

A Review of Domestic and Non-Domestic Energy Performance Certificates in Scotland

**Research report for the Scottish
Government, Heat, Energy Efficiency and
Consumers Unit**

Executive Summary

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Executive Summary

Introduction

With the publication of Energy Efficient Scotland: A Route Map in May 2018, the Scottish Government set out its ambitious programme to reduce energy demand, to contribute to its climate change objectives whilst continuing to assist tackling fuel poverty and ensuring Scotland is a good place to do business. Energy Performance Certificates (EPCs) will be an intrinsic component within the Energy Efficient Scotland (EES) Route Map.

In January 2017, the Scottish Government published a series of consultations to inform its policy decisions on the overall design and operation of Energy Efficient Scotland (previously called Scotland's Energy Efficiency Programme). During pre-consultation workshops for the consultation on SEEP, stakeholders raised a range of issues and challenges that need to be considered as the programme is developed. This included concerns around the application, limitations and quality of EPC-based building assessments for broader purposes such as setting standards. EPCs and their underlying assessment methodologies are used to underpin Scottish Government actions to improve properties. A robust assessment of the issues raised around EPCs is needed to ensure these issues are investigated, responded to and, where appropriate, addressed through further review.

In December 2017, the Scottish Government commissioned a strategic examination of EPCs and their underlying calculation methodology to support the development of EES, and specifically:

- to examine the concerns raised in terms of using EPC-based building assessments to underpin the Scottish Government's actions to improve the energy performance of buildings;
- to determine if these concerns merited a material change to the EPC-based building assessment methodologies;
- to assess the changes that could be made to the EPC-based building assessment methodologies to address these concerns;
- to evaluate the impact of the proposed changes on the information reported on domestic and non-domestic EPC certificates;
- to consider the potential cost and time implications for implementing the proposed changes; and,
- to determine the changes that could be implemented within the scope and competency of the currently defined for the role of EPC assessor.

The starting point for this examination was the responses to three public consultation exercises carried out by the Scottish Government published in November 2017: the generalised summaries published by the Scottish Government in November 2017,

and the actual individual public responses received via the three separate public consultation exercises, that is,

- the 98 published responses to the consultation on Scotland’s Energy Efficiency Programme (SEEP) (as it was then referred, now EES);
- the 84 published responses to the consultation on Heat and Energy Efficiency Strategies, and Regulation of District Heating (LHEES); and,
- the 161 published responses to the consultation on Energy Efficiency and Condition Standards in Private Rented Housing (PRS).

Methodology

Text searches were carried out on each of the 343 individual responses using 17 different search terms identified through an iterative process involving reading the initial consultation documents, the consultation questions, and each of the individual responses. This search exercise was not just concerned with the consultation document questions specifically addressing SAP, RdSAP, SBEM or EPC issues, but drew from across the responses, to inform on the breadth of EPC-related issues. Of the 343 responses, 101 were categorised as making ‘no relevant comment’ with regard to SAP, RdSAP, SBEM or EPC issues.

The remaining 242 responses generated 1066 comments that were extracted and collated within a spreadsheet. Subsequently, these 1066 contributions were assigned metatags, broad themes, descriptors, and keywords to enable common topics and themes to be identified, grouped, and further analysed through a bottom up analysis. Details of the methodology and the thematic analysis are set out in Chapters 3 and 4 of the main report.

The frequency analysis of the broad themes is set out in Table ES1.

Broad Themes (n=1066)	Frequency
Methodology	793
Modelling	722
Report	299
Assessor	290
Improvements	289
Occupancy	128
Built Form	103
Convention	75
Location	65
Heating	64
Fabric	56
Data Collection	52
Data Storage & Retrieval	33
Energy Supply	29
Climate	26
Condition	19

Age of Dwelling	12
Ventilation	11

Table ES1 - Frequency analysis of broad themes applied to contributions extracted from the three responses to the public consultations

Rather than limit this review to a desk analysis of the consultation responses, discussion was opened up to a wider public forum to canvass opinion on the nature of concerns on EPC issues and on possible solutions going forward. The topics and concerns identified through the thematic analysis informed a more-detailed deliberation and scrutiny in four public workshops held around Scotland during February and March 2018.

To support the workshops, further modelling and sensitivity analysis was performed and six supplementary topic notes on specific EPC-related concerns with regard to domestic dwellings: issues relating to traditional dwellings; the assessment of rooms in the roof; a sensitivity analysis using default and full window data within the RdSAP program; a comparison of the impact of RdSAP ventilation defaults within a full SAP program; assessing the impact of changing the thermal mass parameter within RdSAP; and comparing the differences between using a full SAP program and RdSAP with regard to assessing community heating. These supplementary topic notes are published separately as an addendum to the main report.





