Zero Carbon Working Group

Brighton & Hove City Council

Title: Monitoring Energy Performance

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This document has been distributed to:

Name	Version	Date Sent
Housing Supply Programme Board	V1.0	
Housing Supply Member Board	V1.1	

1   Objective

1.1   Monitoring the energy use of our buildings would allow us to calculate the actual carbon emissions and to check whether the building meets the performance estimated during the design phase of the development project.

1.2   We can use this information to:
- feedback into the design of new buildings, improving their energy performance;
- calculate the amount of carbon to offset to reach net zero operational carbon emissions;
- and identify opportunities to improve performance through behaviour change.

1.3   In support of measuring performance and to identify problems with our new build homes, we may also measure, for example: temperature, humidity, and water usage.

1.4   Households which do not manage their ultra-efficient homes correctly could spend more on heating than they need to and see an increase in their energy bills. By monitoring performance, we can identify when this is happening and help residents to manage their property in a way that reduces their bills.

1.5   Publishing our 'in use' data along with information about the building's design is an effective way of supporting the wider industry to improve on other projects.

2   Background and context

2.1   Evidence suggests buildings in general do not perform as well 'in use' as is anticipated and estimated during design. The difference between the anticipated and actual performance of a building is the performance gap.

2.2   It is difficult to determine the reasons that buildings do not always perform as designed. It may be a consequence of the design itself, its construction, the performance of materials or components (or the information provided about them), assessment techniques, or residents not using the building as designed.

2.3   The construction industry recognises buildings underperform and has issued calls to gather data to aid improvement, but currently there is little data out there. As the industry attempts to reduce the carbon emissions of buildings, moving towards zero carbon, this information will be increasingly important.

2.4   The LETI Climate Emergency Design Guide notes: the absence of reliable, independent, trusted data on building performance has led to a situation where the performance of, and emissions from, buildings is broadly unknown. Measuring and reporting real energy consumption means the actual carbon emissions arising from buildings can be calculated and verified during operation, and the effectiveness of the other measures described in this guidance evaluated. With real energy data we can:

- assess progress;
- make building energy consumption visible;
- improve benchmarking and targets for new buildings;
- demonstrate what is possible;
- share successful interventions;
- and speed up change in the sector.

2.5   Officers have concerns about how residents will use their new homes, which require changes in behaviour, such as keeping doors and windows closed, may significantly reduce the performance of ultra-efficient buildings and lead to greatly increased bills.

3   Consultation

3.1   We consulted with colleagues from other Local Authorities who have installed energy measurements systems to ask: whether they have been valuable in monitoring the performance gap between design and in use; if they have been valuable in supporting residents to use their homes efficiently; were the specific systems used fit for purpose, and are there systems to avoid; and to share cost information.

3.2   Crawley Borough Council use three different systems to measure a district heat network and Passivhaus properties. Their Mechanical, Electrical and Energy Efficiency Surveyor reports the systems have been valuable to confirm room temperatures and energy usage, for metering and billing confirmation, and dealing with complaints from tenants. They have also been valuable as means of making sure equipment is operating correctly i.e. backup immersions, timers, and boilers. The preferred system measures energy usage, temperatures, gas usage, and PV generation and Officers are invited to see how the system software works.

3.3   Adur and Worthing Councils use monitoring equipment in some of their new build schemes. They provided an example data report following 8 months of occupancy in two homes. This system monitors heating, room temperature, alarm activations, MVHR (mechanical heat recovery) faults, boiler faults, voltage, and water pressure. The Senior Development Manager noted it is quite expensive to install and monitor the system and the consensus is that it is only worthwhile if there is complete buy-in from the maintenance teams and they can fully use the data.

4   Proposal

4.1   To achieve the highest benefit from monitoring new homes it is best to monitor ultra-efficient buildings rather than those with incremental improvements. The benefits are achieved through monitoring the performance gap (which is more likely with greatly improved fabric efficiency) and the potential need to support residents to keep bills low.

