

How to deal with the CEN package in building regulation and software The Italian experience

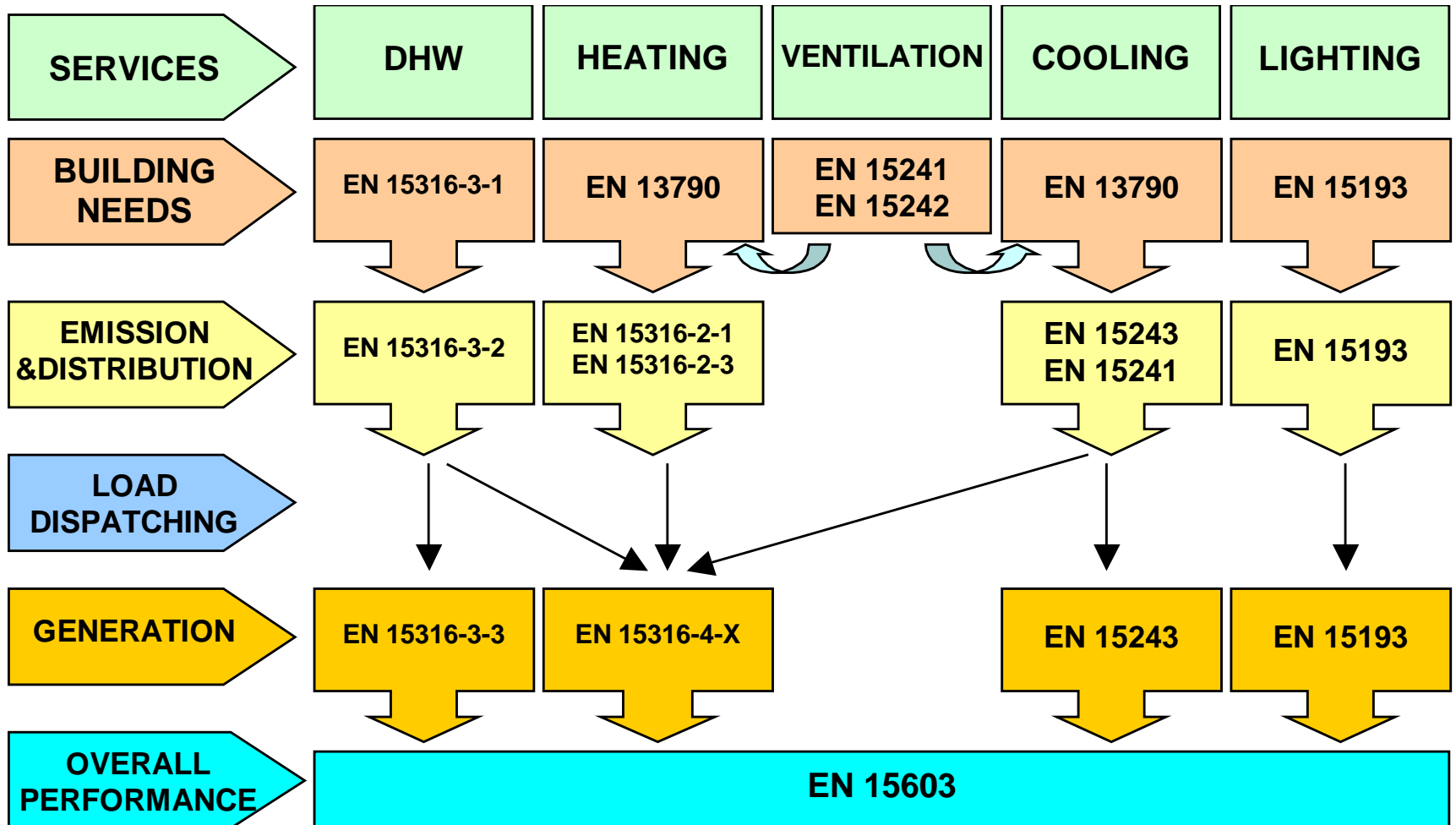
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CENSE

Leading the CEN Standards on Energy performance of buildings to practice

*Towards effective support of the EPBD implementation and acceleration in
the EU Member States*

EN set of standards



Issues about EPBD package

The package has a clear overall structure but...

- time step: hourly, monthly, yearly or bins?
 - several methods for the same topic...
 - sometimes there are only requirements to methods (cooling)
 - default data shall be checked or replaced by national data...
 - do you need to consider all services with the same details?
 - besides energy, how to follow operating conditions (water temperature)?
- For calculation purpose, a fully consistent procedure without loose ends is required
→ **evidence comes when producing application software...**
- A national document is necessary...
... to give guidance and to fix loose ends → **UNI-TS 11300**



Use of EN standards in Italy

Yesterday...

