EPBD 2021 REVISION

INITIAL EU.BAC SUGGESTIONS

eu.bac welcomes the 2021 revision of the Energy Performance of Buildings Directive, which has become necessary in light of the increased ambition agreed in the Renovation Wave. To meet EU climate targets and fully decarbonise the building stock by 2050, stronger measures must be put in place at the European level. In this paper, we provide our initial suggestions. We have structured our suggestions in 6 chapters, each containing specific policy recommendations:

1. Implementation of the revised EPBD first
2. Digitalization as the driving force of the renovation wave
3. Decarbonisation and energy efficiency: defining the indicators for successful building policies
4. Filling the gaps on the basics: dynamic hydronic balancing, self-regulating devices and solar shading
5. Harmonization and synergies between different legislation at the EU and national level
6. Indoor environmental quality

1. IMPLEMENTATION OF THE REVISED EPBD FIRST

While new measures are needed to address new challenges and pursue greater goals, before discussing any new policies we believe that the existing policies should be properly implemented. Unfortunately, this is not the case concerning the EPBD revision, as approved in 2018. Even though the deadline for transposition expired on 10th March 2020, many Member States have still not fully implemented this legislation. This results in uncertainty for investors and professionals who are left to find their way through measures that are already approved at the European level but still waiting to be implemented at the national level, with many details and parameters still to be defined. As an example, all non-residential buildings, existing and new, with an effective rated output > 290kW, will have to be equipped with certain BACS capabilities by 2025. Some Member States did not implement this measure at all, while others implemented it but without providing any "clearly identified, framed and justified"[1] parameters for defining feasibility nor specifying how to identify whether a BACS can implement the capabilities required by the Directive[2]. According to the Waide Study on the "Impact of the Revision of the EPBD on energy savings from the use of building automation and controls", if implemented properly, only the BACS measures approved in the revised EPBD (in articles 8, 14 and 15) would lead to savings corresponding to 14% of the total building energy consumption, with 64 Mt CO2 annual savings and €36 billion energy bill savings triggered. As eu.bac, following our guidelines and the previously mentioned Waide study, we continue to provide our support to the Member States by providing further guidance and expertise: in November 2020 we released the eu.bac Compliance Verification Checklist[3], to support the implementation of the above-mentioned measures. We urge the European Commission to ensure full implementation of the Directive in the Member States, putting in place all the necessary initiatives as soon as possible.

[1] COMMISSION RECOMMENDATION (EU) 2019/1019 of 7 June 2019 on building modernisation (paragraph 2.3.4, page 23)
[2] An exception is represented by France, which has successfully implemented the art.14/15 par.4 in 2020, setting up a requirement for BACS deployment to be considered as economically feasible when the return on investment is below six years
[3] eu.bac EPBD BACS Compliance Verification Package as an annex to the eu.bac guidelines for the transposition of the new EPBD in Member States

Recommendation: Speed up and facilitate the proper transposition of the revised EPBD in the Member States, ensuring full implementation of the measures by setting up all the necessary initiatives towards the Member States.

Supporting material: eu.bac guidelines for the transposition of the new EPBD in Member States with the Annex: eu.bac Compliance Verification Package, Waide Study on the Impact of the Revision of the EPBD on energy savings from the use of building automation and controls,

2. DIGITALIZATION: THE DRIVING FORCE OF THE RENOVATION WAVE

Most of the potential of digitalization is still unexploited in the EU building sector. The 2018 EPBD revision took the first step in the right direction and this review should continue where we left off. Readily available, cost-effective smart technologies should be deployed on a large scale, making the building stock future-proof and preparing it to play an active role in smart integrated energy systems. Demand response to maintain indoor environmental quality while interacting with the (electricity as well as heating) grid, consumption prediction, management of energy storage and generation from renewable sources (e.g. solar roof-top PV) are some examples of "smart functions" strongly connected to an optimal functioning building. Building automation and control systems can integrate and optimize these functions, enabling building managers to have real-time access to cloud-based analytics, reporting and services, allowing for informed decision making.

Recommendation: Use the review of the EPBD, as well as the national recovery funding programs, to accelerate the roll-out of digital solutions in buildings in line with *the Renovation Wave* and the *Energy System Integration Strategy*

SMART READINESS INDICATOR

eu.bac has been very supportive of the work carried out on the development of the Smart Readiness Indicator since 2018. With the implementing and delegated regulations approved, it is now time to accelerate the SRI adoption at the Member States level, creating new initiatives so that the efforts bear fruit. In addition to this, it is of utmost importance to explore synergies between SRI and EPCs. For example, the SRI score could be integrated into the EPC.

