Community Buildings – An evaluation of the improvement in energy performance in community buildings in England

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Executive Summary/Key Findings

New research by Social Investment Business has shown that the UK's community buildings are in desperate need of renovation to improve energy efficiency.

The sector's buildings are in a worse condition than other non-domestic buildings, resulting in lower quality buildings with higher energy bills. Many community buildings do not meet current minimum energy efficiency standards for non-domestic buildings. With standards likely to rise, many more risk becoming non-compliant in the future rendering them impossible to let or sell.

However, the research has also uncovered that there are a few small, simple improvements which could improve their energy efficiency and ensure they comply with regulations. Community buildings need investment and support to be able to make these improvements.

The 3 key findings of the paper are summarised here:

1. Community buildings are falling behind

SIB's research has shown that improvements in community buildings' energy efficiency has been much slower than non-domestic buildings. This has become more pronounced since 2017, as non-domestic buildings have improved twice as fast as community buildings. This results in higher energy bills, emissions, and regulatory risk for community buildings.

In 2023, the Government stalled its policy of raising the minimum standard of an Energy Performance Certificate (EPC) rating from an E to a C. At the time of writing this report, legislation had not yet been introduced by the new Labour Government, but Minimum Energy Efficiency Standards seem likely to play a part in reaching Net-Zero targets.

2. Simple energy efficiency upgrades are possible

An important finding from SIB's research is that many community buildings have been missed out on making 'low hanging fruit' improvements, such as draughtproofing, installing efficient lighting, or adding heating controls.

These simple, relatively cheap measures can improve EPC ratings, keeping community buildings safe if the Government does tighten regulations in the future. These measures are important for the community sector to undertake, as they provide a clear pathway to keeping community buildings open.

3. Investment and support is needed to address the challenges

The need to upgrade community buildings' energy efficiency is important. There is also a clear pathway to begin upgrading our buildings through simpler improvements. However, community buildings are falling behind the rapid pace of change that is currently needed and they are showing signs of falling behind further.

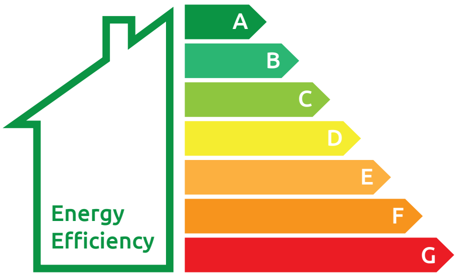
Intervention is needed through investment and support to prevent the gap continuing to widen. Without this investment, we will not be able to future-proof our community buildings and meet the challenge of Net Zero.

- This paper is an expansion of SIB's existing energy paper "Energy Efficiency of Buildings across England: A descriptive Analysis", which investigated Energy Performance Certificates (EPCs) in the Community Sector over the past 16 years.
- Community buildings in the UK need to improve their energy efficiency to meet regulatory demands, as well as respond to the challenges of climate change and higher energy prices.
- Since the introduction of the EPC rating and Minimum Energy Efficiency Standards (MEES), the UK's community buildings have improved their energy efficiency.
- However, they are being outpaced by the UK's other non-domestic buildings, which are becoming more efficient at a faster rate.
- Community buildings with low initial EPCs have made greater improvements, which is to be expected given they are at greater energy and regulatory risk.
- However, given likely increases in regulatory demands, as well as rising energy costs and concerns around Net Zero, improvements are still required even for community buildings with EPCs in higher bands.
- Smaller buildings tend to make more significant improvements on average, while larger buildings have difficulties improving at all.
- Many community buildings still have not acted on 'low hanging fruit' improvements, such as installing energy efficient lighting.

Introduction

In the context of recent energy shocks and the ongoing climate crisis, the energy efficiency of buildings in the UK is an increasingly important topic. For community buildings, this is particularly the case as the need to provide a warm and safe space exists alongside a need to be conscious of energy bills, all whilst cutting carbon emissions.

Energy Performance Certificates are the Government's tool for providing consistent and comparable energy efficiency ratings. Since 2008, any building built, sold, or rented in the UK must have an EPC, which remains valid for 10 years. EPCs are rated from A+ (Net Zero ready), meaning very energy efficient, to G, indicating very poor energy efficiency. A building's EPC also contains a set of retrofit recommendations for improving its energy efficiency.



In 2018, the Government introduced new Minimum Energy Efficiency Standards (MEES) for non-domestic buildings in the UK. These standards enforced the improvement of buildings with the worst energy efficiency. Since 2018, landlords of non-domestic buildings have been prohibited from granting a new tenancy in a building with an EPC in band G or F; and since 2023, landlords have not been allowed to continue renting out a property rated at a G or F, even if it is already being let. The Government has considered extending this ban to properties with an EPC rating less than C. MEES means that improving EPCs is now essential for community buildings in the UK to stay in use.

After 15 years[1] of the EPC system, 348 community buildings have obtained two EPCs. This may be due to a change in use, needing to rent or sell the building, or to measure the impact of energy improvements. This allows us to explore the change in EPC rating for the same building over time. Analysing updated EPCs for the same building also allows us to understand the most common steps that community buildings have taken to improve their EPC ratings and the impact of those. This is particularly important as community buildings are often more financially vulnerable than privately owned buildings, so it is important for them to improve EPC ratings in a cost-effective way.

Due to the limited information about buildings with non-domestic EPCs, we also explore the retrofit recommendations included[2], such as window changes, insulation improvements, or boiler changes, and how these have developed over time.

1 The EPC analysed in this report is up to the lodgement date of 31 October 2023
2 A full list of EPC recommendations can be found in the Annex of this report

Methodology

EPCs and their renewal comparison

In England and Wales, non-domestic EPCs are calculated using the Simplified Building Energy Model (SBEM). This model provides each building with an 'Asset Rating', a measure of how energy efficient a building is. The asset rating of a building dictates its EPC band, with a lower asset rating indicating better energy efficiency. The rating bands are intervals of 25, for example Band A is an asset rating of 0-25 and Band B is 26-50, until Band G which includes all asset ratings above 150. By comparing earlier and later EPCs, we can review the changes in asset ratings and other information over time.

EPC recommendations

Unlike domestic EPC data, non-domestic EPC data contains very limited information about a building's specific characteristics such as the wall types and the window type. However, while a building's specific characteristics are not directly available in the EPC rating, they are reflected in the retrofit recommendation report connected to an EPC. By comparing where two EPCs have been issued, we can see how those retrofit recommendations have changed, indicating which improvements have been completed. If a recommendation appears on an earlier EPC and not on a later one, we can safely assume that recommendation was implemented.

