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Building performance evaluation and certification in the UK: is SAP fit for purpose?

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There is now overwheliming evidence from extant literature that some of the largest potential for emissions reductions are from buildings. Moreover, buildings offer some of the lowest cost opportunities for CO2 mitigation. Building Performance Evaluation and Certification (BPEC) procedures are thus vital for estimating and recommending cost effective improvements to buildings for lowering emissions and meeting future energy and climate change targets. This paper crititiques existing BPEC procedures and offers vital recomendations for improving the present system to improve the speed and extent of energy efficiency deployment in the UK building stock.

In the UK, building performance is estimated using the Standard Assessment Procedure (SAP) for new dwellings and Reduced SAP (RdSAP) for existing dwellings. The energy performance estimations produced by these tools are then used on Energy Performance Certificates (EPCs) which are required every time a building is sold or leased. The objective of this paper is to identify what characteristics and properties of the present system are working well, and what factors may lead to larger and more rapid improvement in efficiency and CO2 mitigation of the building stock.

We suggest the present use of BPEC tools such as BREDEM (Building Research Establishment Domestic Energy Model) SAP and RdSAP are legacy tools that are the result of historical lock-in and are therefore not fit-for-purpose for existing policy objectives. SAP estimates of building energy consumption are shown to have a weak correlation with actual energy consumption and thus its value in identifying energy efficiency options for buildings is greatly reduced. Furthermore, the BREDEM model that underpins both SAP and RdSAP has never been validated against a robust sample of heterogenous UK dwellings spanning any meaningful geographic-

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climatic region. Importantly, despite popular belief, SAP does not estimate building energy efficiency, but instead attempts to estimate cost-effective performance. This introduces perverse incentives that encourage building occupiers to switch to low cost-fuels such coal in order to improve a buildings SAP value but at the same time does not lead to a reduction in either energy consumption or CO2 emissions. Inconsistencies in the SAP calculation procedures allow renewable micro-electricity generation to deducted off the buildings estimated final energy consumption, but this treatment is not extended to renewable heat production which still negaitively impacts SAP rates. This inconsistency in SAP procedures benefits wealthy households that can afford to negate energy consumption with expensive micro-electricity generation technologies.

The role of EPCs for removing asymmetrical imformation between sellers and buyers of properties as well as recomending cost-effective building improvements is well documented. Since 2009, every member state of the EU was reuqired to implement their own BPEC system for meeting compliance with the European Performance of Buildings Directive (EPBD). The energy rating of dwellings needs to be made explicit at the earliest stages of the leasing and buying process. Certificates need to be clear and well trusted by existing owners as well as new tenants, or their effectiveness as a policy instrument is reduced. At present recommendations on an EPC for improving building performance are based on estimated energy consumption and crude assumptions about the future price of different fuels. Including actual energy consumption data on the EPC will act as a reality check against which calculated energy performance can be compared. Using metered energy consumption data, for cost-effective efficiency recommendations (instead of estimated performance) will improve the accuracy of estimating the cost of energy saving technologies.

In the UK, as SAP is given on a scale ranging from 0-100 with no evident link to physical measures of performance, there is no relevant feedback to the user about what this means in terms of their relative energy consumption or emissions and how this may compare to other dwellings of a similar building type. Many MS in Europe have therefore opted to retain the original energy units on EPCs (i.e. in kWh/m2) so that occupiers of dwellings are encouraged to think about energy consumption in original units, therefore increasing awareness and perhaps changing energy practices.

It is argued that SAP and RdSAP confound cost-effectiveness, energy efficiency, environmental performance and GHG emissions adding

unnecessary complexity and confusion to the SAP calculation procedure. As a result it is not clear which of the many national policy aims – reducing fuel poverty, increasing energy efficiency, decreasing overall energy use, or reducing carbon emissions – is being captured by the various performance measures. This then leads to confusion and disconnect between performance measures, policy instruments and policy objectives. As it stands policy instruments are used haphazardly to meet multiple policy objectives. Unfortunately this approach leads unpredictable and possibly ineffectual outcomes. Redesigning BPEC tools so that they target specific policy objectives may lead to more cohesive and productive outcomes. For example, an EPC would contain separate indicators for energy consumption (kWh/m2), CO2 emissions (kgCO2 /m2), and energy costs (£/dwelling). Matching measurements with policy objectives reduces confusion and may improve the effectiveness of policy instruments. If required, an additional aggregate indicator that transparently combines each of the three sub-indicators could then be used to assess the overall performance of a dwelling against a combined set of policy objectives.

There is also a clear need for more detailed information about the building stock to be made available at the dwelling level to be made available for research purposes. These data will allow comparison of estimated and actual performance of buildings, enhancing confidence that such performance measures are useful in identifying the most cost-effective strategies for energy and carbon reduction. Such a statistical database will allow a set of criteria to be established so that buildings can be benchmarked against buildings of the same type. It will also allow researchers to monitor the progress being made in the transformation of the buildings sector.

In conclusion, SAP, RdSAP and EPCs are critical for the transformation to a zero-carbon building stock. It is important that these indicators accurately measure building performance, and that the measurements directly relate to policy objectives. This requires calculation procedures that are robustly validated; standards that measure and compare the right factors; EPCs that are understandable and reliable and drive decision making; and finally, a system of data gathering and research methods that provide feedback into understanding and transforming the efficiency of the building stock.

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