Low Carbon Skills Fund Heat Decarbonisation Plan Research Project

Final Report

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Contents

Abbreviations

Abbreviation	Meaning
AI	Artificial Intelligence
ASHP	Air Source Heat Pump
COP	Coefficient of Performance
DEC	Display Energy Certificate
DESNZ	Department for Energy Security and Net Zero
ECMs	Energy Conservation Measures
EEHD	Energy Efficiency and Heat Decarbonisation
EnPC	Energy Performance Contract
EPC	Energy Performance Certificate
ESCO	Energy Service Company
HDP	Heat Decarbonisation Plan
HNDU	Heat Network Delivery Unit
IGA	Investment Grade Audit
LCSF	Low Carbon Skills Fund
LED	Light Emitting Diode
LLM	Large Language Model
MATs	Multi-Academy Trusts
M&V	Measurement and Verification
NDBS	Non-Domestic Buildings Survey
NLP	Natural Language Processing
PSDS	Public Sector Decarbonisation Scheme
QA	Quality Assurance
SBIT	Supplementary Building Information Tool
WSHP	Water Source Heat Pump

Executive summary

The Low Carbon Skills Fund and Heat Decarbonisation Plans

In 2020, the Department for Energy Security and Net Zero (DESNZ), working in partnership with Salix Finance, launched the Low Carbon Skills Fund (LCSF). This programme supports public sector organisations in creating plans to decarbonise heat in public buildings through providing grant funding for consultants to prepare Heat Decarbonisation Plans.

As stated in the Phase 4 programme guidance[1], the purpose of a Heat Decarbonisation Plan (HDP) is to describe how an organisation intends to reduce direct greenhouse gas emissions by replacing fossil fuel heating systems with low carbon alternatives. This document should outline the most cost-effective pathways to decarbonising heat through integration of energy efficiency measures that reduce heat demand, taking a "whole building approach".

The HDP guidance and a Quality Assurance (QA) factsheet support the production of HDPs. HDP guidance has been produced for each programme phase since Phase 2 and at the time this research project was undertaken was in the Phase 4 iteration. The QA process aims to demonstrate the grant recipients' level of understanding of the quality, purpose, and benefit of the HDP including the requirement to achieve at least 70% in a quality assurance self-assessment.

Heat Decarbonisation Plan Research Project

AECOM have been appointed by DESNZ to undertake research that provides insights into the decarbonisation potential of the public sector and to identify learnings on how best this can be supported through access to skills and expertise to unlock heat decarbonisation.

Specifically, this research allows DESNZ to understand the extent to which the LCSF supports organisations to develop best practice heat decarbonisation plans, and to provide findings and lessons learned which will be used to inform policy on how the LCSF programme can be improved to better meet its aims.

AECOM's research has been delivered through the desktop analysis and assessment of a sample of Heat Decarbonisation Plans provided by DESNZ. A manual review was completed for 60 HDPs, and a much larger sample of 1,251 Heat Decarbonisation Plans underwent a computational review comprising of data on building characteristics and energy efficiency and heat decarbonisation (EEHD) measures. This provided an assessment of the quality of HDPs to inform findings and insights for future policy development.

[1] Salix, 27th March 2023, Guidance on the preparation of heat decarbonisation plans, Salix, viewed 2nd February 2024 <https://www.salixfinance.co.uk/sites/default/files/2023-03/Heat%20Decarbonisation%20Plan%20Guidance%20Phase%204%20LCSF.pdf>

HDPs produced by AECOM were excluded from the research project to avoid any potential challenge around bias in the research findings.

This report is a shorter version of the report prepared for the Public Sector Decarbonisation Strategy team at DESNZ, with the aim of appealing to a wider audience. Its intended audience comprises other DESNZ teams delivering policy relating to non-domestic buildings, the Salix team, public sector organisations commissioning HDPs and those preparing them. The public sector organisations may wish to take some of the findings to assist them in being more specific in their requests for funding and the HDP brief they issue. Depending on their experience and the scope of the HDP requested, those preparing reports will also find this analysis useful.

Navigating this document

Two types of text boxes are used in this document to help readers distinguish key messages:

Tint boxes are used to highlight recommendations that could be implemented to improve the quality of HDPs produced through the LCSF.

Outlined boxes are used to highlight speculative findings based on research insights generated by the HDP research project.

In addition, this report refers to two HDP audience types:

HDP commissioners – public sector organisations who have secured LCSF funding and instruct “HDP authors” to produce a Heat Decarbonisation Plan.

HDP authors – parties responsible for the development of Heat Decarbonisation Plans, typically private sector consultants, responding to “HDP commissioners’” requests for the production of HDPs.

Summary of findings and recommendations

Table 1 consolidates all recommendations generated as a result of the LCSF HDP Research Project. Each recommendation is accompanied by an associated research finding, providing the justification as to its inclusion. For further information, readers of this report can click the bold text for each recommendation (e.g. “Recommendation 1 ”) to hyperlink to relevant areas of this document.

The main report provides further detail on insights, including a summary of the research approach, sampling of HDPs and detailed findings from both the computational and manual review of HDPs.

For context, there are seven scopes for a HDP that LCSF grant applicants were able to apply for funding to develop, termed workstreams in this report. Table 2 provides a description of each of these potential workstreams, however, in summary these fall into seven categories:

1. Building audit
2. Desktop assessments
3. Detailed design
4. Feasibility study
5. Investment grade audit (IGA)
6. Preparation of a strategic plan
7. Specialist technical site survey

Table 1: Summary of recommendations

Theme	Research finding	Recommendation
HDP quality	The ability to extract information from HDPs is variable depending on the document length, structure, layout, and format in which information is presented. This limits DESNZ's ability to gather information on the LCSF which could be used to inform future policy.	**Recommendation 2** - Develop a standardised data return for key HDP metrics that can be submitted along with completed HDPs in a consistent and unified format, with clearly defined units set as a requirement.
	Phase 4 HDP guidance does not differentiate how a HDP should be produced in terms of both methodology and the scope of the HDP in the context of the HDP workstreams undertaken. For example, the guidance is the same whether an organisation wishes to prepare a strategic plan or a detailed design. In addition, final HDPs are not checked against workstream-specific requirements following submission of the HDP Quality Assurance Factsheet.	**Recommendation 19** - Amend the HDP Quality Assurance process to ask HDP commissioners to confirm that the HDP meets the requirements of the HDP workstreams requested.
LCSF application	There is a relatively small pool of organisations authoring HDPs as identified across the sample reviewed.	**Recommendation 1** - DESNZ could undertake additional supply chain analysis/research to identify and better understand the number and types of organisation preparing HDPs for public sector organisations, their skills and motivation, allowing for more effective strategic decision making and resource allocation.
	The combination of workstreams requested by LCSF applicants suggest that they may be unsure over the level of support they need, the stage they are at in their decarbonisation journey or the level of detail in each workstream.	**Recommendation 11** - Amend HDP guidance for HDP commissioners to direct LCSF applicants to the most appropriate HDP workstreams when submitting a LCSF application depending on the client/project maturity.

	LCSF applicants are requesting a variety of support, both strategic and technical design, in one application.	**Recommendation 17** - DESNZ could ask LCSF applicants to provide evidence of previous decarbonisation planning/feasibility work when requesting HDP workstream funding that requires a more detailed level of design (e.g. detailed design/Investment Grade Audit (IGA)). If a LCSF applicant requests both strategic and technical workstreams, DESNZ could request justification as to why this is the case, including a detailed cost summary to back up cost justifications. For example, a HDP commissioner may require a "Preparation of a strategic plan" for a university campus but as part of this also require a "Detailed design" for a specific heating system upgrade in one building based on previous feasibility studies. In such cases, a HDP commissioner would be able to provide the justification for this in any LCSF application.
	There is no agreed industry standard/guidance for production of Investment Grade Audits. Therefore, HDP commissioners may not be aware of the implications of requesting an Investment Grade Audit (IGA), and HDP authors may not understand the requirements of such an audit in the context of producing a HDP.	**Recommendation 18** - Produce guidance stating the requirements of an IGA and reflect this in subsequent HDP guidance both at the LCSF application stage and in the "Guidance for the preparation of HDPs" document for HDP commissioners and HDP authors.
	A high proportion of buildings in the sample are related to educational and healthcare activities.	**Recommendation 25** - Review the level of support provided for each sector to encourage other sectors that may have limited experience and/or resource to bid for, and utilise, LCSF funding.
For HDP guidance	The scope of a HDP is not always clear, e.g. single building, multiple buildings on one site, a portfolio, etc. This has implications for the level of data that may be presented in a report.	**Recommendation 4** - Amend HDP guidance for HDP authors to require a clearly defined and explained assessment scope to remove ambiguity.

	There is little consistency with how information is presented within a HDP report, and it is difficult to understand in some cases why certain pieces of information may be missing from a HDP.	**Recommendation 5** - Amend HDP guidance for HDP authors to include an information hierarchy in terms of the level of reporting required for key metrics/HDP outcomes.
	Current HDP guidance is directed at those commissioning HDPs not those producing HDPs. Further clarity is required so HDP authors can understand the expectations of each workstream, and the level of information required.	**Recommendation 6** - Produce additional HDP guidance aimed at HDP authors, as well as for HDP commissioners.
	Many metrics were rarely or never included in the HDPs reviewed.	**Recommendation 7** - Amend guidance for both HDP authors and HDP commissioners to reflect the relative importance of HDP requirements e.g. core, workstream specific and additional metrics.
	The number of buildings presented in a HDP can be unclear and not reported correctly. Further, the term “building” is used interchangeably with the term “site”.	**Recommendation 9** - The terms “building” and “site” should be explicitly defined in the HDP guidance for both HDP authors and HDP commissioners.
	The requested combinations of HDP workstreams are many and often encompass a broad range of activities: from strategic planning to detailed design. This leads to a misalignment between which workstreams have been selected at the application stage and what the final HDP assessment actually covers. Further, it may be necessary that certain workstreams are completed before others, so this may not be a best practice approach when developing investable/deliverable projects.	**Recommendation 12** - Amend HDP guidance for both HDP authors and HDP commissioners to provide additional guidance on requirements/outcomes of a HDP depending on the HDP workstreams undertaken.

	There are instances where hybrid heat pump arrangements, new gas boilers and no change to existing heating systems are recommended in HDPs.	**Recommendation 15** - Where a fossil-fuel free heat generation technology is not recommended as part of the whole building solution, HDP guidance could be amended for HDP authors to explicitly require justification as to why the proposed solution is most suitable in that instance.
	Manually reviewed HDPs did not identify a difference in the level of design i.e. the HDPs that sought to complete detailed design did not contain evidence that demonstrated a RIBA Stage 3 level of design between HDPs of different workstreams.	**Recommendation 20** - Update HDP guidance for both HDP authors and HDP commissioners to clearly state design requirements for HDP workstreams. In addition, DESNZ should be clearer on whether up to RIBA Stage 3 means up to the start of or up to the end of RIBA Stage 3. Such guidance would possibly need to reflect the impact of any proposed procurement routes (e.g. an Energy Performance Contract (EnPC)) as this could affect the level of design required before procuring the works.
	Varying HDP scopes leads to a variation in how information and recommendations are presented which can lead to missing data. For example, for HDPs covering multiple buildings/sites, information is often consolidated, reducing the granularity of the data provided.	**Recommendation 21** - Amend HDP guidance for both HDP authors and HDP commissioners to reflect the differences in the HDP assessment scope. For example, this could include guidance for assessments comprising of one building, or multiple buildings on one site (campus), or multiple sites.
	It is not always clear what the HDP scope is when there is no site plan or building list and only limited descriptions are included in the report.	**Recommendation 23** - Amend the HDP guidance for HDP authors to request that site plans, maps, and sketches are included to clearly identify which areas are included and excluded within the HDP assessment scope.
	1 in 10 HDPs in the computational analysis and 1 in 3 HDPs in the manual review identified buildings with heritage characteristics.	**Recommendation 24** - Provide additional guidance for HDP authors for complex-to-decarbonise buildings including key considerations, approaches, and opportunities for buildings with heritage requirements.

	Information on costs and savings from proposed energy efficiency and heat decarbonisation (EEHD) measures is often consolidated, making it difficult to understand the impact of individual measures.	**Recommendation 29** - Amend the HDP guidance to promote a clear hierarchy for how HDP authors should be presenting costs/savings depending on the HDP scope.
	HDPs are not always clear over what is included within estimated costs, with some including additional costs associated with design and profit, etc., whereas others have provided materials and installation costs only.	**Recommendation 30** - Amend the HDP guidance to include a clear set of cost guidelines on what should be included and encourage HDP authors to clearly list where additional costs have been accounted for and their assumptions.
	Information is reported at a variety of levels e.g. by portfolio, by site, by building or by measure. At present, HDP guidance does not specify how information should be reported at a variety of levels, therefore information collected from HDPs has not been consistent.	**Recommendation 31** - Amend HDP guidance for HDP authors to promote the use of a data/information hierarchy.
	Future decarbonisation of the UK electricity grid is not being considered in HDPs.	**Recommendation 33** - Revise HDP guidance for HDP authors to dictate the emissions forecasts to be used and the future period over which lifecycle savings should be determined. Include this in any future data return.
Data collection and presentation	A standardised set of data on key metrics to be submitted along with HDPs will provide a consistent and unified format which enables Artificial Intelligence (AI) and digital data extraction techniques.	**Recommendation 3** - Formalise all recommendations in the future data return forms to provide consistency and clarity on HDP activities and outputs.
	Parent and child reporting may represent a good quality approach where organisations are producing multiple HDPs across a portfolio of assets. This is because technical details can be provided in “child” HDPs, and information for key decisions makers can be summarised in the “parent” HDP.	**Recommendation 8** - Add a reference within HDP guidance for both HDP authors and HDP commissioners to describe how parent and child reporting may represent a good quality approach for instances when organisations are producing multiple HDPs across a portfolio of assets.