- Primary energy for heating calculation since 1993
 - Building → Standards UNI 103XX based on EN 832, then EN 13790
 - Heating system → UNI 10348 and 10347 standards
- Italian experts participated actively in EPBD package development
- **Since 2003 → first drafts of EN standards were incorporated in a national recommendation → copy of EN draft standards for a smooth shift**

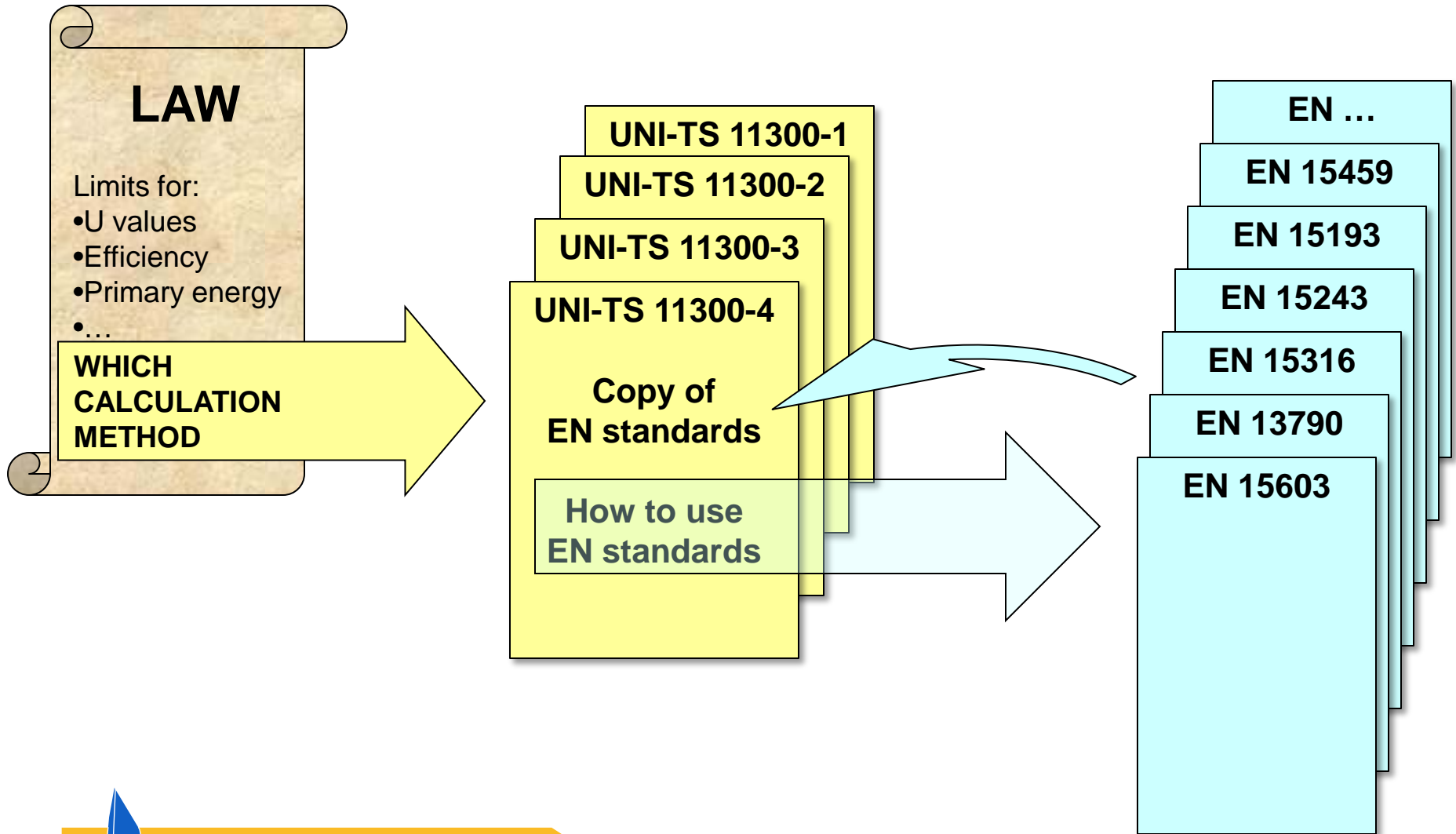
PRESENT SITUATION

- **UNI-TS 11300-1: building needs → how to use EN 13790**
- **UNI-TS 11300-2: simple heating and dhw: → copy of part of EN 15316 series**
+ complementary information (how to select methods)
- **UNI-TS 11300-3: cooling system → structured according to EN 12143**
→ monthly tabulated method → public enquiry finished
- **UNI-TS 11300-4: other generation systems and renewables → copy of EN 15316-4 parts → to be finished** (*problems with heat pumps and other special generators*)

