Jaap Hogeling

Editor-in-chief of the REHVA-Journal

EPB Center, The Netherlands

TIMEPAC-2022

International Workshop

Turin, November 30th 2022

Politecnico
di Torino

EU Green Deal, Renovation Wave Fit for 55 by 2030 , Repower EU plan drivers for the EPBD revision in 2022

will it affect the use of the set of EPB standards?

Jaap HOGELING

Chair CEN/TC 371 Energy Performance of Buildings

Expert at EPB CENTER

My background

- CEN/TC 371: Energy Performance of Buildings, chairperson since 2004
- Project leader of the EU Mandate/480 to CEN regarding the development of the set of EPB standards.
- Participation in 5 CEN/TC's and 2 ISO/TC's related to Energy Performance of Buildings
- Manager international standards at ISSO, Rotterdam, the Netherlands
- Initiator of EPB Center (an initiative of ISSO and REHVA)
- Fellow of ASHRAE and REHVA
- Officer at **I**ndoor **E**nvironmental **Q**uality **G**lobal **A**lliance board www.IEQ-GA.net

Additional to this presentation I may refer to several videos and webinars and case studies on EPB standards that are available at https://epb.center/support/

EU Green Deal – Fit for 55 by 2030 Renovation Wave REPowerEU plan (05/2022)

- drivers for the EPBD revision in 2022,
- will it affect the use of the set of EPB standards?
- A need to revisit the set of EPB standards

EU Green Deal, Renovation Wave, Fit for 55 by 2030 towards Zero Carbon emission by 2050

- Buildings are acknowledged as one of the key focus areas for the European Green Deal and more specific the Renovation Wave Strategy.
- ambition: at least double annual renovations of EU building stock with focus on **deep renovation to 3%**
- **Basis for the urgent revision of EPBD (version 2018) to direct the national renovation strategies to achieve a decarbonised building stock by 2050**
- **3 focus areas in Renovation Wave:**
  - tackling energy poverty and worst-performing buildings> towards healthy housing
  - lead examples: priority for renovation of public buildings
  - **decarbonisation** of energy delivered to and exported from the buildings
- To accomplish this the Commission promotes:
  - MEPS (Minimum Energy Performance Standards) , which actually stands for **M**inimum **E**nergy **P**erformance **R**equirements, MS's shall set, and regularly review, these requirements with a view to achieving at least cost-optimal levels, Those requirements shall take account of general indoor climate conditions, in order to avoid possible negative effects such as inadequate ventilation
  - The use of EPC's (Certificates) and Building Renovation Passports.

European green Deal: Carbon/Climate neutral by 2050

- The Building is no longer an energy consumer, but also an energy producer
- Optimize:
  - **Energy efficiency first:** building envelope & building systems
  - **Decarbonize** energy carrier and produce on-site **RENEWABLES**
  - Interaction with the energy grid (hourly/storage..) **Smart Readiness of buildings to become operational (SRI)**
- Step by Step towards Zero CO2
  - We have to show the impact of our components (products) in the energy chain:
    - AC, Heat Pump.. is not longer evaluated as a product, just looking at the product label, but part of the building system in a holistic way
  - We have to address the embodied Carbon as well!

Revision EPBD : How to make EPC's of buildings more popular/reliable?

- **Address the performance gap** (calculated versus metered) and on-site verification : **the new Annex I of EPBD IV offers the opportunity to use metered values to verify the correctness of the calculated energy use, also to use these metered values as additional information on the EPC.**
- **By referring to EN16798-1 in EPBD Annex 1 there is an incentive to include the IEQ performance indicator on the Energy Performance Certificate (EPC) and by doing so, include the calculated energy use of absent or underperforming building systems in the EP:**
  - **in the expected EPBD IV the IEQ requirement is softly addressed in art.4 (related to MEPS),**
  - **in art.6 (New Buildings) IEQ issues shall be addressed. Annex I art.2 ..** *indoor conditions, and in order to optimise health, indoor air quality and comfort levels defined by MS's*

Revision EPBD (2022):

