

EU Mandate (M480) for CEN to develop the second generation CEN-EPBD standards

Results phase 1, the OAS & connected TR with feedback on MS's comments , status phase 2 work

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Phase 1 results

- **FprEN 15603:2014 Over-Arching EPB Standard**
- **draft-prTR (Technical Report) 15615:2014 on the prEN 15603**

Supporting documents for the EPB standard developers:

- CEN TS (Technical specification) 16628:2014 on Basic Principles, **published**
- CEN TS 16629:2014 on Detailed Technical Rules, **published**

EXCEL files to support the checking of the calculation procedures as given in the FprEN15603 and generating the examples in the TR

OAS out for Formal Vote; draft TR to be prepared for next CEN-TC- Approval procedure

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

FINAL DRAFT
FprEN 15603

August 2014

ICS 91.120.10

Will supersede EN 15603:2008

English Version

Energy performance of buildings - Overarching standard EPB

Performance énergétique des bâtiments - Norme cadre
EPB

Energetische Bewertung von Gebäuden - Rahmentext zur
Europäischen Gebäuderichtlinie

This draft European Standard is submitted to CEN members for formal vote. It has been drawn up by the Technical Committee CEN/TC 371.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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CEN/TC 371

Date: 2013-08

TC 371 WI

CEN/TC 371

Secretariat: NEN

Energy Performance of buildings — Module M1-x — Accompanying Technical Report on draft Overarching standard EPBD (prEN 15603)

Einleitendes Element — Haupt-Element — Ergänzendes Element

Élément introductif — Élément central — Élément complémentaire

ICS: 91.140.99

Descriptors:

Document type: Technical Report

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Document stage:

Document language: E

Current status of the FprEN15603 and connected TR



- The OAS is currently out for FV (closure 7th Oct. 2014)
- **As soon EN15603 is published CENTC371 will request registering new WI to update the OAS.**
- Current: Draft TR (version 22/9/14: CENTC371-N359)
- Next TR will be produced in parallel of the to be revised OAS (during 2015)

Very constructive cooperation

EPBC- Liaison Committee of MS's

- As the OAS includes many policy related issues this cooperation is essential to achieve broad acceptance at MS-regulators level.
- By intensive and frequent interchange of checklists, draft-standard versions and TR's .
- Current (22-09-2014) draft TR includes many amendments to the OAS;

Proposed future amendments for EN 15603

The following text in Clause 2 of EN 15603:

- The following documents are indispensable for its application." is the standard phrasing for any CEN or ISO standard.
- **This does not imply that this standard can only be used if the normatively referenced standards are used as well.**

Proposed future amendment of EN 15603: In 3.1.23 (thermal envelope): Replace:

- "total of all elements of a building that enclose thermally conditioned spaces.... "
- "total of all elements of a building that enclose **at least** thermally conditioned spaces.... "

- Justification The current definition does not exclude thermally unconditioned spaces within the thermal envelope (see criteria given in 7.2.3), but the amended text makes this more explicitly clear.

On-site (term 3.4.21)

Text Proposal on how this could be treated

- This definition is linked with those of "nearby" and "distant". On-site is a larger perimeter than the building only. On-site is often linked to energy production or energy transformation that can be exported. This issue is addressed in 7.5. Nearby the building site (term 3.4.18)
- The current definition for "nearby the building site" is not fitted for nearby electricity generation. It is **intended** to introduce also nearby electricity. **A proposal could be:** Connected to the same branch of the distribution grid (distribution grid meaning voltage level lower than 150 kV)".

Distant to the building site (term 3.4.45)

"On-site" and "nearby" are defined in the EPBD related to nZEB. "distant" is defined in this standard to cover all perimeters where energy can be produced or transformed.

3.5 Energy performance, rating and certification

Under this clause we improved several definitions:

- **3.5.6 energy performance indicator:**
energy performance
divided by the reference
floor area

replaced by:

- **3.5.6 numerical indicator of primary energy use:**
- primary energy use per square metre of floor area

NOTE: As for instance mentioned in EPBD art. 9.3.a

Replace in OAS:

- **3.5.10 measured energy indicator**
- measured energy performance divided by reference area

by:

- **3.5.10 measured energy indicator**
- energy performance indicator based on measured energy performance

Add in OAS: 3.5.19 energy performance indicator

- calculated or measured energy performance of a building expressed in a transparent manner

NOTE For instance for the energy certificate: energy performance per square metre of floor area or energy performance divided by the energy performance of a specific benchmark.

Justification for these changes More consistency with the EPBD and differences between countries.