Workshops

The workshops were organised around nine topics: five overarching topics and four, more specific technical issues:

Five overarching topics:

-  • Traditional buildings
-  • EPC reporting and recommendations
-  • SAP and RdSAP Metrics
-  • Non-domestic buildings
-  • Assessors

Four technical issues:

-  • Room in the roof dwellings
-  • District heating
-  • Ventilation
-  • Measuring windows

All four workshops were open events. The intention was to be pro-active in canvassing a diverse array of opinions to encourage discussion on these topics, and to allow feedback to be captured from each participant. Presentations on the topics were used to introduce 'evidence' of the issues, to seek verification of the validity of the concerns, and to consolidate the research team's thinking on possible actions on EPCs going forward. The presentations by the research team were followed by facilitated discussions with the participants. Participants were asked to record any comments and/or their views of this evidence within structured workbooks to allow the research team to determine if this evidence had any bearing on consolidating or changing opinions on the effectiveness of the EPC system in Scotland. Details of the workshops and the topics covered in them are set out in Chapter 5 of the main report

Topic Analysis

The feedback from the consultations and the workshops highlighted a number of concerns around EPCs. This report has analysed the responses to the consultations and taken into account the feedback from the workshops to identify the potential actions that could be undertaken by the Scottish Government to strengthen EPCs to support the further development of EES. The possible actions, organised by the overarching topic or technical issue, are set out in Chapter 6 of the main report.

The possible actions have been divided into four categories which correspond to the four components of the EPC process:

- calculation issues
- assessment issues
- reporting issues
- database issues

The category into which an issue falls has implications for the time and cost of making any proposed changes. For example, resolving and improving calculation issues would need changes to the underlying methodologies and / or the calculation models. These models are currently within the remit of, and lead by, two UK government departments, BEIS and MHCLG. As the underlying methodologies are empirically-based, changes in SAP, RdSAP and SBEM are based on new data. If a change to the underlying methodology also requires data collection to inform or validate the process, then that will increase the time required to make a change. Further details on these categories are set out in Chapter 3.

Conclusion

This review extracted 1066 contributions relating to SAP, RdSAP, SBEM and EPCs from the 343 published responses to the three consultation documents that were the source data for this report. These responses were collated, and grouped through a thematic analysis to identify topics and technical issues that were examined and discussed in more detail across 4 workshops that were organised in 4 different locations across Scotland in 2018. The 1066 contributions were distilled down into

80 possible actions for the Scottish Government's consideration in taking forward the EPC process in Scotland. Each action was assessed against an indicative framework with regard to the rationale for the change, the time frame needed to implement the change, the cost of making the change, the impact on the rating, and the magnitude of the building stock affected.

The 80 possible actions along the indicative assessment of the rationale, time frame, cost, impact on the rating, and magnitude of the stock affected are summarised below.

Possible actions



Domestic Building recommendations

Possible actions	rationale	time frame	cost	impact	magnitude
The Scottish Government to arrange for the data gathered through the monitoring of the SEEP Pathfinder projects and HEEPS ABS to be collated and assessed against improving the accuracy of the calculation methodologies.	improving accuracy	medium term	medium	low to medium	medium
A systematic research programme to measure in-situ U-values for different existing stone wall types to assess the validity of the current range of U-values within RdSAP; proposed revision to the stone wall U-value calculation algorithms. This research program would probably take at least 2 years to identify and monitor sufficient properties to provide a robust empirical basis to make changes to the existing algorithms. This research programme could assess the impact of the wall condition and water saturation levels on the thermal performance of the walls.	improving accuracy	long term	high cost	high	medium
Extending the range of stone wall types would require collating more empirical data in terms of the type of stone and its heat loss performance so that default U-values could be derived and included into the software. This certainly could be part of the above research program. In the interim, a piece of research could collate and calculate default U-values that could be published as a	improving accuracy	medium term	low cost	medium	medium

