

Energy performance of existing buildings: Overcoming the technical difficulties

The energy certificate: a useful guide to energy performance improvements? The German experience

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The major concern of building owners, who need an energy certificate, is how to measure the amount of energy consumed in (not by) the building. Even though this is mostly influenced by the users of the property – the tenants or the owners themselves – depending on the temperature they choose to live in, many experts recommend a “calculation” and grading of buildings comparable to fridges or light bulbs. The effect of this lobbying is obvious when you take a look at the latest EPBD update, Art 2: Until now this allows to establish the amount of energy used by or in a building by “consumption” or “estimation”. The update changes this to either “calculation” or “measuring”.

But will this help the building owner to find out more about the energy consumption of the building? Will this help to reduce the energy consumption and the carbon footprint? Will the owner be better informed on how to modernize the building properly?

Germany today grants the option to set up energy certificates based on the energy consumption based on the EPBD. It gives an index to the owner. But it is challenged by specialists, experts and the tenant’s organisation as not useful at all, because they prefer to have a calculated version.

To find out if this is better, the United German Property Unions (BSI) made a simple test. The BSI asked to building owners to order energy certificates for their buildings from certified energy inspectors of the DENA – the German Energy Agency. These inspectors are qualified higher than demanded by the law: They must be either long-term craftsmen with specialist diplomas or engineers and architects with university degrees.

Building no 1 was an 8-unit house, 534sqm large, build approx. 1900, with a new central heating and new central hot water installed in 2004, using gas as energy. Seven different inspectors were asked to issue an energy certificate. What did the owner get?

First target for the experts was to calculate the primary energy demand **reference**. This is the primary energy demand in relation to the usable building space. The reference calculated varies according to the experts in between 132 and 212 kilowatt hour / sq m. Accordingly the certificates were issued with very different results: from an acceptable “C” to a deterrent “E”. The top value is a 160% of the lowest value!

Looking at the calculated primary energy demand and the calculated usable building space it becomes clear, why the calculations differ: The lowest primary energy demand has been calculated at 113 kw/h, the highest at 171 kw/h. And the usable building space has been measured by the experts in between 629sqm (minimum result) and 906sqm (maximum result). This is a difference of 277sqm – in an 8 unit building only – or a surprising 44%. It shows that the major challenge is not the act of calculation, but getting the right data for each individual building. This is **the unsolved problem** for all “calculated” certificates. By the way, the only aspect all certificates have in common is, they do not reveal, how both the primary energy demand and the usable building space are calculated.

Consequently the calculated demand for heating power differed, the carbon footprint calculated in the certificate is varying like the footprints of mice and elephants, as well as the suggestions, how to improve the building:

- Some suggested insulating the walls on top of the existing insulation.
- Mostly the insulation of the top and the lowest floor were suggested, but again with strong differences, this time concerning the amount of insulation material needed: It varied in between 5 and 30 cm!
- And of course, all other possible modernization suggestions were given at least once but never twice: new windows, heating for the staircase, solar energy, even a new heating – the old one being three years in use only.

Building no 2 was a one family home, 125sqm large, build in 1971, with a new central heating and central hot water boiler installed in 2003. The energy used is gas. Three inspectors were asked to issue a certificate. What did the owner get?

The primary energy demand **reference** varies according to the experts in between 166 and 256 kilowatt hour / sq m and accordingly the certificates were issued with different results from a “C” to an “E”. The top value is a 153% of the lowest value. The primary energy demand has been calculated with 29 kw/h (minimum value) and 35 kw/h (top value) and the usable building space in between 123sqm (minimum) and 211sqm (maximum). This is a difference of 88sqm in a one family home. Again it is shows: not the act of calculation, but getting the right data is the problem.

The results for the one family home are even more disappointing, because the building was easy to certify. The building was perfectly maintained and all materials used were known. The experts were given plans, which were presenting accurately the existing building. So this was one of the rare buildings, which was not only built according to the plan, but the plans were also updated during modernisation.

The last surprise for the owners was the inspectors' bills! The energy certificates issued were priced – in 7 different ways – in between 240 and 1.070 Euros for the 8-unit building and the certificates for the one family home were priced – in 3 different ways – between 232 and 414 Euros! In both cases the money for the most expensive certificate would have been enough to insulate the top floor of the buildings!

The German experience on the energy certificate, seems to be a bitter one. Therefore calculated certificates themselves are not of sustainable use. Our conclusion is that certificates give little help, resulting from covering the correct building data, but they cost money, which should have rather been invested into the modernisation of the building itself. An expensive certificate alone simply turns out to be a waste of money. The right, the true investment of the owner, is the cost for the improving works in the buildings, and this is where the experts' opinion is useful!