3.7.3 Undefined and/or unspecified policy related terms

- There are certain quantities, that are strongly related to national or regional policy, due to differences in culture and building tradition, building typologies (building use), policy and legal frameworks and administrative practices (including the type and level of quality control and enforcement and assessment cost expectations). It is impossible to fully harmonize these terms at the moment. Therefore they are not, or not completely, defined in the EPB standards:
 - useful floor area;
 - the boundaries between "on site", "nearby" and "distant";
 - assignment of building and space categories (e.g. office space, shop, assembly room or hall, bed and breakfast, children day care, nursing home, ...);
 - subdivisions of building and space categories (e.g. residential buildings: single family house, student flat, senior homes, mobile home, house boat, holiday home, ..);
 - assignment of category:
 - **designed building;**
 - **new building after construction;**
 - **existing building in the use phase;**
 - **majorly renovated building.**

3.7.3 Undefined and/or unspecified policy related terms

- **Any definition of these terms** (except the first two bullets: useful floor area and site, nearby and distant) **would already be a too strong constraint for the required national or regional detailed specifications.**
- This does not lead to a problem in the form of an open end in the energy performance assessment, because such national or regional detailed specifications are done in the "pre-processing phase" of the energy performance assessment, so that it can be assumed that these have been assessed when starting the routing through the overarching standard (see Clause 5 of OAS)

Replace in OAS:

- **3.5.15 standard energy indicator**
- standard energy performance divided by the reference floor area

by:

- **3.5.15 standard energy indicator**
- energy performance indicator based on energy performance under a set of standard conditions

NOTE Assessed under standard conditions or corrected for deviating conditions.

5.2 Type of application

Proposed future amendment of EN 15603:

Add in 5.2.2, below Table 5:

- The modular structure and the flexibility offered by the choices according to the Annex A in each of the EPB standards will enable specific assumptions and possibilities for simple input in the same general methodology in relation to existing buildings. See also A.1, the introduction to Annex A.

Justification: There is a strong need for specific assumptions and possibilities for simple input in the same general methodology in relation to existing buildings.

7.2 Categorization of spaces

- 7.2.1 Additional explanation
This clause in OAS already contains the basic explanations.
- **The TR illustrates the approach with 6 different example cases**
- The TR provides further explanation on **Useful** (floor) area versus **Reference** (floor) area

7.2.5 Example case 4

Description: Dwelling with (habitable) attic, sunspace, storage

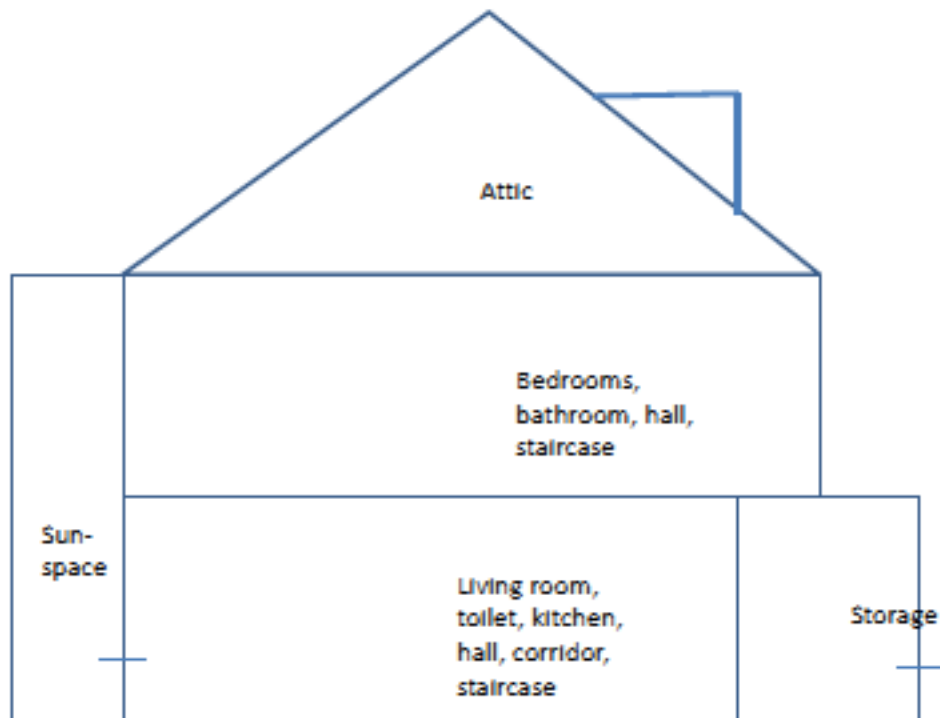


Figure 7d — Example 4

Exercises:

Exercises Example case 4 of 6:

- a) **What to do with attic if legally not habitable, but in practice habitable/habited?** See 7.2.3:assessment of thermal envelope.
- b) **Storage included or excluded?** Depends on rules, see 7.2.3
- c) **Zoning for hot water needs?** For a calculated EP, the amount of hot water needs (shower, kitchen) are (nationally) defined per person, with a given standard occupancy per m² floor area. In a residential building, the counting of persons is of course for the whole dwelling (evidently, because all the persons in the dwelling together determine the hot water needs of kitchen and bath room). **Consequently: for the hot water needs of a dwelling: the whole dwelling is a single zone.**

MORE explaining text 7.6.6 **Weighting factors for exported energy** ; 7.6.6.1 General

- The idea of weighted energy associated to delivered energy is easy until no exported energy is involved. Recent and new buildings often export energy and a careful analysis is required,
- The weighted energy associated to the actual exported energy on the assessment boundary can be evaluated in two ways:
- MORE explaining text is give how to use this step A & step B approach.