Analysis

Yearly Trend

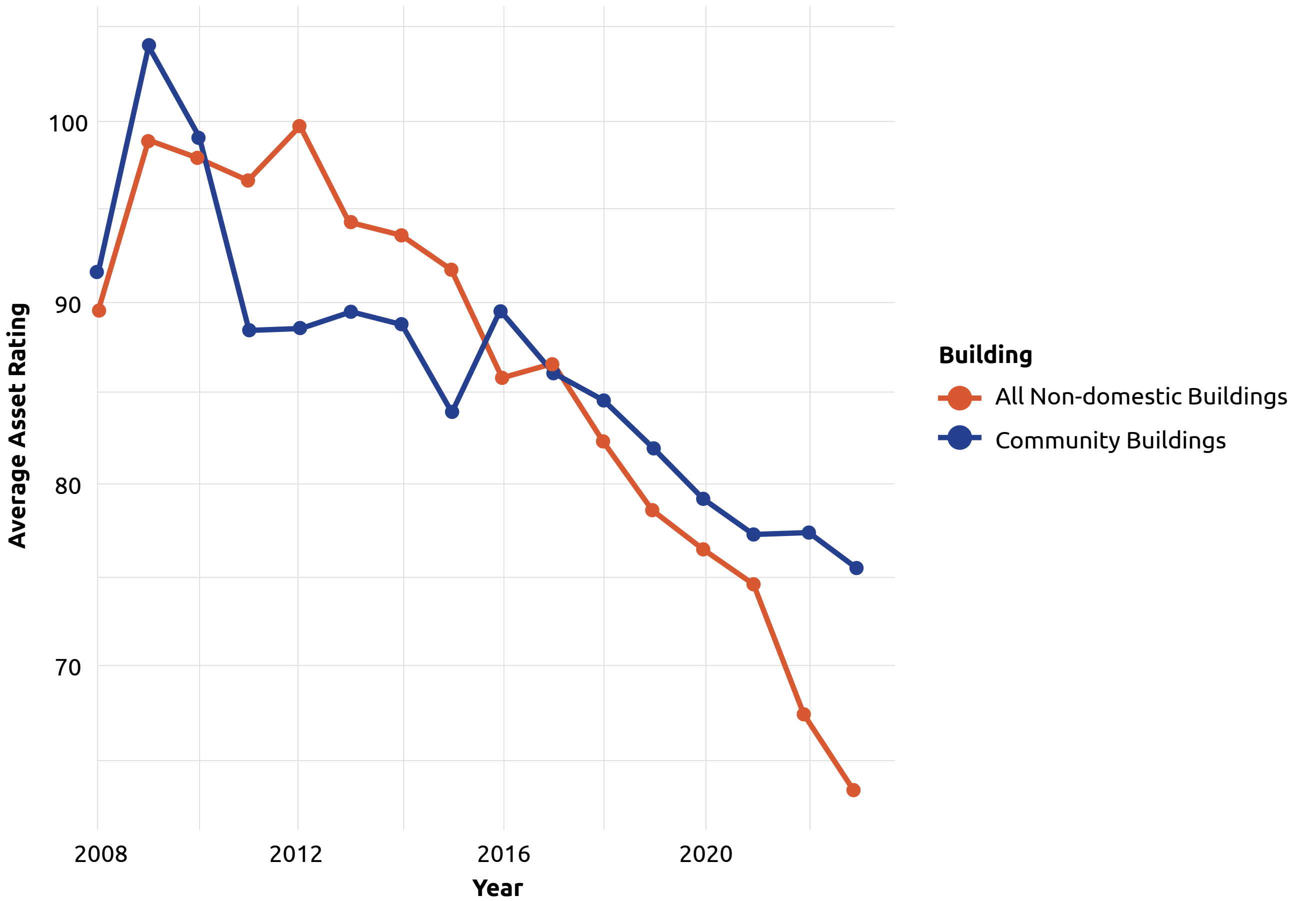


Figure 1 - Yearly trend of average (mean) Asset Rating, comparison between community buildings and all non-domestic buildings.

EPC asset rating trend

Figure 1 shows that community buildings improved their asset ratings faster than other non-domestic buildings immediately after the introduction of the EPC system in 2008. As the asset rating falls, the closer the building gets to Net Zero carbon emissions and the more energy efficient the building becomes. However, since 2017, improvements in community buildings have consistently been slower than other non-domestic buildings, with this underperformance worsening in recent years. To better understand this trend, and to seek ways to help community buildings to improve faster, we analyse the community buildings that have multiple EPCs since 2008. This allows us to learn from their energy efficient improvement choices.

EPC updating time gap

The time difference between two EPCs issued for the same building can reflect how active a building is, as they are required if a building is sold, rented, or built. However, a very short time gap between two EPCs for the same building suggests that an EPC was inaccurately generated. If two EPCs were recorded within the same day we can assume the second EPC is a reissue of an incorrect EPC.

In our dataset, this is a common problem. Among the 348 buildings that have two EPCs issued, 25 of them have their EPCs recorded on the same day, 75 have only a one-day gap, and 126 (39%) have a time gap within one month. Figure 2 shows the distribution of EPCs reissued over time. While there is a spike at the beginning, likely due to EPCs being reissued due to errors, the graph then has a long tail. The rise in EPCs reissued towards the end of the graph is likely due to EPCs being redone just before they reach their 10-year expiry.

