openBIM for a nordic sustainable building industry

Finnish requirements for energy simulation

New BIM requirements for energy analysis

Tuomas Laine, Granlund Oy

31.1.2013 BuildingSMART Client seminar, Copenhagen

Less energy gives more

buildingSMART NORDIC

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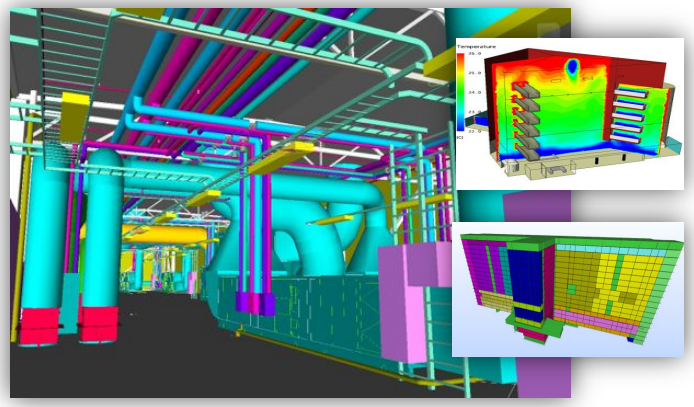
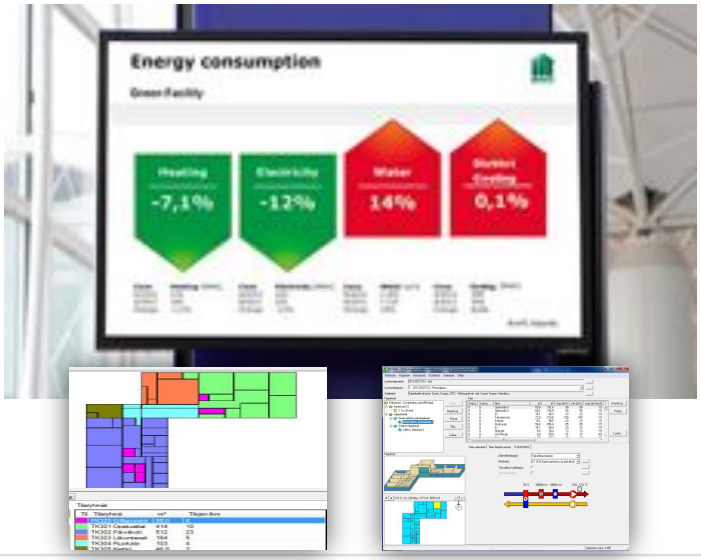
Granlund Oy – Company shortly





Consultancy

- MEP design
- Facilities management
- Energy and sustainability

Software

- RYHTI – facilities management
- RIUSKA – energy analysis
- BSPro – IFC middleware

Statistics

- 470 persons, 33 MEUR

buildingSMART Finland

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Common BIM Requirements 2012

Common BIM Requirements 2012, COBIM, is based on the BIM Requirements published by Senate Properties published in. The update project was funded by Senate Properties in addition to several other real estate owners and developers, construction companies and software vendors. BuildingSMART Finland participated also in the financing of the project. As a result, the updated Series 1-9 and new Series 10-13 were released in Finnish on March 27th 2012.

Series 1: General part

Series 2: Modeling of the starting situation

Series 3: Architectural design

Series 4: MEP design

Series 5: Structural design

Series 6: Quality assurance

Series 7: Quantity take-off

Series 8: Use of models for visualization

Series 9: Use of models in MEP analyses

Series 10: Energy analysis

Series 11: Management of a BIM project

Series 12: Use of models in facility management

Series 13: Use of models in construction

COBIM 2012 in English

The Common BIM Requirements, that were published March 27th 2012, are now available also in English. Click on the link COBIM 2012 in the menu.

