.

Despite being the most likely housing typology to be in fuel poverty, flats in North Lanarkshire are the most energy efficient homes, likely due to the high proportion of social tenure flats that have benefitted from programmes such as EESSH. This enhances the benefit of habitual behaviour change campaigns for such households.

Non-domestic:

Class A Retail, Financial/Professional services, Food and beverage outlets - Due to its strong prevalence in North Lanarkshire, it is recommended that Class A properties are the initial focus of energy performance retrofit in the non-domestic sector.

Class B Offices, Workshops, Industrial, Storage, Distribution are low energy intensity buildings. The Scotland Heat Map energy demand for these buildings shows

unrealistically high heat demand due to the benchmarking process used.

Class C Hotels and Residential institutions - have the lowest average U-value, indicating better building fabric performance than the average in North Lanarkshire.

Class D Non-residential institutions, Assembly and Leisure - Education buildings in North Lanarkshire are better performing than the average across the whole non-domestic sector, with 20% in the lowest energy band, compared to 37.4% across North Lanarkshire as a whole.

Relation to existing programmes and North Lanarkshire council activities:

North Lanarkshire’s Local Housing Strategy 2016-2021, emphasising the potential of LHEES to contribute to ‘Priority 5: tackle fuel poverty and contribute to meeting Climate change Target’

The North Lanarkshire Local Plan is also referred to in the policy review. However, specific carbon reduction targets are not identified here. The socio-economic framework does mention North Lanarkshire’s goal to be carbon neutral by 2030, but no specific documents are referred to.

Use of the six stages framework:

Elements of all 6 stages were included, but the report focuses on **stages 1-4**.

Stages 1 and **2** are extensively detailed. **Stage 3** includes recommendations for heat demand reduction and decarbonisation, but does not establish authority-wide aggregate targets; instead targets are set to be in-line with SG goals. **Stage 4** (socio-economic analysis) is detailed in a separate report. There is some indicative costing provided (**Stage 6**) but this is based on broader, estimated figures.

Contribution to broader LHEES:

Use of socio-economic methodology clearly laid out in separate report. Identifies challenges with a number of parameters in the socio-economic approach (socio-economic assessment report p.51-2):

Ref	Observations	Possible mitigation/ Improvement
1	Data availability needs to be strengthened and adapted to the purpose of socioeconomic assessment, especially for non-domestic buildings	Currently, there is very poor coverage of non-domestic EPCs across North Lanarkshire. Display Energy Certificates (DECs) have even poorer coverage as they are generally only required by buildings in the public sector. DECs contain more useful information relating to energy use, as they are based on actual building fuel consumption rather than the modelled approach taken for EPCs that is not usually representative of actual building performance.
2	There is limited research relating to energy efficiency improvements in non-domestic buildings, making it difficult to determine the improvement seen in buildings when energy efficiency interventions are carried out.	A National Energy Efficiency Database for non-domestic buildings would assist in calculating the impact of interventions carried out as part of the EES programme.

Ref	Observations	Possible mitigation/ Improvement
3	The interventions packages assumed in this package of work have been based on EPC recommendations in both the domestic and non-domestic sector, as this is aligned to targets detailed in the EES Routemap upon which the LHEES is built. However, these targets will not necessarily meet the aims of Scotland's Climate Change Plan and more recent target to become net zero by 2025.	Section 6 (used for non-domestic EPCs) and SAP (used for domestic EPCs and in PEAT) are not geared towards the large step-change in technology that will be required to deliver carbon neutrality. An alternative or paired analysis approach should be considered using available carbon emissions data in EPCs
4	There is no responsibility available that links energy efficiency interventions already carried out through programmes such as HEEPS and EESSH to property UPRNs. This would assist in developing a more accurate baseline for the Local Authority, taking into account impact of more recent energy efficiency schemes.	Link data on local generation of heat and electricity to UPRN to identify wider opportunities for energy decarbonisation.
5	The SEA methodology includes a wide range of impacts, some of which are not suited to this type of analysis (e.g. play areas, green spaces etc)	Consider simplifying the SEA approach by nullifying some indicators
6	The definition of some criteria would benefit from improvement, e.g. <i>local</i> has to be clear to understand the 'local economic impact', and to define a catchment area for measuring the local economic impact	Improved definition of some criteria is required or provide additional sub-indicators e.g. for regeneration
7	Absoluter capital cost may not be the best indicator of financial viability	This report suggests looking at composite indicator including IRR and NPV, which would assist in identifying funding models
8	The scoring criteria or bands for each indicator may not be consistent across urban, semi-urban and rural zones, or for domestic and non-domestic sectors	Any comparisons across zones should be undertaken with care and careful consideration of the assumptions and approach
9	Weighting is very biased to carbon and fuel poverty, but indirect benefits such as jobs, skills etc can support fuel poverty and support the wider political agenda, for example the UK Clean Growth Strategy	Suggest ability to adjust weighting for some criteria according to parallel initiatives being conducted by the LA

Key challenges/ findings:

Lack of data for the non-domestic sector resulted in vague recommendations being made.