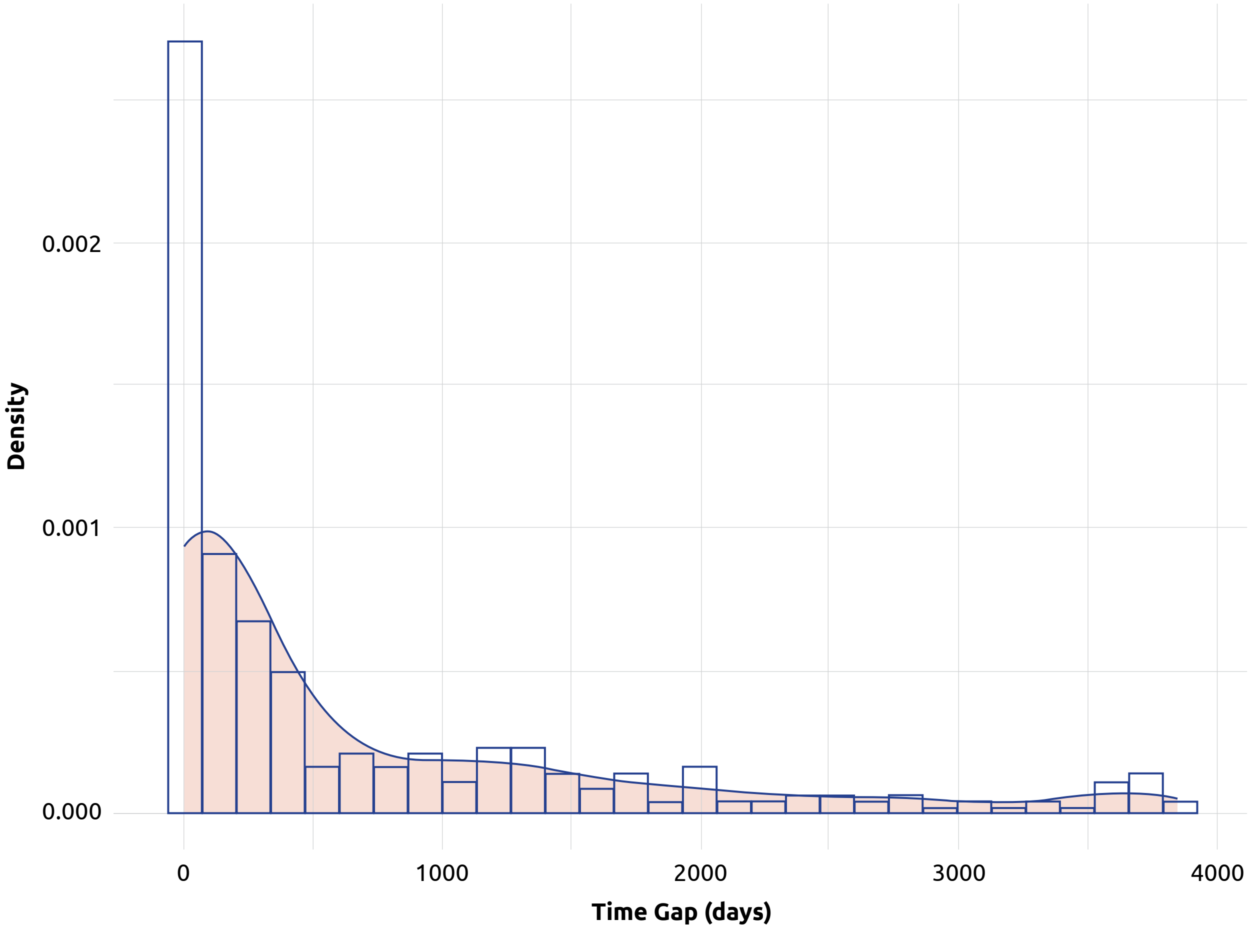


Figure 2 - Density of time gap in days between two issues of EPCs for the same building.

Our aim is to analyse buildings that updated their EPCs due to market activities. However, an issue is that there is no data showing if an EPC is recorded due to an error correction, or because of a legitimate need for a new EPC. We assume that buildings that gained their second EPC more than a month after their first did this for a legitimate reason[3], rather than the need to correct an error.

In the following analysis, we focus on the 61% of buildings that have at least a one-month time gap between their two EPCs.[4]

EPC asset rating improvement

When we directly compare the asset ratings between the two EPCs for the same community building in Figure 3 we can see that there is a significant shift towards lower (better) asset ratings in the second EPC, with the mean asset rating falling from 99.51 to 85.50. The 14.01-point asset rating improvement signals that community buildings have made effective improvements and energy efficiency has increased. We can also note a reduction in the number of EPCs with a much higher asset rating showing an improvement at the most inefficient end.

This trend may be in part the result of charities often taking on older or more inefficient buildings that would otherwise fall into disuse.