News

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Contact

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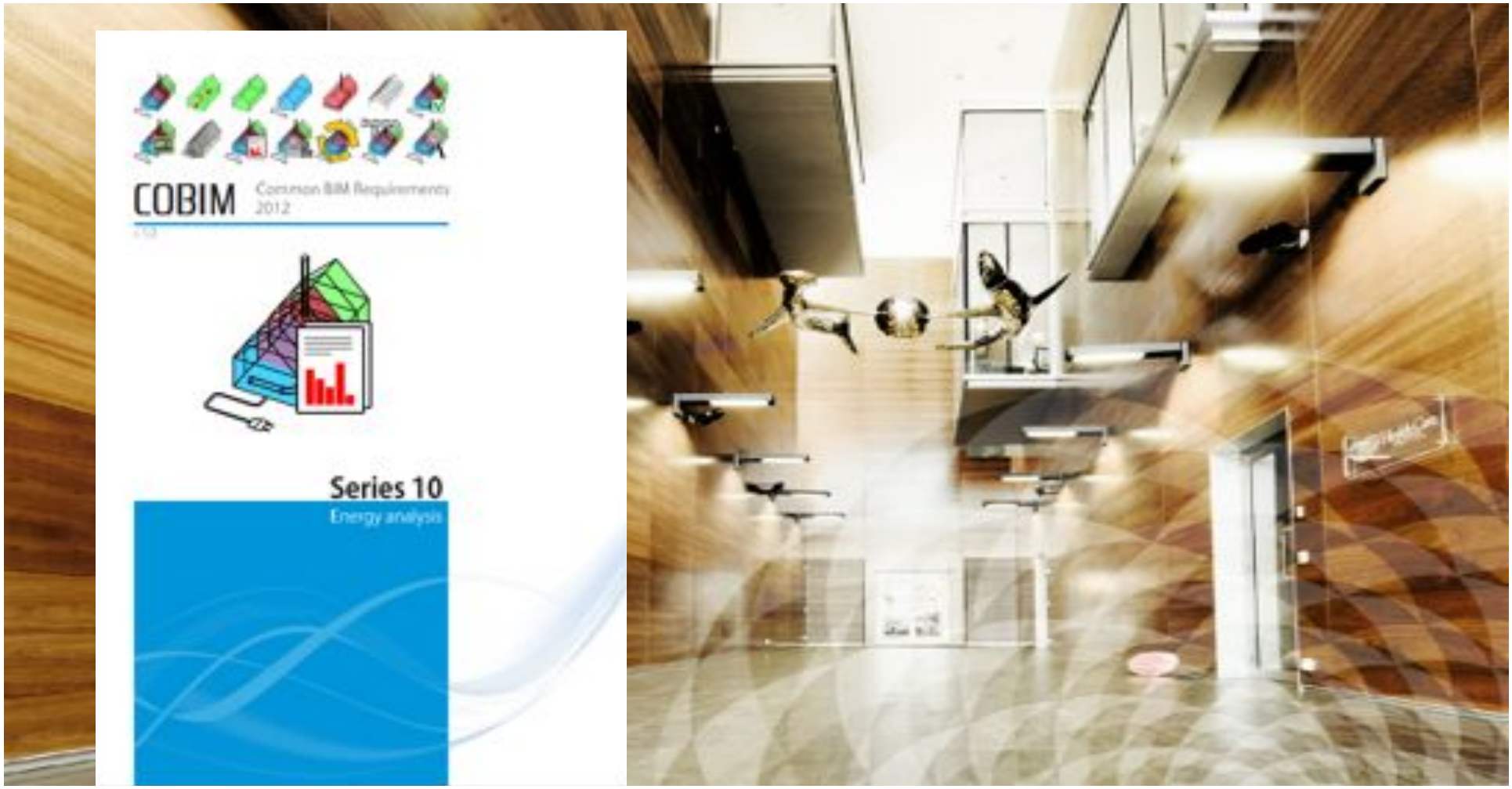
COBIM Series 10 for Energy Analysis



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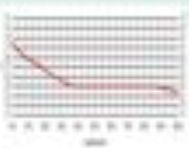
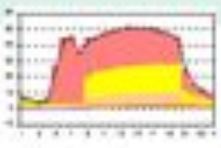
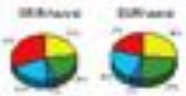
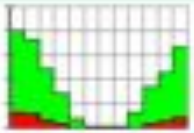
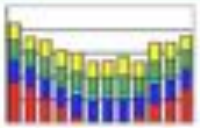
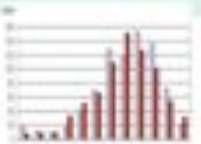
Background

- New energy regulations 7/2012
  - Primary energy, E-value
  - Includes indoor condition constancy requirements
  - Standardized use and climate
  - Requirements for simulation tools: dynamic and validated
- New energy certificate – law was approved 18.12.2012
  - From measured to E-value based calculated certificate
  - Gradually also for small residential buildings
- New EU regulations (EPBD recast)
  - Public buildings 2019 ”nearly zero energy buildings” (nZEB)
  - All new buildings 2021 ”nearly zero energy buildings”