	Inconsistences over reporting the building activities (i.e. school, restaurant) within buildings on site means that it is difficult to make comparisons between different HDPs/organisations.	**Recommendation 10** - Activities completed within a building should be aligned with industry practice such as the Non-Domestic Buildings Survey (NDBS) to ensure comparability between HDPs/organisations.
	Geographical information on where decarbonisation potential exists is not being recorded.	**Recommendation 13** - DESNZ could require and extract information on a postcode/UPRN level to gain a better understanding of decarbonisation potential, linking to other areas of department activity.
	Despite being requested in guidance, it is likely that Display Energy Certificate (DEC) information is not reported in HDPs.	**Recommendation 14** - DESNZ could request that HDP commissioners have an updated DEC record in place before commencing a HDP.
	There is a variety of assessment scopes that could be undertaken within the context of a HDP (see Table 7).	**Recommendation 22** - Future data return forms should allow for collecting data at building, energy centre and site level and portfolio level.
	HDPs have not been providing all costs and savings consistently by each recommended measure for each building.	**Recommendation 27** - Encourage HDP authors to present all capital costs and savings for all recommended measures where applicable to the HDP scope and include this as one of the parameters within any future data return template that may be created.
	HDP authors are grouping together individual EEHD measures when presenting capital costs and energy savings e.g., glazing, roof insulation and wall insulation are grouped as generic “fabric measures” meaning the individual benefits of each measure cannot clearly be determined.	**Recommendation 28** - Where applicable, encourage HDP authors to not group together similar measures and instead clearly present capital costs and savings separately for individual recommended EEHD measures.

	Some HDPs that explored many different potential options/scenarios did not always put forward a final solution.	**Recommendation 32** - Request a list of final recommendations along with supporting energy/cost/emissions savings with the final recommended measures for each building and include these in any future data return that may be developed. Where it is not possible to provide a final recommendation, HDPs should provide reasons why this cannot be recommended (e.g. further feasibility is required) and actions for the HDP commissioner to undertake to determine the final recommended solution (e.g. key decisions, impacts due to funding secured).
	There are instances where energy consumption is presented as combined values for single measures across energy sources	**Recommendation 34** - Encourage authors to present energy data that is split by fuel type and by measures for clarity in accordance with the HDP scope and suggested information hierarchy. Include in any future data return.
PSDS application	Public Sector Decarbonisation Scheme (PSDS) funding would likely be oversubscribed and insufficient to meet funding demand.	**Recommendation 16** - Update guidance to support HDP commissioners with considering other forms of funding as the PSDS could be oversubscribed. Alternatively, amend guidance to state that specific HDP workstreams should be completed to support a compliant PSDS application.
EEHD measures	Controls were one of the least frequently recommended EEHD measures. These are often seen as relatively simple to implement, cost-effective measures.	**Recommendation 26** - Encourage a focus on the long-term maintenance and review of control systems.

Summary of research approach

Research Plan

At the project outset a Research Plan was developed. This outlined the proposed research methodology including identification of what would be evaluated, what data would be collected and analysed, how and when research would be completed, and what would be reported.

Accounting for HDP workstreams

From Phase 3 of the LCSF, grant applicants were able to apply for funding to develop a HDP that addresses one or more of the seven workstreams as shown in Table 2 below.

Table 2: Potential workstreams undertaken during HDP development

HDP workstream (presented alphabetically)	**Description (text is adapted from the LCSF Supplementary Building Information Tool (SBIT) guidance)2**
Building audit	Research into the energy performance of a building. This could include information related to: Building features – such as the energy performance of the building fabric, heating, and cooling system. Energy consumption baseline, types of energy sources and energy benchmarks. Energy measures that can be implemented to reduce energy consumption and switch fossil fuel systems to low carbon solutions.
Desktop assessments	High-level assessments are executed by considering information about the building without any site visits.
Detailed design	Project design as defined in RIBA stages in the RIBA Plan of Work. Detailed design (referred to as spatial coordination) is defined as up to RIBA Stage 3. Based on LCSF Phase 4 guidance, a detailed design should include information related to: Methodology process for selecting a preferred solution. Production of the technical design including design specification (e.g. size, flow temperatures, model) and detailed drawings. Consideration of facilitating works required, for example, electrical infrastructure upgrades. Design works up to at least RIBA Stage 3.

[2] Salix, 31st March 2023, Supplementary Building Information Tool Guidance, Salix, viewed 2nd February 2024 <https://www.salixfinance.co.uk/sites/default/files/2023-03/SBIT_October%20Revision_5_1.xlsx>

Feasibility study	Evaluation of the practicality and deliverability of a proposed project. A feasibility study aims to holistically appraise the strengths and weaknesses of an existing system; deduce opportunities and risks present in different solutions; consider the resources required to complete a project; and conclude the best course of action or likelihood of success.
Investment grade audit (IGA)	Typically produced by an Energy Service Company (ESCo), an investment grade audit should detail key information including Energy Conservation Measures (ECMs) to be installed, guaranteed energy savings, tonnes of CO2to be saved each year, capital costs, maximum payback periods and a measurement and verification (M&V) plan.
Preparation of a strategic plan	The preparation and production of a HDP. For the purposes of the HDP research project, it has been assumed that this comprises building audits, desktop audits and feasibility studies.
Specialist technical site survey	Site surveys for the building included in a HDP where specific low carbon technologies are recommended, and specialist technical site surveys would support the feasibility of the low carbon solution identified. An example would be a borehole inspection for installing a ground source heat pump.

Indicators and metrics

To complete analysis of HDPs, indicators and metrics were identified to provide a framework that would support the repeatability and consistency of the assessment process, as follows:

Indicator – a qualitative or quantitative measure of performance that provides a means to express achievement or attainment of a goal (e.g., how well does a HDP consider opportunities for external heat sources). Indicators are made up of one of more different metrics.

Metric – a single variable that is used to assess, track, or compare performance of an indicator.

Indicators and metrics were primarily based on Phase 4 HDP guidance[3] and those identified in Annexes D and E of the DESNZ specification for the Research Project. In addition to these, industry guidance and AECOM's own experience of preparing HDPs were used to identify further metrics that would represent good practice.

[3] Salix, 27th March 2023, Guidance on the preparation of heat decarbonisation plans, Salix, viewed 2nd February 2024 <https://www.salixfinance.co.uk/sites/default/files/2023-03/Heat%20Decarbonisation%20Plan%20Guidance%20Phase%204%20LCSF.pdf>

Data extraction methods

A combination of computational and manual methods was proposed to extract data against each metric:

- **Computational** – data extraction through the use of computers using Artificial Intelligence (AI) or other general data extraction methods.
- **Manual review** – data extraction through manual review by an AECOM consultant.

Qualitative and quantitative assessments

Independent of whether extracted through computational or manual methods, data was divided into two broad categories:

1. **Qualitative analysis** – analysis of information and data that are descriptive in nature and generally expressed in terms of language rather than numerical values.

   Using this analysis approach to scrutinise the level and detail at which components of a HDP have been addressed, providing insight into how well HDPs support public sector organisations with taking the next steps to decarbonise their buildings.

   This data was to be extracted primarily by manual reviews.

2. **Quantitative analysis** – analysis of information and data that can be counted or measured and is generally presented as numerical values.

   Using this analysis approach to gather knowledge on how public sector organisations can decarbonise heat, providing insight into existing performance from analysis of building characteristics, and potential performance through the collection of information on EEHD measures.

   This data was to be extracted primarily from computational methods.

Demonstrating quality

When extracting data against individual research metrics, the presence of information does not necessarily mean that information is robust and representative of the relative importance of that information within the context of the HDP workstream that is being completed. For example, the presence of an internal governance structure in a HDP does not mean that this is robust, representative of the structure required and/or appropriate to the scale and nature of the organisation. Further, a robust internal governance structure may not be required for a feasibility study but could be expected for an Investment Grade Audit (IGA).

Therefore, qualitative data extraction was based on a number of open questions that allowed manual reviewers to assess the quality of information provided and identify examples that demonstrated good quality.

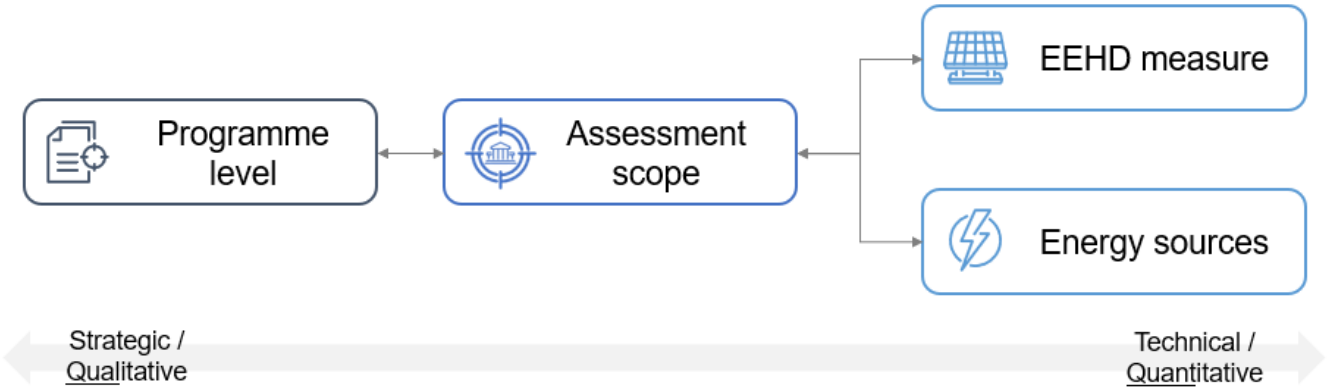
Metric hierarchy

To gather meaningful information on each metric it was agreed with DESNZ that data should be reported at one of four levels. This is presented in Figure 1 which summarises:

- **Programme level** – overarching information required to provide context to the document and/or support next steps e.g., delivery methods, resourcing, challenges and risks.
- **Assessment scope** – information related to the individual sites, buildings and/or heating systems that together form the scope of a HDP e.g., age of the building, listed or heritage status, heat sources, occupancy hours, etc.
- **EEHD measures** – information on proposed EEHD measures e.g., their costs, savings and return on investment.
- **Energy sources** – information on the fuel types consumed, their carbon emissions, costs and data accuracy.

It was found that these levels form a hierarchy, supporting document users to understand HDP outcomes. As Figure 1 shows, Programme level information tended to be more strategic and qualitative. Information on the EEHD measures and energy sources tended to be more technical and quantitative.

Figure 1: Metric hierarchy



Assessing quality

The focus of the HDP Research Project was to understand the extent to which the LCSF supports organisations to develop best practice heat decarbonisation plans, and to provide findings and lessons learned which could be used to inform policy. It was not intended that it should focus on the presence or absence of individual metrics/data points.

Based on this, initial findings from qualitative data extraction using open questions and manual reviews were found to be sufficient to assess quality.

Improving the methodology

Results from the Preliminary Findings Report led to the following amendments to the research methodology.

Categorisation of metrics

Given poor coverage of the full suite of metrics across the sample of 12 HDPs, reviewing HDPs against all the metrics was determined not to be an effective approach to assessing quality within the time and budgetary constraints of the project. A revised approach was developed, and metrics were reviewed and assigned to one of five categories:

- **Core metric** – a fundamental requirement and essential for the production of a reasonable quality HDP (i.e., a HDP that is fit for purpose).
- **Workstream specific metric** – metrics that are not essential for all HDPs but are required to demonstrate good quality for a HDP addressing a specific workstream. For example, a metric that might not be essential for all HDPs, but which could be expected to be included in an Investment Grade Audit.
- **Benchmarking metric** – metrics required to produce programme-level benchmarks, but which are not core, workstream specific or research metrics.
- **Research metric** – metrics which support LCSF HDP Research Project outcomes to assess the level and detail of a given response, enabling the identification of good/poor quality.
- **Additional metrics** – metrics that could be included in a HDP but depend on the organisation that is commissioning the HDP, and possibly, the grant amount received for HDP production.

Focus on quality reviews

To maintain a focus on assessing quality, 60 HDPs were manually reviewed against the full revised list of metrics. In addition, 1,251 HDPs were reviewed by computational methods against a reduced number of metrics.

HDP sampling

Computational analysis

Computational analysis involved processing, querying, and extracting data from individual HDPs. The full portfolio consisted of approximately 2,200 documents across 240 submissions within the sample. The highest aggregated submission contained 139 HDPs, whilst more commonly many submissions included a stand-alone HDP. This was refined to a sample of 1,305 HDPs using exclusion criteria that excluded supplementary documents unsuitable for running against the AI model, such as technical drawings, or documents that are irrelevant to the scope and aims of the AI extraction. The exclusion criteria eliminated noise, allowing the computational analysis to focus on relevant information in the HDPs themselves.

Manual review of 60 HDPs

The approach for selecting the HDPs to be manually reviewed as part of the Research Project was to seek to represent the variety of HDPs produced through the LCSF rather than to match the distribution within the overall portfolio of HDPs produced. In this way, examples of good quality and potentially poor quality would be captured, in addition to variations between HDPs for clients or assets that were similar. HDPs produced by AECOM have been removed from the sample to avoid any potential challenge around bias in research findings.

Based on the research, it was found that HDPs produced by the same authors tended to have similar formats, layouts, sizes, complexities, and levels of information. Furthermore, the same authors may use the same methodologies and assumptions to base costs, emissions, and savings for EEHD measures. The sample of 60 manual reviews included more than 50% of the total number of authoring organisations across the portfolio.

It is perhaps surprising that the manual review of 60 HDPs represented 53% of the total HDP authors across the portfolio. However, it should be noted that the sampling approach sought to cover a range of different HDP authors to support the identification of good quality examples. Further analysis of HDP authors was not in scope.

Across the 1,251 HDPs reviewed, only 69 HDP authoring organisations have been identified, indicating there is a relatively small pool of organisations should DESNZ wish to engage with them around greater consistency of output.

There is not necessarily a direct correlation between the number of HDPs in the wider sample which an organisation authored and the quality of reports delivered. For example, the HDP author could have offered the most economically competitive proposal for HDP production, or they could have produced multiple HDPs as part of one appointment. Secondly, the author may have been selected due to an existing relationship with the

client, or because of the type of organisation they are and their potential role delivering follow on work.

Furthermore, the number of HDPs produced may not reflect the expertise required to meet the requirements of the HDP commissioner. For example, one organisation could have produced ten HDPs for ten single school sites at building audit level only, whereas another organisation could have produced only one HDP for a large hospital/university campus with multiple buildings and a broader HDP scope. In these examples the likely level of expertise, work and resource requirements would differ.

Recommendation 1 - DESNZ could undertake additional supply chain analysis/research to identify and better understand the number and types of organisation preparing HDPs for public sector organisations, their skills and motivation, allowing for more effective strategic decision making and resource allocation.

