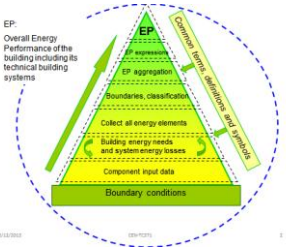
European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung



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

Results phase 1, time schedule and intermediate results phase 2

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Phase 1 results

- **FprEN 15603:2014 Over-Arching EPB Standard**
- **prTR (Technical Report) 15615:2014 on the prEN 15603**
- **prEN stands for Draft Standard; prTR stands for Draft Technical Report**

Supporting documents for the EPB standard developers:

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

Software tool to support the checking of the calculation procedures for phase 1 as given in the FprEN15603

Current status of the FprEN15603

all ENQUIRY comments + late comments satisfactory resolved>> N342

- Majority of the CEN members are expected to vote yes on the acceptance as an European Standard.
- Many questions at the Enquiry have been resolved by amongst others:
  - **it is more clear that the default values and options given in the Annex B are informative**
  - more explicit applicability and visibility for the Monthly Calculation procedures although the standard will continue to support hourly procedures.
  - more clarification on how the partitioning and assessment boundaries should be handled
  - inclusion of informative Annex G on nZEB

CEN TC 371 decided to publish the OAS: FprEN15603 for Formal Vote

- FV means that NSB's (National Standard Bodies) while casting their votes, can suggest minor editorial changes
- Being aware that a future fine-tuning of the standard during phase 2 where we are developing the entire set of EPB standards , results in a continues maintenance status for the OAS
- Estimated publication for FV by August/Sept. '14
- 2 months voting by National Standards Bodies (NSB's)
- after positive vote: 2-3 months processing before final publication by CEN (in practise the NSB's) estimate: January '15

Annex B of OAS (informative) Input data : CEN values and choices

1.1 Type of energy performance ratings according to building type and assessment purpose

2 Building categories

2.1 The space categories and reference area of the assessed building

3 Building services included in the energy performance calculation

4 Overheads and perimeters included in the primary energy factors

5 Primary energy factors

6 Weighting factors for exported energy

7 Overall calculation procedures

8 Energy flows to be included in the energy balance

9 The k-exp-factor

10 Distribution rules criteria

EPB standards: have 2 annexes on defaults: Annex A: normative template on the choices Annex B: informative tables with the CEN defaults values and choices

- No National Annex if the default values of the informative part of the annex B are followed (we hope valid for most NSB's)
- A recommendation to the NSB's to produce and publish a national annex **if there is deviation of one or more of these default values or choices.**
- It is up to the MS's and NSB's to find the best solution:
  - follow the defaults and consider this as normative, or publish a national annex conform Annex A with the national choices to the standard if they have to deviate on some issues due to the national regulation.
- If the CEN default Annex B is not followed a national annex is considered the most transparent solution.

Next to the OAS we have the set of EPB standards, the different modules as illustrated in the OAS

- About 40-50 standards or parts thereof
- and about same number of Technical Reports connected to these standards
- For all standards an excel file has to be produced to report the input and output data and to verify the described calculation procedure and correct interconnection with referred standards