- EPBD Article 4 (unchanged): *Adoption of a methodology for calculating the energy performance of buildings: Member States shall apply a methodology for calculating the EP of buildings in accordance with the common general framework set out in EPBD Annex 1. That methodology shall be adopted at national or regional level. (the EPB standards provide this flexibility)*
- Annex 1. art. 2: The new draft EPBD requires an EP assessment calculation using an **hourly or sub-hourly calculation step** approach. The monthly is mentioned as well. However the hourly procedure is more easy to use, more transparent, reproduceable and innovation supportive, it is also expected that it will reduce the performance gap.
- Annex 1 art.1: National methods shall be described according EN ISO 52000-1, 52003-1, 52010-1, 52016-1, 52018-1, EN 16798-1, EN 17423

Most important part of the EPB calculation that requires an hourly calculation is the EN ISO 52016-1

EN ISO 52016-1, Calculation of energy needs for heating and cooling, internal temperatures and sensible and latent heat loads

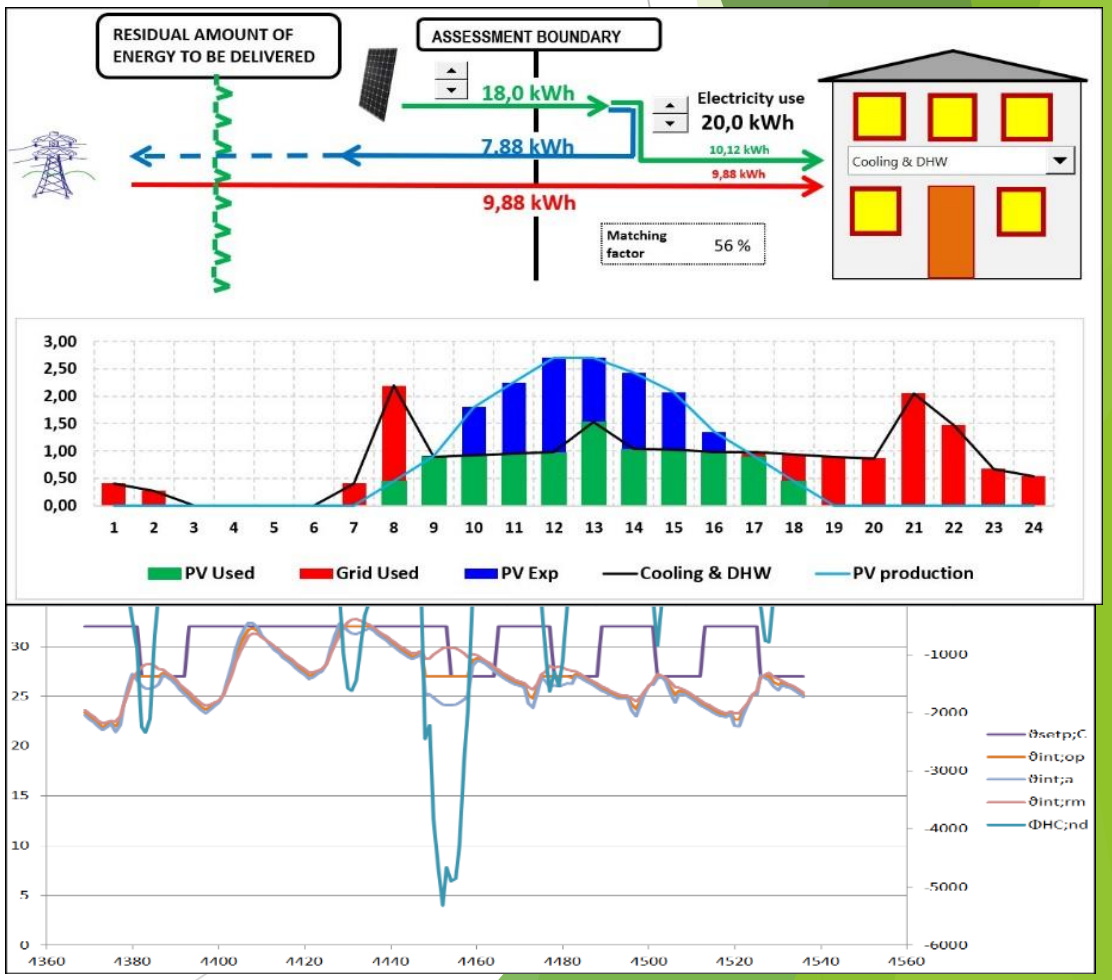
- Published in 2017
- Contains both a **monthly** and an **hourly** calculation method
  - *To keep a **monthly** method was upon request of some EU Member States*
- Monthly and hourly method use **same set of input data** for the user
  ➔ switch from monthly to hourly method is made very simple!:

See webinar4 PowerPoint slides at www.epb.center/support/webinars

- In EC's proposal for revised EPBD (Dec. 2021): hourly method is a must
- **That makes sense!** We are no longer in the 20th century with dominating heating demands and simple technologies!

Why hourly calculation method?

- To assess the interaction between onsite PV and the grid
  - For zero emission buildings there is no room for disguising fossil energy use by averaging the energy produced and used over a month (or even a year…)
- To take into account the dynamic (hourly) interaction between systems and energy needs (e.g. for heat pumps)
- To use the Smart Readiness of the building systems
- To assess thermal comfort
  - E.g. in case of undersized or absent systems, or…
  - e.g. in case of ventilative cooling
  - Etc..



Calculation step and Electricity Balance

In particular relevant when it comes to renewable energy (like PV) produced and used on-site

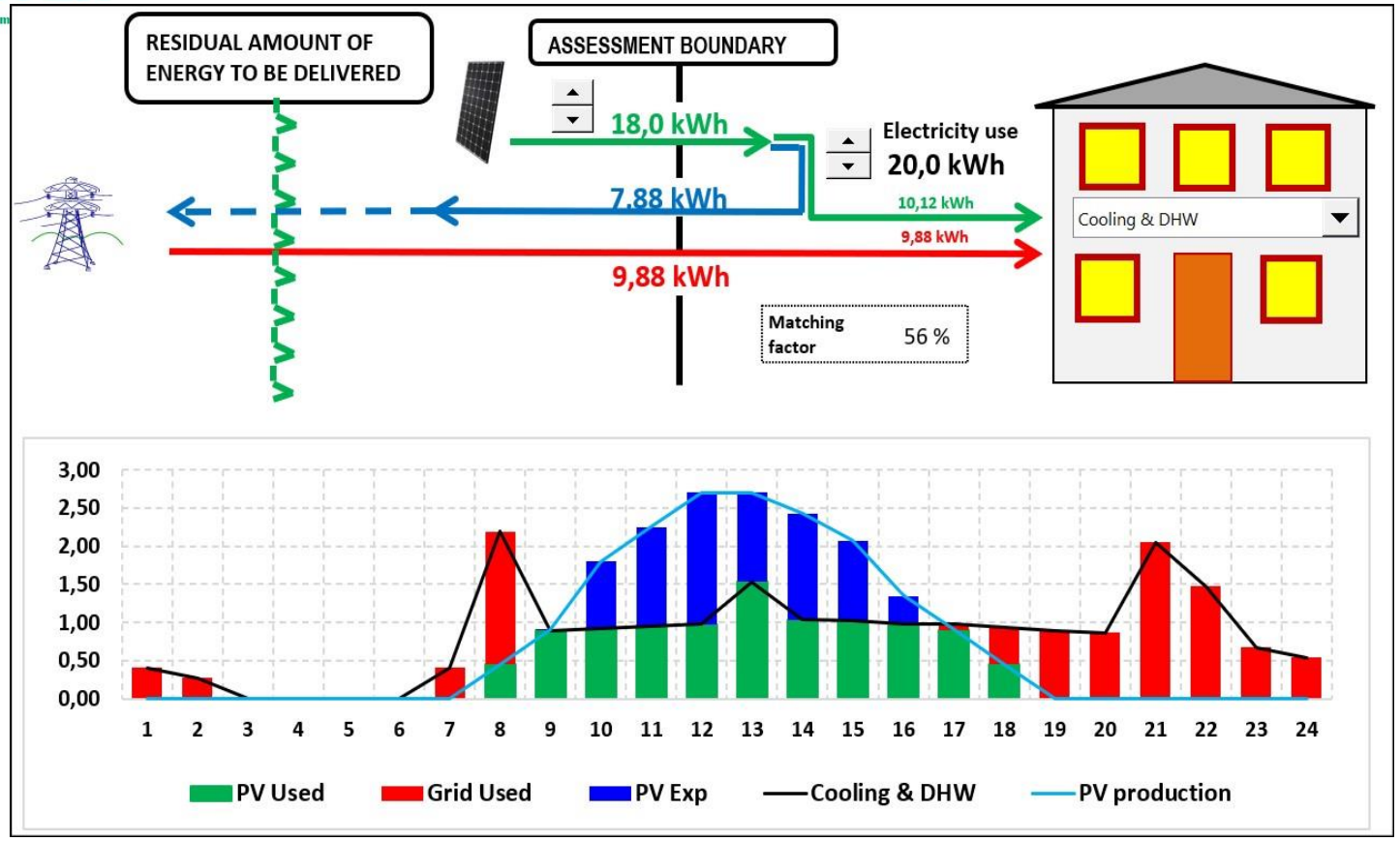
In case of a monthly method:

- The energy balance is averaged over a longer period
- The need for electricity from the grid during the evening is “covered” by the surplus of PV during daytime

Electricity balance in case of a monthly method: **a cover-up**

- The daytime surplus does not “cover” night time shortage; it is only compensated in the calculation:
- It’s a cover-up: it disguises non-renewable energy use, so it leads to **fake ZEB (Zero Emission Building)**
- And yes, this could be quasi “solved” in a monthly method with a correction factor for the phase difference between supply and demand, but such factor gives only a generic correction and you will not see (and thus not reward) the impact of optimization of the energy balance between building and grid, e.g. by smart use of equipment, by batteries, thermal storage…
- Note: the ZEB is even more fake if winter shortage of electricity is allowed to be compensated [in the calculation, not in reality!] by a summer surplus: the “net annual calculation”. *This concept might have been good enough for nZEB, but **not** for the trajectory towards true Zero Carbon Emission Buildings*

EXAMPLE



Hourly method:
9,88 kWh from grid

Monthly method:
2,00 kWh from grid

Source: case studies EPB Center
https://epb.center/support/case-studies/

➔Absolute need for **hourly calculation steps**

➔(also for thermal comfort, IEQ)

Conclusions on hourly

- Hourly calculation steps necessary
  - Real use of non-renewable energy use instead of disguised use of non-renewable energy due to monthly or annual average (=fake zero carbon emission)
  - For assessing SRI and thermal comfort (IEQ)
  - For awarding hourly sensitive systems like:
    - Heat Pumps
    - Solar protection
    - Smart controlled systems
    - Etc..

New EPBD: Art.13 Smart readiness of buildings

- 1. The Commission shall adopt delegated acts concerning an optional common Union scheme for rating the smart readiness of buildings. The rating shall be based on an assessment of the capabilities of a building to adapt its operation to the needs of the occupant and the grid and to improve its energy and overall performance. For this we need:
  - (a) the definition of the smart readiness indicator; and
  - (b) a methodology by which it is to be calculated.
- 2. The Commission shall, by 31 December 2025, adopt a delegated act for rating the smart readiness of buildings for non-residential buildings with an effective rated output of HVAC system of over 290 kW

New EPBD : Towards improved EP & reduction of GHG emission from buildings

- EPBD art.2: 'zero-emission building' means a building with a very high energy performance, according Annex 1, 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 1 art.3: For the purpose of expressing the energy performance of a building, Member States may define additional numeric indicators of total, non-renewable and renewable primary energy use, and of operational greenhouse gas emissions produced in kgCO2eq/(m2 .y). Following the EN17423 on PEF's and CO2 emission coefficients
  - Zero-Emission Building : The NZEB (Nearly Zero **Energy** Performance) approach is deleted and replaced by **Zero-Emission Building (ZEB)**
  - Building Renovation Passport: providing a tailored roadmap to ZEB, issued by certified expert, on basis of a visit on site. (delegated act by 2023),
  - Sustainable mobility infrastructure in and adjacent to buildings (smart charging (2-way) and bicycle parking)
- Renewable Energy Sources includes now geothermal and **ambient** energy