Findings from the research approach

Data extraction

The following findings were determined while developing the research approach. These are accompanied by recommendations to support the production of higher quality HDPs for future phases.

Data extraction methods – The ability to extract information from HDPs is variable depending on the document length, structure, layout, and format in which information is presented.

Recommendation 2 - It could be beneficial for DESNZ to require a standardised set of data on key metrics to be submitted along with HDPs in a consistent and unified format, with clearly defined units. This would enable simpler analysis or collation of data and benchmarks at a programme wide level.

For example, DESNZ's Heat Network Delivery Unit (HNDU) requires organisations to provide a standardised "Opportunity metrics template". This records project summary, project stage, project metrics, and CAPEX analysis.

Recommendation 3 - Most of the further recommendations below could be formalised and structured into future data return forms, providing consistency and clarity on HDP activities and outputs.

It should be noted that any such data requirement should be carefully considered to avoid overburdening HDP commissioners/authors and to ensure that any data gathered is of benefit to DESNZ. Ideally it would also need to give regard to the variability of "best practice" outputs across the different activities that can contribute to the development of an HDP.

These considerations could be supported by aligning data returns as per the proposed hierarchy in Figure 1. For example, DESNZ could choose to focus on information relating to EEHD measures and fuel types. Additional information on assessment scope (e.g. level of design, buildings covered) could then be used to provide context to this data. As per Figure 1, programme level information tends to be organisation-specific and therefore is unlikely to be useful to wider DESNZ information requirements. An additional benefit of collecting information EEHD and fuel types is that benchmarking information could be collected as per Annex D and E of DESNZ's original research specification for this project.

Buildings and sites – With multiple sites, or large numbers of buildings covering numerous heating systems/meters, it can be difficult for reviewers to ascertain the scope of a HDP.

Recommendation 4 - It could be beneficial to amend HDP guidance to support authors in clearly defining and explaining the scope of the HDP assessment undertaken. For example, requiring the number of sites, buildings, meters and heating systems within the boundary of any analysis to be explicitly identified. This would remove ambiguity around what is covered within the extent of the HDP and support with the handover to and understanding of recommendations by parties not involved in the document's development.

Metric hierarchy – It was found that HDPs address a hierarchy of potential information requirements, including the overall strategy, the site wide level and the specific decarbonisation measures relating to individual buildings. Where information in the HDP is clearly structured and presented to address this hierarchy, it can assist document users in understanding the HDP outcomes.

Recommendation 5 - It could be beneficial to amend HDP guidance to include an information hierarchy similar to that presented in Figure 1.

At present information is combined or split out in various ways in HDPs. This includes consolidating information such as costs and savings for specific EEHD measures at the site or report level. Where it is not clear how information has been consolidated and segmented, there is insufficient detail for document commissioners to take the next steps in implementing recommended measures.

Providing guidance in terms of the level of reporting required for key metrics would provide clarity on how information is presented for the document reviewer and support understanding on the level of information required for document authors.

Linked to the recommendation above, at present guidance on the preparation of HDPs is directed at those commissioning HDPs, i.e. the guidance states "your plan should or may", "your heat decarbonisation plan needs to", "your organisation", etc.

Recommendation 6 - At present Phase 4 HDP guidance is focused on the organisation who owns the asset(s), not those producing HDPs. It could be beneficial to produce additional HDP guidance aimed at HDP authors, i.e. those gathering and creating information and communicating project outcomes, as well as for HDP commissioners.

This will remove any ambiguity on the required level of work that authors should undertake to develop a reasonable quality HDP whilst maintaining information for HDP commissioners in terms of what they can expect when receiving a HDP.

Metric importance - Many metrics were rarely or never present in the HDP sample.

Recommendation 7 - HDP guidance could be amended to reflect the relative importance of HDP requirements. This could be:

• **Core** – a fundamental requirement and essential for the production of a reasonable quality HDP (i.e., a HDP that is fit for purpose).

• **Workstream specific** – requirements that are not essential for all HDPs but are required to demonstrate good quality for a HDP addressing a specific workstream. For example, a metric that might not be essential for all HDPs, but which could be expected to be included in an Investment Grade Audit.

• **Additional** – requirements that could be included in a HDP but depend on the organisation that is commissioning the HDP, and possibly, the grant amount received for HDP production.

This would support understanding for both HDP authors and commissioners in terms of the requirements for producing a reasonable quality HDP and directing resources towards the areas that will deliver best support in terms of moving projects towards delivery.

Parent and child HDPs - Parent and child reporting may represent a good quality approach where organisations are producing multiple HDPs across a portfolio of assets. This is because technical details can be provided in “child” HDPs, and information for key decisions makers can be summarised in the “parent” HDP.

Recommendation 8 - Add a reference within HDP guidance for both HDP authors and HDP commissioners to describe how parent and child reporting may represent a good quality approach for instances when organisations are producing multiple HDPs across a portfolio of assets.

Building definition – The term “building” is often used in the guidance but not defined. As such, there are many interpretations as to what level of information is provided at a “building” level. For example, a primary school may comprise of a single building, or it may have several. A secondary school will have teaching buildings, but potentially also a main hall, a sports hall,

a swimming pool, a theatre, science labs and a canteen/dining hall. HDPs are inconsistent in designating a building number and providing building-level data.

Recommendation 9 - The term "building" should be explicitly defined in the HDP guidance so that building characteristics datasets and benchmarking can be consistent.

Recommendation 10 - The activities completed within a building should be aligned with industry practice (potentially the Non-domestic Buildings Survey) to ensure comparability between HDPs/organisations.

HDP sampling

As detailed in Section "Accounting for HDP workstreams" on page 16, there are seven potential workstreams that could be considered within a HDP. When undertaking the HDP sampling the distribution of these workstreams was reviewed based on information from 594 Phase 3 LCSF applications. The other 606 HDPs that made up the 1,200 HDP sample were Phase 2 LCSF applications where workstream types were not identified and so this could not be applied to Phase 2 HDPs. This is presented in Table 3.

Table 3: HDP workstreams and workstream combinations covered in the sample

	HDP workstream	Building audit	Desktop-assessment	Detailed design	Feasibility study	Investment grade audit	Preparation of a strategic plan	Specialist technical site surveys	Number of HDPs with this combination
Workstream combinations based on sample	1	×	×	×	✓	×	×	×	1
		×	×	×	×	×	✓	×	49
	2	✓	×	×	✓	×	×	×	21
		✓	×	×	×	×	✓	×	54
		×	×	×	✓	×	×	✓	3
	3	✓	✓	×	×	×	✓	×	5
		✓	×	×	✓	×	✓	×	1
		✓	×	×	×	×	✓	✓	42
		×	×	✓	×	✓	×	✓	2
		×	×	✓	×	×	✓	✓	4
	4	✓	✓	×	✓	×	✓	×	6
		✓	✓	×	×	×	✓	✓	1
		✓	×	✓	×	×	✓	✓	1
		✓	×	×	✓	✓	×	✓	3
		×	✓	×	✓	×	✓	✓	1
		×	×	✓	✓	✓	✓	×	12
		×	×	✓	✓	×	✓	✓	2
		×	×	×	✓	✓	✓	✓	57
	5	✓	✓	✓	✓	×	✓	×	37
		✓	✓	×	✓	✓	✓	×	6
		✓	✓	×	✓	×	✓	✓	144
		✓	×	✓	✓	×	✓	✓	2
	6	✓	✓	✓	✓	✓	×	✓	1
		✓	✓	✓	✓	×	✓	✓	4
		✓	✓	×	✓	✓	✓	✓	13
		✓	×	✓	✓	✓	✓	✓	1
	7	✓	✓	✓	✓	✓	✓	✓	121
	Number of HDPs with this workstream	312	217	147	251	127	346	225	

Lower number of HDPs — Higher number of HDPs

As shown in Table 3, based on this review of HDP workstreams:

- The most commonly requested HDP workstream within the 1,251 HDP sample is "Preparation of a strategic plan" (346 HDPs or 60%).
- The least commonly requested workstream within the 1,251 HDP sample is "Investment Grade Audit" (127 HDPs or 22%).

The workstreams requested by LCSF applicants could suggest:

- LCSF applicants are typically at the start of their net zero journey, i.e. they require support to develop strategic plans and commence building audits.

- LCSF applicants to date require less support with detailed design and/or Investment Grade Audits or do not have projects sufficiently developed to request this level of support or both. It should be noted that it is unlikely that LCSF applicants require less support with detailed design/IGA development as these workstreams typically require specialist technical knowledge and expertise.

HDP workstream combinations

- Across the sample of 594 Phase 3 HDPs, 50 (8%) exclusively cover one HDP workstream. Of these, 49 cover "Preparation of a strategic plan" and one covers "Feasibility study".
- 329 HDPs (55%) cover five or more HDP workstreams.
- 121 HDPs (18%) considered all HDP workstreams.
- The most common combinations of HDP workstreams requested across the sample are illustrated in Table 4.

Table 4: Most commonly requested HDP workstream combinations

Combination of HDP workstreams	Building audit	Desktop assessment	Detailed design	Feasibility study	Investment grade audit	Preparation of a strategic plan	Specialist technical site surveys	Number of HDPs with this combination
5	✓	✓	×	✓	×	✓	✓	144 - (24%)
7	✓	✓	✓	✓	✓	✓	✓	121 - (20%)
4	×	×	×	✓	✓	✓	✓	57 - (10%)
2	✓	×	×	×	×	✓	×	54 - (9%)
1	×	×	×	×	×	✓	×	49 - (8%)

The workstream combinations requested by LCSF applicants could suggest:

- LCSF applicants require a broad range of support when developing HDPs, including both strategic and technical feasibility/design.

- LCSF applicants are typically not sufficiently progressed on their net zero journeys to require detailed designs/investment grade audits as these are the less commonly requested workstreams.

- In the absence of specific guidance, LCSF applicants are not aware of differing requirements /outputs when requesting different HDP workstreams.

Recommendation 11 - It may be beneficial to amend HDP guidance for HDP commissioners to direct LCSF applicants to the most appropriate HDP workstreams to request when submitting a LCSF application depending on the client/project maturity. This will remove any ambiguity around what LCSF applications request versus what is required to help progress HDP projects towards the point of delivery.

Recommendation 12 - It may be beneficial to amend HDP guidance to provide additional guidance on requirements/outcomes of a HDP depending on the HDP workstreams undertaken. As noted above, this would likely be recorded in guidance directed at HDP authors as well as HDP commissioners.

Computational review – Insights and findings

The following section of the report provides insights and findings from the computational review of 1,305 HDPs: of these, data could be extracted for 1,251 HDPs. The HDPs were reviewed against a reduced set of 10 metrics to allow the identification of commonalities and trends across a large sample of documents.

Overview

The 1,251 HDPs comprised 225 different organisations. As shown in Figure 2 most organisations in the sample commissioned one HDP (138 or 61%). 57 or 25% of the 225 organisations have commissioned between 2 and 10 HDPs: of these, most are either Local Authorities or Multi-Academy Trusts (MATs).

Figure 2: Number of HDPs commissioned by organisation

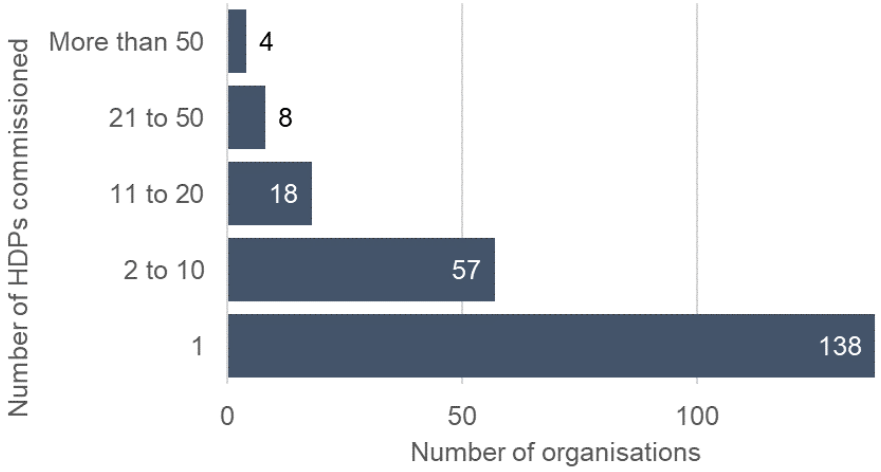
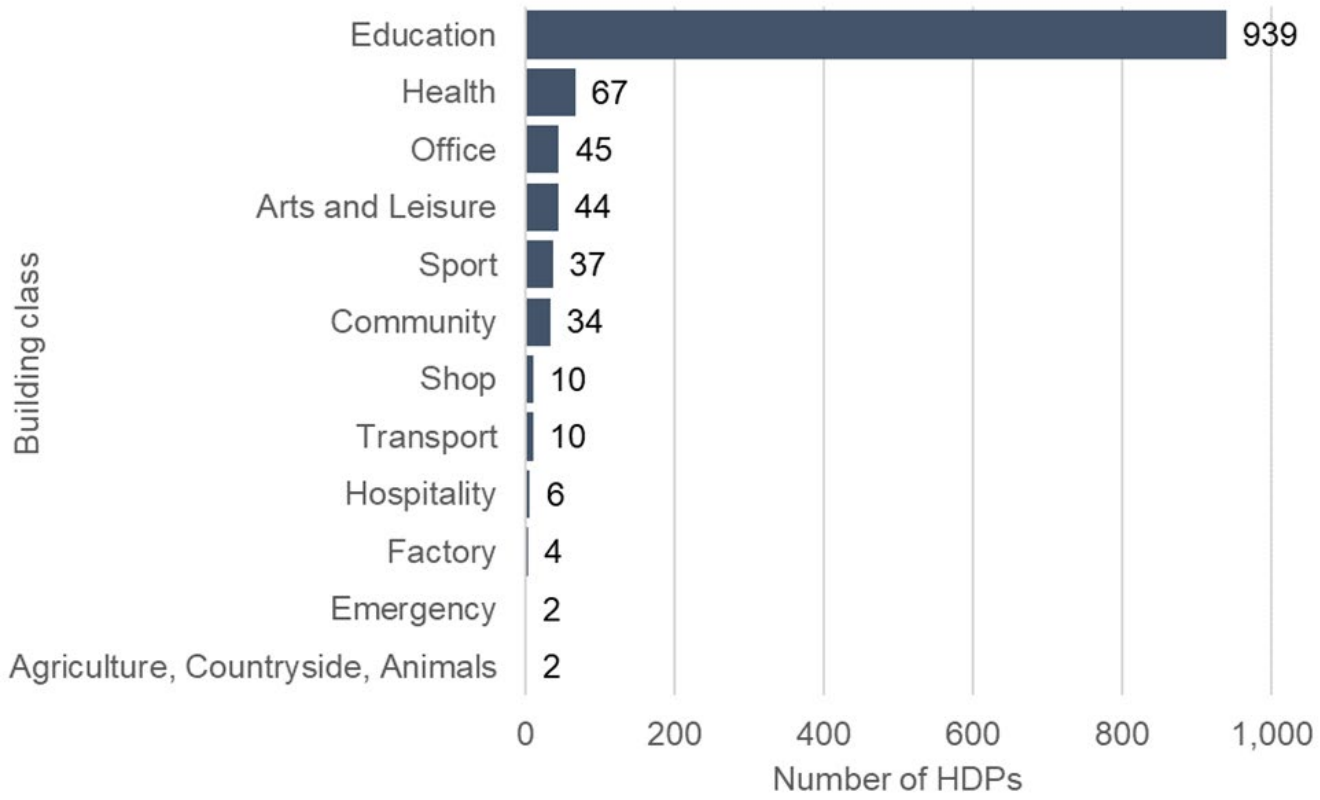


Figure 3 shows the distribution of the building class most closely associated with the buildings included within each HDP. At DESNZ's request building classes are aligned with the Non-Domestic Building Survey[4]. As this shows, education is the most common building class, accounting for 939 or 72% of all HDPs within the sample of HDPs reviewed.