M1	Overarching	M2	Building (as such)	Technical Building Systems									not under EPBD	
					Heating	Cooling	Ventilation *)	Humidification	Dehumidification	Domestic Hot water	Lighting	Building automation & control	PV, wind, ..	Transport people (elevators,	Others (appliances etc.)
sub1		sub1		sub1	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13
1	General	1	General	1	General	General	General	General	General	General	General	General	General	General	General
2	Common terms and definitions; symbols, units and subscripts	2	Building Energy Needs	2	Needs	Needs	Needs	Needs	Needs	Needs	Needs	---	---	---	---
3	Applications	3	(Free) Indoor Conditions without Systems	3	Maximum Load and Power	Maximum Load and Power	Maximum Load and Power	Maximum Load and Power	Maximum Load and Power	Maximum Load and Power	Maximum Load and Power	---	---	---	---
4	Ways to Express Energy Performance	4	Ways to Express Energy Performance	4	Ways to Express Energy	Ways to Express Energy	Ways to Express Energy	Ways to Express Energy	Ways to Express Energy	Ways to Express Energy	Ways to Express Energy	Ways to Express Energy	Ways to Express Energy	Ways to Express Energy	Ways to Express Energy
5	Building Functions and Building Boundaries	5	Heat Transfer by Transmission	5	Emission & control	Emission & control	Emission & control	Emission & control	Emission & control	Emission & control	Emission & control	Emission & control	---	Emission & control	Emission & control
6	Building Occupancy and Operating Conditions	6	Heat Transfer by Infiltration and Ventilation	6	Distribution & control	Distribution & control	Distribution & control	Distribution & control	Distribution & control	Distribution & control	Distribution & control	Distribution & control	Distribution & control	Distribution & control	Distribution & control
7	Aggregation of Energy Services and Energy Carriers	7	Internal Heat Gains	7	Storage & control	Storage & control	Storage & control	0	0	Storage & control	--	Storage & control	Storage & control	Storage & control	Storage & control
8	Building Partitioning	8	Solar Heat Gains	8	Generation & control	Generation & control	Generation & control	Generation & control	Generation & control	Generation & control	Generation & control	Generation & control	Generation & control	Generation & control	Generation & control
9	Calculated Energy Performance	9	Building Dynamics (thermal mass)	9	Load dispatching and operating conditions	Load dispatching and operating conditions	Load dispatching and operating conditions	--	--	Load dispatching and operating conditions	--	Load dispatching and operating conditions	--	Load dispatching and operating conditions	Load dispatching and operating conditions
10	Measured Energy Performance	10	Measured Energy Performance	10	Measured Energy Performance	Measured Energy Performance	Measured Energy Performance	Measured Energy Performance	Measured Energy Performance	Measured Energy Performance	Measured Energy Performance	Measured Energy Performance	Measured Energy Performance	Measured Energy Performance	Measured Energy Performance
11	Inspection	11	Inspection	11	Inspection	Inspection	Inspection	Inspection	Inspection	Inspection	Inspection	Inspection	Inspection	Inspection	Inspection
12	Ways to Express Indoor Comfort	12	--	12	---	---	---	---	---	---	---	BMS	---	---	---
13	External Environment Conditions														
14	Economic Calculation														

The OAS EN15603 as backbone for the set of EPB standards:

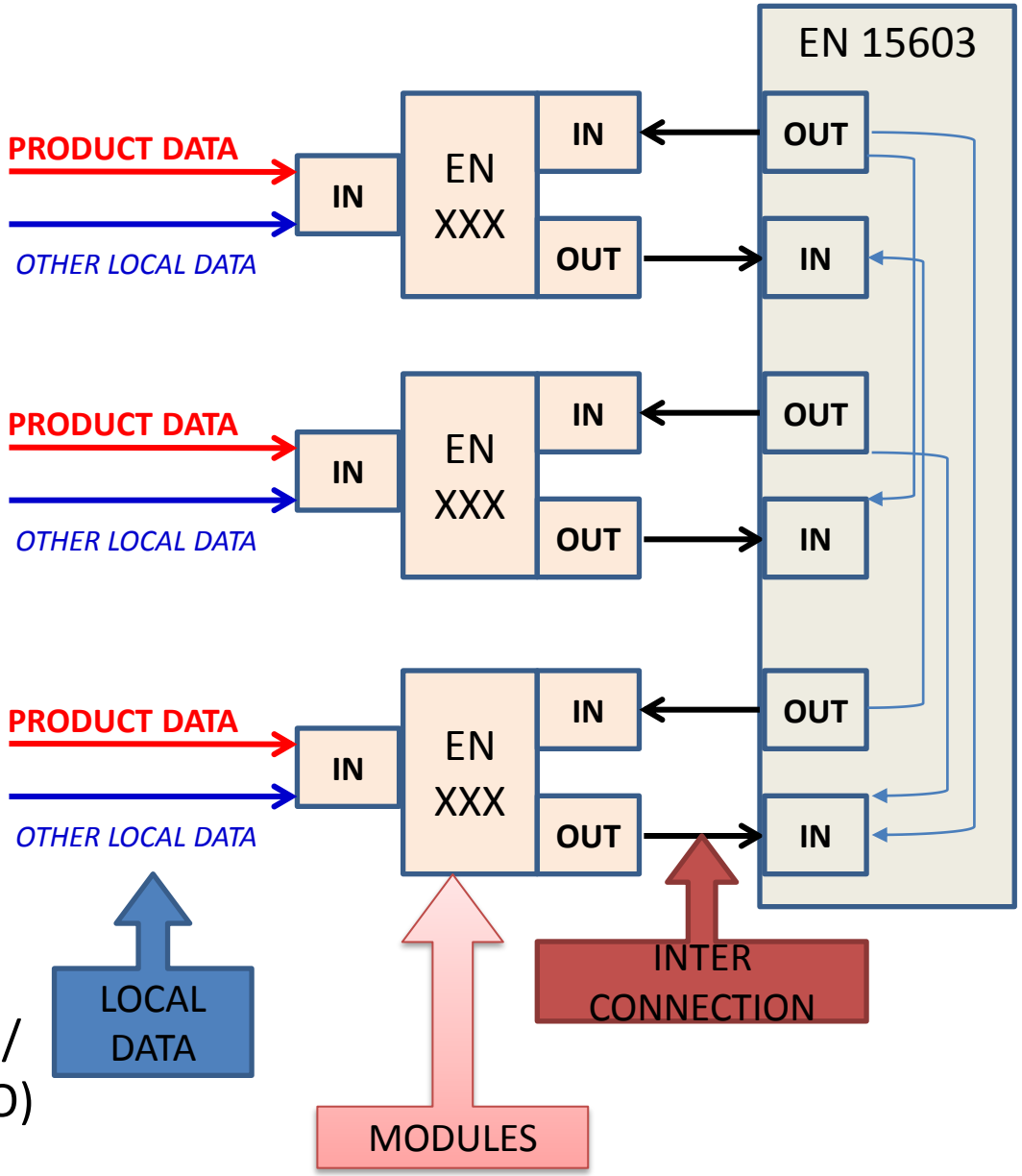
Implementing the EN-EPB standards

STEP BY STEP APPROACH

AND AGGREGATION OF INPUT-VALUES

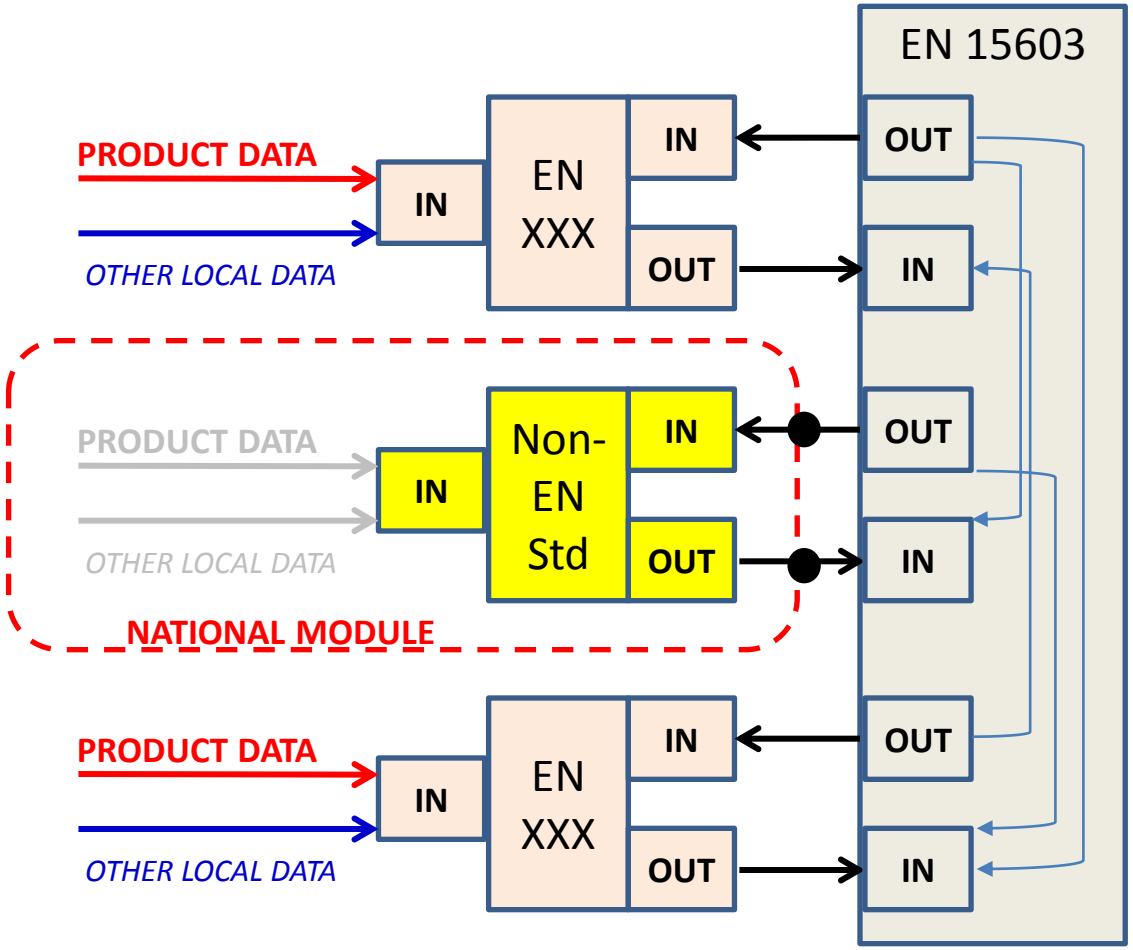
CEN EPB PACKAGE OF STANDARDS

- CALCULATION STRUCTURE
  EN 15603 + general parts
- CALCULATION MODULES FOR EACH STEP
  1 **Excel** file per module
- EACH CALCULATION MODULE REQUIRES
  - INTERCONNECTION VALUES (I/O TO THE STRUCTURE)
  - PRODUCT DATA (LOCAL DATA)
  - OTHER LOCAL DATA ABOUT SPECIFIC APPLICATION (LIKE LOCALISATION , INDOOR/ OUTDOOR INSTALLATION INFO)



Replacing a module with a non-CEN one

- Possible **thanks to the modular structure**
- … but the I/O structure has to be respected
- Needed info can be found both in the accompanying excel file and in the specific I/O clauses in the EN standard



Connection of custom modules: input data

Each calculation module needs two types of input data:

- Data coming from other parts of the calculation (required energy output, operating conditions, etc.),
- Data that are specified only when using this module, «**local data**» Typically examples: product data and application conditions like localisation of components (boiler, pipes indoor/outdoor)