Recommendation: support wide adoption of the SRI and integrate it, where possible, in the EPC and other current and upcoming building certificates (e.g. Digital Building Logbook)

Recommendation: Ensure that all Member States start at least the testing phase, for example by sponsoring one public building of the same type in each country. This could be a lighthouse renovation project in the context of the Renovation Wave.

ENERGY PERFORMANCE CERTIFICATE

The periodic "inspection-only" approach is outdated. Buildings need ongoing supervision/monitoring, delivered digitally through modern technologies already available on the market such as BACS. Where installed (by law – in conformance with the revised EPBD, from 2025, in all large non-residential buildings), these technologies could therefore provide real-time, accurate data. A common standardised data template could be developed to identify which data could be provided digitally[4].

Recommendation: Make sure that the new EPCs make full use of smart technologies already available. Include and display measured annual energy performance in the EPC.

BACS REQUIREMENTS IN THE RESIDENTIAL SECTOR

Despite the significant potential, no Member State has decided to implement measures adopting BACS capabilities in the residential sector. With the increased ambition to renovate the building stock, more

[4] The eu.bac Compliance Verification Package provides further information on the BACS capabilities.

should be done in the residential sector. This is even more true considering that the existing barriers have not been overcome yet, such as split incentives between building owners and tenants.
The current voluntary requirements ex art. 14/15, par. 5 on continuous monitoring and effective control should therefore become **mandatory for residential buildings** with an effective rated output of > 70kW, in line with the provisions on physical inspections of heating and air-conditioning systems.

Furthermore, the existing capabilities could be complemented with:

- interoperability between different domains/TBS: heating, cooling, ventilation, lighting, DHW, solar shading…
- provision on flexibility services / demand-response / interaction with grid
- remote access to data (for building owner/manager) and end-consumer/tenant, e.g. from an application on a mobile phone / pc
- remote control of energy performance e.g. from an application on a mobile phone / pc

The implementation of these recommendations would make sure that the new buildings and, especially, those that are being renovated are future-proof and healthy ensuring savings while reducing CO2.

Recommendation: Establish minimum requirements to equip residential buildings with continuous monitoring and effective control functionalities, complementing them with the additional capabilities mentioned above.

EXTENDED BACS REQUIREMENTS IN THE NON-RESIDENTIAL SECTOR

In terms of the scope of buildings covered by these requirements, it is important to keep consistency: all non-residential buildings with an effective rated output of > 70kW should be equipped with BACS functionalities, in line with the provisions on physical inspections of heating and air-conditioning systems. In view of the ambitious EU climate objectives for a green and digital transition, the urgency of this transition in the building stock and the slow transposition experience, the building automation requirements should be extended and strengthened now.

Recommendation: Extend the existing minimum requirements under art.14/15 par. 4[5] to all non-residential buildings with an effective rated output of > 70kW.

MINIMUM ENERGY PERFORMANCE STANDARDS (MEPS)

eu.bac supports the establishment of these requirements as they have proven to be effective and useful where implemented. Together with aspects related to decarbonisation and energy efficiency (see paragraph below), these measures should include some minimum requirements for digitalisation to support the transition to smart buildings.

Once a renovation is complete (whether deep or staged deep), the building is expected to last for several years without further interventions. This is one more reason to make the most of the intervention and to require a minimum level of "smartness" that must be available in the building when

[5] Member States shall lay down requirements to ensure that, where technically and economically feasible, non-residential buildings with an effective rated output for heating systems or systems for combined space heating and ventilation of over 290kW are equipped with building automation and control systems by 2025. The building automation and control systems shall be capable of:
A. continuously monitoring, logging, analysing and allowing for adjusting energy usage;
B. benchmarking the building's energy efficiency, detecting losses in efficiency of technical building systems, and informing the person responsible for the facilities or technical building management about opportunities for energy efficiency improvement;
C. allowing communication with connected technical building systems and other appliances inside the building, and being interoperable with technical building systems across different types of proprietary technologies, devices and manufacturers.

the renovation is over. This goal can be achieved in different ways, for example requiring a minimum SRI score or adding more requirements at a horizontal level (BACS requirements after the renovation).