Figure 3: HDP class overview (102 or 8% were unknown)



It is important to note that HDPs, not individual buildings within HDPs, have been assigned a building class. There may be instances where HDPs contain multiple building classes e.g. a HDP produced for a university may contain education, arts and leisure, and shop building classes. However, the computational analysis could not ascertain this unless a separate HDP was produced for each individual building.

Locations

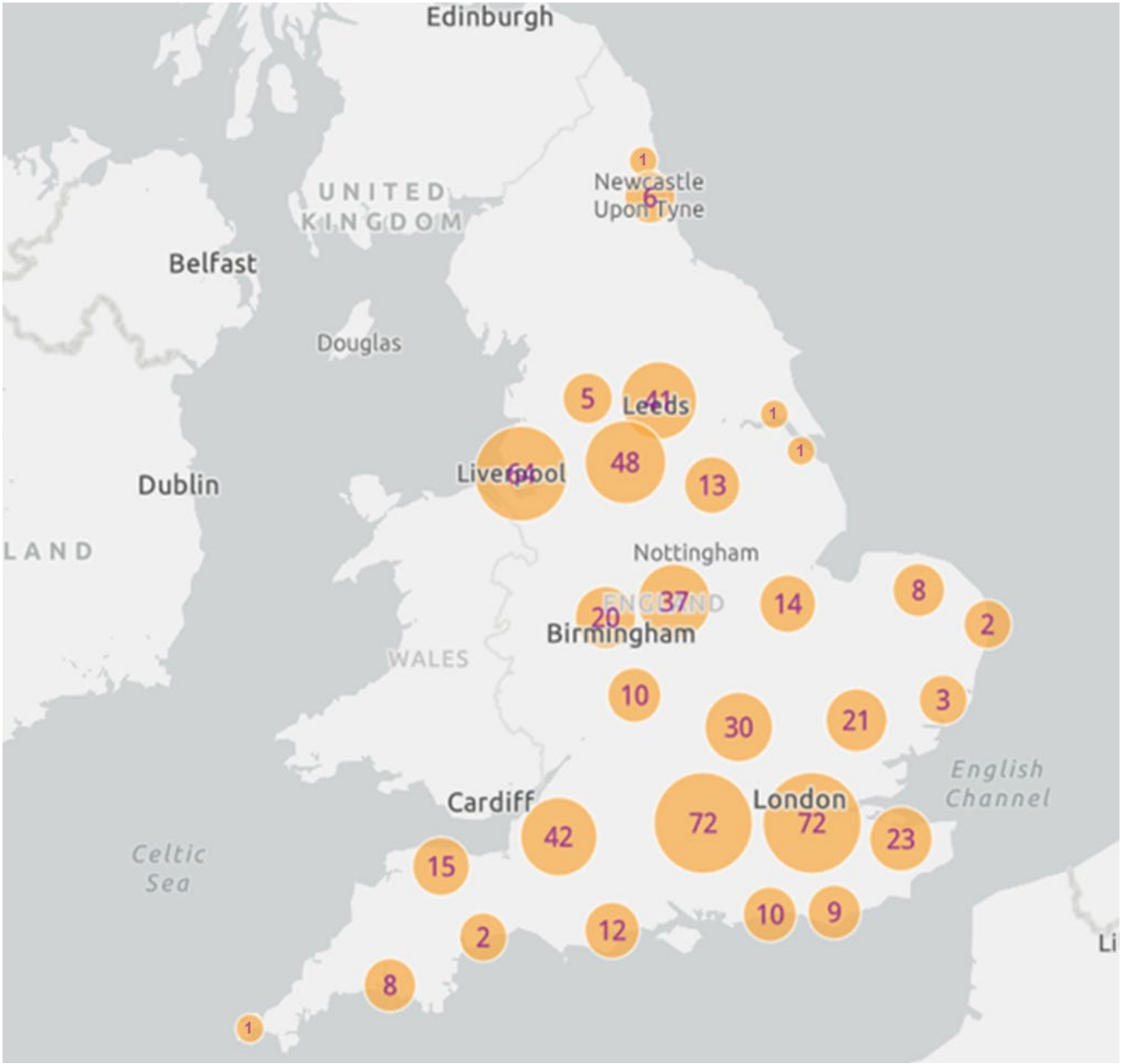
Figure 4 shows the distribution of HDPs reviewed within the sample across England where postcodes have been extracted from HDPs. The Greater London area, North West and South East regions report the most building postcodes across the sample. This broadly aligns with organisations that commissioned the most HDPs (see "Overview" above").

[4] DESNZ, published 12th January 2022, Survey of building energy use: part of the Non-domestic Building Survey, DESNZ, viewed 27th February 2024 <https://www.gov.uk/government/publications/building-energy-use-survey/survey-of-building-energy-use-part-of-the-non-domestic-building-survey>

Recommendation 13 - At present, DESNZ records information at LCSF funding allocation at the regional level (i.e. Greater London, North East, etc.). It could be beneficial for DESNZ to extract information on a postcode/UPRN level to gain a better understanding of decarbonisation potential which in turn could be applied to other areas of department activity e.g. Heat Network Zoning.

This requirement could be contained within a standardised data return as explained in **Recommendation 2** .

Figure 4: Distribution of reported HDP postcodes (38% unknown)



Current energy performance

Figure 5 shows the number of HDPs that reported Display Energy Certificates (DEC) or Energy Performance Certificates (EPC) within the sample of HDPs reviewed. 585 HDPs in the sample refer to DECs (53%). This is perhaps lower than expected as all public buildings, over 200m2, at least partially occupied by a public authority and having public access, require a DEC. Therefore, this should be a readily available information source. As EPCs are only required when a building is bought, sold, rented or constructed, it is perhaps unsurprising that they are less commonly referenced (34 or 3% of HDPs). There were 104 HDPs where an Energy Performance Certificate (EPC) and DEC were both referenced (8%).

Figure 5: Number of HDPs with reported EPC/DEC ratings (45% unknown)

As all buildings within HDPs are public sector buildings, and analysis suggests that 53% of buildings are reporting DECs, this suggests either:

- HDP authors are not including DEC information within the report despite this being a requirement in HDP guidance.

- HDP commissioners either do not have a DEC for their building or the current DEC is not up to date and therefore not suitable for inclusion in a HDP.

Recommendation 14 - Despite being requested in guidance and the SBIT, it could be beneficial for DESNZ to request that HDP commissioners have an updated DEC record in place before commencing a HDP.

Space heating and hot water technologies

The most commonly reported current space heating and hot water technologies are present in Figure 6. This shows that boilers are the most common space heating technology, referenced 1,762 times within the sample of HDPs reviewed.

Figure 6: Top 10 current heating and hot water systems

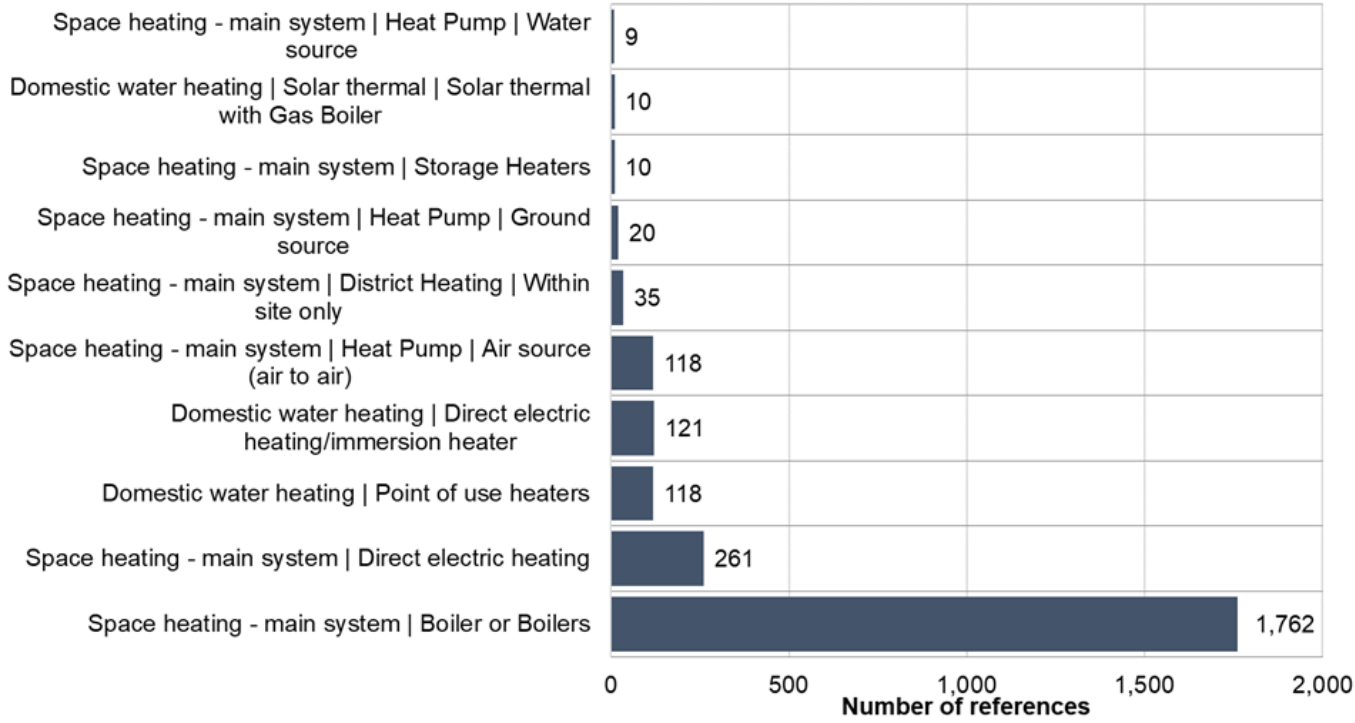
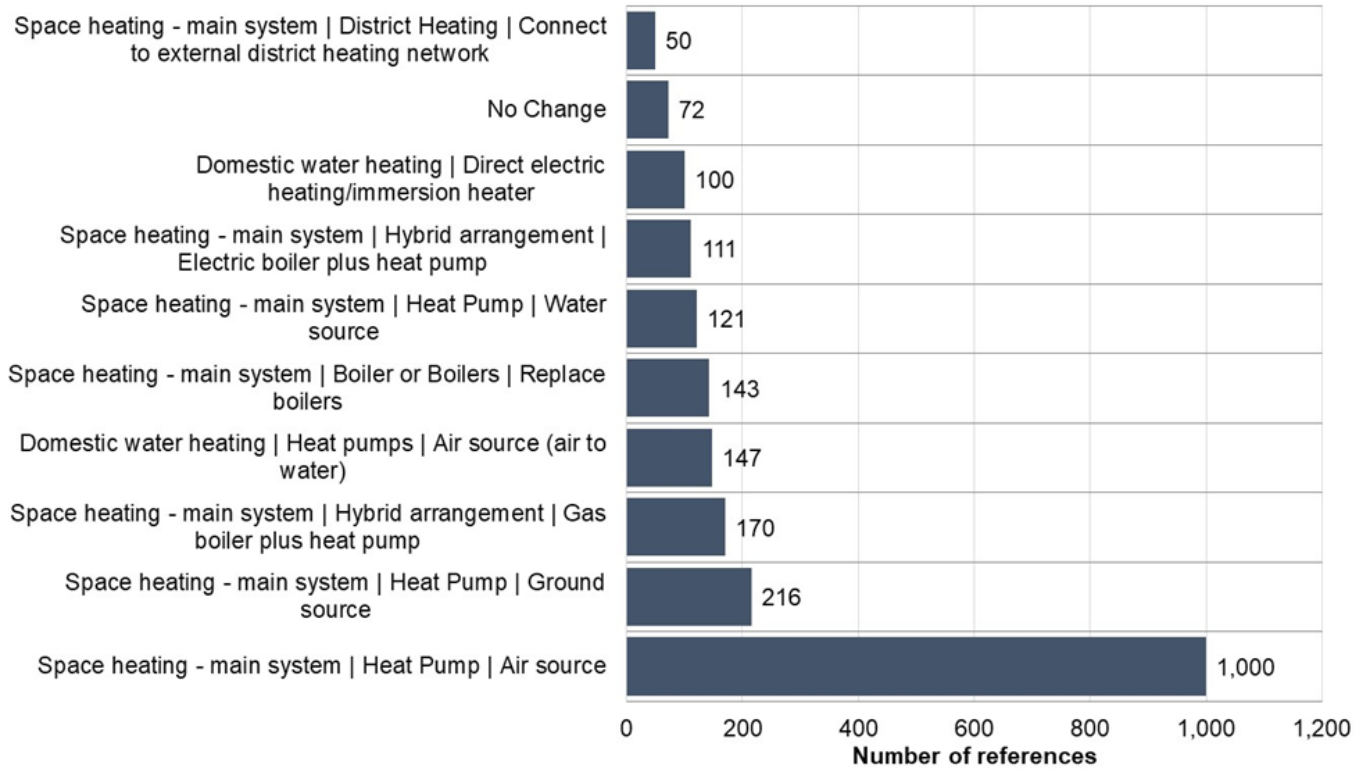


Figure 7 shows the most commonly reported proposed space heating and hot water technologies. As this shows, air source heat pumps (ASHPs) are the most often proposed space heating technology, referenced 1,000 times within the sample of HDPs reviewed.