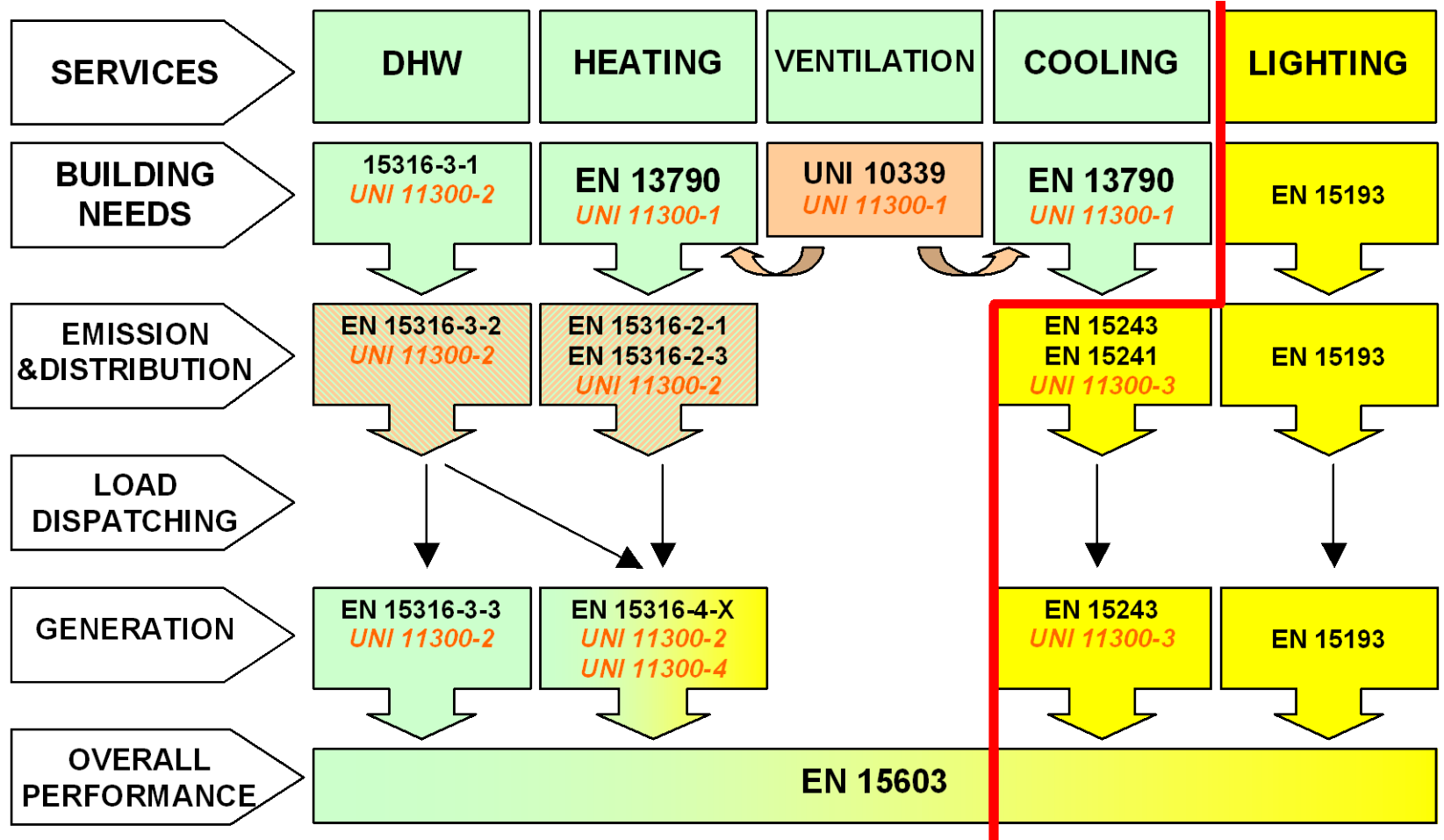
Next step: UNI-TS 11300 as a national annex specifying how to use EN standards



