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COMPARISON OF NEARLY ZERO-ENERGY BUILDINGS (NZEBS) – ENERGY PERFORMANCE DEFINITIONS ACROSS EU-COUNTRIES

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Motivation

The building sector has been identified as one of the key sector to achieve the energy and climate policy targets of the EU. The recast of the Energy Performance of Buildings Directive 2010/31/EU (EPBD), an important legislative instrument at EU level for improving the energy efficiency of European buildings has been adopted. A decisive mechanism of the EPBD, especially for achieving these longer term objectives, is its requirements regarding Nearly Zero-Energy Buildings (NZEBs). Nearly zero-energy building means a building that has a very high energy performance, which according to its definition: ”shall be determined on the basis of the calculated or actual annual energy that is consumed in order to meet the different needs associated with its typical use and shall reflect the heating energy needs and cooling energy needs (energy needed to avoid overheating) to maintain the envisaged temperature conditions of the building, and domestic hot water needs.” Detailed application of the nZEB shall be included in the national plans by specifying: a very high energy performance of the building; a very low amount of required energy by the building and a numerical indicator of primary energy in kWh/m²a. Furthermore, they should contain a very significant contribution of renewable energy to cover the remaining energy use.

Research question

In this context, this paper aims to analyse how do definitions of Nearly Zero-Energy Buildings (NZEBs) differ between EU Member States according to their national plans for nearly zero energy buildings. For this purpose, five countries were selected: Austria, Germany, Spain, England and Portugal. The results of this analysis should contribute to understand the differences and – if required – reducing the gap between national nZEB definitions and therefore future new building standards across EU, of course taking into consideration climatic and other differences.

Methodology

The methodological approach is based on three steps: first, reference buildings from each country (single family and multi-family houses) were defined according to the TABULA EU-building typology database, which delivers information about building geometry, building envelope and installations (heating, cooling and ventilation systems). Second, the energy efficiency of the reference buildings was assessed by applying a MATLAB Model, which enables the monthly calculation of energy need, delivered energy and primary energy demand (based on the calculation methodologies specified on the DIN V 18599). Finally, national nZEB definitions were applied to the reference building in order to provide a cross-country comparison.

Results and Conclusions

Results showed that primary energy consumption [kWh/m²a], set as main energy indicator by the Directive 201/31/EU might not be the most appropriate indicator to be applied to an EU cross country comparison. Moreover, nZEB definitions based on the following two measures; (1) the set of an absolute value for the maximum energy need for heating and cooling in [kWh/m²a] with a correction factor depending on the climate zone at EU level and; (2) the set of a relative maximum value [%] for the primary energy consumption in regard to a reference building could be more supportive for building designers and project planers and encouraging to comply with nZEB standard definitions. This approach could also provide an even standard between the EU countries.

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