Proposed New EPBD

- **Deep Renovation leading to Zero Emission Buildings (ZEB)**: only deep if more as 30% reduction (this is important to prevent the lock-in effect)
- Definitions for Useful and Reference floor area according EN ISO 52000-1, many new definitions used in EPBD are now in accordance with this standard
- **New Buildings:**
  - All buildings ZEB by 2030, public buildings by 2028
  - Life-Cycle GWP (Global Warming Potential) has to be calculated according EN 15978 and reported at EPC by 2028 (>2000m2) and for all by 2030
  - The EPBD draft : IEQ could be addressed at the EP-Certificate as well

Proposed New EPBD

- Existing Buildings with low EPC classes have to be upgraded:
  - Non –residential: By 2027 G>>F by 2030 F>>E
  - Residential : F>>E by 2033
- No fossil fuel boilers support by MS after 2027 allowed.
- The scales of EPC's should be harmonised in Europe, to make it possible to compare, but this seems only useful if we agree to harmonise the EPB assessment procedures as well.
- The performance of technical building systems shall be considered as installed systems and not on basis of ECOdesign product declarations: example: use EN 15316-4-2 on HP Systems
- Member States shall ensure that the requirements they set for technical building systems reach **at least the latest** cost-optimal levels
- Regular maintenance & inspection of HVAC systems by qualified personnel

Proposed New EPBD art.11 on Technical building systems

- MS's shall require zero-emission buildings to be equipped with measuring and control devices for the monitoring and regulation of **indoor air quality**.
- In existing buildings, the installation of such control devices shall be required, where technically and economically feasible, when a building undergoes a major renovation
- MS's shall ensure that, when a technical building system is installed, the overall energy performance of the altered part, and where relevant, of the complete altered system, **is assessed**. The results shall be documented and passed on to the building owner, so that they remain available and can be used for the verification of compliance with the minimum requirements and the issue of energy performance certificates
- Art.14 on Data exchange: MS's shall ensure that the building owners, tenants and managers can have direct access to their building systems' data without additional costs for those parties.

Reducing building GHG emissions: what can we do?

- Energy Efficiency First: reduce the building energy need and use energy efficient systems and improve operation and maintenance
  - This seems logic but you need to balance reducing the need (by building related measures) and improving the system efficiency (by applying more efficient systems)
- Reduce building embodied carbon (for new buildings you can choose for carbon neutral building materials….)
- HP's: Eliminate refrigerant releases, minimize leakage and use low GWP refrigerants
- Design buildings and systems to optimize grid flexibility and integration (storage, interactive control, real-time carbon data from grid provider, applying SRI functionalities …)
- On-site renewable energy production
- Decarbonize the electrical grid