Energy analysis in different phases

	CONCEPTUAL DESIGN	SCHEMATIC DESIGN	DESIGN DEVELOPMENT	BUILDING PERMIT PHASE	DETAILED DESIGN	CONSTRUCTION	COMMISSIONING AND WARRANTY	OPERATION AND MAINTENANCE
Comfort								
	• Simulations supporting set up of comfort requirements	• Comparison of alternatives, ao. solar shadings • Finding solution and update of requirements	• Further analysis of selected solution • AC requirements air flows, cooling loads and heating losses	• Energy survey • Indoor temperature constancy in summer	• Analysis of detailed design solutions' impact	• Analysis of contractor's equipment selection impacts	• Verification of resulted comfort to requirements	• Comfort performance monitoring and verification to requirements
Energy consumption								
	• Simulations supporting set up of energy requirements • In renovations benefitting inventory model	• Comparison of alternatives, ao. facades, technical systems etc • Finding solution and update of requirements	• Further analysis of selected solution • Simulation of building energy consumption estimate	• Energy survey • Total energy cons. (E-value) • Heatloss balancing • Dimensioned heating capacity • Energy certific.	• Analysis of detailed design solutions' impact • Update of energy consumption estimate	• Analysis of contractor's equipment selection impacts • Energy targets for normal operation and 1st guarantee year	• Requirements management after 1st year of warranty • Update of normal operation target if needed	• Energy monitoring and verification to requirements • Update of energy consumption target
Initial data	• Architectural as-required model • Inventory model or spatial/space group model	• MEP as-required model • Architectural spatial or space group model • In case of missing window voids, data of window coverage (%)	• Architectural spatial or building element model • Structure, door and window types	• Architectural spatial or building element model • Structure, door and window types • Building block based area and volume information	• Architectural building element model • Structure, door and window types • MEP system data	• Architectural as-built model • Product data of selected equipment	• Architectural as-built model • Updated system operation data	• Measurements of comfort and energy performance • FM BIM models

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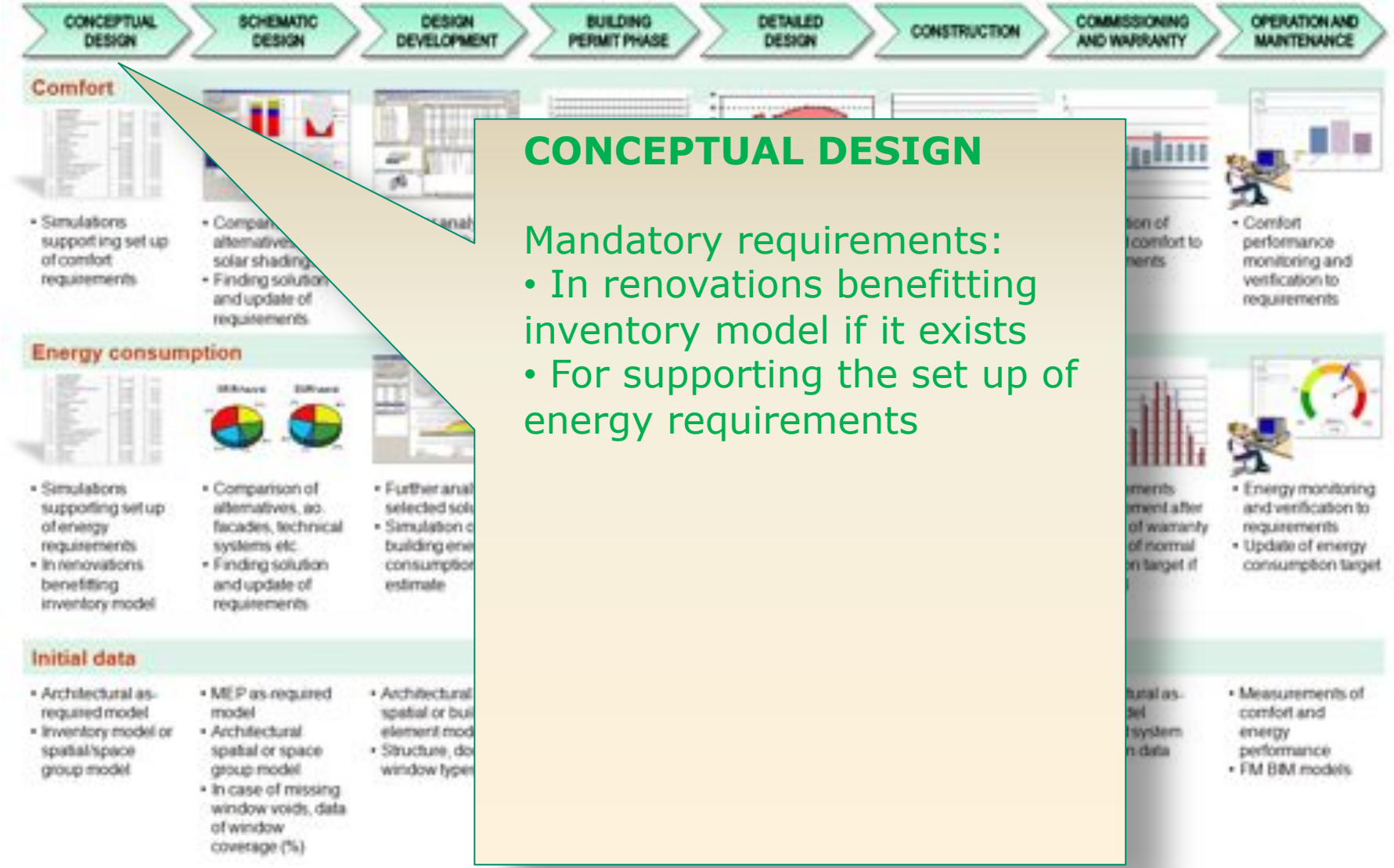
Energy analysis in different phases