Figure 7: Top 10 proposed heating and hot water systems



There are 385 instances where either hybrid heat pump arrangements, new gas boilers or no change is recommended in HDPs within the sample reviewed. As the aim of HDPs is "to reduce direct greenhouse gas emissions by replacing fossil fuel heating systems with low carbon alternatives"[5], this is representative of a potentially poor HDP outcome.

Recommendation 15 - Where a fossil-fuel free heat generation technology is not recommended as part of the whole building solution, HDP guidance could be amended for HDP authors to explicitly require justification as to why the proposed solution is most suitable in that instance. For example, a hybrid solution may be justifiable in the short to medium term in the instances of a constrained site, if there is a long-term plan to move away from this in the future

Manual review - Insights and findings

The following sections provide insights and findings from the manual review of 60 HDPs.

Research insight – a clear and deep understanding of the particular issue.

Research finding – facts and/or observations discovered from the manual review.

Using conclusions from the Preliminary Findings Report this has been structured into four levels:

- **Programme level** – overarching information required to provide context to the document and/or support next steps e.g., delivery methods, resourcing, challenges and risks.
- **Assessment scope** – information related to the individual sites, buildings and/or heating systems that together form the scope of a HDP e.g., age of the building, listed or heritage status, heat sources, etc.
- **EEHD measures** – information on proposed EEHD measures e.g., their costs, savings and return on investment.
- **Energy sources** – information on the fuel types consumed, their carbon emissions, costs and data accuracy.

Programme level

The following section details findings on programme level information recorded within HDPs. This includes overarching information required to provide context to the HDP document and/or

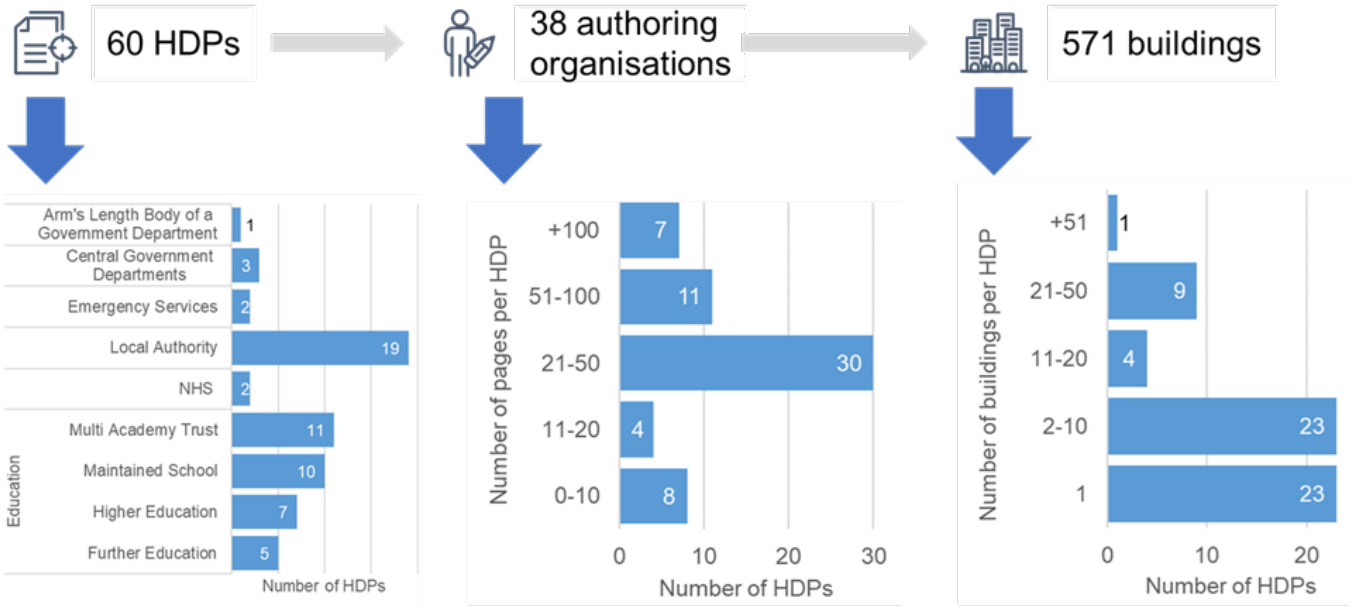
[5] Salix, 27th March 2023, Guidance on the preparation of heat decarbonisation plans, Salix, viewed 2nd February 2024 <https://www.salixfinance.co.uk/sites/default/files/2023-03/Heat%20Decarbonisation%20Plan%20Guidance%20Phase%204%20LCSF.pdf>

information that supports the next steps in project delivery e.g., delivery methods, resourcing, challenges and risks.

Programme-level research insights

As shown in Figure 8, the 60 manually reviewed HDPs cover a range of public sector organisations, with education being the most numerous. This is in line with the sample of 1,251 HDPs which are most commonly educational buildings (see Figure 3 above). The size of HDPs vary, with most comprising 21-50 pages. The 60 HDPs comprised of 571 buildings with most HDPs in the sample (46 or 77%) containing 10 or fewer buildings.

Figure 8: Overview of 60 manually reviewed HDPs



Delivery planning

As with project resourcing, Table 5 shows that information on delivery planning is scant. The most commonly addressed area is funding arrangements, of which 50% of HDPs identify Public Sector Decarbonisation Scheme (PSDS) funding as the main funding arrangement for recommended measures.

Further along in the report, Table 8 identifies that the total capital cost of EEHD measures recommended in the 60 HDPs amounts to £221.9 million. In contrast, the department states that the total budget for the Public Sector Decarbonisation Scheme between 2022/23 to 2025/26 is confirmed at £1.425 billion, or £475 million per year on average. Recognising that the 60 HDPs represent 47% of the annual PSDS budget, it could be concluded that the 2024/25 PSDS funding would likely be oversubscribed and insufficient to meet funding demand, particularly if extrapolated across 1,251 HDPs.

Table 5: Delivery planning

What funding arrangements have been identified?	Potential procurement routes have been identified?	Is there a monitoring and verification plan in place?	Has a delivery model been identified? What is the delivery model?
30/60 identify PSDS	1*/60 **Organisation will develop framework*	0/60	0/60

Recommendation 16 - Details on the website for Phase 4 of the LCSF[6] state HDPs "will help them [public sector organisations] to apply for any future grant funding for capital decarbonisation measures such as the Public Sector Decarbonisation Scheme".

Given available funding for PSDS could be oversubscribed based on HDPs in the sample of 60 alone, DESNZ may wish to consider updating guidance to support public sector organisations with considering other forms of funding.

Alternatively, DESNZ could consider amending guidance to state that specific HDP workstreams should be completed to support a compliant PSDS application. For example, it could require a detailed design/Investment Grade Audit to be completed before applying for PSDS funding and that preparation of a strategic plan is insufficient. This may have the added benefit of de-risking PSDS applications as DESNZ could expect applications based on a more detailed design level.

Programme-level research insights by HDP workstream activity

As previously stated, workstreams can only be identified for HDPs produced from Phase 3 of the LCSF. Half of the 60 HDPs manually reviewed were taken from Phase 3, therefore intended workstreams for these can be ascertained for 30 HDPs. This is presented in Table 6. This shows that 9 of the HDPs in the sample contained all HDP workstreams and 6 contained 5 workstreams.

[6] DESNZ, last updated 28th March 2023, Public Sector Low Carbon Skills Fund, DESNZ, viewed 27th February 2024 <https://www.gov.uk/government/publications/public-sector-low-carbon-skills-fund>

Table 6: HDP workstreams and workstream combinations covered by the manual review of Phase 3 HDPs

	HDP workstream	Building audit	Desktop assessment	Detailed design	Feasibility study	Investment grade audit	Preparation of a strategic plan	Specialist technical site surveys	Number of HDPs with this combination
Workstream combinations based on sample of 60 HDPs	1	×	×	×		×	×	×	
		×	×	×	×	×		×	
	2		×	×	×	×		×	
	3			×	×	×		×	
			×	×	×	×			
	4			×		×		×	
		×	×					×	
		×	×	×					
	5			×		×			
	6			×					
						×			
	7								
Number of HDPs with this workstream									

Lower number of HDPs ← → Higher number of HDPs

Analysis of the HDPs with specific workstreams generated the following findings:

Determining HDP costs – In all cases where a "Detailed design" and "IGA" have been requested, the "Preparation of a strategic plan" HDP workstream has also been requested within the sample of HDPs reviewed. A valid challenge could be that if a LCSF applicant is requesting strategic support (i.e. RIBA Stage 0/1), organisations would not understand the costs to further develop these actions into RIBA Stage 3 designs. It would potentially be more likely that an organisation would complete strategic/feasibility studies before developing preferred options to a more detailed design.

Recommendation 17 - DESNZ could request that LCSF applicants provide evidence of previous decarbonisation planning/feasibility when requesting HDP workstreams that require a more detailed level of design (e.g. detailed design/IGA).

If a LCSF applicant requests both strategic and technical workstreams, DESNZ could request justification as to why this is the case, including a detailed cost summary to back up the justification. For example, a HDP commissioner may require a "Preparation of a strategic plan" for a university campus but as part of this require a "Detailed design" for a specific heating system upgrade in one building based on previous feasibility studies. In such cases, a HDP commissioner would be able to provide the justification for this in any LCSF application.

Level of design – The manual review did not identify a difference in the level of design between HDPs of different workstreams i.e. the 12 HDPs that sought to complete detailed design did not contain evidence that demonstrated RIBA Stage 3[7] – Spatial coordination.

[7] The RIBA stages referred to are from the RIBA Plan of Work (2020)

Research identified that HDPs generally fulfil RIBA Stage 1 - Preparation and briefing requirements with elements of RIBA Stage 2 – Concept design for specific recommended measures. There are a number of instances where potential manufacturers and equipment models were presented in HDPs although they were provided for illustrative purposes only and were not final, recommended options for implementation.

In the absence of an industry agreed standard for the production of investment grade audits, HDPs within the sample were reviewed against the following four criteria as set out in a publicly available framework[8] produced by the Scottish Government. This identifies that an IGA should comprise the following:

- Measurement and verification (M&V) plan – No HDP had a M&V Plan
- Development and agreement of all technical schedules – No HDP fulfilled the requirements of RIBA Stage 4 – Technical Design
- Full commercial and contractual proposal of the Contractor undertaking the works – No HDP identified a delivery model
- Guaranteed level of energy savings – Guaranteed savings were not offered in any of the HDPs reviewed

Based on these findings:

- In the absence of an agreed industry standard/guidance, HDP commissioners may not be aware of the implications of requesting an IGA, and HDP authors may not understand the requirements of such an audit in the context of producing a HDP.

- Projects may not be developed to the point of being able to satisfy the requirements of a HDP. For example, HDPs typically identify potential EEHD measures but require subsequent decisions from HDP commissioners to identify a preferred commercial/contractual delivery route.

- HDP authors may not be in a position to offer a guaranteed level of savings in line with the requirements of an IGA (which are typically carried out by contractors) and so are excluding this from their HDPs.

Recommendation 18 - Based on the findings above, DESNZ could produce guidance stating the requirements of an IGA and reflect this in subsequent HDP guidance both at the LCSF application stage and in “Guidance for the preparation of HDPs” document. This will provide clarity to both HDP commissioners and authors on required outcomes when undertaking an IGA.

[8] Scottish Ministers, April 2021, Non Domestic Energy Efficiency (NDEE) sub £1 Million Projects Framework 2020-2024, viewed 27th February 2024 <https://www.gov.scot/binaries/content/documents/govscot/publications/transparency-data/2021/04/sp-019-42-non-domestic-energy-efficiency-ndee-sub-gbp1-million-projects-framework-agreements-2020-2024/>

Programme-level research findings

Based on the insights above, AECOM have identified a range of findings relating to:

- HDP guidance
- Level of design

These are set out in the following sub-sections.

HDP guidance

Phase 4 HDP guidance does not differentiate how a HDP should be produced in terms of both methodology and the scope of the HDP in the context of the HDP workstreams undertaken. For example, the guidance is the same whether an organisation wishes to prepare a strategic plan or a detailed design. Whilst many of the workstream terms are broadly understood by the industry (e.g. detailed design, feasibility study), it could be beneficial for DESNZ to provide more detail on the expected outcomes of such workstreams. However, it is not necessarily the Department's role to define the methodologies, standards and requirements needed to complete such workstreams.

Evaluating a HDP as poor quality may be unfair if those commissioning the HDP were not clear on the required outcomes of completing such works and therefore may not have accounted for this in any LCSF applications and/or scopes of work for HDP authors. Further, consideration of whether LCSF applicants have requested the right workstream(s) to support where they are in their decarbonisation journey is not reviewed at the application stage by DESNZ. In addition, final HDPs are not checked against workstream-specific requirements following submission of the HDP Quality Assurance Factsheet[9].

Recommendation 19 - It could be beneficial to produce additional HDP guidance aimed at HDP authors, as well as for HDP commissioners as highlighted in the section "Findings from the Research Approach" on page 22.

In addition, the HDP Quality Assurance process could be amended to ask HDP commissioners to confirm that the HDP meets the requirements of the HDP workstreams requested. This will provide confidence that HDPs meet outcomes commensurate with the level of design/detail required.

Level of design

Manually reviewed HDPs within the 60 HDP sample did not identify a difference in the level of design between HDPs of different workstreams, i.e. the 12 HDPs that sought to complete detailed design and/or 14 HDPs that sought to complete IGA activities did not contain evidence that demonstrated RIBA Stage 3.