stand-alone booklet (or more likely as an online data reference) that could be referred to by assessors.					
Adopt thickness related U-values for half-brick thick, and for 1.5 and 2-brick thick walls, amend Appendix S accordingly, and then embed the appropriate defaults into the SAP, RdSAP and SBEM software models.	improving accuracy	medium term	medium to high cost	medium	low
Include an assessment of the dwelling's thermal mass into Appendix S of the SAP manual, and within the RdSAP software.	improving accuracy	medium term	medium	high	medium
Include shutters within RdSAP as an item to be recorded during the survey.	improving accuracy	medium term	low cost	low	low
Use The Guide to Non-traditional Housing in Scotland 1923 -1955 ¹ , and other individual BRE reports on specific non-traditional dwelling types, to calculate theoretical U-values for different non-traditional dwelling types and incorporate them into SAP and RdSAP.	improving accuracy	long term	high cost	high	low
Establish a Scottish PCDB reference database to allow for Scottish-based inputs such as fuel costs and improvement costs, to calculate the EPC outputs on the EPC such as the savings on fuel costs, and the paybacks.	improving accuracy	long term	high cost	high	high
Amend RdSAP procedures and software to differentiate between CFLs and LED with regard to assessing lighting energy consumption, and potential savings.	improving accuracy	medium term	medium	low	medium to high
Allow the inclusion of in-situ test results such as air pressure testing or U-value measurements to be included into the RdSAP assessment of existing properties. Such procedures are already defined in SAP for dwellings.	improving accuracy	medium term	medium	high	high
The impact of the changing fuel prices on the SAP rating over time is accounted for in quite a blunt way within SAP and RdSAP. Rather than use an overall average fuel price index, a fuel price index for each fuel should be calculated and embedded with the SAP and RdSAP calculations. Going forward we can no longer have the confidence that all fuel costs will follow a similar trend or direction.	improving accuracy	long term	high cost	high	high

¹ Scottish Office Building Directorate (1987) The Guide to Non-traditional Housing in Scotland 1923 - 1955, HMSO, Edinburgh

Review the financial benefit of embedded generation within the EPC process. Currently the SAP score on the EPC is improved with electricity generating renewables; however, it is not clear how this translates to an energy cost saving for the occupant.	improving accuracy	long term	high cost	high	low to medium
Develop a Scottish PCDB which all approved software would use when generating Scottish EPCs. This would have data on energy efficiency improvements and fuel prices which reflect the Scottish market.	improving accuracy	long term	high cost	high	high
Develop more algorithms for default room in the roof shapes	improving accuracy	long term	high cost	medium	medium
Redefine half-wall type dwellings in RdSAP.	improving accuracy	long term	high cost	medium	medium
Incorporate the full SAP DH/CHP system data entry items into the RdSAP methodology with appropriate conventions and defaults when the information is not available.	improving accuracy	medium to long term	high cost	high	low
Consider possible changes to the SAP and RdSAP methodology with regard to 'penalising' flat rate charging.	improving accuracy	medium term	medium	medium	low
Consider possible change to convention on definition of a heated corridor in multi-storey blocks connected to DH/CHP systems where the system risers are in the circulation areas.	improving accuracy	short term	low cost	low to medium	low
Allow the actual number of extract fans, air bricks, and flues, and the presence of a draught lobby to be entered within RdSAP programs.	improving accuracy	medium term	medium	medium	high
Allow for air infiltration rate test results to be entered into RdSAP.	improving accuracy	medium term	medium	medium	low to medium
Change the Appendix T rules so that draughtproofing is included as an improvement recommendation where the level of draughtproofing of the windows and doors is less than 100%.	improving reporting	medium term	medium	low	low
Include variations in pre-2003 wood double glazing default U-values to take account of different thicknesses in the glazing gap.	improving accuracy	medium term	medium	low	medium
Amend Appendix T so that both a recommendation for secondary glazing and replacement double glazing can appear on the EPC.	improving reporting	medium term	medium	low	medium
Incorporate shutters into the RdSAP methodology and into Appendix T.	improving accuracy and reporting	medium term	medium	low	low

Publish a convention to accommodate wall insulation that is less than 50mm thick, or falls between the default thicknesses.	improving accuracy	short term	low cost	low to medium	medium
'System built' conjures up negative perceptions, and the term should be switched to 'non-traditional'. System-built describes a particular method of construction; not all non-traditional housing in Scotland is system-built.	improving consistency	short term	low cost	low	low
Publish a guide on calculated and tested U-values for non-traditional and 'system built' buildings in Scotland	improving consistency	long term	high cost	high	low
Develop procedures and conventions to take account of insulation that cannot be seen. This would include adding an addendum to the data entry take account of insulation and improvements that do not meet the current standard of documentary evidence.	improving accuracy and consistency	medium term	medium	high	medium
Develop a household log book akin to the benchmark log book for boilers in which contractors would sign off insulation improvements completed in a dwelling.	improving accuracy and consistency	medium term	medium	high	medium
Clarify conventions with regard to using 'system built' as a wall type. This designation should only be used after all non-destructive means have been employed to categorise the wall type as this has a big influence on how measures are automatically generated for wall insulation.	improving consistency	long term	low cost	medium	low
Support the development of a wider role for EPC assessors in Scotland through further training and CPD	improving consistency	medium to long term	medium to high cost	medium	high
Clarify RdSAP conventions with regard to circumstances under which automatic recommendations can be suppressed.	improving consistency	short term	low cost	low	low
Enable and allow assessors to modify the PCDB costs for improvement works, allowing the reporting of capital costs of improvement measures to be made more specific to the community where the works would be carried out.	improving consistency	medium to long term	medium to high cost	medium	high
Allow variations in the costs of the works proportionate with the percentage of the property being treated.	improving consistency	medium to long term	medium to high cost	low	low to medium
Amend the RdSAP software to allow for the inclusion of Appendix Q calculated savings for technologies not currently incorporated in RdSAP, following the same guidelines that	improving consistency	medium to long term	high cost	medium	low