Proposed future amendment of EN 15603:

Add to the Introduction of Annex A :

- Where necessary for certain input values to be acquired by the user, a datasheet according to the template of Annex A may contain a reference to national procedures for assessing the needed input data.
- For instance to a national assessment protocol comprising decision trees, tables and pre-calculations. (The precise formulation of the sentence is subject to review)
- *Justification: There is a strong need for specific assumptions and possibilities for simple input in the same general methodology in relation to existing buildings.*

End proposed future amendment of EN 15603

some TR-clauses with improved text additions and explanations:

- Table 2 – Relevance of OAS for different applications
- 7.7 Share of Renewable Energy: RER
- 7.8 Energy performance indicators for technical building systems; 7.9 Partial energy performance indicators
- 9.1 Building Zoning General; 9.8 Zoning procedure
- 10 Technical systems calculation modular structure
 - 10.1.1 Modular calculation structure development status
 - 10.1.3.2 Eight Basic System Types are considered
 - 10.1.4 Supporting Step by Step implementation and simplification by aggregation (boiler example)

TR provides text proposals to be included in clause 11 of OAS:

- 11.1.3. Description of the calculation procedure
- 11.1.4 Output data
- 11.1.5 Input data
 - 11.1.5.3.1 General
 - 11.1.5.3.2 Electricity input to generators
 - 11.1.5.3.3 Auxiliary energy input
 - 11.1.5.3.4 On-site produced electricity
 - 11.1.5.3.5 Electricity use
 - 11.1.5.3.7 Energy carrier specification

Annex K: Calculation example, electric energy balance

- This annex provides calculation examples that demonstrate the use of the OAS and of its options.
- examples of simplified energy balances, to highlight the use of primary energy weighting factors and of the controlling parameter k_{exp} .
- a complete calculation example, to highlight the overall calculation process and the feature of temporary exported and redelivered energy.
- **in total 9 Examples with all details are presented.**