Conditions to be satisfied by custom non-EN modules:

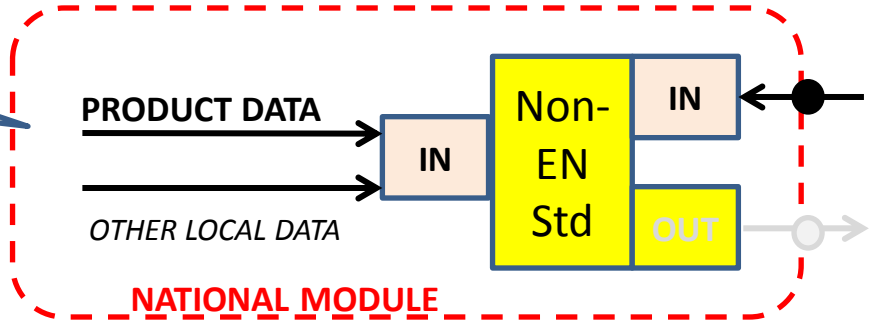
- The set of input data of the replaced module, together with custom local data, shall be complete to perform the calculation according to the custom module.
- The available input data coming from other parts are listed as «***operating conditions***» in the input data specification of the replaced EN module

Example: boiler module, input

ORIGINAL MODULE INPUT DATA SPECIFICATION

Name	Symbol	Software name	Unit	Value	Range	Origin	Varying
Operating conditions data							
heat output to the heat distribution sub-system(s);	$Q_{H;gen;out}$	*Q_H_gen_out*	kWh	28000	0…∞	M3-6	Yes
calculation interval	t_{ci}	*t_ci*	h	744	0…8760	M1-9	Yes
total time of generator(s) operation	t_{gnr}	*t_gnr*	h	710	0…8760	M1-6	Yes
average water temperature in the boiler;	$\vartheta_{gnr;w;m}$	*theta_gnr_w_m*	°C	70	0…100	M3-6	Yes
return water temperature to the boiler (for condensing boilers);	$\vartheta_{gnr;w;r}$	*theta_gnr_w_r*	°C	60	0…100	M3-6	Yes
external temperature of the calculation interval	ϑ_{ext}	*theta_ext*	°C	4	-50…+50	M1-13	Yes