Orkney Islands Council LHEES Report

Focus:

The LHEES provides an Orkney Islands Council-wide energy efficiency and heat decarbonisation strategy.

The LHEES focuses on domestic buildings in Orkney. It explores options for decarbonising heat and supplying low carbon energy to Orkney households.

Data sources:

Council Tax Register (from Orkney Islands Council)

Private Sector Landlord Registration Database

Orkney Housing Association Limited

Scottish House Condition Survey

Home Analytics Scotland

Estimates of Households and Dwellings in Scotland 2017 (National Records of Scotland)

EPC database

BEIS Sub-national total final energy consumption

Additional data collection:

90 survey letters were sent to the key businesses and non-domestic sector; only 4 responses were received.

Survey sent to 11,000 residents; 930 responses received.

Recommendations made:

The key actions emerging from this LHEES are:

1. Develop and undertake research into the best ways to decarbonise the heating of different property types
2. Develop a specific focus on non-domestic buildings and business to try and bring these hard to engage sectors into the work of decarbonising heating in Orkney
3. Enhance advice and information provision for households and businesses around decarbonisation options. The specific recommendation is to develop an 'energy advice service' to engage householders and integrate existing energy advice services from national (HES and RES) and Orkney-based organisations.
4. The provision of a suitable staff base within the Council to provide the required resource to maximise the funding that can be brought into Orkney and utilised to help meet the above targets
5. Ensure coordination of the various insulation, heating and building upgrade programmes underway in Orkney to maximise the funding that can be utilised and provide the more benefit to households, businesses and Orkney in general.
6. Work closely with Scottish and Southern Energy Networks to ensure that any grid upgrades that are required to facilitate the decarbonisation of heat in Orkney.

The targets set through the LHEES include:

- No more than 5% of households in Orkney are in fuel poverty and no more than 1% of households in Orkney are in *extreme* fuel poverty by 2040.

- Improvements to EPC ratings in the private rented, owner occupied and social rented sectors in line with Scottish Government targets laid out in the Energy Efficient Scotland programme.

Relation to existing programmes and Orkney Islands Council activities:

The LHEES closely aligns with the Orkney Sustainable Energy Strategy 2017-2025 and Orkney's Fuel Poverty Strategy 2017-2022. Also referenced are Orkney's Local Housing Strategy, the Orkney Local Development Plan, the Orkney Hydrogen Strategy and the Orkney Islands Council Carbon Management Programme 2016-2026.

Use of six stages framework:

The LHEES follows the **6 stages** of LHEES development, as described by Scottish Government.

Contribution to broader LHEES:

This is an area-wide LHEES, which covers a 20 year period. It includes a phased delivery programme for energy efficiency based on designated zones.

The LHEES is for an off-gas grid region, so it focuses on solutions for moving heating oil and solid fuel customers to electric systems. The area is dispersed and remote, as such, the report notes that district heating is not viable in many areas, and so the LHEES focuses on alternative low carbon heating technologies.

The report incorporates an options appraisal for different heating systems, including potential costs and sources of funding for different options.

South Lanarkshire Council LHEES Report

Focus:

1. Analyse and quantify the current condition and energy efficiency of the private rented sector stock within South Lanarkshire
2. Identify low-regret low to zero carbon options within rural off-gas grid settlements

Data sources:

Corporate Address Gazetteer; Heat Map;
Home Analytics; Address list of privately rented properties;
Spatial data from Local Development Plan; Changeworks Fuel Poverty Map;
Domestic and non-domestic EPCs; Scottish Index of Multiple Deprivation 2016;
Demographics Census 2011 data; BEIS gas/ electricity use data

Additional data collection:

Telephone interviews were conducted with three Council employees to explore the barriers and priorities when considering building fabric and heat decarbonisation upgrades. A target setting workshop was held for South Lanarkshire Council staff, facilitated by Changeworks.

Recommendations made:

63% of the PRS was identified as suitable for energy efficiency and heat decarbonisation measures. The number of properties suitable for each measure is identified, along with the potential costs of installation and CO₂ savings per year:

Potential measure	Number of suitable properties	Modelled costs			Potential CO ₂ savings per year (t)
		Installation	Total annual saving	Est. annual saving per property	
Virgin loft insulation	2,609	£769,425	£325,895	£215-£115	1,495
Top-up loft insulation	2,674	£644,795	£30,490	£20-£10	149
Cavity wall insulation	2,432	£941,550	£251,370	£245-£70	1,100
External wall insulation	373	£2,984,000	£69,610	£425-£120	296
Internal wall insulation	1,608	£8,580,700	£261,875	£425-£120	1,116
Solar thermal hot water	4,148	£16,736,000	£277,900	£95-£50	1,256
Air Source Heat Pump	260	£1,820,000	£104,490	£830-£130	782
High Heat Retention Heaters	3,169	£6,121,210	£401,545	£190-£175	1,746

Source: South Lanarkshire LHEES report, page 12.

The installation costs of all potential measures within the private rented sector is estimated at £38 million. The total CO₂ savings would equate to a reduction of about 7% of South Lanarkshire’s total domestic property emissions.