[9] Salix, March 2023, Heat Decarbonisation Plan Quality Assurance Factsheet, Salix, viewed 2nd February 2024 <https://www.salixfinance.co.uk/sites/default/files/2023-03/Phase%203%20LCSF%20HDP%20Quality%20Assurance%20factsheet%20v4_Final%202.pdf>

Aside from Detailed Design, which states “design works up to at least RIBA Stage 3”, HDP guidance does not outline the level of design required for HDP outputs. This means the level of design for individual HDPs could be variable.

Recommendation 20 - It could be beneficial to update HDP guidance to clearly state design requirements for HDP workstreams. This could possibly be aligned to the RIBA Plan of Works or similar, providing clear guidance for HDP commissioners when developing scopes of work and clear expectations for HDP authors when developing HDPs. In addition, DESNZ should be clearer on whether up to RIBA Stage 3 means up to the start of or up to the end of RIBA Stage 3. Such guidance would possibly need to reflect the impact of any proposed procurement routes (e.g. Energy Performance Contract - EnPC) as this could affect the level of design required before procuring the works.

HDP assessment scope

The following section has information related to the individual sites, buildings and/or heating systems that together form the scope of a HDP. For example, this includes information on the age of buildings, listed or heritage status, existing heat sources, etc.

HDP assessment scope research insights

As stated in Section “Programme-level research findings” on page 37, from the sample of 60 HDPs reviewed, there were a total of 571 buildings identified. However, our analysis has identified that the scope of a HDP is often unclear on the definition of a building. For example, the terms site and building may be used interchangeably; a single building may be referred to when actually there are multiple buildings on a site (most notable with schools), and in some cases heating systems cover part of a site or multiple buildings rather than being specific to a single building.

Recognising that a HDP could cover one or more site boundaries, buildings, heating systems, incoming utilities and/or energy centres (on or offsite), it is important that HDP authors are clear when defining the assessment scope of a HDP. Failure to be clear about the scope of any HDP assessment could be a sign of poor quality.

Table 7 provides some examples of how a HDP may be understood depending on the scope of the assessment. As this shows, the complexity of information and/or the presence/absence of information may vary depending on this scope. For example, it is easier to understand incoming utilities or meters and heat sources in a single building compared to a campus. Therefore, for single building HDPs a reasonable quality HDP could be produced addressing all requirements as per current HDP guidance as it would be less likely to require further investigation, additional data review and estimations.

Table 7: Typical HDP assessment scopes and the implications for understanding HDP content

HDP assessment scope example	Implications for understanding HDP content
 Single building in isolation Example: An office building accessed from a street.	**Incoming utilities and metering** The incoming utility data available from any meters can be directly attributed to the actual consumption of the building. **Heat sources** The energy consumption of the building will be related to the meter readings and incoming fuel consumption. It may also be possible to determine the peak heat load from the consumption data due to there being only one building. It should also be possible to determine the heating capacity of the heat sources from a site survey. **Assessing EEHD measure impact** Estimations of savings from EEHD measures should be possible as the energy consumption and how energy is used are known.
 One site consisting of multiple buildings Example: A university campus with multiple buildings, each with its own heat source.	**Incoming utilities and metering** There may only be one incoming meter to the site, so energy consumption may be difficult to allocate to each building if there is no sub-metering. To report the existing energy consumption building-by-building, estimations may need to be made. These may be on a floor area basis only, or be more sophisticated, considering the age of the buildings, the building fabric, hours of occupancy and the level of servicing. There are instances where estimations for current energy use have not been provided within a HDP report for all buildings. Where data is required to be estimated this could represent poor practice should opportunities to improve this not be identified. Further, estimation techniques are often not presented in HDPs which could undermine their accuracy and robustness. **Heat sources** Heat sources and heating strategies may be different from building to building. The service life and condition of each system may vary and may therefore dictate the order in which interventions take place. It should be possible to determine the heating capacity of each heat source from a site survey or from record information, but an analysis of energy data will only provide the peak simultaneous heat load for the whole site if there is only one meter.

	Where a client has multiple buildings, they are likely to require a plan of phased interventions over a period of time, reflecting prioritisation. **Assessing EEHD measure impact** Estimations of building energy consumption or heat loss estimations will be required to assess the impact of EEHD measures on the energy consumption and emissions of each building. If this is not available, the figures may not be reported at building level. Where there is a single site meter, the combined effect of a package of measures across all the buildings may be reported. However, the independent impact on energy consumption attributed to each measure may not be reported.
 One site consisting of multiple buildings served by one or more energy centres Example: A school with one main building containing a central boiler system serving the main building and the neighbouring blocks and buildings	**Incoming utilities and metering** There may only be one incoming meter to the site, so the energy consumption may be difficult to attribute to each building. Sub-meters may only be available on the supplies to each energy centre. To report existing energy consumption building-by-building, estimations are likely to be needed. A boiler house and energy centres may be located within one of the buildings, supplying that building and others. If the energy centre consumption has been reported for this building, analysis may suggest a disproportionately high energy consumption (kWh/m2) if the number of supplied buildings and total heated floor area have not been clearly explained within the report. If an energy centre is located within its own dedicated building, e.g. an independent boiler house, the author may decide not to report energy consumption on a building-by-building basis. There are instances where estimations for current energy use have not been provided within a HDP report for all buildings. **Heat sources** Heating strategies may vary across the buildings on a site. It may be that some of the buildings on the site are not connected to the energy centre and have their own heat source. This could lead to inconsistences with how some of the energy consumption figures are reported. It should be possible to determine the heating capacity of each heat source from a site survey or from record information, but an analysis of energy data will only provide the peak simultaneous heat load for all of the buildings served from each energy centre. The site owner may require a plan of phased interventions to match budget or fundings and/or capacity constraints. **Assessing EEHD measure impact** Estimations of building energy consumption or heat loss estimations will be required to assess the impact of EEHD measures on the energy

	consumption and emissions of each building. If this is not available, the figures may not be reported at building level. The combined effect of a package of measures across all the buildings served from an energy centre may be reported. However, the independent impact on energy consumption by each measure may not be reported.
 An estate portfolio consisting of a number of sites Example: A Police Service with police stations in a number of towns across a county.	**Incoming utilities and metering** Utility data may be simplified to reflect the size and complexity of the estate being considered. Data coverage and quality is likely to vary from site to site. **Heat sources** It is likely that a large portfolio will consist of a combination of all of the circumstances discussed above. The information reported may be summarised to reduce the size and complexity of the HDP. **Assessing EEHD measure impact** Recommendations for EEHD measures may be combined into packages to highlight the key information for decision makers to progress the plan (e.g. high level costs, priority interventions and timescales). Building by building measures may not be reported.

Lack of clarity over the HDP assessment scope could lead to:

- An impression that a HDP is poor quality because the metric coverage is low, even if the way information has been reported is logical and appropriate for the site and the data available to HDP authors.

- Distorted energy consumption figures due to heat sources serving multiple buildings.

- Missing information because data is not available for analysis at building level and EEHD measure impacts cannot be quantified individually.

With findings from the above in mind, the following pages provide a summary of some of the key insights into the types of buildings that are included in the sample reviewed.

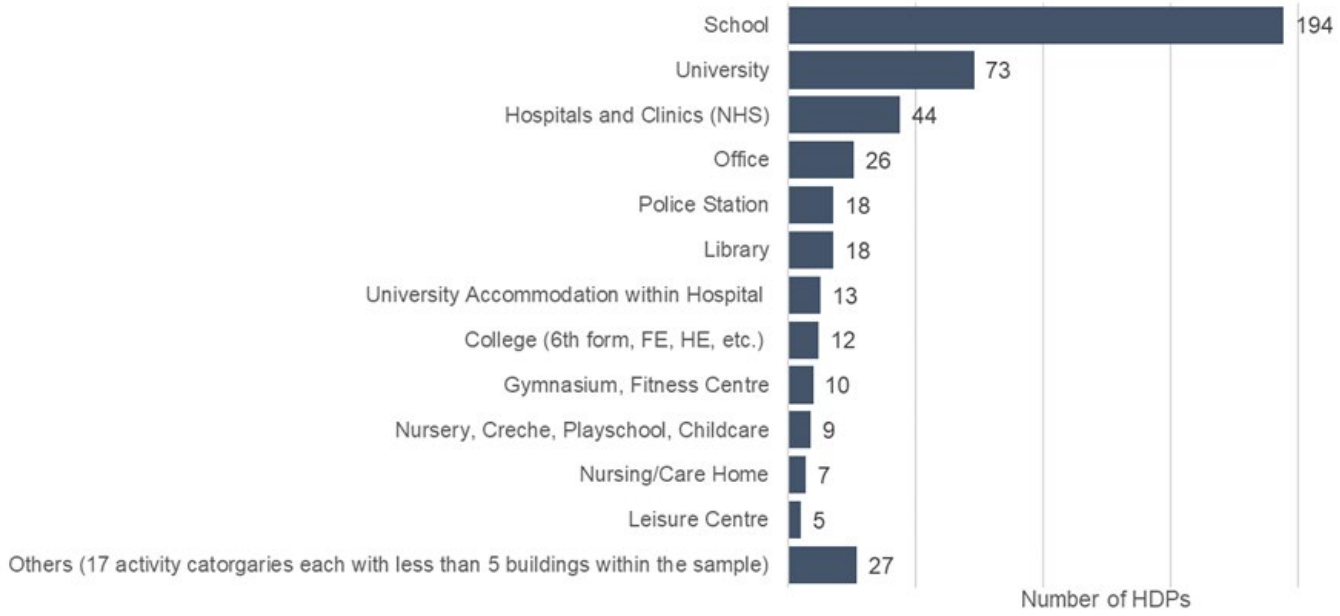
Overview of buildings

Figure 9 provides a breakdown of the activities, aligned with the NDBS, for buildings included in the 60 HDP sample. This highlights that:

- School buildings make up 34% of the sample – *This reflects the larger sample in Figure 3 which shows "Education" as the most common building class referenced in HDPs.*

- University buildings make up 13% of the sample - *This again reflects the larger sample in Figure 3 which shows "Education" as the most common building class referenced in HDPs.*
- Hospital and Clinic buildings make up 8% of the sample - *This reflects the larger sample in Figure 3 which shows "Health" as the second most common building class referenced in HDPs.*

Figure 9: Breakdown of building activities (unknown 118, 21%)



Assessment scope research insights by HDP workstream activity

With many of the HDP reports within the sample covering multiple buildings and, in some cases, multiple sites it could be suggested that the current primary purpose of the HDP reports is to help form Strategic Plans and Feasibility Studies for Clients. This is reflected in Table 3 where "Preparation of a strategic plan" is the most commonly undertaken HDP workstream.

Given the scale of some of the HDP scopes, e.g. hospital sites and university campuses, it could be unrealistic to expect HDPs to be taken through to full detailed design given the time and cost that would be required to complete the work.

Planning for a long-term decarbonisation strategy:

- the sample review suggests that many estate owners are in the early stages of their decarbonisation journey and are looking to understand their options to move forward, for a guide to the level of investment that will be required and for an understanding of the rate at which work needs to be completed.

- it is likely that many estate owners are not yet in a position on their decarbonisation journey to progress recommendations through to detailed design stage.

- given the size of some of the estates in the sample, progressing all recommended work through to detailed design stage would stretch available budgets and resources. This is more likely to be spread out over a long-term programme.

- in terms of the PSDS, where match funding is available, the scope and scale of any work needs to be carefully considered against the maximum funding that could be secured and the level of match funding that will be required from the estate owner. The funding window will also need to be factored into any decisions as there may be a risk that large projects may not be completed in time.

Recommendation 21 - It may be beneficial to amend HDP guidance for both HDP authors and HDP commissioners to reflect these differences in the HDP assessment scope as there may be different information requirements for each scenario. e.g. a "Detailed design" would require specific architectural and engineering information as well as fulfilling any planning application requirements. This level of detail may not be provided in a "Preparation of a strategic plan".

Recommendation 22 - Future data return forms should allow for collecting data at building, energy centre and site level and portfolio level.

Recommendation 23 - It may be beneficial to amend the HDP guidance for HDP authors to request that site plans, maps, and sketches are included to clearly identify which areas are included and which areas are not included within the HDP assessment scope.

Assessment scope

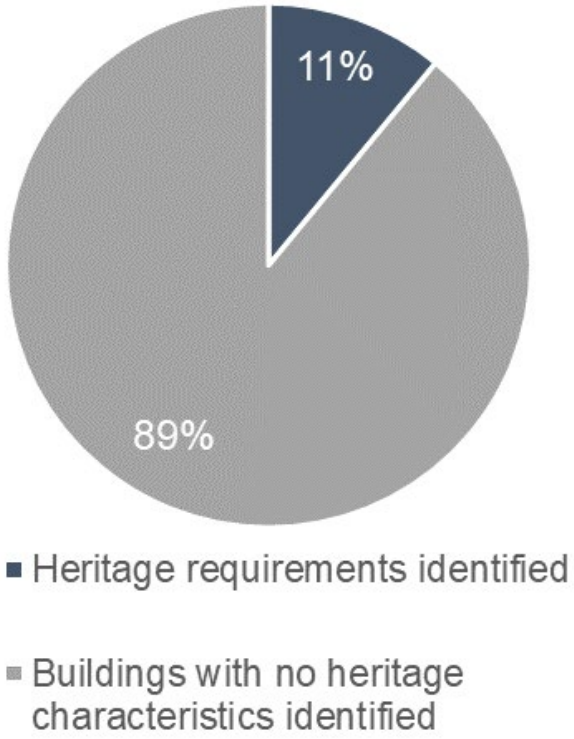
Assessment scope research findings

Phase 4 HDP guidance does not differentiate between site complexity e.g., a single building, a single site with multiple buildings or a portfolio of sites. Further, the guidance uses the terms building/site interchangeably.

Where the building areas were available, the manual review sample suggests that a range of building sizes have been included. This may reflect some of the types of building that were included, e.g. hospital and university estates typically include large buildings. These larger buildings could be large consumers of energy and high impact targets for decarbonisation.

As shown in Figure 10, 11% of the buildings in the manual review sample were of historic status, and 1 in 3 HDPs identified heritage requirements of some form. This may reflect the type of estate portfolios included in the sample as organisations working in long established locations, e.g. schools, hospitals and universities, may have retained much of the original building stock.