CUSTOM LOCAL INPUT



AVAILABLE FOR INPUT

In general there will more data available than the required input by simplified modules

Connection of custom modules: output data

OUTPUT DATA

Each calculation module is intended to supply well defined data to other calculation parts.

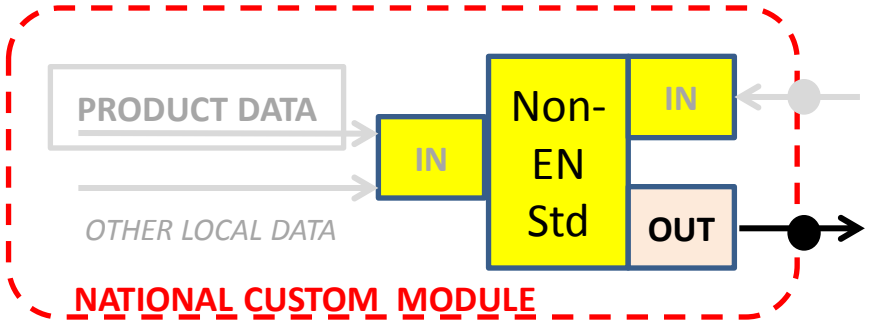
Conditions to be satisfied by custom non-EN modules:

- The custom module has to produce the same sort of output data as the replaced original EN module
- The «output data» are listed in a specific clause of that standard
- Usually the output data is a limited number of data
- some of these data may be replaced by default values as to be included in the custom module

Example: boiler module, output

ORIGINAL MODULE OUTPUT DATA SPECIFICATION

Name	Symbol	Software name	Unit	Value	Range	Intended destination	Varying
Energy flow data							
Generation input	$E_{H;gen;in}$	*E_H_gen_in*	kWh	30.561	0...∞	M3-1	Yes
Recoverable heat	$Q_{H;gen;ls;rbl}$	*Q_H_gen_ls_rbl*	kWh	96	0...∞	M2-2	Yes
Total auxiliary energy	$W_{H;gen;aux}$	W_H_gen_aux	kWh	137	0...∞	M3-1	Yes
Operating condition data							
Flow rate							
Temperature 1							
Temperature 2							
Other data							
Fuel type	BLR_FUEL	BLR_FUEL	List	BLR_FUEL_OIL	List	M3-1	Yes



HAS TO BE PROVIDED AS OUTPUT

The full set of output data has to be provided.

Unknown data?

The calculation procedure asks for a number of data about products

- **New products**
  → make, model
  → catalogue / data–base
- **Old product, recent product but model unknown**
  → ???

Possible solutions:

1. **Change the method** to allow simpler data
2. **Aggregate data** under one single choice (identifier)