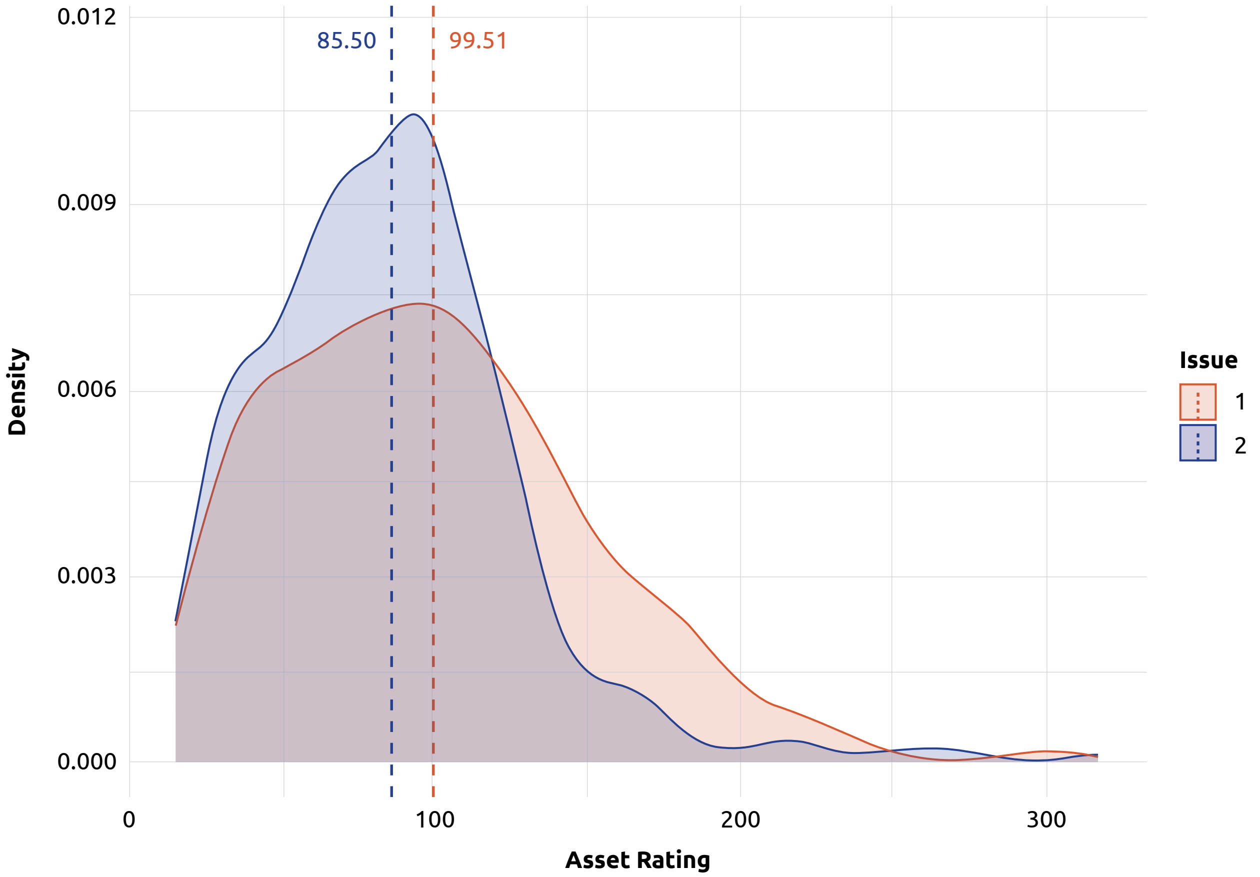


Figure 3 - Comparison of Asset Rating densities in different issues of EPCs for the same community building.

However, Figure 3 compares community buildings to the whole non-domestic sector, which improved 22.71 points from an average of 104.69 to 81.98. This is 62% higher than community buildings and shows that the community building sector is lagging behind the wider non-domestic sector.

3 A different time gap can be taken, but it was deemed reasonable to draw the line for a retrofit EPC at one-month.
4 We assume that any other errors in the EPCs are happening uniformly so do not affect the comparison of EPC ratings at scale.

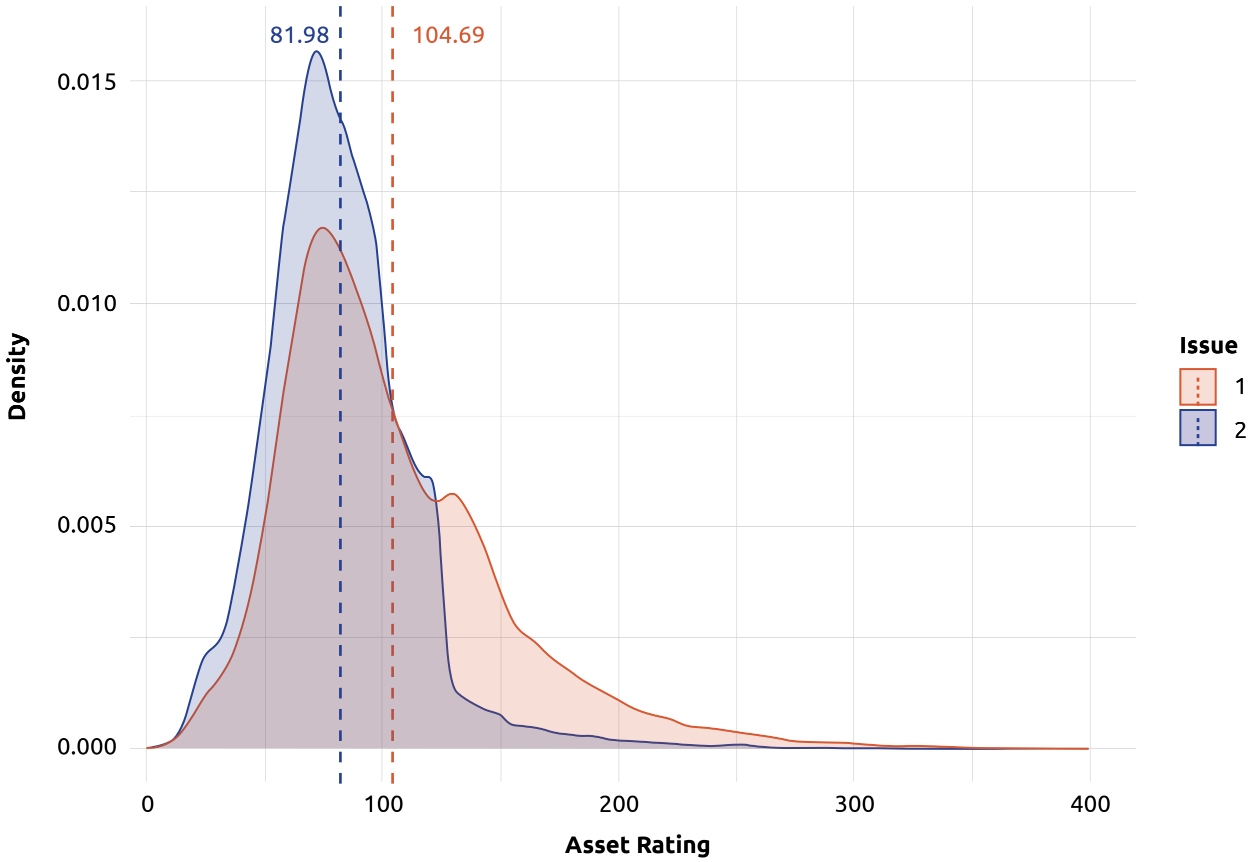


Figure 4 - Comparison of Asset Rating densities in different issues of EPCs for the same non-domestic building.

Comparison between EPCs

The general density comparison does not show how an individual building's asset rating changes. To see this comparison more clearly we apply local regression LOWESS curves[5] to study the relationship between the original and updated asset ratings for the same building. Figure 5 plots the asset rating difference between two EPCs against the original asset rating. A negative difference indicates that a building's asset rating fell, and its energy efficiency improves. A positive difference shows that a building's asset rating increased, and its energy efficiency worsened.[6]

Significance of the initial asset rating

In Figure 5 we can see that when the original asset rating is low, below 100, the buildings tend to have a slightly worse asset rating when updated. However, when the building is rated above 100, it is likely that the building will get a better rating in its new EPC. Furthermore, the worse the original asset rating is, the greater the improvement tends to be. This is reasonable, as it is easier for buildings with worse asset ratings to be retrofitted and improve their rating, as they have more obvious problems. They are also more at risk of falling short of MEES regulations and so owners will be more motivated to improve their EPC asset ratings.

While the former Government paused plans to raise the MEES to a C EPC rating which would require buildings to get their asset rating below a 75, it is likely that energy efficiency standards will be raised in the future. It is important to find ways for community buildings that already have good asset ratings to further improve their energy efficiency.

