31.3.2022
Built Environment and Bioeconomy

Tampere University of Applied Sciences feedback for the revision of the Energy Performance of Buildings Directive

Tampere University of Applied Sciences welcomes the new proposal of the Energy Performance of Buildings Directive and appreciates the opportunity to provide feedback. Tampere University of Applied Sciences located in Tampere, Finland, is a professional higher education institution oriented towards working life and RDI co-operation. Our strengths are multidisciplinary education, creativity, and a strong international profile. Tampere University of Applied Sciences and Tampere University form together the Tampere Universities community. Together we are building a new model for higher education and research in Finland.

The zero-emission building stock target and the phase out goal of fossil fuels, which is the basis for the proposed amendment to the directive, have become increasingly important during the last few months. The energy revolution electrifies the energy solutions of the entire building stock, in which electric vehicles recharging forms one important component. Improving energy efficiency and reducing the need for heating energy is the basis for the energy revolution in buildings. In this case, most of the needs for the usability and functionality of the building will be covered with solutions based on renewable electricity.

In the future, the public electric power distribution network will still be needed in almost all buildings. The location and energy demand of buildings play a major role in what other regional energy distribution systems in general should be built and maintained in buildings, for example because of the heating required for a few months of a year.

Legislation should be based more on the features of electrical system. The effects of the production and use of electricity, especially when it is affected by climatic conditions in different locations, cannot be considered in the same way as combustion-based energy production solutions. Electricity is a very efficient way of transferring energy, and it is easy to measure and control, but the effects of usage must be seen in

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terms of the profile and timing of use. The use of electricity also contributes to the profitability and implementation of structural energy efficiency measures due to the relatively high energy price. On the other hand, electricity pricing can encourage more widespread consumer flexibility solutions and services. The requirements should consider the geographical constraints, especially northern locations of EU, where the greatest energy demand occurs during the coldest and darkest times of the year and where the implementation of structural and technical energy efficiency measures is challenging.

In the following sections, we would like to bring attention to some key aspects of the proposed revision.

2. Feedback for the proposal, direct quotations from the proposal in italics

2.1 Zero-emission building and energy systems

Article 2, Definitions

2. 'zero-emission building' means a building with a very high energy performance, as determined in accordance with Annex I, where the very low amount of energy still required is fully covered by energy from renewable sources generated on-site, from a renewable energy community within the meaning of Directive (EU) 2018/2001 [amended RED] or from a district heating and cooling system, in accordance with the requirements set out in Annex III

ANNEX III, I. Requirements for zero-emission buildings
The total annual primary energy use of a new or renovated zero-emission building shall be fully covered, ***on a net annual basis****, by*

- *energy from renewable sources generated on-site and fulfilling the criteria of Article 7 of Directive (EU) 2018/2001 [amended RED],*

- *renewable energy provided from a renewable energy community within the meaning of Article 22 of Directive (EU) 2018/2001 [amended RED], or*

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- *renewable energy and waste heat from an efficient district heating and cooling system in accordance with Article (24(1) of Directive (EU) …/… [recast EED].*

A zero-emission building shall not cause any on-site carbon emissions from fossil fuels.

*Only where, due to the nature of the building or lack of access to renewable energy communities or eligible district heating and cooling systems, **it is technically not feasible to fulfil the requirements** under the first paragraph, **the total annual primary energy use may also be covered by energy from the grid complying with criteria established at national level.***

The definition of an emission-free building (Article 2 + ANNEX III) is very difficult to meet in Finland. In addition, one fixed specific consumption value for the whole country is not functional and does not describe the emissions caused by the production of the required energy at the time of consumption. From the geographical and climate point of view, for example the need for heating energy in the northern parts of Finland is almost 1.5 times higher than in the southern parts. In addition, in a sparsely populated country, it is not technically feasible to build district heating systems outside urban areas.

Annual primary energy in a situation where energy production is not based on combustion, does not give a true picture of the emissions or impacts of different solutions. For example, regarding the heat pump systems, suitability of primary energy analysis is limited for estimating the effects of system in carbon emissions. Solutions based on heat pumps, especially in cold conditions, must include non-linear power requirements and additional heating that cannot be met by local production. Primary energy should therefore at least be calculated separately at different times of the year.