Product data				
Product description data				
Condensing boiler	*BLR_COND*	*BLR_COND*		BLR_COND_NO
Fuel	*BLR_FUEL*	*BLR_FUEL*		BLR_FUEL_OIL
Product technical data				
generator output at full load;	Φ_{Pn}	*Phi_Pn*	kW	60
generator efficiency at full load;	$\eta_{gnr;Pn}$	*eta_gnr_Pn*	%	**92,0**
generator output at intermediate load;	Φ_{Pint}	*Phi_Pint*	kW	18
generator efficiency at intermediate load;	$\eta_{gnr;Pint}$	*eta_gnr_Pint*	%	**90,0**
stand-by heat loss at test temperature difference $\Delta\theta_{i,test}$;	$\Phi_{gnr;ls;P0}$	*Phi_gnr_ls_P0*	kW	0,72
power consumption of auxiliary devices at full load;	$P_{aux;gnr;Pn}$	*P_aux_gnr_Pn*	kW	0,32
power consumption of auxiliary devices at intermediate load;	$P_{aux;gnr;Pint}$	*P_aux_gnr_Pint*	kW	0,06
stand-by power consumption of auxiliary devices;	$P_{aux;gnr;P0}$	*P_aux_gnr_P0*	kW	0,015
auxiliary power when the generation system is inactive	$P_{aux;off}$	*P_aux_off*	kW	0
minimum operating boiler temperature.	$\vartheta_{gnr;min}$	*theta_gnr_min*	°C	50
Recoverable fraction of stand-by losses	$f_{gnr;env}$	*f_gnr_env*	-	0,5
correction factor of full-load efficiency;	$f_{corr;Pn}$	*f_corr_Pn*	-	0,04
correction factor of intermediate load efficiency;	$f_{corr;Pint}$	*f_corr_Pint*	-	0,05
generator average water temperature at test conditions for full load;	$\vartheta_{gnr;test;Pn}$	*theta_gnr_test_Pn*	°C	70
generator average water temperature at test conditions for intermediate load;	$\vartheta_{gnr;test;Pint}$	*theta_gnr_test_Pint*	°C	50
difference between mean boiler temperature and test room temperature in test conditions;	$\Delta\vartheta_{test;P0}$	*deltatheta_test_P0*	°C	50
part of the auxiliary energy recovered	$f_{rvd;aux}$	*f_rvd_aux*	-	0,75
part of the nominal electrical power not transmitted to the distribution sub-system	$f_{rbl;aux}$	*f_rbl_aux*	-	0,25

Input data required to define a boiler
DIN, RT, UNI, …

Aggregation of data

One choice

Standard boiler, CE marked

Old atmospheric boiler, before 1994
Standard boiler, CE marked
Condensing boiler
...
Other default boilers

One set of data

Old atmospheric boiler, before 1994

Standard boiler CE marked

Condensing boiler

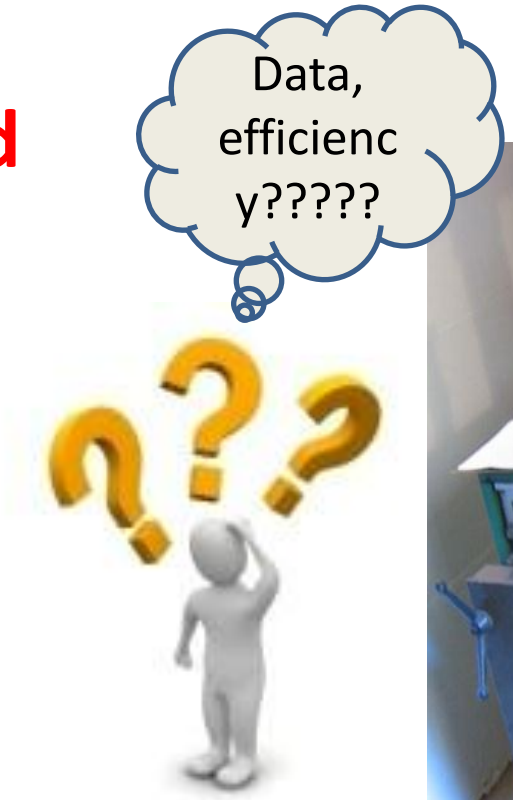
BLR_COND_YES
BLR_FUEL_GAS
60
95,8
18
99,8
0,69
0,32
0,06
0,015
0
0
0,5
0,2
0,2
70
30
50
0,75
0,25
15
0,7

BLR_COND_NO
BLR_FUEL_GAS
60
88,6
18
86,8
0,99
0,32
0,06
0,015
0
50
0,5
0,04
0,05
70
50
50
0,75
0,25
15
0,7

BLR_COND_NO
BLR_FUEL_GAS
60
84,0
18
79,0
0,40
0,60
0,05
0
0
50
0,5
0,04
0,05
70
50
50
0,75
0,25
15
0,7

Input simplification: how

- **Changing the method**
  - One choice required
  - Loss of interactions
  - Possibly inconsistent with other modules
- **Aggregation of data**
  - One choice required
  - Interactions maintained (load factor, operating conditions)
  - Consistent with other modules