K.2.2.3 Partial coverage of electricity use with PV

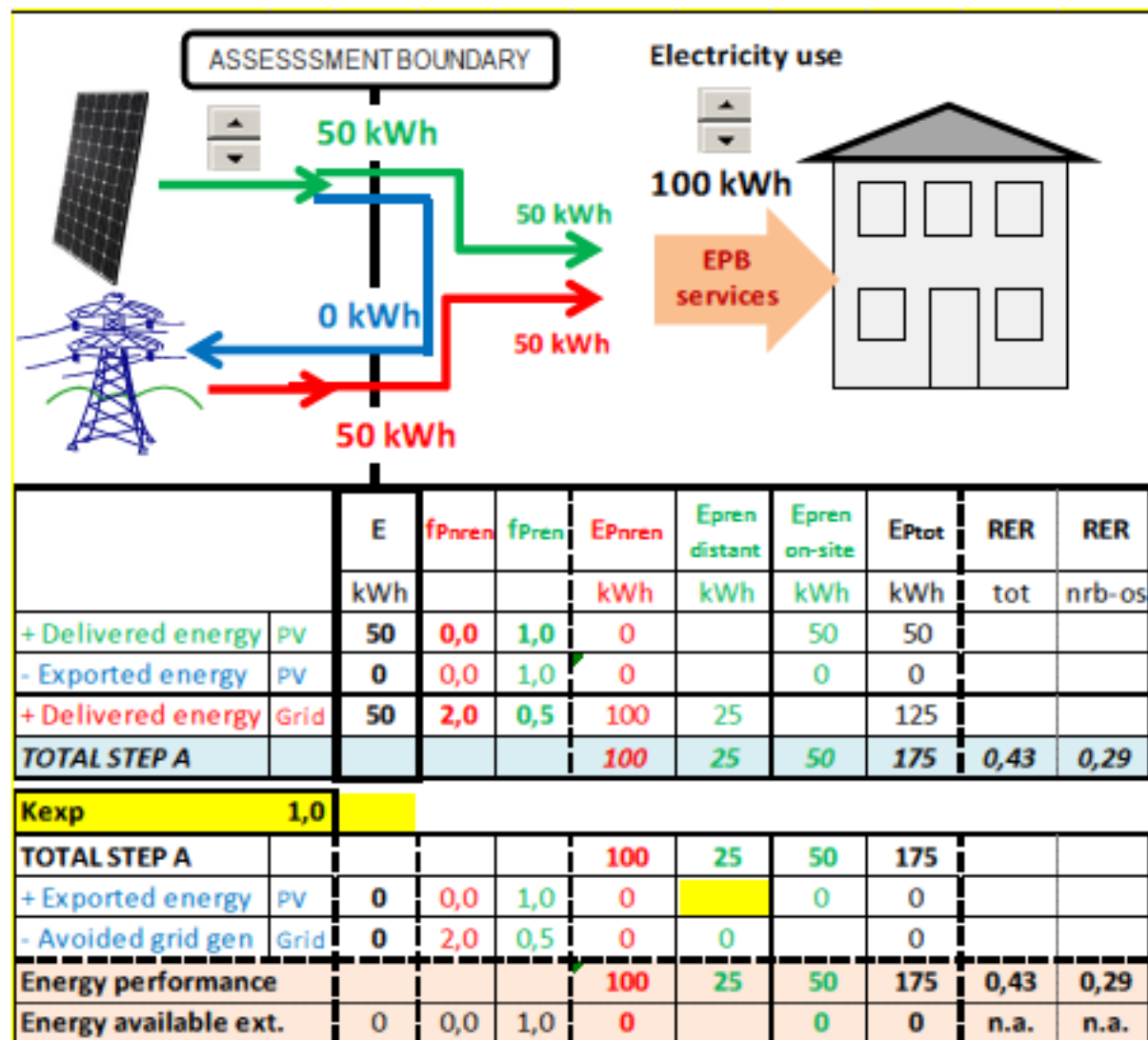


Figure K.2 — All electric system, 50% covered by PV

This example is shown in figure K.2. The PV production is 50 kWh and provides 50% of the actual electricity use in the building.

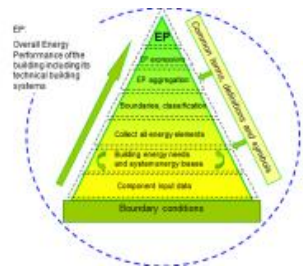
example cases in OAS/TR

- The TR includes a lot of examples to illustrate the procedures given in the OAS
- Example cases on:
 - Zoning: 9 examples on zoning & partitioning
 - 6 Calculation examples on electric energy balance; 3 monthly balance and a yearly balance example with all calculation details.
 - example how to deal with technical system module
 - example on nZEB
 - 12 tables with output examples included the illustration of the step A - step B approach

Phase 2 of the CEN EPB project



- the improvement and expansion of the current set of CEN-EPB standards on the basis of :
 - communication with the regulators of the EU-member states via the Liaison Committee ;
 - Resulting in 40-50 standards and TR's or parts thereof
 - For all standards an excel file will be produced to report the input and output data and to verify the described calculation procedure and correct interconnection with referred standards



Status/Planning M480-Phase 2

- most draft prEN's are ready and have been published as N-doc's at the CENTC371 livelink
- almost all draft prEN's: are ready for acceptance for enquiry
- **September-December 2014** publication of the prEN's for enquiry
- It is expected to reach and possibly finish the enquiry stage of all EPB-standards around **April-May 2015**
- **Before the end of 2015** we expect all Enquiry comments to be resolved and Formal Vote versions ready at TC level.
- After publishing and voting we expect that **during 2016 all EPB-standards will ready and available as EN (or EN-ISO) standards**
- **By 2016 stable versions of these EPB standards will become available; to serve for a long period of time;**
- **But upgraded versions are expected to support neutralising the energy use in the build environment during the coming decades!**

Software tool to support the development and future use of the EPB-standards by software developers

- **Phase 2: internal tool to support, to demonstrate and validate**
 - the consistency and unambiguity of equations in the set of EPB-standards and
 - their interconnecting procedures: all in- and outputs of the EPB standards will clearly be defined

Checking the calculation procedures in each Phase 2 EPB standard

EPB standard with formulas

input data from other EPB standards, product data or boundary conditions

Excel files including all calculations and input output

final or intermediate results as input for the OAS EN15603 like Energy Performance expressions etc.