are currently applied to using such procedures in SAP.					
Explore with SQA and RICS the development of a higher-qualified, broader-skilled, more professional EPC assessor.	improving consistency	long term	medium to high cost	medium	high
Undertake a research exercise to determine how many EPCs issued under RdSAP 2012 v9.92 breached the 'smart audit rules'.	improving consistency	short term	medium	high	high
Introduce 'smart auditing' as part of the Protocol Organisations' quality assurance targets in Scotland.	improving consistency	short term	low cost	high	high
Introduce the requirement that the quality assurance procedures include independent on-site re-inspections.	improving consistency	medium term	high cost	high	high
Establish an independent regulator (or vest it within Scottish Government) to oversee the independent re-inspection of EPC assessments, and to report annually on the results.	improving consistency	medium term	high cost	high	high
The Scottish Government in conjunction with SQA to identify and introduce Scottish qualifications, based on National Occupational Standards, for EPC assessors, for existing dwellings, new build dwellings, and non-domestic dwellings. Part of this qualification would be the potential assessor successfully completing a national examination.	improving consistency	medium term	high cost	high	high
All SAP, RdSAP and SBEM training courses being offered in Scotland, and the respective trainers, should be vetted with regard to their competence and the experience of the trainers. These items should not be left in the hands of the accreditation Schemes.	improving consistency	medium term	medium	high	high
The Scottish Government to agree with the Accreditation Schemes rules and procedures for suspending and de-registering assessors or companies that bring the EPC scheme into disrepute by misrepresenting data.	improving consistency	medium term	medium	high	high
The convention on rooms in the roof should be re-written to provide clear, unambiguous and definitive guidance on when detailed room in the roof measurements are required.	improving consistency	medium term	medium	medium	low

Develop procedures to take account of insulation that cannot be seen. This would include adding an addendum to the data entry that the U-values take account of insulation that has not been accompanied by the current standard of documentary evidence.	improving consistency	medium term	medium	medium	low
Develop a household log book akin to the benchmark log book for boilers in which contractors would sign off insulation improvements completed in a dwelling.	improving consistency	medium term	medium	high	high
Require a full SAP assessment when a dwelling is connected to a DH/CHP system.	improving accuracy	medium to long term	high cost	high	low
Define a convention on when to make the recommendation to connect to a local DH/CHP system.	improving consistency	short term	low cost	high	low
The Scottish Government could mandate that Display Energy Certificate-type certificates be displayed outside the door on boiler plant setting out the DH/CHP operational efficiencies. This would provide an accessible source of data to the assessor.	improving accuracy	medium term	low cost	high	low
The Scottish Government should encourage DH/CHP system owners to get the operational parameters of their systems added to the PCDB database.	improving accuracy	medium term	low cost	high	low
Define a convention in RdSAP for assessing air bricks.	improving consistency	medium term	medium	low	high
To support the inclusion of air infiltration rate test results, define a convention within RdSAP governing the necessary standards to be met by the tests, the qualifications of those carrying out the tests, and the requisite documentation to support this development.	improving accuracy and consistency	medium term	medium	medium	medium
Change the convention to require RdSAP assessors to measure individual windows in Scotland.	improving accuracy and consistency	short term	low cost	medium	high
Identify appropriate wall insulation techniques for different non-traditional dwelling types so that the EPC will potentially recommend insulating the walls.	improving reporting	medium term	medium	high	low
Incorporate shutters into Appendix T so that they may appear as a possible improvement.	improving reporting	medium term	medium	low	low