Recommendation: Ensure that digitalization is duly taken into account in the MEPS (e.g. real-time monitoring and reporting of a few KPIs: energy performance and indoor air quality)

BUILDING INFORMATION MODELLING (BIM)

eu.bac strongly supports BIM as a fundamental tool in the transition to a future-proof building stock. It enables detailed data collection, evaluation and visualisation, providing transparency and efficiency in the building sector and supports policy-makers in testing and developing building policies. BIM can support achieving environmental objectives through simulation of optimised energy management scenarios to lower energy demand, perform whole life-cycle analysis and increase resource efficiency. Thus BIM is essential to achieve the European Green Deal objectives in the construction sector, providing the data necessary for successful implementation of Level(s) (The European framework for sustainable buildings), the Smart Readiness Indicator (to assess a building's ability to adopt smart technologies) and European Digital Building Logbook among other initiatives. These are key in achieving the Commission's ambition to make this "Europe's digital decade". Governments are the largest procurers of construction, spending approximately 30% of construction total output (EUBIMTG 2019). They are in a unique position to influence and encourage innovation. The opportunity to introduce BIM requirements is even more evident if we consider that the construction industry is highly fragmented with 95% of the industry defined as small to medium-sized enterprises (SMEs), not easily able to organise itself and align in one single direction.

Recommendation: Gradual introduction (until 2025) of mandatory BIM for all new and renovated public buildings above a certain size and large-scale infrastructure projects[6].

Recommendation: Awareness campaigns involving the private sector similar to Germany's Bauen 4.0- a gradual introduction of BIM practices within SMEs (with pre-agreed industry best practice guidelines), through pilot projects financed by the EU or the Member State with an obligation to involve SMEs using BIM.

FEEDING BUILDING DATA IN THE EU BUILDING STOCK OBSERVATORY (BSO)

One of the main objectives in the energy transition and the Renovation Wave is to make buildings greener and smarter. In this process, useful building information (such as actual energy performance data, SRI score, building certificates from audits and inspections, etc.) could and should be collected, aggregated and made transparent to European citizens and various stakeholders in the building sector. Thus, the foundations of building data that would be used in the Digital Building Logbooks will also be laid.

The deployment of smart technologies and digital processes would facilitate and save costs in gathering and transferring this data into building data repositories at the national and European level (e.g. BSO), which then could be analysed and evaluated for various purposes, e.g. in policy-making or to study the impact of specific policies.

[6] Examples from Member States: Italy introduces mandatory requirements gradually on all public procurement construction works. At first for projects exceeding 100 million EUR from 2019, gradually decreasing the amount until 2025, when BIM will be mandatory in all public procurement. In Denmark BIM is mandatory since 2011 for all local and regional projects exceeding 2,7 million EUR and central government projects exceeding 677.000 EUR.

Recommendation: Ensure that existing initiatives such as the SRI, Level(s) and building certificates in combination with the new BACS capabilities required are feeding into building data repositories.

3. DECARBONISATION AND ENERGY EFFICIENCY: DEFINING THE INDICATORS FOR SUCCESSFUL BUILDING POLICIES

Buildings are at the heart of decarbonization. Making them net-zero carbon, ultra-efficient, smart and healthy should therefore be the main goal of EU policies if we want a carbon-neutral Europe by 2050. This objective must go hand-in-hand with the continuation of the efforts on energy efficiency. Building automation and control systems are quick payback technologies that can contribute to both decarbonisation and energy efficiency. They can optimize overall efficiency and functionality, ensuring that the systems and services are effectively working together, using only the necessary amount of energy in the building.

PRIMARY AND FINAL ENERGY SAVINGS

The current EPBD requires the energy performance of buildings to be measured in primary energy. This criteria, alone, is not sufficient to measure the energy consumed by energy users – expressed in final energy. Electricity appears as less performing vs. gas, and the use of such a parameter alone could end up being a barrier to decarbonization. It is crucial to require Member States to reach the energy performance targets both in primary and final energy to efficiently correlate energy savings and GHG emissions reductions.

Recommendation: Require Member States to measure the energy performance of buildings through final energy savings, in addition to primary energy.