Heat pumps reduce buildings' annual energy consumption and are very cost-efficient for building owners, but the most cost-efficient solution (EE1 principle) for the building owner is not the best for the energy system. The problem is that heat pumps' capacity is usually inadequate to meet the max. heating demand of the building and during the coldest days additional heating is produced by some other heat source (typically electric top-up heaters in the hot water tank). When the energy consumption in the coldest days is already high, cost-efficiently sized

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31.3.2022
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heat pump systems increase the grid power demand and consequently emissions, but the effect in primary energy analysis is only modest. For example, ground-source heat pump delivering only 60 % of heating demand will still produce 95% of total annual heating energy. In addition, with air-to-water heat pumps the situation is even more challenging – in the coldest days in Finland, air-to-water heat pumps are switched off and buildings are 100% direct electric heated.

Location of the building and heating solution should be taken into account. For example, in Finland air temperature and soil conditions vary significantly in different parts of the country, and as a result applicability of different heating systems and especially heat pumps vary a lot.

The definition of zero-emission building also seems to relate mainly to the heating energy demand and not to the total energy demand of the building. In accordance with the principle of energy efficiency first, buildings should be built and renovated to require little actual space heating energy. In this case, other use of energy will play an increasingly important role. This use is mainly electricity-based and converts into "free heat" for space heating.

Article 2, Definitions

49. 'energy from renewable sources produced nearby' means energy from renewable sources ***produced within a local or district level perimeter of the building assessed****, which fulfils all the following conditions:*

(a) it can only be distributed and used ***within that local and district level perimeter through a dedicated distribution network****;*

(b) it allows for the calculation of a specific primary energy factor valid only for the energy from renewable sources produced within that local or district level perimeter; and

(c) it can be used on-site of the building assessed ***through a dedicated connection*** *to the energy production source, that dedicated connection requiring specific equipment for the safe supply and metering of energy for self-use of the building assessed;*

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The requirement, that the energy produced within a local or district level perimeter must be supplied through a dedicated distribution network or through a dedicated connection does not support the targets of resource efficiency. Energy produced on a district level or remotely can be verified by smart metering and there is a general economic justification for using the distribution system, especially for the public electric power distribution network, that is necessary to build on the property in any case. In addition, the recharging infrastructure of an electric car (Article 12) requires investment in a strong electricity grid, so it would make sense to make the most out of it. The use of the integrated electricity grid also enables intelligent controls, efficient and versatile energy storage and versatile utilization of the energy produced.

Article 2, Definitions

57. 'exported energy' means, expressed per energy carrier and per primary energy factor, the proportion of the renewable energy that is exported to the energy grid instead of being used on site for self-use or for other on-site uses.

The role of renewable electricity should be equated with the electricity produced in "renewable energy community", regardless of where it is produced. In the proposal, role of renewable energy produced and exported elsewhere as part of buildings' energy efficiency measures remains unclear. Exported energy should be considered in the energy efficiency measures, as it creates possibilities for the local energy production in the areas and building sites which are the most optimal for renewable energy production.

Article 2, Definitions

10. 'non-renewable primary energy factor' means non-renewable primary energy for a given energy carrier, including the delivered energy and the calculated energy overheads of delivery to the points of use, divided by the delivered energy;

11. 'renewable primary energy factor' means renewable primary energy from an on-site, nearby or distant energy source that is delivered via a given energy carrier, including the delivered energy and the calculated

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31.3.2022
Built Environment and Bioeconomy

energy overheads of delivery to the points of use, divided by the delivered energy;

12. 'total primary energy factor' means the weighted sum of renewable and non-renewable primary energy factors for a given energy carrier;

It is questionable, what is the role of the "energy carrier"? Why should primary energy coming from different energy carriers be treated differently during the electric decade? For example, does such regulation promote the conversion of solar electricity into heat before it is distributed into a property and building?

The definition of primary energy should not encourage unnecessary energy conversions, such as converting electricity into heat outside buildings, but should encourage the use of the most efficient clean energy transmission methods. Electricity should be seen at least as equivalent to district heating and, in fact, as a much more versatile form of energy transmission, for which, in any case, a public distribution network will be built and maintained in sparsely populated areas also.

Article 12, Infrastructure for sustainable mobility

4. …Member States shall ensure that ***the pre-cabling is dimensioned to enable the simultaneous use of recharging points on all parking spaces****. Where, in the case of major renovation, ensuring two bicycle parking spaces for every dwelling is not feasible, Member States shall ensure as many bicycle parking spaces as appropriate.*

Article 16, Energy performance certificates

1. Member States shall lay down the necessary measures to establish a system of certification of the energy performance of buildings. The energy performance certificate shall include the energy performance of a building expressed by a numeric indicator of primary energy use in kWh/(m2.y), and reference values such as minimum energy performance requirements, minimum energy performance standards, nearly zero-energy building requirements and zero-emission building requirements, in order to make it possible for owners or tenants of the building or building unit to compare and assess its energy performance.

