The role of NCM (compliance/EPC) software in modelling of low energy buildings

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Presentation Overview

- Building regulations are becoming a key driver to low energy buildings.
- Low energy buildings rely on innovative technologies that are potentially more complicated to model
- Modelling these features is potentially an even bigger challenge to compliance tools

- Is it technically possible, within the compliance framework, to adapt the current simplified tools for the more demanding modelling requirements of future building features required by tighter building regulations?

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Presentation Overview

- Energy modelling: Proving the design works vs. assessing energy performance
- Computational simplifications in compliance tools are available from the adopted CEN algorithms
- but the key driver for simplicity is the requirement for an ‘uncomplicated’ approach for the majority of ‘simple’ buildings

- Is the industry ready for the increased complexity of more detailed modelling options?
- Future developments of compliance tools

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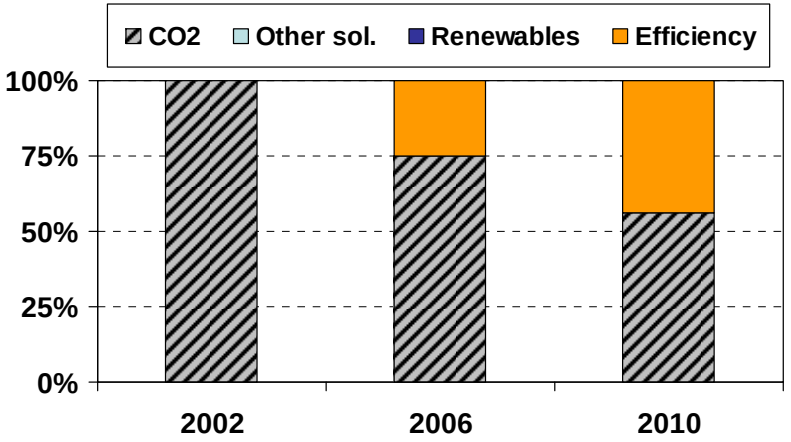
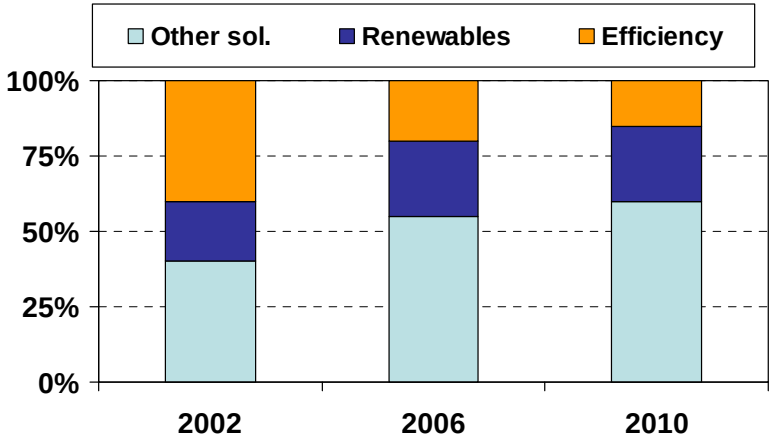
Building Regs. driving low energy buildings

- Current building regulations are enforcing the implementation of energy efficiency measures in buildings, within the limits of cost effectiveness



- Notional Building 2010 (NB10): Mainly lighting and HVAC systems for cooling for additional obvious cost effective energy efficiency measures.



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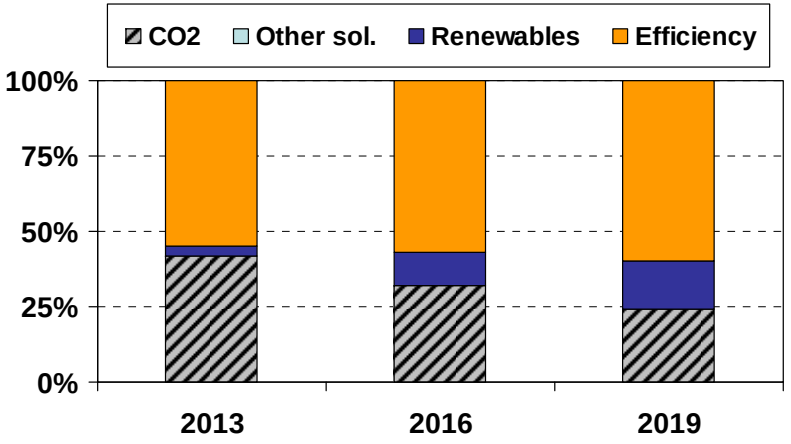
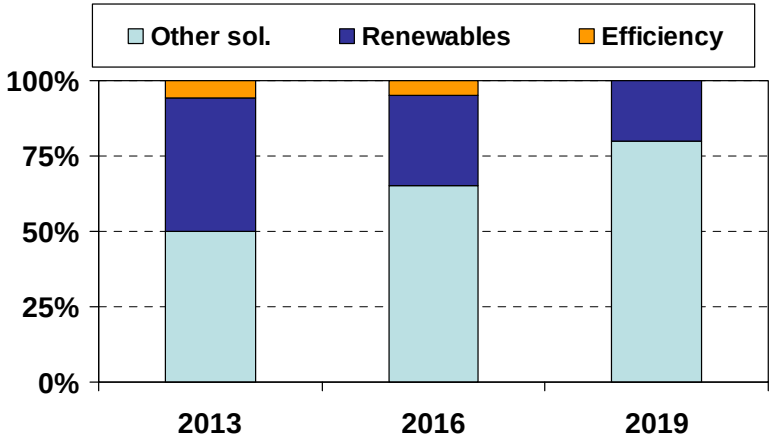
Building Regs. driving to low energy buildings