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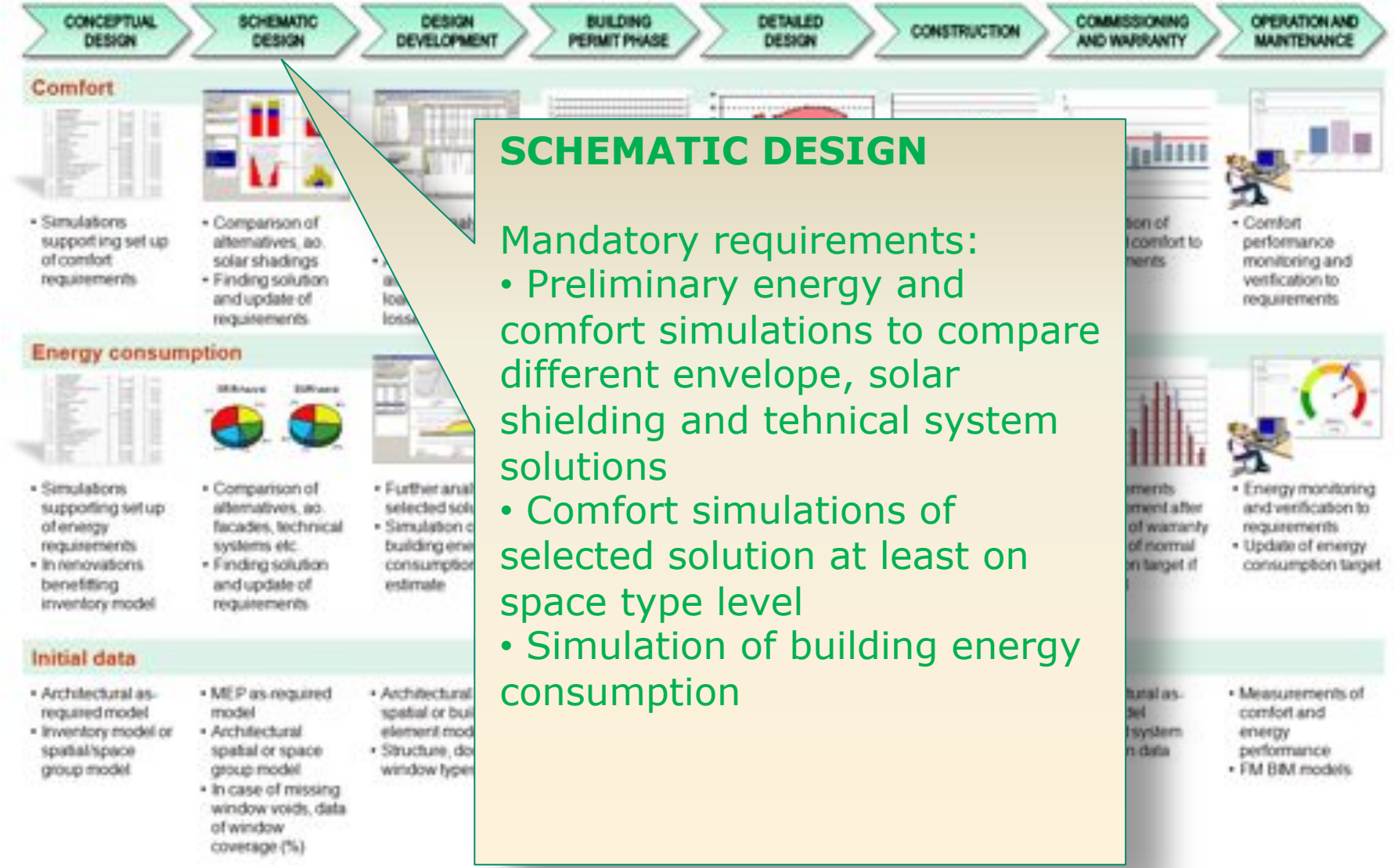
Energy analysis in different phases