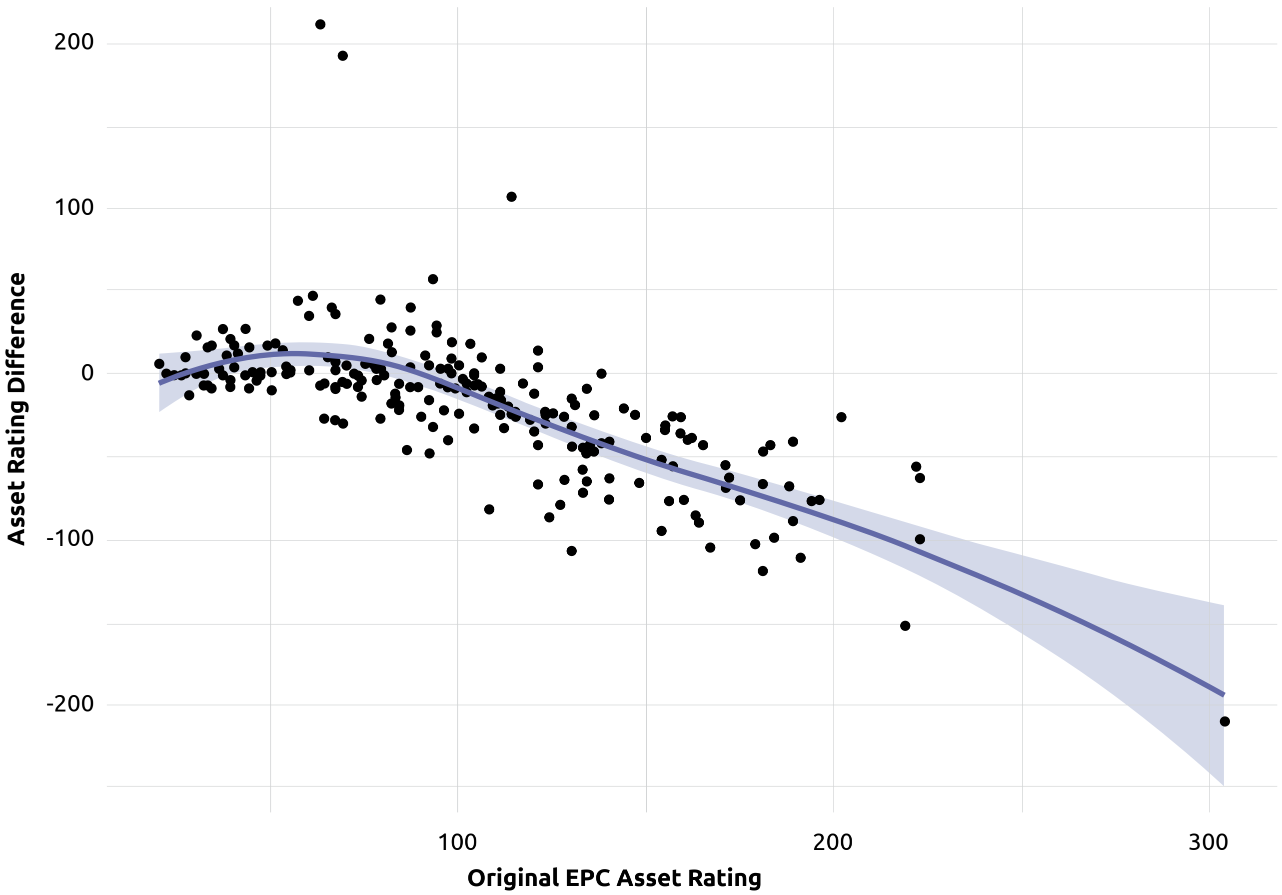


Figure 5 - LOWESS curve of Asset Rating Difference between two issues for the same building against the Original Asset Rating.

5 Full description of this methodology can be found in the appendix.
6 The LOWESS curve shows flexible local trends of the relationship with a 95% confidence interval. When the value zero is not included in the confidence interval, we can infer that the relationship (asset rating getting better or worse) is significant.

Energy consumption

Asset ratings reflect the theoretical energy efficiency of a building. However, this does not directly reflect the actual energy consumption of the building. When looking at the energy consumption of primary fuel in the community buildings, there is a 17.03% cut from 454.13 to 376.78 kWh/m2 per year. Yet when compared to the asset rating distribution, we can see that some primary fuel consumption is clustered at the higher end, meaning the buildings with very high energy consumptions are playing a bigger role here as they are skewing the mean average consumption away from the most common one (mode). The next steps should be reducing the energy consumption of buildings with much higher consumption than the majority.