output data to be used as input for other EPB standards

To other EPB standards

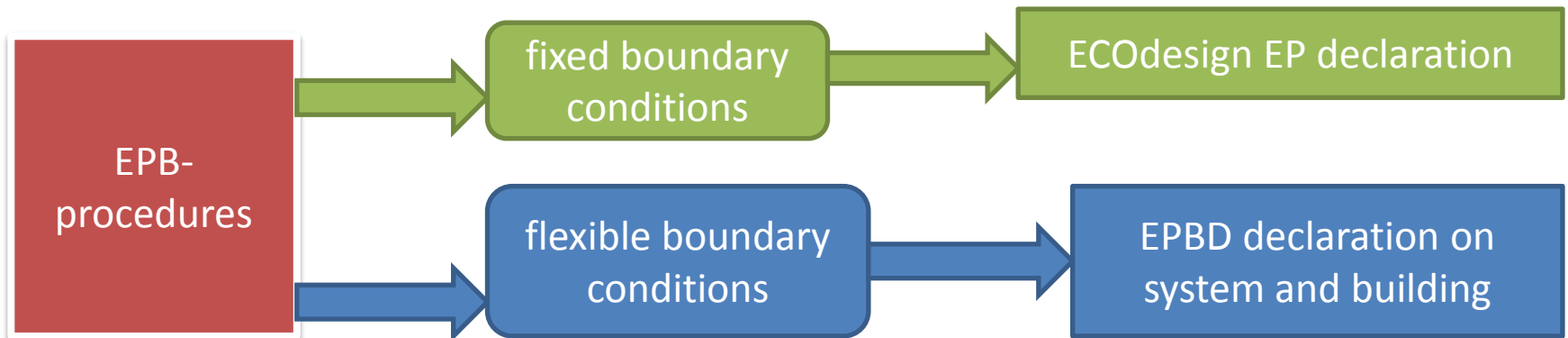
defining the data exchange in an unambiguous way offering software developers a clear interpretation how standards shall be used

Building and system EP: also depending on product EP: relation to the ECO-DESIGN Directive and connected M495

- By developing system standards we have to consider, where possible, the relevant product standards on:
 - product performance data needed for our EPB building/system descriptions
 - the EPB system standards should be considered as basis for the product EP evaluation when declaring product-EP 's at the product labels
 - be aware that many “products” can be considered as sub-systems as they are including control-devices, electronics, storage element, other auxiliary functions, etc.

Building and system EP: also depending on product EP: relation to the ECO-DESIGN Directive and connected M495

- The current status is that, given the independent process developing the ECOdesign EP assessment procedures (some of them are already in place), the **result of not using the EPB** procedures for the Ecodesign EP assessment is not predictable. Using these Ecodesign-EP declared values as input for EPB system assessment procedures may lead to misleading EPBD declarations.
- **USE EPB Procedures:**