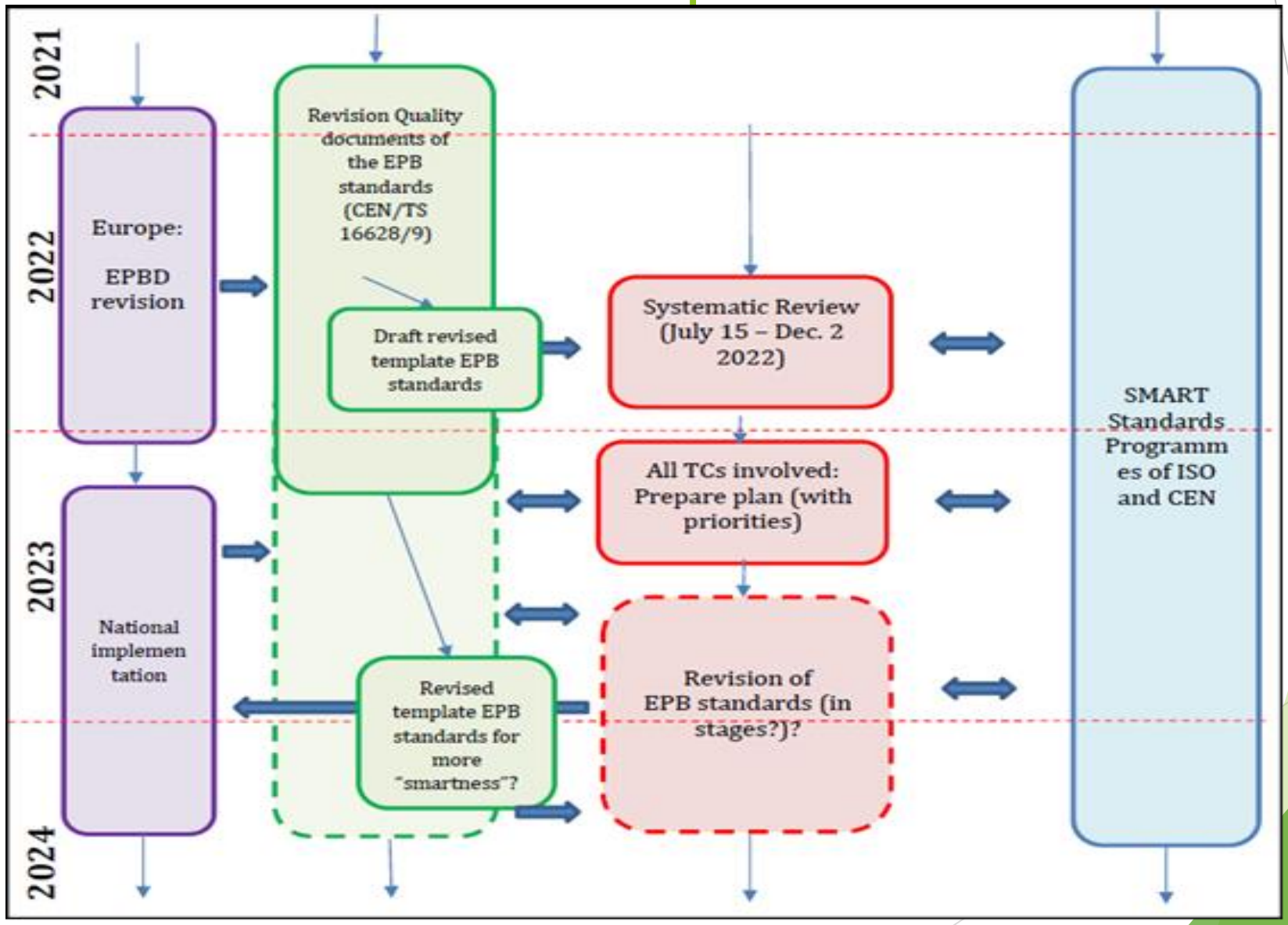
EPBD revision will have impact on the use of EPB standards

- A more stringent policy regarding EPC's their quality and acceptance will emphasize the role of a correct use of the set of EPB standards
- an EU-harmonised GHG metric will make use of the EN 17423 on PEF's (Primary Energy Factors) and CO2 emission coefficients.
- Reducing the performance gap by improving the reliability of the calculated asset rating is supported by the required hourly calculation step
- Hourly calculation step brings the use of the SRI (Smart Readiness Indicator) to a next stage where the building and grid interaction will become visible and able to demonstrate the level of decarbonisation of the energy used by the building systems

EPB standards (2017) Systematic Review after 5 years:

- According CEN and ISO rules standards are revisited for review every 5 year after publication.
- CEN/TC371 considers (in cooperation with the 5 connected CEN/TC's and 2 ISO/TC's for the 52000 family) to coordinate this review process of the set of EPB standards.
- Given that the EPBD is currently under revision this EPBD revision will be taken into account as well.
- Apart from this EPBD issue, we already know that some standards need some update (editorial and/or technical updates).
- Updates may also be needed to make standards better suited for software development which is needed to make the standards better accessible.

Up taking the Systematic Review and EPB standard update



Thank you! Questions?

- Contact:
- jaap.hogeling@epb.center
- Convenor CEN/TC371 Energy Performance of Buildings

EPB CENTER
Consultancy Services on the Energy Performance of Buildings
Consultancy and Services

If you would like more information, please contact us at

jaap.hogeling@epb.center

Thanks for your attention!