Conclusion

- The clearly defined **modular structure**
  - Clear list of inputs and outputs
  - Indicated in the standard and in the accompanying excel-file

  allows to connect custom non-EN modules (step by step approach)
- **The aggregation of data** solves the problem:
  - To minimise the effort for the calculation (one single choice needed)
  - and to guarantee at the same time
    - consistency of calculation with other modules
    - consideration about interaction with other parts

  Default aggregated values are given in annex B of each EPB standard

Accompanying informative Technical Report FprCEN TR 15615 to the OAS EN15603

- As for all **EPB standards**, standards shall only deal with **normative text**; explanations, considerations, justifications and background information shall be included in a **Technical Report (TR)**
- The complexity of the building energy performance calculation requires guidance and good documentation and justification of the procedures.
- **CENTC371 decided not to publish the January 2014 version and to have a 2nd Voting to bring the TR in line with the current FV version of the OAS**

additional information to be expected in the TR

- the justification and background info in the TR will contribute to the transparency
- the TR is the place where we can elaborate on the fact that default values can be derived from national protocols/legislation,
- more information of possible simplifications in the input assessment procedures is expected in the underlying set of EPB standards
- **example case (simple building) to illustrate the usability of the OAS will be included in the TR**

Phase 2 of the CEN EPB project

- the improvement and expansion of the current set of CEN-EPB standards on the basis of :
  - the set of requirements developed in phase 1: EN15603, TR15615, TS 16628 and TS 16629;
  - communication with the regulators of the EU-member states via the Liaison Committee ;
  - Related supporting information ;

- The actual revision of the standards will be carried out by the 5 related CEN Technical Committees on the basis of this clear set of common principles and rules and priorities .

Work Program M480-Phase 2

- About 100 Work Items
- Resulting in about 40-50 standards or parts thereof
- and about same number of Technical Reports connected to these standards
- For all standards an excel file has to be produced to report the input and output data and to verify the described calculation procedure and correct interconnection with referred standards