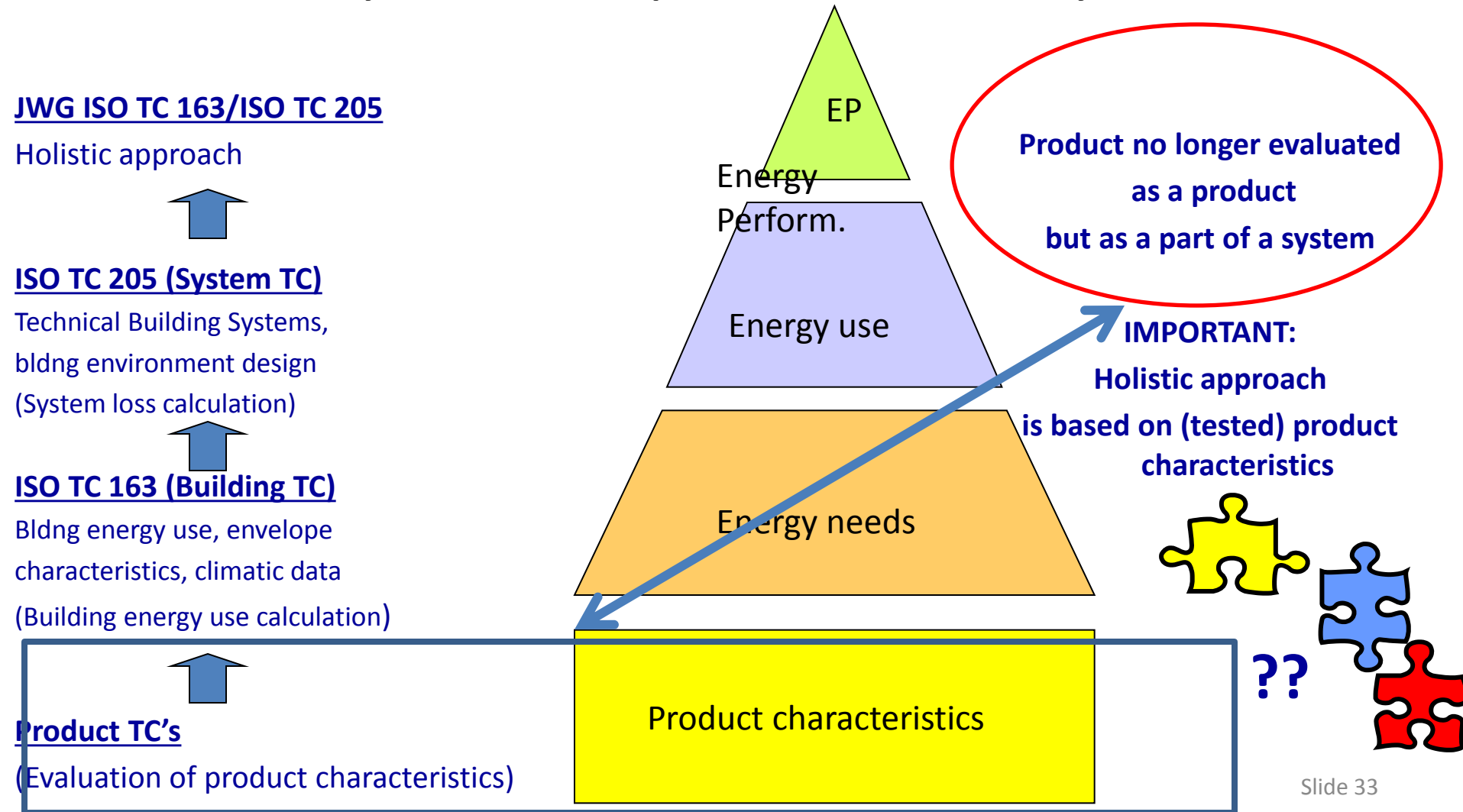


The CEN ISO interaction

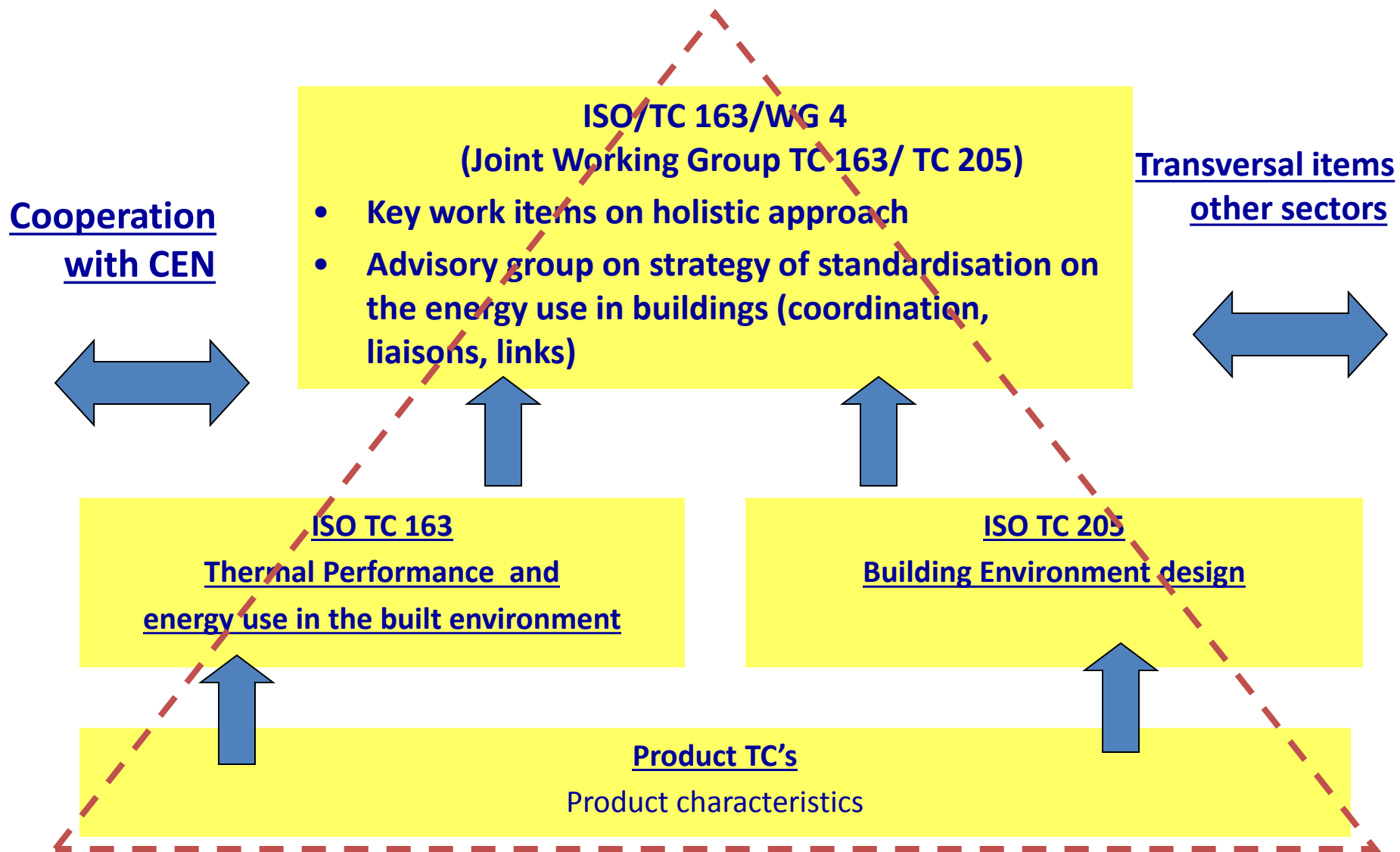
- An active process of interaction for the **Overarching Type of standards** through the **JWG of ISO TC 163 & 205**
- for the other standards via the different WG's of ISO TC 163 and 205, Sharing early prelim draft texts
- Sharing experts in the ISO and CEN teams working on these standards, with the ultimate goal to agree on ISO standards
- A challenge given the geographic and other differences in the building sector, given the very tight time scale at CEN level, for EPB standards under some of the CEN TC's the cooperation with ISO is for the time being informal (no parallel voting).
- In ISO a series of numbers has been reserved for all EPB standards (52000----52150); it is expected that most Building Physics related standards (CENTC89) will be published as EN-ISO standards in this series.