LAW and STANDARDS: Italy



EN standards use: current status Italy



COLOR CODE

- EN COMPLIANT
- DEVIATION FROM EN
- NOT YET INCLUDED



Not all services may be relevant

- **Ventilation:** EN infiltration flow calculation is very complicated. You need to enter all internal partitions which is much more than taking into account only external structures.
- Italian approach for ventilation (UNI-TS 11300-1) is quite simplified:
 - **without mechanical ventilation**, you shall take into account a fixed air exchange rate (design calculation $0,5 \text{ h}^{-1}$, energy calculation $0,3 \text{ h}^{-1}$) for special activities (theatre, restaurant...) UNI 10339 provides the flow rate
 - **with mechanical ventilation**, you take into account the designed flow rates and the effect of any heat exchanger

... and this is done within EN 13790 application

- This might be acceptable because of local conditions
 - ventilation systems are very seldom in Italy
 - in Italy wooden or "dry built" houses are very seldom. The rule is plaster which provides a tight envelope, except for windows, doors and installations
 - the climate allows easy airing and ventilation needs are in the range $8 \dots 20 \text{ kWh/m}^2$

... should the infiltration provide more than $0,3 \text{ h}^{-1}$...you should change the windows !



Cooling calculation Italy

An hourly method is usually recommended but there is little experience about an entire building energy calculation with an hourly method.

Typically only some rooms are cooled in the Italian residential context.

There is no finished method in the EN package → there is only a frame for systems (subsystems concept) and requirements to methods → a national document is required again

Legal requirements are based on cooling needs only (regions + Italy)

UNI-TS 11300-3 “cooling systems” has recently undergone public enquiry

- Needs: EN 13790, monthly calculation method
- System: tabulated values for all subsystems
- Very simple... maybe even too simple?



Which time step?

Heating and dhw are usually calculated with monthly methods.

- There is a lot of experience in many countries on this topic.
- Monthly methods are accurate enough for “conventional” heating systems...

... but heat pumps require a bin calculation because of strong influence of operating conditions on performances

... and in Italy we have only monthly standardized climatic data...

CTI just started producing hourly data for a “standard year” based on past climatic data

→ **UNI-TS 11300-4** (*will be at public enquiry in autumn 2009*)

→ connection via monthly bins

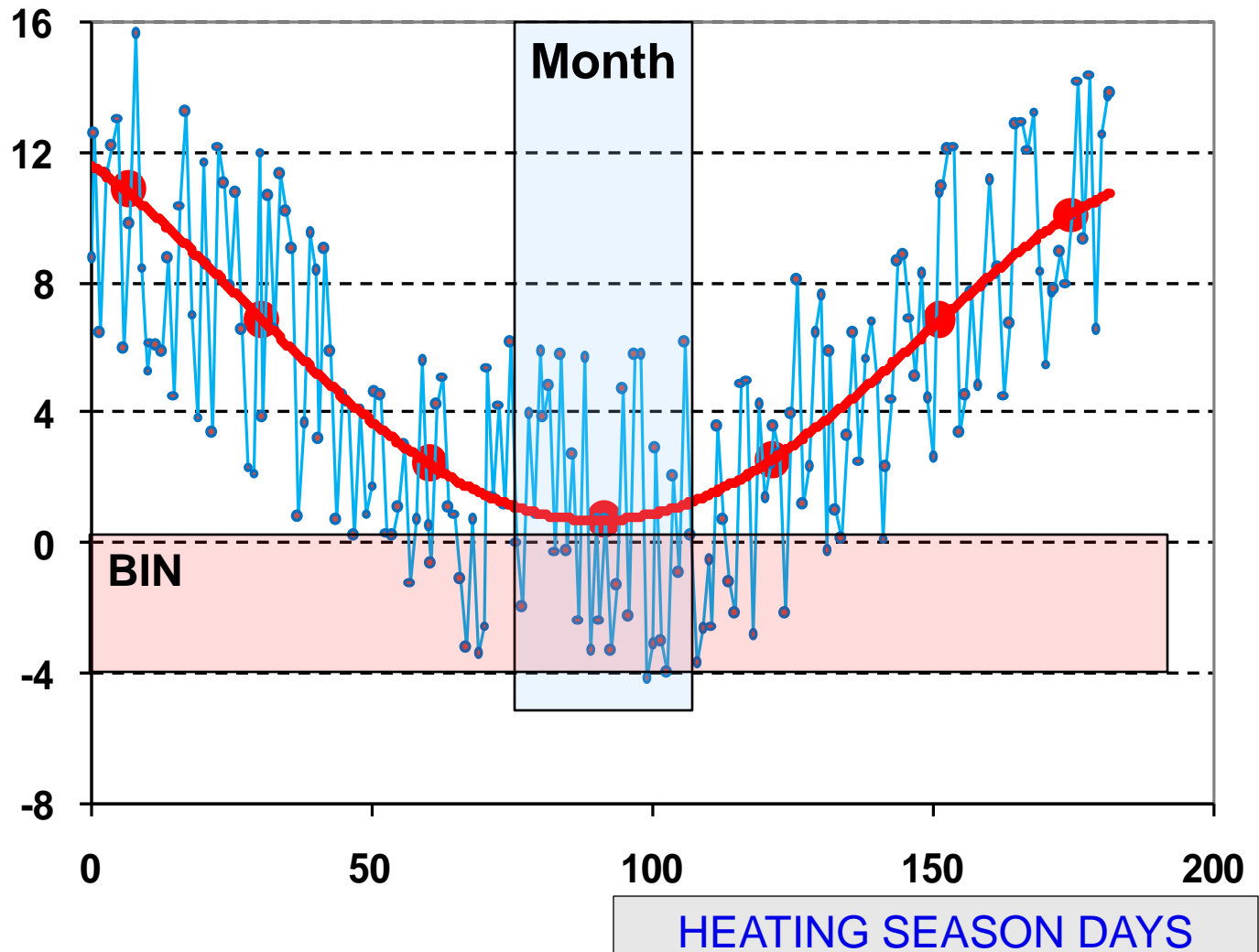
→ method to build monthly bins from monthly data