In order to avoid significant material changes to the EPC as required for EPBD, consideration should be given to a separate associated energy efficiency advice report or improvements report. This report would be both methodologically and administratively linked to the EPC itself.	improving reporting	long term	high cost	high	high
The format of the EPC in Scotland should reflect on the potential for assistance through Scottish Government schemes and/or the Energy Companies Obligation. Assessors are currently required to identify the tenure of the properties being assessed and many of the schemes for assistance are targeted at specific tenures. Messages around whether the property does or does not meet a sectoral EPC band target could be provided on the EPC.	improving reporting	long term	high cost	high	high
In order to avoid significant material changes to the EPC as required for EPBD, consideration should be given to a separate associated energy efficiency advice report or improvements report. This report would be both methodologically and administratively linked to the EPC itself.	improving reporting	long term	high cost	high	high
Use the EPC data to provide tailored advice and support to householders by developing a parallel reporting process.	improving reporting	long term	high cost	high	high
A consumer review of the EPC format is needed in order to revise the way that information is presented on the document so that it is understandable by the householder, and not just a technical audience. The review should consider information such the values and terms used and what these mean to the consumer. The certificate itself is an authorised legal document; however, the information contained within certain sections is indicative and not an approved schedule of planned works.	improving reporting	long term	high cost	high	high
Amend the wording on the EPC with regard to recommendations for specific construction types, that more additional expertise is needed. This could be done achieved through the assessor selecting an addendum item for the need for professional expertise with specific construction types.	improving reporting	long term	high cost	high	high

Amend the wording on the EPC with regard to recommendations where the building is obviously not wind and weather tight that additional work may be required for the benefits of any improvement works are to be realised. This could be done achieved through the assessor selecting an addendum item for the need for professional expertise with specific construction types.	improving reporting	long term	high cost	high	high
Develop differential SAP targets for dwellings for different primary heating fuels.	improving reporting	long term	high cost	high	high
Where the rating is subject to the type of metering (e.g. with electric storage heating) or the presence of low energy lighting, a note should be added to the EPC stating that switching tariffs or replacing the low energy lighting with less efficient lighting may have a negative impact on the rating to landlords and owners on the actions that can have an adverse impact on the SAP rating.	improving reporting	short to medium	low cost	low to medium	low to medium
Adjust the presentation of fuel costs and savings to reflect annual fuel bills (not 3-year totals) and annual savings. There may also be some benefit of also including what the annual total converts to in terms of an average weekly fuel bill in summer and winter, to better inform householders.	improving reporting	medium term	medium	low	high
Consider the value that can be added to the EPC process with a separate occupant report. This kind of approach could help to address the view that the EPC in itself should not fundamentally change; the data used to generate it could add significant value to a supplementary advice report which then brings into play specific occupant factors.	improving reporting	long term	high cost	high	high
Adjust the wording on the domestic EPC so that it refers to carbon dioxide equivalent (or CO ₂ e) emissions rather than simply carbon dioxide.	improving reporting	short term	low cost	low	high
All data referenced from the PCDB to produce the various metrics on an EPC should be declared on the lodged document.	improving reporting	long term	medium	low	high
Use the EPC data to provide tailored advice and support to householders by developing a parallel reporting process.	improving reporting	long term	high cost	high	high

Include connecting to DH/CHP system within Appendix T.	improving reporting	medium term	medium	high	low
Require the summary data report to be lodged on the national register alongside the EPC, and to make this summary report available online alongside the EPC.	improving reporting	medium term	high cost	medium	high
Develop a database alongside the EPC register to upload PAS20/30 certificates of compliance that can be accessed by householders and assessors to check if insulation has been installed.	improving consistency	medium term	high cost	medium	medium

Non-domestic Building recommendations

Possible actions	rationale	time frame	cost	impact	magnitude
Contact BRE/UK Government department to determine whether there are any plans to increase the range of new technologies catered for in SBEM.	improving accuracy	medium term	medium	high	medium
Amend the EPC generator module to allow input of operational energy data such as used in DECAs in other parts of the UK.	improving accuracy	medium term	medium	medium	medium
Require more detailed energy audits as the basis for funding decisions.	improving accuracy	short term	low cost	low to medium	medium
Include operational ratings on EPCs in addition to asset rating. Include more comparators (e.g. typical figures for building stock, or at least the building archetype).	improving reporting and recommendations	medium term	medium	low to medium	high
Publish operational as well as asset information on EPCs.	improving reporting and recommendations	medium term	low to medium cost	low to medium	medium
EPCs should not be used as the basis for works specifications or costs without further more detailed assessment.	improving reporting and recommendations	short term	low cost	medium	medium
Produce and publish a database of EPCs and operational energy consumption for public buildings in Scotland	improving accuracy	medium term	medium	low to medium	high



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