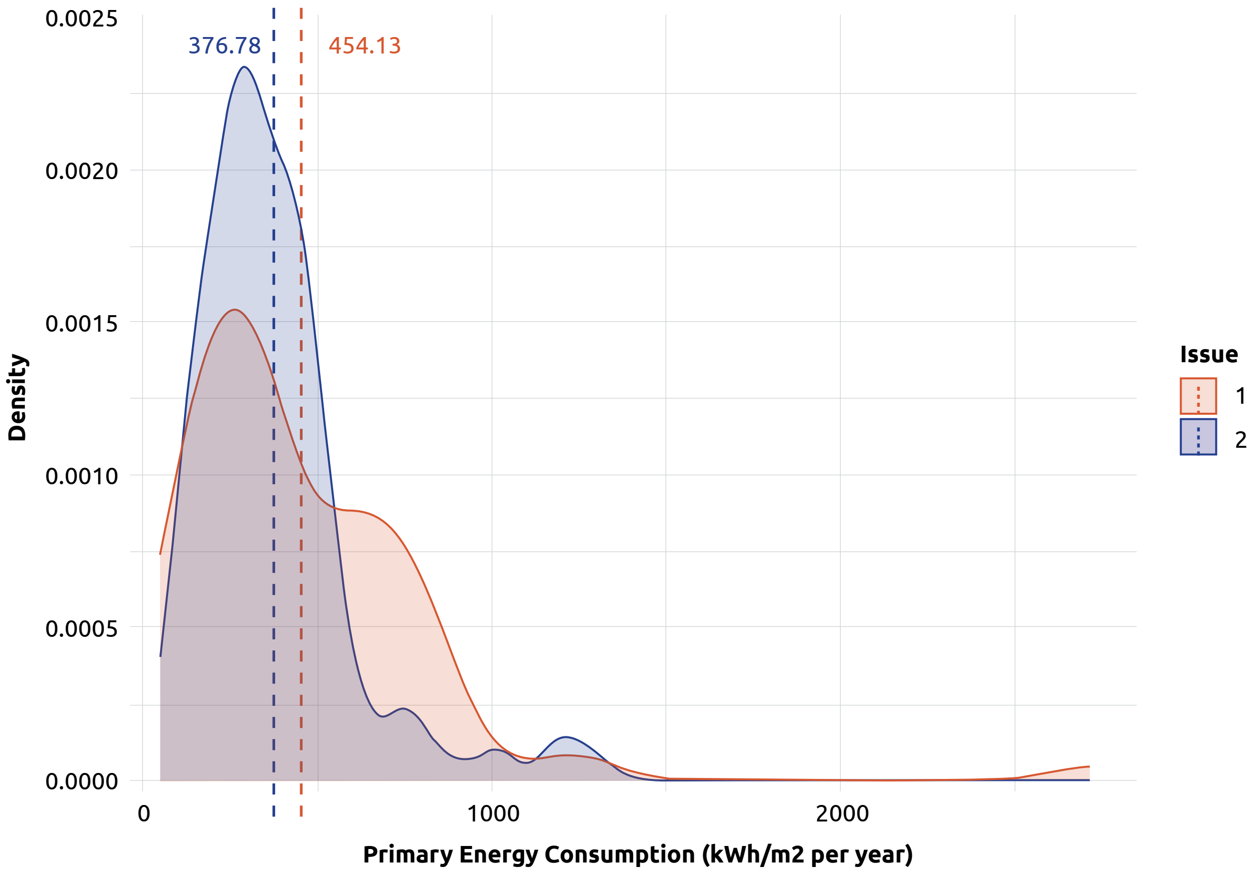


Figure 6 - Comparison of Primary Energy Consumption densities in different issues of EPCs for the same community building.

Size of the building

The relationship between the size of a building (measured by floor area) and its improvement in energy efficiency is complex, as shown in Figure 6. In general, the smaller the building is, the more improvement it will gain in the EPC update, we do not see significant improvement for buildings beyond 600 m^2. This result may be due to it being cheaper to improve the energy efficiency of a smaller building.

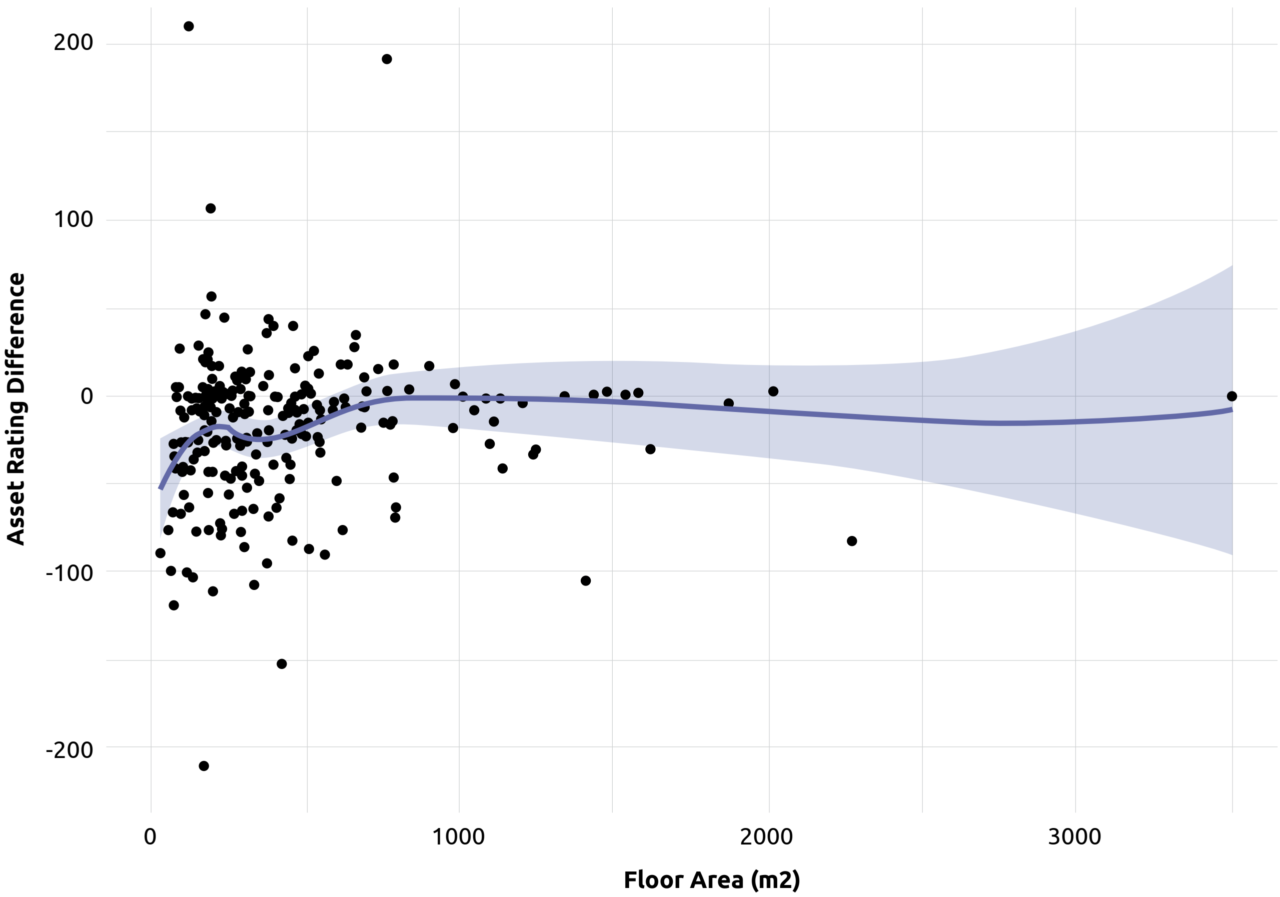


Figure 7 - LOWESS curve of Asset Rating Difference between two issues for the same building against the Floor Area of the building.

EPC recommendations

The table below identifies the common EPC recommendations, including their main headline, the wording of the categorisation, and a final bracket in italics for ease of understanding of what it suggests.

Table 1 - Count rank of EPC recommendations in the original and new EPC.