Figure 10: Proportion of the buildings within the sample that identify heritage characteristics



Assessment scope research insights

Whilst historic buildings will need to be considered as part of an organisation's decarbonisation plan, the options for interventions may be limited and/or more expensive to implement. Good quality HDPs would make recommendations within the constraints of the protected status of the historic building and would also adjust their intervention costs to account for longer installations times and more sympathetic working practices, etc.

The inclusion of historic buildings within the HDP assessments may suggest:

- that building owners require guidance and assistance in decarbonising these potentially complex-to-decarbonise buildings.

- that building owners require more clarity over which EEHD measures they can use to improve performance, when options may be limited, and the costs they can expect to pay for the work.

- the number of historic buildings may influence costs presented in HDPs as installation costs may be higher for these types of buildings.

Recommendation 24 - It may be beneficial to provide additional guidance for HDP authors for complex-to-decarbonise buildings e.g. those with heritage requirements or historic buildings. This could specifically include key considerations, approaches and opportunities for buildings with heritage requirements.

47% of the buildings within the sample were from school and university estates and 8% of buildings were hospitals and clinics (NHS). This may reflect the proactive nature of some of these organisations, particularly with their own dedicated estates teams, who may be able to act quickly to secure funding.

A high proportion of buildings used for educational and healthcare activities may suggest:

- that there may be a higher prevalence of educational and healthcare buildings within the building stock.

- plans produced by organisations in this sector encompass more buildings.

- that these sectors are better resourced and more proactive than other sectors when it comes to bidding and securing funding.

- that these sectors may be more experienced at bidding and securing funding.

- that the funding system looks more favourably on funding these sectors compared to others.

- other sectors may need more guidance, support and time to develop viable bids and projects.

As per Figure 8, most HDPs in the sample were from "Local Authorities". However, this sector comprises of many different building types including "Maintained Schools" (Educational). For this Research Project, distribution of grant award by building type/organisational sector was not reviewed. As an organisation could comprise of many different building types, care needs to be taken when extrapolating this against grant funding distribution.

Recommendation 25 - Review the level of support provided for each sector so that organisations with limited experience and resources are able to capitalise on the help and funding that may be available.

Energy efficiency and heat decarbonisation measures

The following sections provide information on proposed EEHD measures included within HDPs. This includes EEHD measure costs, savings and return on investment.

Energy efficiency and heat decarbonisation measures research insights

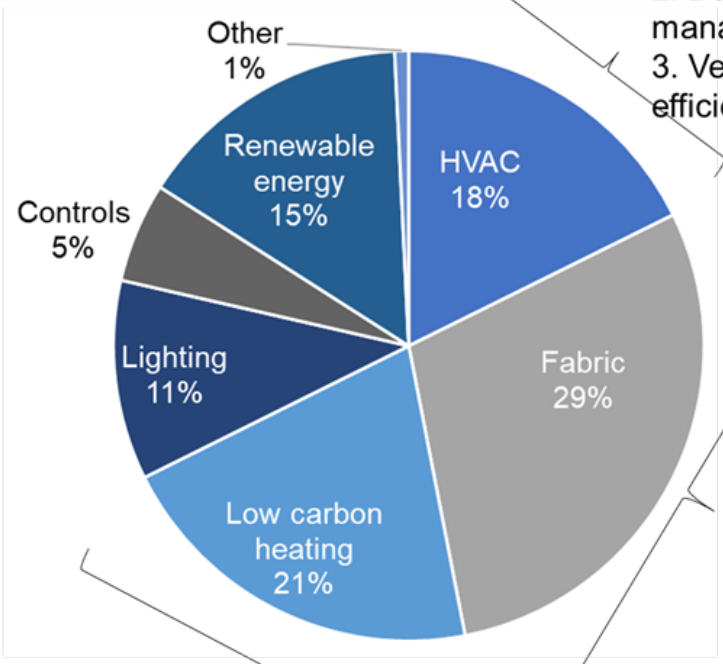
As mentioned previously, the initial review of 12 HDPs identified proposed EEHD measures against 153 potential technologies as taken from a combination of the examples of eligible technologies for PSDS and the Salix Technology List & Persistence Factors documents. However, following the initial reviews, this list was consolidated to 100 measures. An example of this consolidation includes lighting controls, where the measures “Lighting controls - discrete controls” and “Lighting control system – centralised” were all accounted for under “Lighting controls”.

The sample of 60 HDPs identified a total of 54 measures (54%) from the consolidated technology list. Figure 11 shows that the most commonly recommended EEHD measure type was fabric measures at 29% within the sample of HDPs reviewed. This category includes cavity wall insulation, double glazing and loft insulation. This is followed by low carbon heating, making up 21% of recommended EEHD measures.

Well-designed, functioning and commissioned control systems for heating, ventilation, cooling, and lighting are essential for producing a consistently comfortable environment whilst monitoring and optimising the performance of mechanical and electrical equipment within buildings. Controls can deliver greater energy efficiency resulting in reduced operating costs and emissions. They can be relatively simple and cost-effective to implement. However, from the sample of 60, controls were one of the least frequently recommended measures.

Recommendation 26 - It may be beneficial for DESNZ to encourage a focus on the long-term maintenance and review of control systems so that systems operate as the design intended.

Figure 11: Most recommended measure type (percentage of 1,975 EEHD measures)



HVAC:
1. Hot water: Hot Water - distribution improvements (6%)
2. Boilers: Boilers - burner management(5%)
3. Ventilation: Fans - high efficiency (2%)

Fabric:
1. Insulation - building fabric: Roof insulation (9%)
2. Insulation - building fabric: Double glazing (8%)
3. Insulation - building fabric: Cavity wall insulation (6%)

Low carbon heating:
1. Low Carbon Heating: Air source heat pump (19%)
2. Low Carbon Heating: Water source heat pump (2%)
3. Low Carbon Heating: Ground source heat pump (2%)

Figure 12: Most recommended EEHD measures

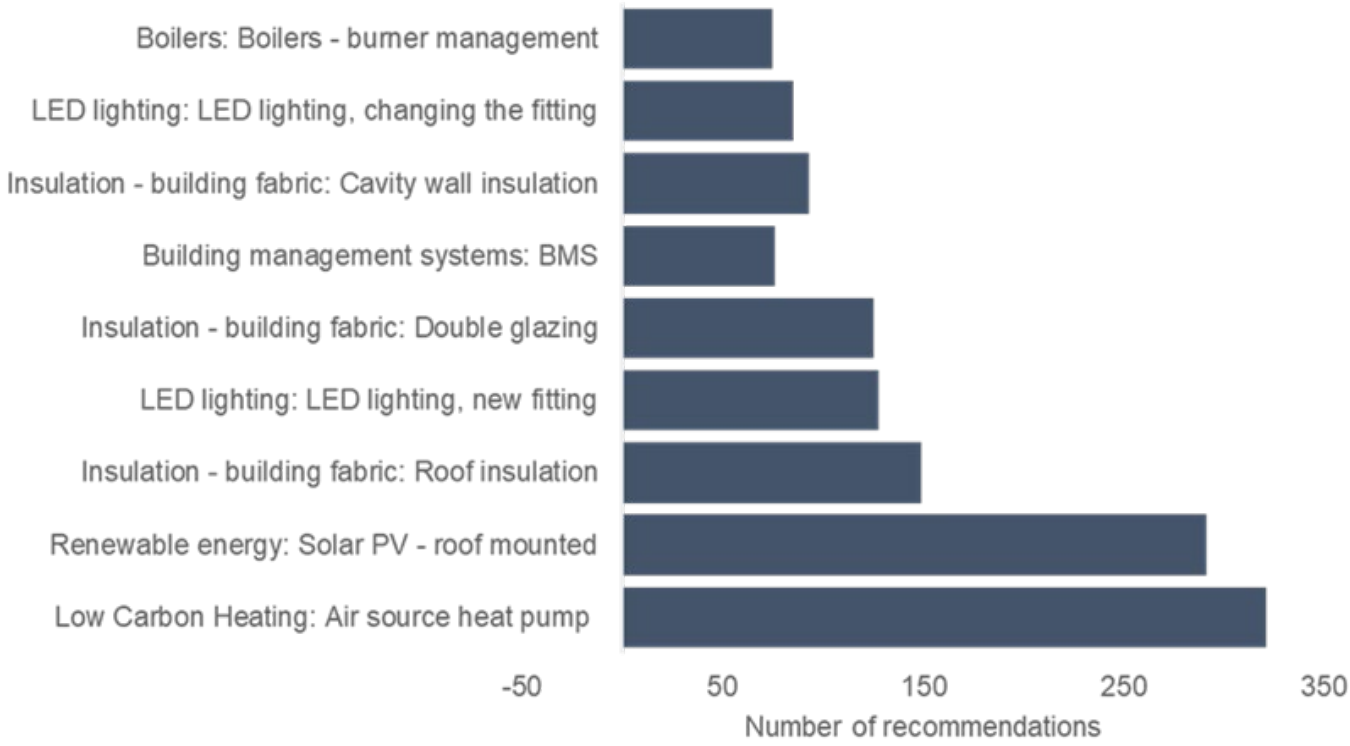


Figure 12 provides an overview of the 1,975 reported EEHD measures across the sample of 60 HDPs. This section provides the key findings in terms of individual EEHD measures recommended in HDPs. The aim of this is to identify the most commonly recommended measures, their estimated costs, and potential savings. This includes looking at which building types of measures are most commonly recommended for, as well as looking at any differences between recommended measures and HDP workstreams undertaken. We recognise that measures are often presented in packages of work, but from our analysis these packages often depend on specific site circumstances and the age and condition of existing plant and systems on site.

As Figure 12 shows, the most recommended EEHD measure is an ASHP. This aligns with the Government's goal of achieving 600,000 heat pump installations annually by 2028[10]. Figure 12 also shows that the second most recommended individual EEHD measure is "Solar PV – roof mounted" where this was recommended for more than one in two buildings. Lighting recommendations (i.e. upgrading to LED) make up 11% of the total measures recommended in the sample. Typically, in cases where LEDs were not recommended, it was due to this measure having already being installed in the building as part of previous energy efficiency improvements.

[10] GOV, 1st September 2023, Energy Security Bill factsheet: Low-carbon heat scheme, GOV, viewed 19th March 2024 <https://www.gov.uk/government/publications/energy-security-bill-factsheets/energy-security-bill-factsheet-low-carbon-heat-scheme>

Table 8: Summary of recommended EEHD measures

Measure	Number of reported measures	Total capital cost (£)	Total annual tCO2e savings	Total annual cost savings (£)
HVAC	349 (18%)	£13,080,035	2,200	£162,308
Fabric	578 (29%)	£70,879,032	5,056	£579,174
Low carbon heating	409 (21%)	£104,027,454	6,834	£344,657
Lighting	216 (11%)	£13,584,664	632	£106,468
Controls	108 (5%)	£5,843,485	1,225	£234,407
Renewable energy	300 (15%)	£14,391,712	1,489	£648,659
Other	15 (<1%)	£117,100	10	£711

Table 8 shows the total reported capital cost and cost savings, but a simple return on investment cannot be calculated from these figures for the following reasons:

- Plans are not consistently providing capital cost and cost savings for all recommended measures.

Recommendation 27 - DESNZ should encourage HDP authors to present all capital costs and savings for all recommended measures where applicable to the HDP Scope. This should be included as one of the parameters within any future data return template that may be created.

- HDP authors are grouping together individual EEHD measures when presenting capital costs and energy savings e.g., glazing, roof insulation and wall insulation are grouped as generic “fabric measures”.

Recommendation 28 - Where applicable to the HDP Scope, it may be beneficial for DESNZ to encourage HDP authors to not group together similar measures and to clearly present capital costs and savings separately for individual recommended EEHD measures.

- Plans are not clear on which capital costs/savings apply to which building. There are also instances where the data is grouped together for the site and not provided for individual buildings.

Recommendation 29 - It may be beneficial for DESNZ to amend the HDP guidance to promote a clear hierarchy for how HDP authors should be presenting costs/savings depending on the HDP scope.

- Plans were not consistent in relation to what is included in the capital cost. Some plans accounted for additional cost elements (i.e. design and engineering, installation, contingency/risk, etc.) within capital costs whilst other plans did not and often it was unclear whether reported capital costs had accounted for these additional cost elements.

Recommendation 30 - It may be beneficial for DESNZ to amend the HDP guidance to include a clear set of cost guidelines on what should be included as a minimum within costs. Furthermore, DESNZ should encourage HDP authors to clearly list where additional costs have been accounted for and their assumptions for the additional costs (e.g. percentage uplifts, etc.). It is not expected that a numerical figure is provided for each of these additional costs.

Table 8 shows that the most common cost and carbon saving measure is low carbon heating with estimated carbon savings of 6,834 tCO2e, and annual cost savings of almost £345,000 across the sample of 60 HDPs. Fabric measures deliver carbon savings of 5,056 tCO2e, with annual cost savings of almost £580,000. Despite fabric measures being the most often recommended, the highest reported capital cost comes from low carbon heating measures which had a total cost of £104 million. This suggests that low carbon heating measures require a higher CAPEX to implement compared to proposed fabric measures.

Fabric measure recommendations may have a high reported number of instances as several different measures may have been recommended on the same building at once (e.g. wall insulation, roof insulation and replacement glazing). In contrast a low carbon heating system may be proposed once per building/site.

Further, the focus on reducing their heat demand through the recommendation of fabric measures may be a lower cost measure than some of the alternatives and potentially reduce the size of a replacement heat source, which is often one of the more expensive measures.

Energy efficiency and heat decarbonisation measures research findings

One of the common themes of HDPs that showed poor quality and led to missing data was due to the hierarchy discussed in Section “Metric hierarchy” on page 19 not being followed. There were instances where individual EEHD measures were grouped together when presenting capital costs and energy savings e.g., glazing, roof insulation and wall insulation are grouped as generic “fabric measures”. There were also instances for plans with multiple buildings, where the total capital costs and energy savings were presented as one value across all the buildings. In both cases, this represented poor quality and provided little clarity on commonalities and trends between individual building types. However, this could be seen as acceptable if the package is required to be implemented at the same time and/or affects a single heating system/meter.

Recommendation 31 - It may be beneficial for DESNZ to promote the use of a data/information hierarchy by amending HDP guidance for HDP authors to detail information requirements supporting clarity on the presentation of information in relation to the HDP Scope.