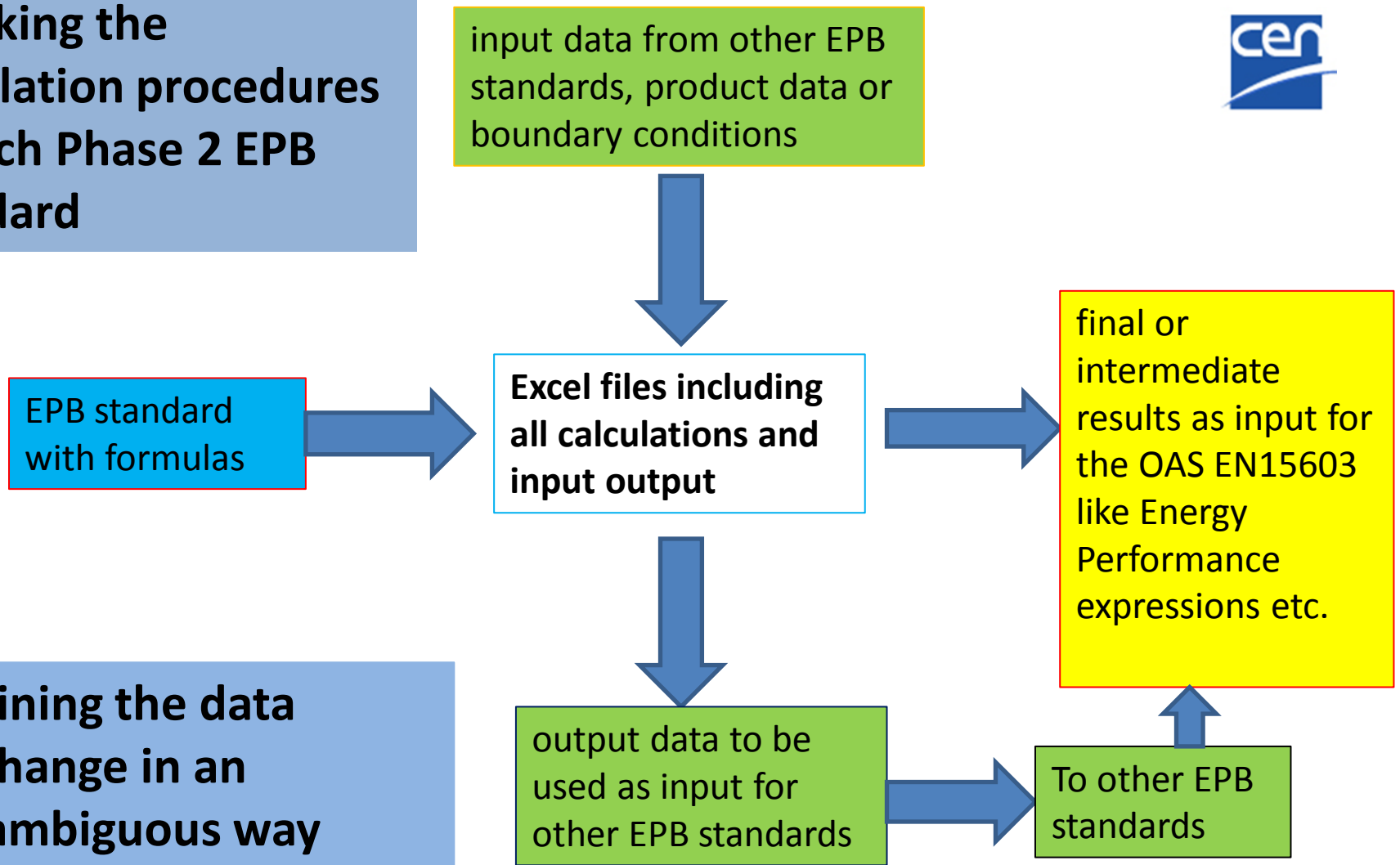
Status/Planning M480-Phase 2

- The first draft prEN's are ready and have been published at the CENTC371 livelink
- **It is expected that in May/June 2014** almost all draft prEN's: are ready for acceptance for enquiry
- **September-November 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 2015**
- **Before the end of 2015** we expect all Enquiry comments to be resolved and Formal Vote versions ready .
- After publishing and voting we expect that **during 2016 all EPB-standards will ready and available as EN** (or EN-ISO) standards
- **the EPB standards will be developed to serve for a long period of time; 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
- **Phase 1: The software tool of the OAS will be made publicly available, this allows the user to 'play' with it to see the impact of chosen options and defaults**

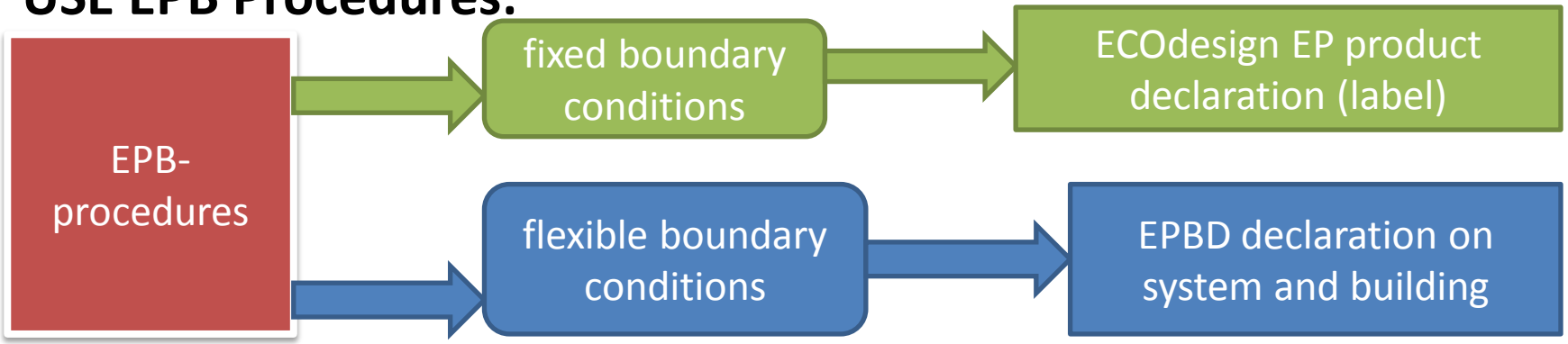
Checking the calculation procedures in each Phase 2 EPB standard



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 product labelling system

- **Additional** we have to be aware that many "products" can be considered as sub-systems as they are including control-devices, electronics, storage element, other auxiliary functions, etc.
- 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)