Rank	Original EPCs	Count	New EPCs	Count
1	Lighting 5 (Consider replacing T8 lamps with retrofit T5 conversion kit) *(Install energy efficient lightbulbs)*	145	Envelope 7 (Identify and treat identified air leakage) *(Draughtproofing)*	143
2	Heating 8 (No heating weather compensation control) *(Add heat controls to adjust temperatures in hot weather)*	136	Lighting 5 (Consider replacing T8 lamps with retrofit T5 conversion kit) *(Install energy efficient lightbulbs)*	138
3	Envelope 7 (Identify and treat identified air leakage) *(Draughtproofing)*	132	Heating 8 (Add weather compensation controls to heating system) *(Add heat controls to adjust temperatures in hot weather)*	131
4	Heating 7 (Add optimum start/stop to the heating system) *(Add heating controls)*	131	Renewable 3 (Consider installing solar water heating) *(Install solar thermal)*	123
5	Lighting 7 (Introduce HF (high frequency) ballasts for fluorescent tubes) *(Improve ballasts in lightbulbs)*	124	Heating 7 (Add optimum start/stop to the heating system) *(Add heating controls)*	116
6	Renewable 3 (Consider installing solar water heating) *(Install solar thermal)*	118	Envelope 5 (Consider installing secondary glazing for windows) *(Install double glazing)*	112
7	Envelope 5 (Consider installing secondary glazing for windows) *(Install double glazing)*	117	Lighting 7 (Introduce HF (high frequency) ballasts for fluorescent tubes) *(Improve ballasts in lightbulbs)*	110
8	Envelope 8 (Replace/improve glazing and/or frames) *(Improve window frames)*	112	Renewable 2 (Consider installing building mounted wind turbine(s)) *(Install a wind turbine)*	106
9	Renewable 2 (Consider installing building mounted wind turbine(s)) *(Install a wind turbine)*	112	Heating 5 (Add local time control to heating system) *(Add timers to central heating system)*	100
10	Heating 5 (Add local time control to heating system) *(Add timers to central heating system)*	111	Envelope 8 (Replace/improve glazing and/or frames) *(Improve window frames)*	95

The average number of recommendations per EPC decreased from 10.61 to 9.55, which shows a general improvement of community buildings. Table 1 shows the most recommended building improvements. While the frequency of most recommendations decreases, they remain at the same scale. The top 10 recommendations are the same recommendations from the old to the new EPCs, just in a slightly different order, indicating that the same areas of improvements are required. Some 'low hanging fruits' like 'Lighting 5', a recommendation to replace low energy efficiency lighting bulbs, are not improved significantly. This indicates that many community buildings can easily improve their energy efficiency with simple actions like changing their lighting bulbs.

Table 2 - Improvement (dropped in the new EPC) of EPC recommendations ranked by percentage.

Recommendation	Improvement	Frequency in the old EPC
Water 4 (Add time control to DHW secondary circulation)	66.67%	6
Lighting 2* (Replace tungsten GLS lamps with CFLs)	50%	74
Heating 3 (Consider replacing heating boiler plant with a condensing type)	50%	58
Heating 1 (Consider replacing heating boiler plant with high efficiency type)	46.15%	26
Lighting 1 (Replace 38mm diameter (T12) fluorescent tubes)	45.45%	33
Heating 4 (It is recommended that the heat generator system be investigated)	37.31%	67
Water 1 (Install more efficient water heater)	35.89%	39
Water 2 (Consider replacing DHW system with point of use system)	35%	20
Overheating (V) 1 (The solar gain limit defined in the NCM is exceeded)	20%	85
Heating 2 (Add time control to heating system)	16.27%	43

Table 2 shows the top 10 most improved recommendations by percentage and indicates that the most improved aspects of the community buildings are very different from the most frequent recommendations. Most improvements come from heat generator-related recommendations (Heating 3, Heating 1, Water 1, Water 2) which are bigger investments with longer payback times, plus Lighting 1 which is the cheapest (shortest payback time) option.

Table 3 - Improvement (dropped in the new EPC) of EPC recommendations ranked by count.

Recommendation	Improvement by count
Lighting 2* (Replace tungsten GLS lamps with CFLs)	37
Heating 3 (Consider replacing heating boiler plant with a condensing type)	29
Heating 4 (It is recommended that the heat generator system be investigated)	25
Overheating(V) 1 (The solar gain limit defined in the NCM is exceeded)	17
Envelope 8 (Replace/improve glazing and/or frames)	17
Lighting 1 (Replace 38mm diameter (T12) fluorescent tubes)	15
Heating 7 (Add optimum start/stop to the heating system)	15
Water 1 (Install more efficient water heater)	14
Lighting 7 (Introduce HF (high frequency) ballasts for fluorescent tubes)	14
Heating 1 (Consider replacing heating boiler plant with high efficiency type)	12

Looking at the improvement by frequency, we can see that the cheapest (Lighting 2) and most expensive (Heating 3) options are still most popular. The drop of Heating 4 indicates the quality of inspections (carried out by EPC assessors) is improving as well, as the new EPC are using less default values.

Conclusion

Community buildings have improved their energy efficiency in the last 15 years, but the scale of improvement is falling behind that of the wider non-domestic sector, with the gap growing in recent years. It is obvious that community buildings need more support to improve energy efficiency. With regulations likely to become tightened in the future, sluggish improvements in energy efficiency expose community buildings to the risk of being forced out of use.

Looking into buildings which have had their EPCs updated, we found that community buildings with initially bad ratings tend to improve more in their new EPCs, while the ones initially rated better tend not to have any improvements. Moreover, smaller buildings tend to have more significant improvements on average, while larger buildings have difficulties improving at all. When it comes to the actual energy consumption, there is a clear reduction on average, but the buildings that have exceptionally high consumption remain a problem.

The decrease in average recommendations in the renewal of EPCs is aligned with the improvements found in the EPC asset ratings. However, the major improvements recommended in EPCs remain the same, indicating more work needs to be done addressing what some may view as simple improvements - inefficient lighting, envelope glazing, heating control, which are still the major concerns of community buildings.

All of this clearly shows that greater support needs to be provided to community buildings as they lack clear improvement strategies and are often not making easy improvements. It also shows the importance of investing in this sector, as the current rate of improvements will not keep the community sector ahead of improving regulations. Importantly, if we want the community sector to avoid experiencing a stranded assets problem and stay afload, this is a priority area of investment.