Air source heat pumps and solar PV panels are the most suitable low to zero carbon heating options for off-gas grid properties. The top 10 rural areas (in terms of number of properties that could benefit from ASHP or solar PV) are also identified in the report. It is estimated that installing ASHP and solar PV in a single property would cost £13,500. To fund all potential ASHP and solar PV installations would cost approximately £39 million. This action would contribute to around a 10% reduction in the total domestic property emission levels.

Classification		Number of installations	Modelled costs		Estimated annual CO ₂ savings (t)
			Installation	Est. total annual savings	
Urban	Large urban	37	£499,500	£22,775	163
	Other urban	209	£2,821,500	£123,110	882
	Small town	138	£1,863,000	£72,715	614
Rural	Accessible rural	2,399	£32,386,500	£1,239,990	11,607
	Remote rural	110	£1,485,000	£67,675	574
Total		2,893	£39,055,500	£1,526,265	13,840

Source: South Lanarkshire LHEES report, page 15

The pilot also identified opportunities for district heating systems to be embedded within existing public buildings. 9 potential district heating opportunities are identified.

Relation to existing programmes and South Lanarkshire Council activities:

Local Housing Strategy 2017-22, which identifies the need to focus on developing understandings of the private rented sector.

Sustainable Development and Climate Change Strategy 2017-22.

Use of six stages framework:

The LHEES includes a clear review of South Lanarkshire Council’s policies (**Stage 1**) and the collation and analysis of data about the building stock (**Stage 2**). The authority-wide setting of aggregate targets (**Stage 3**) and socio-economic assessment (**Stage 4**) for energy efficiency and heat decarbonisation have not been completed. However, there is some prioritisation of off-gas grid areas for maximising opportunities to install energy efficiency measures (**Stage 5**) and costing of delivery programmes (**Stage 6**).

Contribution to broader LHEES:

The LHEES report explores how the methodology used here could be applied to other sectors. The stages of process outlined are: select sector; identify data available or required; analyse data available; compile work already in place; develop action plan; consider how this fits with other sectors.

West Lothian Council LHEES Report

Focus:

The report notes a sectoral approach focusing on SMEs, public sector buildings and off-gas domestic properties. However, there is little detail on SMEs and public sector buildings. There is reference to the 'non-domestic' sector generally, although this remains relatively high level and there is limited data used for this sector.

In terms of region, the project focuses on: Breich, Newton, Westfield, and Wilkieston, as well as the Breich Valley – noting that these are areas that do not have access to the mains gas network.

Data sources:

Home Analytics; Postcode level energy use data from BEIS
Corporate address gazetteer data from West Lothian Council
EPC data for the non-domestic stock
Scottish House Condition Survey

Additional data collection:

Stakeholder engagement with members of the council. A survey was developed to collect the views of the non-domestic sector – intended to be circulated using West Lothian Chamber of Commerce mailing list but the survey was never circulated.

Recommendations made:

Focuses on four areas on the basis that they have a high proportion of off-gas grid properties, but in the recommendations, notes that: *“given that many properties have mains gas as their main fuel, few properties were considered suitable for air source heat pumps (13%). This increases substantially (up to 52%) when loosening the criteria for heat pump suitability”*. It is unclear whether this was the conclusion of the project team (despite this being an off-gas area), or a product of the modelling used (which may not account for off-gas areas).

A list of addresses studied with potential insulation and heating upgrades, as well as summaries of installations at settlement, output area and data zone level are provided in separate files to the council.

Overall findings for the domestic sector buildings included (2,736 properties):

- 27% properties suitable for wall insulation measures (cavity or IWI)
- Few properties were considered suitable for an air source heat pump (13%).
N.B. this does not fit with focus on off-grid areas
- Approximately half of the properties with no suggested fabric or heating improvement are in EPC D or lower.

Overall findings for non-domestic buildings suggest: *“across the sample of properties that have had EPCs conducted there is potential for cavity wall insulation, double/secondary glazing, heat pumps and solar thermal.”* (p.26) -

Relation to existing programmes and West Lothian council activities:

The report includes a review of West Lothian council policies which include information related to eight themes: domestic energy efficiency; non-domestic

energy efficiency; heat decarbonisation; carbon reduction; economic development (specific to low-carbon economy); planning/ development for domestic/ non-domestic buildings; fuel poverty; community engagement. The review identified ambitions for energy efficiency and decarbonisation, but few clear targets from the council, noting: *“The council presents dedicated strategies that address the issues of heat decarbonisation, carbon reduction and community engagement. Nevertheless, overall there are few measurable targets, particularly within the themes of non-domestic energy efficiency, economic development and fuel poverty.”* (p.13).

Use of six stages framework:

Elements of all 6 stages are included. The setting of aggregate short and long term targets (**Stage 3**) is limited. Although the report includes a review of existing local and national strategies, the results of the LHEES are not linked back to those strategies. The report includes costing but not phasing of delivery programmes (**Stage 6**). The calculation of costing is not clear from the report (but this may be included in supplementary guidance shared with the local authority).

Contribution to broader LHEES:

The report focuses on energy improvements in buildings in a rural off-gas area. Less detail is provided on the non-domestic stock.



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