4.2   However, it would be beneficial to understand how the projects currently underway (with incremental improvement) perform to develop baseline data from which we can show improvement, and to deliver net zero carbon homes if considering offsetting emissions.

4.3   To monitor the temperature and energy use of new homes as part of the Moulsecoomb Hub project. This would combine with the proposed Whole Life Carbon Assessment to monitor actual performance against design estimates and in doing so provide comprehensive baseline data. Choosing this project may be cost efficient if only some of the buildings are monitored, with the data gathered extrapolated for the whole development.

4.4   To monitor energy usage, energy generation, and temperature only. Monitoring other systems and variables would incur additional costs and do not meet the main objective. Smart meters and thermostats are currently specified in new homes and monitoring software can be added to these systems. These could also be achieved at no additional cost through households reading and reporting meters directly, but this may be difficult to manage, and households may choose to stop providing information.

4.5   To publish data on our new build homes, supporting the wider industry to improve designs for sustainable buildings. An example of the information which should be reported on a publicly available and open source data platform [not all the below data would be published for other organisations to see] is below:

Information to be reported

ABC	**Property information**	→ Address including postcode
		→ Completion date of building
		→ Building regulations Part L version used
		→ Number of dwellings
		→ Total floor area OR Total useable floor area and the definition used for calculation
		→ Building description and photo
		→ For Display Energy Certificates (DEC)s:
		    → Date of assessment OR Issue date
		    → Certificate reference number

	Building categorisation	→ DEC Category(s) OR Residential use category(s) → Gross internal floor area for each use (from DEC Full Technical Table) → Single defined building OR Number of buildings
	Energy consumption	→ Provided over a bespoke date range and normalised to year by platform → Metered electricity consumption (kWh) → Metered gas consumption** (kWh) → Other fuel consumption** (kWh) → Data source quality
	Heat consumption	→ Only required for projects on district heating, optional for others → Metered heat consumption for building (kWh) → Heat network provider* (Carbon factor will be supplied by the heat network provider)
	Energy generation	→ Provided over a bespoke date range and normalised to year by platform, split between PV and other → Metered electricity generation (kWh)
↔	**Carbon offset**	→ Annual CO_2 emissions that are offset (displaced emissions)*

4.6   To review and plan updated questionnaires to see whether answers can support improving performance. We might want to carry out additional evaluation to measure satisfaction and comfort.

4.7   Carry out additional questionnaires at our previous new homes projects, asking for energy use information. And work with Housing management to gather energy use information for properties where we have communal boilers. This information will give us further baseline data from which to understand the performance gap.

5   Risks

5.1   Monitoring energy usage may be seen by residents as snooping. We must seek their agreement to monitor their properties, possibly as a condition of securing tenancy. To do this a clear and persuasive rationale must be given for monitoring performance, including the benefits of support to keep their bills low.

5.2   Data security is of paramount concern when choosing monitoring systems to use, disclosing data, and handling data. This risk can be managed if considered at each stage of procurement, management and disclosure.

5.3   It will be important to understand a range of options for data monitoring systems to ensure they are affordable and reliable. We would work with our supply chain and take advice from colleagues in other organisations to develop a suitable strategy.

6   Resources

6.1   We will engage with our Construction Partnership to better understand how to implement performance monitoring systems and identify costs over the coming months. A meeting has been arranged in October to introduce and explain the purpose of the Working Group and invite them to support our work by providing their expert knowledge and time in the development of future reports.

6.2   Consultation with the Housing service needs to be undertaken to identify the resource required to monitor these systems, produce reports on performance, and to engage residents to use their homes efficiently.

6.3   A review process will need to be created to examine the data gathered and from this identify if problems with the operation of the building exist, and opportunities for improvement. Training will be required to be able to best interpret the information and make suggestions for improvement.

6.4   We need to identify a publicly available and open source data platform on which to publish data about our new homes.