MINIMUM ENERGY PERFORMANCE STANDARDS (MEPS)

As highlighted in the Renovation Wave, we need to set-up mandatory minimum requirements to deliver on the 60% GHG reduction for the building stock by 2030. We must mandate renovation work at the European level to have an impact across the continent. For this, we need to conceive a regulatory instrument that creates both decarbonisation and economic value. The introduction of mandatory minimum requirements must be based on **Long-term final energy reduction milestones** for the building sector to set-up a clear direction and to accelerate the renovation market in Europe. The yearly deep energy efficiency renovation rate barely reaches 0,2% for both residential and non-residential buildings. Based on the current renovation rate, it would take centuries to renovate the European building stock to meet our climate objectives. Such milestones must differentiate between non-residential buildings and residential buildings (non-residential buildings must be early mover because of their innovation/cost-saving potential).In that regard, the French tertiary decree can be used as a benchmark[7]). The French law prescribed all tertiary buildings to reduce their final energy consumption by -40% by 2030, -50% by 2040, and -60% by 2050.

[7] The French Tertiary Decree entered into force in October 2019 in France and specified the implementation of the article 175 of the 'loi Elan' that prescribed all tertiary buildings to reduce their final energy consumption by -40% by 2030, -50% by 2040, and -60% by 2050.
The decree target applies to all tertiary buildings above 1000m2 (all public and private buildings with a few exceptions) and proposes two methods to achieve the targets.

- -First option, building owners/occupants must demonstrate that they fulfill with the final energy consumption reduction objectives (2030, 2040 and 2050 – see above) based on a year of reference that needs to be 2010 or after.
- -Second option, building owners/occupants takes a commitment to achieve a final real energy consumption by a given year based on a set of performance level, which is being set-up by the public authorities (to be adjusted per type of activities/buildings).

The decree includes a list of actions to achieve the energy performance objective (thermal performance, energy management, maintenance, behavioral changes etc). A digital platform has been introduced where buildings owners/occupants must report their final energy consumption (based on a few criteria) to keep track of the level of final energy consumption per building. Penalties are being included in case of non-conformity.

Recommendation: Ensure that decarbonisation is duly taken into account, for example by including parameters on real energy consumption, with CO2 limits, similarly to the Décret Tertiaire in France.

Recommendation: Request commissioning report and ongoing KPI (to be defined) reporting for every renovated building, at least where public funds are used.

Recommendation: Include building KPIs in the Building Renovation Passport for every renovated building.

PERFORMANCE DATABASE REPOSITORY FOR NON-RESIDENTIAL NZEBS

According to the EPBD, all new buildings have to be nearly-ZEB from 2021 onwards (for public buildings this obligation applies as of 2019). BACS are among the most dynamic ZEB-focused technologies. They monitor and manage building energy performance. By tapping into the Internet of Things, advanced sensors, and big data analytics, these smart technologies have shown potential for significant savings through demand control, optimization, and predictive maintenance.

Recommendation: Set a performance data-based repository for non-residential nearly ZEB across the EU to monitor the contribution of new buildings towards the 2050 carbon neutrality goals.

4. FILLING THE GAPS ON THE BASICS: DYNAMIC HYDRONIC BALANCING, SELF-REGULATING DEVICES AND SOLAR SHADING

DYNAMIC HYDRONIC BALANCING

The optimization of heating, ventilation and air conditioning (HVAC) systems in buildings requires more than simply improving the generation efficiency. It is also vital to look at how heating and cooling is distributed from the central generator to points of end-use. Hydronic systems operate through the distribution of warm or cool water around the buildings (systems using air as the distribution medium are similar). 'Balancing the system' means to ensure that this fluid delivers warmth or coolth around the system to satisfy building environmental design conditions as effectively and efficiently as possible. Non-balanced systems can be manipulated by users to deliver heat or cold but this will be sub-optimal in terms of both comfort and running costs.

It is estimated that 95% of buildings in Europe lack dynamic hydronic balancing. In Germany, the majority of heating systems, 80% to 85% are currently installed without even static hydronic balancing.

Although it is a capital-light investment with fast pay-back[8], balancing is an aspect that is usually neglected both in renovation and in new-build markets. Additionally, energy costs paid by the tenant and split incentives in multi-family homes represent further obstacles.

Recommendation: Include new requirements mandating dynamic hydronic balancing when heat generator is installed/ replaced (possible new paragraph 1a in article 8)

Supporting material: eu.bac paper on "System balancing for technical building systems: a great opportunity for energy savings and comfort"

SELF-REGULATING DEVICES

Heating and cooling our buildings accounts for about 30% of the final energy consumption in the EU, over 70% of which comes from fossil fuels. The weight of evidence indicates that the expected saving in heating energy use across EU homes would be 18% where manual radiator valves are converted to

[8] More figures in the eu.bac "System balancing for technical building systems: a great opportunity for energy savings and comfort"

TRVs. Similar savings would be expected with other forms of individual room temperature control. The revised EPBD included requirements for self-regulating devices for the separate regulation of the temperature in each room. Nevertheless, for the existing buildings, the requirement is applicable only when the heat generator is replaced. This circumstance is limiting the effectiveness of a measure that could bring savings up to 30-38% on the energy bills, depending on the current heating system and behaviour, with a payback time, for thermostatic radiator valves, of 1-3 years.