→ method to convert monthly energy data into bin data

→ method to convert monthly operating conditions into bin data



HEATING SEASON TEMPERATURE



Red line
Interpolation
according to
monthly
average
temperatures
(red dots)

Blue line
Typical real
climatic data

Loose ends in the standards

EN 15316-4-2 (heat pumps) gives a general procedure
... but there are loose ends

• **EN 15316-4-2**: “*determine COP for actual operating conditions*” ...

... and therefore **UNI-TS 11300-4** defines:

- how to calculate operating conditions according to heat source type
- the minimum set of COP data required from the manufacturer
(based as far as possible on EN product standards)
- an interpolation rule for COP (interpolate on exergetic efficiency)
according to source and sink temperature
- an extrapolation rule for COP according to source and sink
temperature: max 10 °C with constant exergetic efficiency
- a calculation method for the effect of intermittency...



Multiple methods, why?

- **No single method is “the solution” for all cases**
 - Simple tabulated methods are straightforward but may lead to very bad mistakes out of boundary conditions
 - Detailed methods are more likely to give correct results but require a lot of work

Turn around:

- EN standards: specify a set of methods where appropriate
- National annexes/standards: identify suitable boundary conditions to choose the method for each specific calculation

OTHERWISE, WHY EXPERTS?



Hidden potential of EPBD package

A connection between calculated and actual performance is required

- An essential part of the certificate is economic effective recommendations and this requires reliable simulation capacity and a reasonable link to actual performance
- Actual consumption is usually the only available data to check if calculation is correct.

**EN 15603 annex B → energy signature...
...provides a tool for that connection**



An energy certificate...

An energy certificate is the natural and logical completion of the work of the system designer

Will it be a serious job or just the next piece of paper?

To provide reasonably accurate energy consumption predictions and credible recommendations to users, we need:

- a common, complete, consistent, reliable **calculation method** (standards)
- true experts to perform energy certification
(registered people after 40 hours training are not necessarily experts)
- a stable and common (not too fragmented) regulatory frame
- integrated **energy and design calculation tools** (software)

→ developing software tools requires a complete method without loose ends



Italy: lesson learned

- The EPBD package was developed in a very short time...
 - multiple calculation methods with no clear selection criteria (sometimes only requirement to methods...)
 - multiple generators and system branching cases left implicit
 - uncomplete links between parts (example: what about interactions between systems...);
 - only requirements to energy calculation for cooling systems
- some work has to be done at national level, to select, organise and coordinate relevant parts of the EPBD package to extract a complete overall calculation procedure (according to EN 15603)

It is possible and this shall be done

IN ITALY IT HAS BEEN DONE: UNI-TS 11300 parts 1, 2 and coming parts 3 and 4

and the results shall be an input for the revision of the EPBD package

... **otherwise**, other methods will be invented outside the ordinary standardisation process, leading to **unconsistent results**, instability, **no common market**.

**In Italy, Lombardia invented its own calculation method and software
... and changed it 14 times in 2 years ...**



...THANK YOU FOR YOUR ATTENTION

Energy Performance of Buildings