From the product to the system

Continuity from the product to the system



ISO organisation / buildings



Horizontal - 50001
Energy management -
TC 242

Horizontal - 13273
Energy efficiency and renewable energy
sources - Common international terminology -
JPC 2

Horizontal - General technical rules for
determination of energy savings in
renovation projects, industrial enterprises
and regions -
TC 257

Industrial

Iron and Steel
TC 17 *Steel* (ISO 14404 CO₂ (parts 1 & 2))
TC 25 *Cast irons and pig irons* (nothing)
TC 102 *Iron ore and direct reduced iron* (nothing)

Cement
TC 71 *Concrete, reinforced concrete and pre-stressed concrete* (nothing)
TC 74 *Cement and lime* (nothing)

Chems and petrochem
TC 67 *Equipment for petroleum industry* (nothing)

Systems

TC 115 *Pumps* (ISO/ASME 14414: Pump system energy assessment) (nothing)
TC 131 *Fluid Power* (nothing)
TC 86 *Industrial refrigeration* (ISO/DIS 16494 Heat recovery ventilators and energy recovery ventilators - Method of test for performance)
TC 117 *Fans* (ISO 12759 Efficiency classification for fans)
TC 118 *Compressed air* (ISO 11011 Energy efficiency audit reporting)
TC 127 *Earth-moving machinery* (nothing)
TC 184/SC 5 *Automation systems* (NWIP)
Industrial heating systems (nothing)
Steam (nothing)
TC 203 *Technical energy systems*
TC 178 *Lifts, escalators and moving walks* (ISO 25745 Energy performance of lifts, escalators and moving walks)

Plant

TC 244 *Industrial furnaces* (ISO 13579 now in 4 parts: Method of measuring energy balance & calculating efficiency)
TC 109 *Burners* (nothing)

Gaps

Heat pumps?
Energy storage?

Transport

Road

TC 22 *Road vehicles*
Fuel consumption stds on:
Motorcycles - ISO 6460
Electric - ISO 8714
Hybrid electric - ISO 23274 + ISO TR 11955
Fuel cell - ISO 23828

Sea

TC 8 *Ships* - Working with IMO on GHG emissions and energy issues

Air

TC 20 *Aircraft and space vehicles* (nothing)

Rail

TC 269 *Railway applications* (nothing)

Methods

CEN/320 *Transport - Logistic and services*
Work Item on a calculation method of total energy used in moving people and goods

Gaps

• ??????

Data centres

JTC 1/ SC 39 *Sustainability for and by Information Technology*
WG 1 *Resource Efficient Data Centres*

Buildings

TC 163 *Thermal performance and energy use in the built environment*
75 standards mainly thermal properties, calcs and tests

TC 205 *Building environment design*
9 standards related to heating & cooling

JWG Energy performance of buildings using holistic approach

Existing work e.g.

ISO AW1 16346 Assessment of overall energy performance
ISO AW1 16344 Common terms, definitions and symbols for the overall energy performance rating and certification
ISO 16343 Methods for expressing energy performance and for energy certification of buildings
ISO CD 12655 Presentation of real energy use of buildings

Air cond and refrigeration

TC 86 *Refrigeration and air-conditioning*
Numerous standards and items on rating and performance

Many product standards e.g ISO 18292 Energy performance of fenestration systems.

Gaps

• ??????

Power generation

Turbines

TC 192 *Gas turbines*
17 standards
(Nothing direct on EE)

Cogen

TC 192/WG 13 *Cogeneration systems* (ISO 26382 Cogeneration systems -- Technical declarations for planning, evaluation and procurement)

Gaps

• ??????