Another key finding was that in some cases HDPs that explored many different options/scenarios did not always put forward a final solution. A good quality HDP should identify and select the most viable option whilst explaining the next steps. Where this is not possible, the HDP should provide reasons why this cannot be established at present and provide recommendations for the HDP commissioner in terms of next steps to determine the final solution.

Recommendation 32 - It may be beneficial for DESNZ to request a list of final recommendations along with supporting energy/cost/emissions savings for each building and the final recommended measures. This should be included in any future data return that may be developed. Where it is not possible to provide a final recommendation, HDPs should provide reasons why this cannot be recommended (e.g. further feasibility is required) and actions for the HDP commissioner to undertake to determine the final recommended solution (e.g. key decisions).

Energy sources

Energy sources can have a big influence on a building's overall carbon emissions depending on the type of energy consumed and the emissions factors associated with the energy source. For example, according to the latest set of Greenhouse gas reporting: conversion factors 2023, gas oil has an emissions factor 1.25 times larger than electricity; therefore, it releases more carbon emissions per kWh.

The following section provides information on the energy types consumed, their carbon emissions and costs.

Energy sources research insights

The following figures provide an overview of the energy consumed by buildings included in the sample of 60 HDPs where the building activity was noted.

Figure 13 shows the current kWh/year by fuel type and building activity. This shows that hospitals and clinics consume the most energy from those HDPs in the sample. This is followed by state schools.

Figure 13: Current kWh/year by fuel type and building (28% unknown)

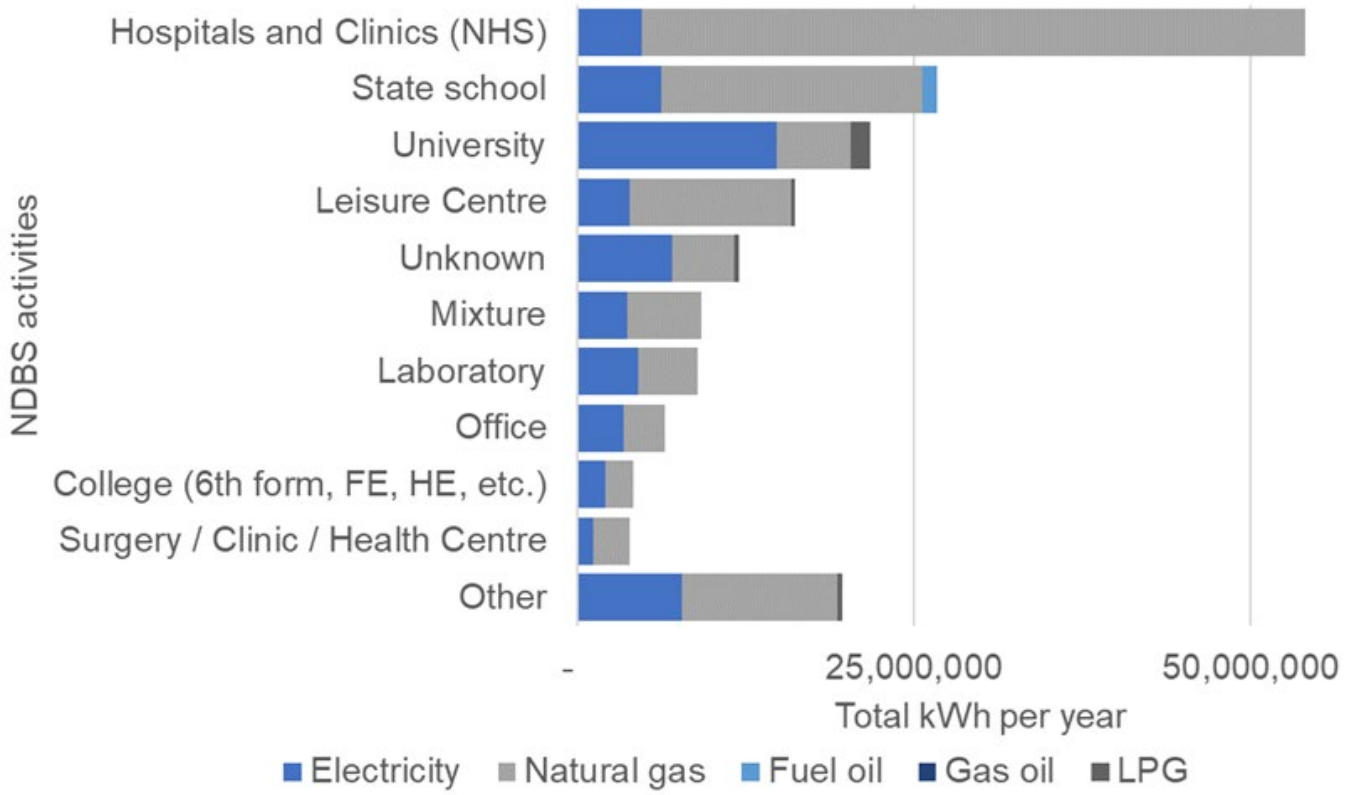


Figure 14 illustrates current fuel costs per year by building activity. This shows that, from HDPs in the sample, universities make up the majority of recorded costs.

Figure 14: Current cost (£)/year by fuel type and building (90% unknown)

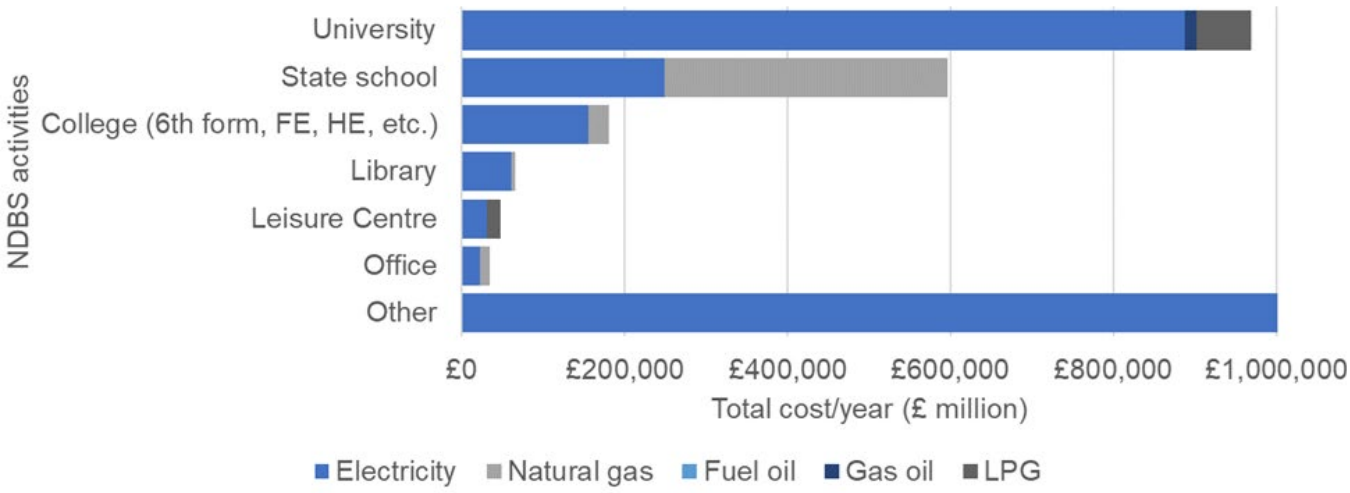
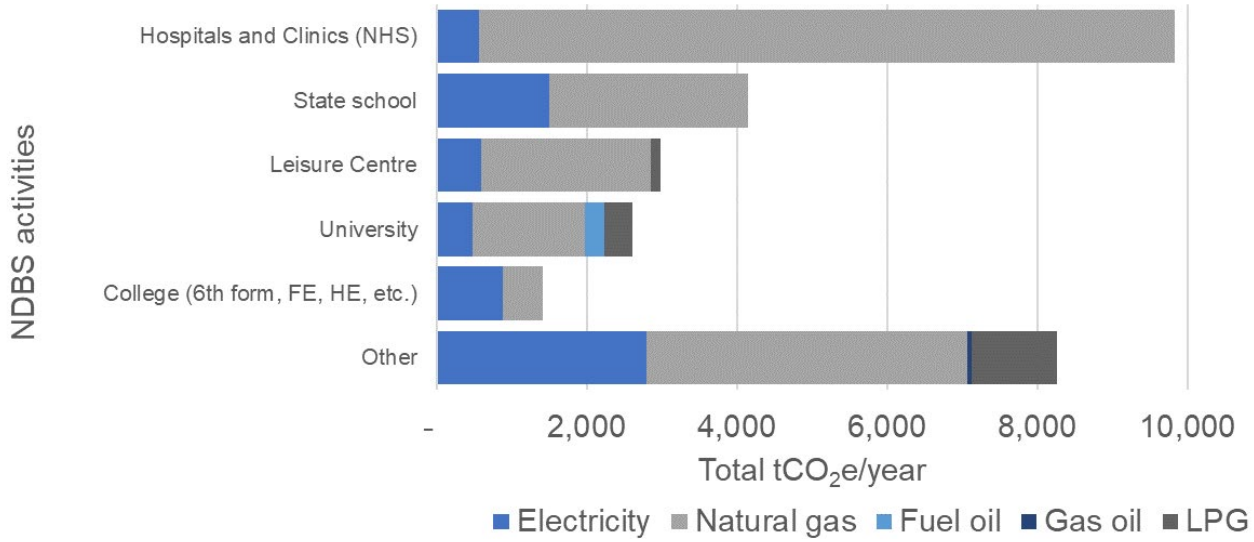


Figure 15 shows current carbon emissions per year by building activity. Hospitals and clinics make up the majority of recorded carbon emissions. This accords with this group consuming the most energy too.

Figure 15: Current tCO2e/year by fuel type and building (51% unknown)



Based on this the following findings have been ascertained from the sample of HDPs reviewed:

- **Four principal energy sources** have been identified, these are electricity (32% of total consumption), gas (66%), fuel oil (<1%), and LPG (<1%).
- **Hospitals and clinics (NHS) currently consume the most energy**. As the third most common building activity, this suggest hospitals are more energy intensive than other more numerous building activities e.g. schools.
- **Cost/year per fuel type was generally not reported** (90% not reported).
- Hospitals and clinics report the highest total energy consumption (Figure 13) but reported carbon emissions in Figure 15 when calculated based on energy consumption are less that what would be expected.

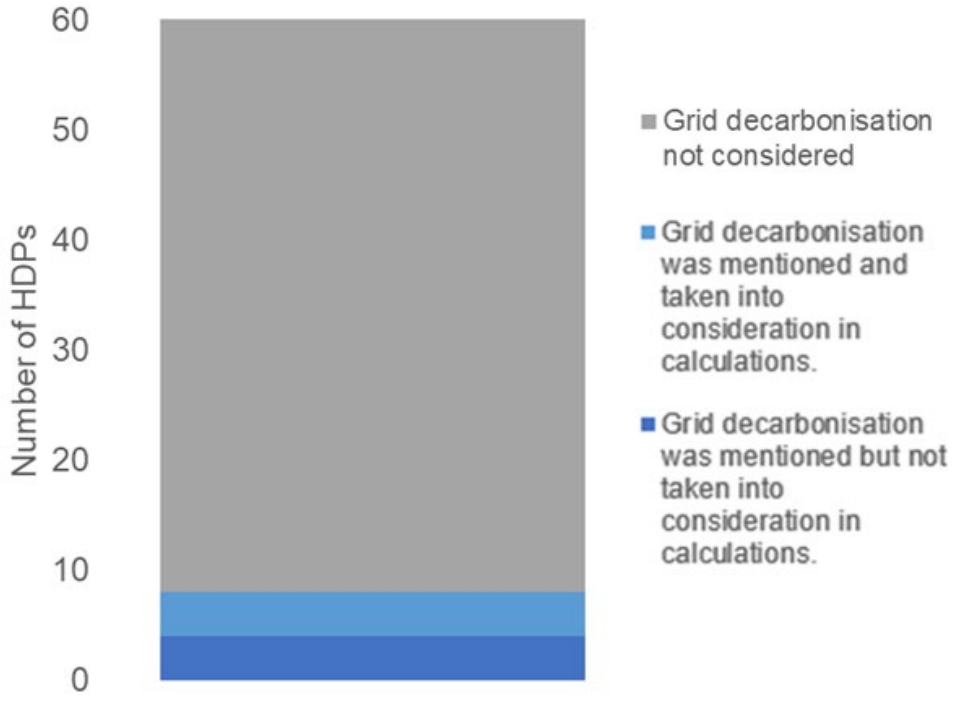
The reasons for this could be:

- Hospitals and clinics are not consistently reporting carbon emissions but they are consistently reporting energy consumption.

- Data may be insufficient to allow HDP authors to estimate emissions.

In terms of projecting future carbon emissions, Figure 16 illustrates the number of plans where this has been considered within the sample of HDPs reviewed. As this shows, 8/60 (13%) of HDPs mention grid decarbonisation and 4/60 (7%) HDPs then take the decarbonisation of the grid into consideration in calculations.

Figure 16: Grid decarbonisation



Recommendation 33 - It could be beneficial for DESNZ to revise HDP guidance for HDP authors to dictate the emissions forecasts to be used and the future period over which lifecycle savings should be determined. This should be included in any data return template that may be created in the future.

Energy sources research findings

There are instances where energy consumption and savings are presented as combined values for single measures across energy sources e.g. a kWh value is provided that includes electricity and gas savings for a single measure. Providing data in this way could be seen as poor quality, if the HDP scope has not been clearly defined, as it is difficult to calculate carbon emissions for a combined consumption/saving figure due to the different emissions factors associated with different energy sources. In addition, presenting data in this way does not allow analysis of which energy sources have increased or decreased, i.e. it is likely that building electricity consumption will increase with the implementation of a heat pump, however this is counteracted by the removal of, or a reduction in, gas consumption. If energy consumption figures are combined, this will be difficult to ascertain.

Recommendation 34 - It may be beneficial for DESNZ to encourage authors to present energy data that is split by fuel type and measures for clarity in accordance with the HDP scope and suggested information hierarchy. This could be included in any data return that may be developed in the future.

This publication is available from: www.gov.uk/government/publications/low-carbon-skills-fund-assessment-of-heat-decarbonisation-plans

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