Recommendation: Extend the requirement for self-regulating devices ex art. 8, par. 1 to all existing buildings by a certain year.

Supporting material: eu.bac TRV white paper

SOLAR SHADING

Automated solar shading is an intelligent system that makes internal and/or external solar shading devices operate automatically. The solar shading device receives real-time input from sensors, such as sun, wind, temperature and combines this with pre-set data and thresholds based on the requirements from both facility managers and tenants to save energy and provide comfort. By managing the appropriate quantity of daylight and solar gain inside buildings, automated solar shading help to reduce and optimize air conditioning during the cooling season, while decreasing heating consumption during the heating season. In a single-family house, external shutters reduce the total energy demand for heating and cooling by 38%[9]. If 75% of windows are installed with dynamic solar shading the potential energy savings can accrue up to 19% saving in heating and cooling energy use (or 49.3 Mtoe/yr) and a carbon emissions reduction of 19% (equivalent to a saving of 117 MtCO2/yr).

Recommendation: Include "solar shading" among the technical building systems in the definition provided by EPBD Art. 2 and consider policy proposals to enhance the use of solar shading in new and renovated buildings to prevent overheating, respecting the energy efficiency first principle

Supporting material: eu.bac- ES-SO Joint-paper "Technical Building System-The chance to introduce Solar Shading"

5. HARMONIZATION AND SYNERGIES BETWEEN DIFFERENT LEGISLATION AT EU AND NATIONAL LEVEL

One of the key elements hampering the fulfilment of EU legislation is often the lack of harmonization. On EPCs, harmonization is missing especially between the approaches followed by the different Member States. They are not equally defined and there is a need to adopt a standardised approach across Europe, to increase transparency, facilitate independent control systems and provide a tool to map and monitor the EU building stock. To achieve the EU climate goals, it is critical to act now.

Furthermore, links are sometimes missing between different legislation at the EU level. The EPBD prescribes certain key requirements (optimization of technical building systems, self-regulating devices, mandatory BACS capabilities in large non-residential buildings) which are not achieving or will not achieve (in the case of the ones approved in the 2018 revision) the desired/expected results due to the absence of compliance verification procedures. Providing an EPC will usually require a building inspection, which will generally include many of the checks that could assess compliance with the EPBD requirements. A mandatory requirement for these checks could, therefore, in many cases, be coupled with the provision of an EPC should and would therefore not bring additional costs but provide another

[9] Passive cooling measures for single-family houses, REHVA, 2015

route to informing building owners, National Governments, and the Commission on the level of compliance with existing regulations.

The same principle is valid for all the other measures concerning the renovation. As an example, when assessing the result of a renovation there should be a mechanism in place to ensure that the result of the renovation is fulfilling all the requirements as set by the legislation.

Recommendation: Harmonise the different approaches on EPC, ensuring consistency. Use EPCs to check compliance with other requirements already set in the EPBD and in force.

6. INDOOR ENVIRONMENTAL QUALITY

The World Health Organisation estimates that we spend approximately 90% of our time indoors, in residential and non-residential buildings. The level of CO2, humidity and other pollutants have a considerable impact on the health, well-being and productivity of the occupants. Harvard Research, with tests conducted on participants in a closed environment, showed an 8% increase in productivity for those who benefitted from better Indoor Environmental Quality over participants who didn't benefit from the improved conditions. This was then quantified as a $6,500 increase in productivity per employee per year. Automatic adjustment of indoor climate conditions according to occupancy. BACS optimize thermal comfort, air quality, lighting levels and operational efficiency while preventing legionella and other infections

Suggestion: Set minimum IEQ requirements for new and renovated buildings, including mandatory continuous monitoring, evaluation and reporting of a few IEQ indicators, e.g. room air quality, temperature, relative humidity and CO2 level [10]. The requirements should include means to make these values visible to the occupants and to inform them about deviations between actual and target values, suggesting actions to be taken in this regard.

Supporting material: IEQ joint manifesto "Healthy Buildings for All: Putting people's health and well-being at the centre of the EU built environment"

[10] View ALDREN project for IEQ indicator examples.