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The directive should encourage holistic power planning and management in buildings and its communication with the energy system in order to 1) ensure a reliable energy system for the future and 2) to promote the spread of energy communities.

A new, holistic approach would require coordination between energy performance measures of the building, recharging requirements of electric vehicles in the building and control and automation requirements in the building.

The energy performance certificate should express the actual energy use and its effects in emissions. It should consider the buildings' timing of the energy use, the power behavior, and the flexibility and controllability of consumption (demand response). Controllability should be considered for both, external and the internal power management needs of the property. In addition, it is important to note, that the planning that considers the power demand of technical building systems and equipment is the primary way to control the power behavior of buildings. Demand response is always a secondary and, on many occasions, limited way to manage power, as demand response cannot override the healthy and safe indoor conditions maintained in a building, for example.

2.2 Challenges of the proposed actions

Timeline for some of the proposed implementations is challenging from the point of view of the experts and actors required to implement the tasks and actions. Shortening the period for energy efficiency calculation and energy performance certification from 10 to 5 years will require an update of the knowledge of existing experts and training of new experts in significant numbers. Proposal also identifies the new renovation passport expert (Article 10). This action itself and training of experts also requires time, resources and new people in the field of industry. Currently there is already a shortage of experts (designers, contractors, energy performance certifiers, etc.) both in growth centers due to intensive construction and renovation and in sparsely populated areas for opposite reasons. Additional work caused by the proposed actions

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31.3.2022
Built Environment and Bioeconomy

shifts experts away from the actual design and implementation of renovation measures, and certificates and passports themselves do not improve the energy efficiency of the buildings. Consequently, the actual lack of experts will lead to inappropriate solutions and sub-optimizations.

The preparation and maintenance of energy performance certificates and renovation passports should be developed in an automated direction, especially for old buildings. Energy efficiency improvement measures should be recorded during the renovation measures and at the same time the energy performance certificate should be updated without the need for a separate energy performance certificate process. In addition, energy performance calculation tools and the input data used in them, for example in terms of equipment performance, should be verified.

Article 9, Minimum energy performance standards

1. Member States shall ensure that
(a) buildings and building units owned by public bodies achieve at the latest

> *(i) after 1 January 2027, at least energy performance class F; and*
>
> *(ii) after 1 January 2030, at least energy performance class E;*

(b) non-residential buildings and building units, other than those owned by public bodies, achieve at the latest

> *(i) after 1 January 2027, at least energy performance class F; and*
>
> *(ii) after 1 January 2030, at least energy performance class E;*

(c) residential buildings and building units achieve at the latest

> *(i) after 1 January 2030, at least energy performance class F; and*
>
> *(ii) after 1 January 2033, at least energy performance class E;*

In their roadmap referred to in Article 3(1)(b), Member States shall establish specific timelines for the buildings referred to in this paragraph to achieve higher energy performance classes by 2040 and 2050, in line with the pathway for transforming the national building stock into zero-emission buildings.

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Built Environment and Bioeconomy

Article 16, Energy performance certificates

2. By 31 December 2025 at the latest, the energy performance certificate shall comply with the template in Annex V. It shall specify the energy performance class of the building, on a closed scale using only letters from A to G. The letter A shall correspond to zero-emission buildings as defined in Article 2, point (2) and the letter G shall correspond to the 15% worst-performing buildings in the national building stock at the time of the introduction of the scale. Member States shall ensure that the remaining classes (B to F) have an even bandwidth distribution of energy performance indicators among the energy performance classes. Member States shall ensure a common visual identity for energy performance certificates on their territory.

Article 9 proposes new energy efficiency class G buildings to be upgraded to a new class F by 2030. This is not appropriate for buildings that are completely or partially empty or that are about to be emptied in the near future. A significant part of Finland's' residential building stock in the new energy efficiency class G 2025 is located in declining areas. This means that the value of the building is reducing and that only 50% of the value of the building is obtained. In this case, the bank loan cannot be used to renovate the entire building. Some of the buildings will be demolished before 2035, when their deep renovation will not make economic sense in the 2022-2030 period. However, some buildings need to be maintained so that they are healthy and safe to live in before being demolished.

In conclusion, it is unlikely that the building stock of the new energy efficiency class G in Finland as a whole will be upgraded by class F by 1.1.2030 or by class E by 1.1.2033.

Article 6, Calculation of cost-optimal levels of minimum energy performance requirements

It is important to note that in the long run, cost optimality is associated with high uncertainties due to uncertainties related to energy prices, changes in price structures (e.g. power-based tariffs) and regional differences even within a single country.

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