Non - Renewables

CCS

TC 265 *Carbon dioxide capture, transportation, and geological storage*

CBM

TC 263 *Coalbed methane*

Nuclear

TC 85 *Nuclear energy, nuclear technologies, and radiological protection*

Natural gas

TC 193

Solid mineral fuels

TC 27

Gaps

• ??????

Renewables

Wind

1 standard on gears (being done for the IEC committee)

Solar

TC 180 *Solar energy*
16 standards
1 stalled WI

Hydrogen

TC 197 *Hydrogen technologies*
14 standards
6 WIs
Dealing with hydrogen for transport and power gen applications

Bioenergy

TC 28/SC 7 *Liquid biofuels*
TC 238 *Solid biofuels (WIs)*
TC 255 *Biogas*
PC 248 *Sustainability criteria*

Geothermal

TC 86 *Refrigeration and air-conditioning*
ISO 13256 *Water-source heat pumps -- Testing and rating for performance*

Gaps

• ??????

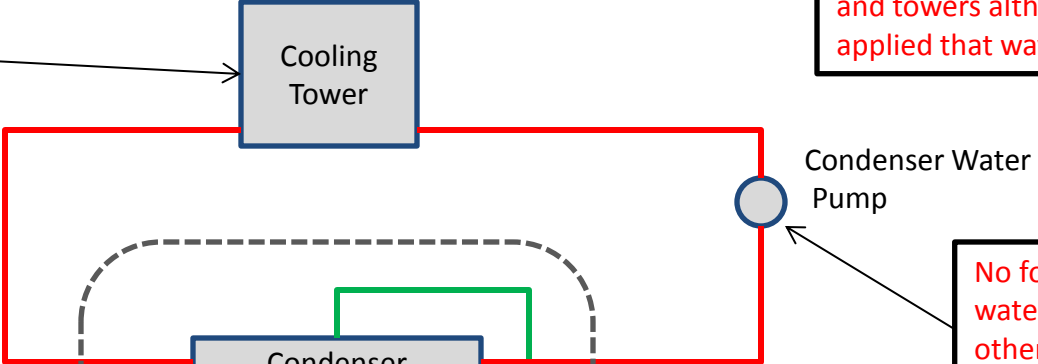
Subsystem Approaches

- Today, AHRI Standards and efficiency regulations like ASHRAE 90.1 and DOE focus on components and equipment at standard ratings conditions and typically at full load.
- There is no direct tie to building level performance and local weather conditions and some of the standards ratings do not reflect building operation.
- Metrics on performance often do not cover the applied energy use of the system when installed in a building, so the overall performance is not determined and it may not be the optimal.
- Often additional power is used in the application, conditions are different than the standard rating conditions, and additional hardware is added to complete the system
- So the concept of a subsystems approach is to expand the scope to cover the HVAC subsystem and not just the components plus focus on annual operation and not full load

Chiller Water "System" Example

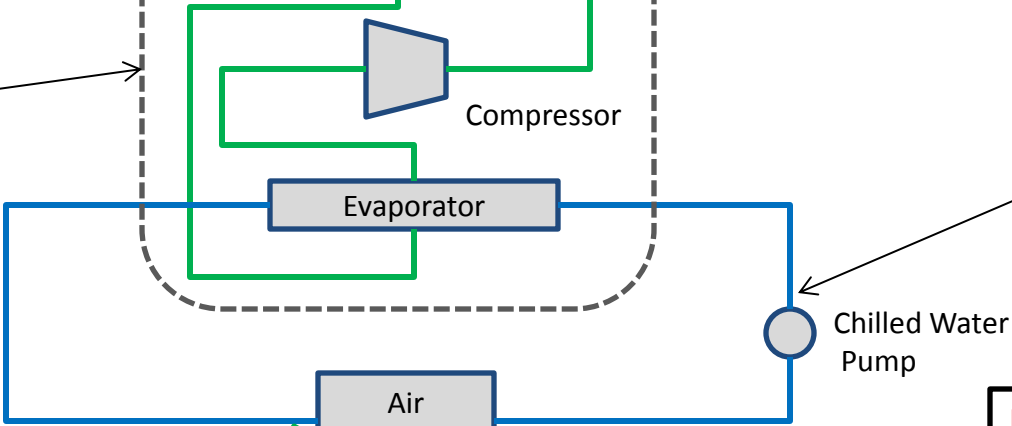
ASHRAE 90.1 fan power requirement, **no approach requirement and ignore water use**

Do not address multiple chillers and towers although most are applied that way



No focus on condenser water pumping power other than a pipe sizing requirement

Current 550/590 Chiller Standard and Certification focus ASHRAE 90.1 **Full and part load efficiency**



No focus on chilled water pumping power other than pipe sizing

No integration of economizers, exhaust fans, ERV and IAQ

No focus on duct pressure drop and very little on applied fan power

Very little focus on the effective air distribution