Appendix

LOWESS curve

The Pearson correlation coefficient is most widely used to assess the global statistical association of two variables, but it is incapable of capturing local variations of relationships. As we want to go beyond a simple linear investigation and study local trends in the patterns in our study, we apply Local Weighted Polynomial Regression, which is a non-parametric regression method that effectively models local trends in the data. This is a standard statistical method applied when the two variables analysed have an unknown relationship and are not expected to have a deterministic relationship that can be described simply via a mathematical function such as linear regression. At each data point, a low-degree polynomial (fitted using weighted least squares) is modelled for a subset of data around the point. As the subset range moves along the data, the algorithm results in a smoothed fitting curve, referred to as LOWESS (locally weighted scatterplot smoothing) curve. As the resulting curve models complex local relationships, it cannot be expressed via any single mathematical formula, making it difficult to summarise.

Energy Performance Certificate Renewal

Code	Trigger	Description	Category	Payback
EPC-C1	Using default cooling efficiency	The default chiller efficiency is chosen. It is recommended that the chiller system be investigated to gain an understanding of its efficiency and possible improvements.	Cooling	3
EPC-C2	Poor/fair cold generator efficiency	Chiller efficiency is low. Consider upgrading chiller plant.	Cooling	3.5
EPC-C3	Poor/fair duct leakage	Ductwork leakage is high. Inspect and seal ductwork.	Cooling	7.5
EPC-W1	Hot water is not provided by the space heating heat generator and poor/fair heat generator efficiency	Install more efficient water heater.	Hot-water	4.15
EPC-W3	Storage heat loss >(default value x 0.9)	Improve insulation on DHW storage.	Hot-water	3.8
EPC-W4	There is secondary HWS circulation and there is no time control	Add time control to DHW secondary circulation.	Hot-water	4.5
EPC-W2	HWS efficiency is poor	Consider replacing DHW system with point of use system.	Hot-water	8
EPC-E1	Any floors have U-value >1.0	Add insulation to the exposed surfaces of floors adjacent to underground, unheated spaces or exterior.	Envelope	15
EPC-E2	Any flat roofs have U-value >1.0	Roof is poorly insulated. Install/improve insulation of roof.	Envelope	25
EPC-E3	Any solid walls have U-value >1.0	Some solid walls are poorly insulated - introduce/improve internal wall insulation.	Envelope	6.5

Code	Trigger	Description	Category	Payback
EPC-E4	Any cavity walls have U-value >1.0	Some walls have uninsulated cavities - introduce cavity wall insulation.	ENVELOPE	3.7
EPC-E5	Any glazing have U-value >3.5	Some windows have high U-values - consider installing secondary glazing.	ENVELOPE	4.6
EPC-E6	Pitched roofs with lofts have U-value >1.0	Some loft spaces are poorly insulated - install/improve insulation.	ENVELOPE	5.6
EPC-E7	Permeability >14	Carry out a pressure test, identify and treat identified air leakage. Enter result in EPC calculation.	ENVELOPE	7
EPC-E8	Any glazing have U-value >3.5	Some glazing is poorly insulated.	ENVELOPE	9.3
EPC-F1	Oil or LPG as fuel	Replace/upgrade glazing and/or frames. Consider switching from oil or LPG to natural gas.	FUEL-SWITCHING	1.08
EPC-F2	Coal as fuel	Consider switching from coal to natural gas.	FUEL-SWITCHING	3.75
EPC-F3	Coal as fuel	Consider switching from oil to LPG or biomass (heating).	FUEL-SWITCHING	3.81
EPC-F4	Oil or LPG as fuel	Consider switching from oil or LPG to biomass (heating).	FUEL-SWITCHING	6.7
EPC-F5	Gas as fuel	Consider switching from gas to biomass.	FUEL-SWITCHING	6.2
EPC-F6	Coal as fuel	Consider switching from coal to oil.	FUEL-SWITCHING	8.4
EPC-H1	Heating system doesn't have centralized time control	Add local time control to heating system.	HEATING	1.8
EPC-H2	Heating system doesn't have room by room time control	Add local room temperature control to the heating system.	HEATING	1.8
EPC-H6	Heating system doesn't have weather compensation controls	Add weather compensation controls to heating system.	HEATING	2.5
EPC-H7	Heating system doesn't have optimum start and stop control	Add optimum start/stop to the heating system.	HEATING	2.3
EPC-H8	Poor heat generator efficiency	Consider replacing heating boiler plant with high efficiency type.	HEATING	2.3
EPC-H3	Poor or fair heat generator efficiency and fuel is gas, oil or LPG	Consider replacing heating boiler plant with a condensing type.	HEATING	6.6
EPC-H4	Using default heating efficiency	It is recommended that the heat generator system be investigated to gain an understanding of its efficiency and possible improvements.	HEATING	3
EPC-L1	Have T12 lamps	Replace 38mm diameter (T12) fluorescent tubes.	LIGHTING	0.6
EPC-L2	Have GLS lamps	Replace tungsten GLS lamps with CFLs. Payback period dependent on hours of use.	LIGHTING	0.85

Code	Trigger	Description	Category	Payback
EPC-L3	Have high-pressure mercury discharge lamps	Replace high-pressure mercury discharge lamps. Payback period dependent on hours of use.	LIGHTING	1.8
EPC-L4	Have GLS lamps	Replace tungsten GLS spotlights with low-voltage tungsten halogen. Payback period dependent on hours of use.	LIGHTING	1.9
EPC-L5	Have T8 lamps	Consider replacing T8 lamps with retrofit T5 conversion kit.	LIGHTING	2.8
EPC-L6	Have high-pressure mercury discharge lamps	Replace high-pressure mercury (SON) lamps.	LIGHTING	3.5
EPC-L7	Fluorescent lamps have mains frequency ballasts	Introduce HF (high frequency) ballasts for fluorescent tubes. Reduced number of fittings required.	LIGHTING	5.7
EPC-V1	Solar gain limit defined in the NCM is exceeded in any zone in the building	In some spaces, the solar gain limit defined in the NCM is exceeded, which might cause overheating. Consider solar control measures such as the application of reflective coating or shading devices to windows.	OVERHEATING	7
EPC-R1	Heating fuel is electricity, and heat generator efficiency <2	Consider installing a ground source heat pump.	RENEWABLES	11.7
EPC-R2	Wind turbine not installed	Consider installing building mounted wind turbine(s).	RENEWABLES	15.9
EPC-R3	Solar thermal water heating not installed	Consider installing solar water heating.	RENEWABLES	20.2
EPC-R4	Photovoltaic system not installed	Consider installing a PV system.	RENEWABLES	44.7
EPC-R5	Heating fuel is electricity, and heat generator efficiency <2	Consider installing an air source heat pump.	RENEWABLES	98

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