- Future improvements (25% every 3 years) in forthcoming building codes will have to go beyond energy efficiency
- Expectation that NB13 (Notional Building 2013) includes renewable sources to reduce associated TER
- NB16 will need a significant amount of renewable energy generation, cross building sectors, in order to set an additional 25% target
- and so on…





Low energy buildings features are potentially more complicated to model

- Renewable energy sources can be very variable, within an interval of less than one hour
- Passive approaches (innovative ventilation strategies, passive facades, etc), usually rely on complex air flows within the building,
- Modelling air flows (highly dependent on indoors and outdoors conditions) that are very complicated to model...
- requiring CFD analysis when modelling a design concept as a proof that it works

Modelling these features is potentially an even bigger challenge for simplified tools

- This presents an even bigger challenge to software tools designed specifically for compliance and EPC assessments, due to their intrinsic simplicity

- It is more difficult, requiring additional pre-processing of more detailed data (hourly) to produce integrated values that can be used in the more simplified procedures of these methods,

- But complexity can be significantly reduced when the purpose of the modelling is not to prove the design works but only to assess energy performance

Energy modelling: Proving the design works vs. assessing energy performance

- Proving the design works?...
- Detail DSM modelling is required,
- Probably with special zoning needs and specific input parameters,
- It might require supporting CFD analysis,
- Uncertainty quickly grows, thus requiring sensitivity analyses
- Increasing time and costs (also high level skills),
- Worthy when proving a design will work and to compare with alternative solutions…

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Energy modelling: Proving the design works vs. assessing energy performance

- If DSM approach is followed but not enough resources are allocated,

- There is a huge risk of inconsistency and disparity in results
- There is a huge risk of errors…

- Typical scenario of rubbish in – rubbish out

- Approach is undermined…

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Energy modelling: Proving the design works vs. assessing energy performance

- Assessing the level of energy performance?...

- There are assumptions and simplifications available,
- that do not drastically influence the results,
- More simplified approaches require less time, budget and skills,
- Thus, affordable for compliance analysis, low-medium profile buildings, etc
- Not suitable for design

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Computational simplifications are available from the adopted CEN algorithms

- Is it technically possible, within the compliance framework, to adapt the current simplified tools for the more demanding modelling requirements of future building features required by tighter building regulations?
- CEN Standards already include examples of successful computational simplifications: Infiltration, SES, Wind energy, ...
- Some are also adopted by the more complex DSM tools
- Latest implementation of ISO standard intermittency calculations show a much closer alignment between simplified tools and DSMs for annual energy demand/consumption figures

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Key driver for simplicity is the requirement for an ‘uncomplicated’ approach

- but the key driver for simplicity is the requirement for an ‘uncomplicated’ approach for the majority of ‘simple’ buildings
- that would not otherwise require design support through the use of dynamic simulation models
- ~85% hits on EPCgen.net service use SBEM engine
- ~50% hits on EPCgen.net service use iSBEM interface
- ~15% hits on EPCgen.net service use DSM engines

Future developments of compliance tools

- Is the industry ready for the increased complexity of more detailed modelling options?
- There has been a significant cultural change in the last 5 years with the implementation of 2006 of building regulations and the generalised introduction of the performance approach
- There was initially a considerable step change for many but there is now much more familiarity with energy modelling/calculation concepts
- This trend will continue thus allowing more complex approaches to be adopted

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Future developments of compliance tools

- Simplified Hourly calculations using CEN methods?
- Maintaining simplified user interface
- Further developments on core CEN Standard to support EPBD implementation and tighter Building Regulations

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