SCHEMATIC DESIGN

Mandatory requirements:

- Preliminary energy and comfort simulations to compare different envelope, solar shielding and tehnical system solutions
- Comfort simulations of selected solution at least on space type level
- Simulation of building energy consumption

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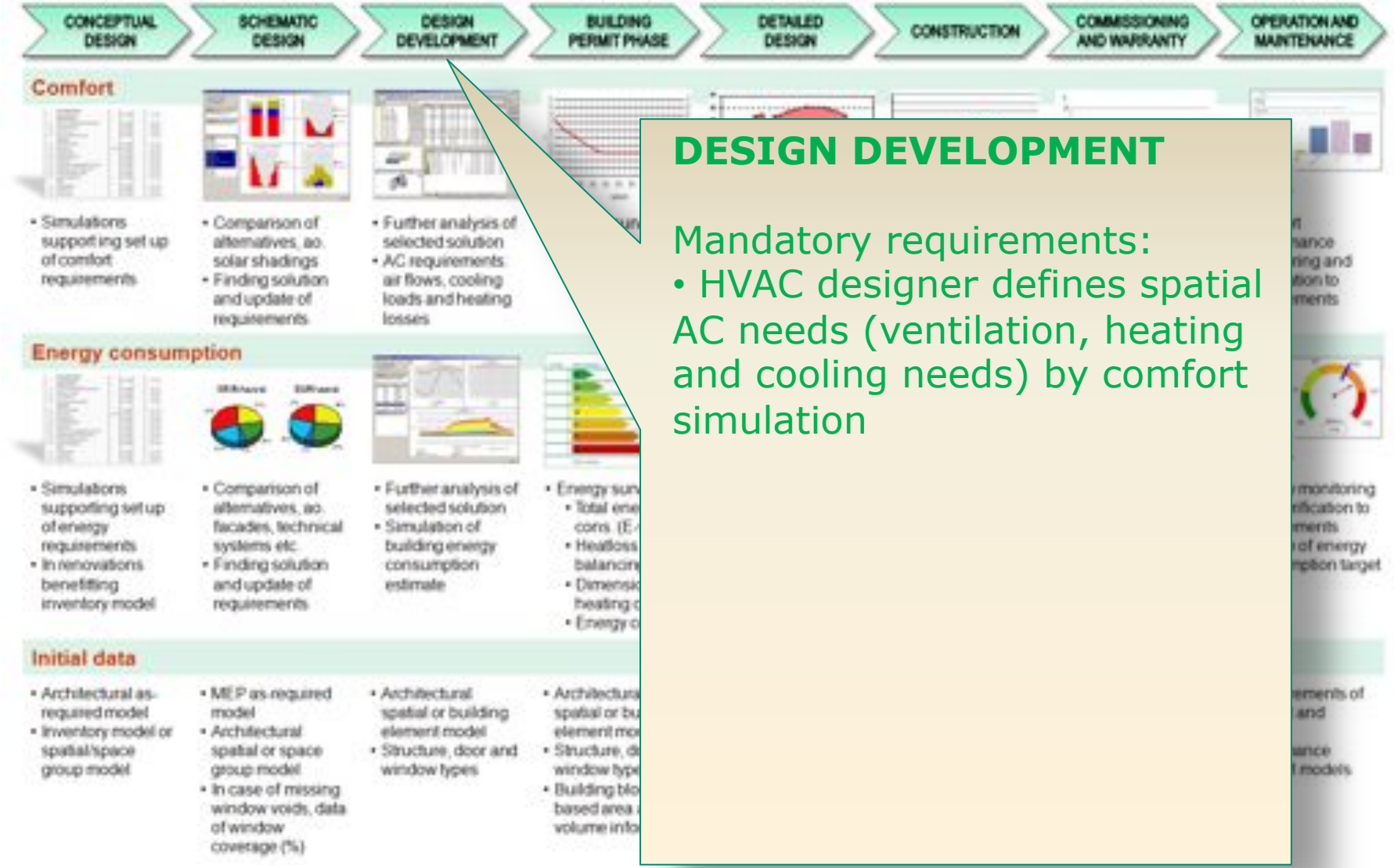
Energy analysis in different phases



DESIGN DEVELOPMENT

Mandatory requirements:

- HVAC designer defines spatial AC needs (ventilation, heating and cooling needs) by comfort simulation

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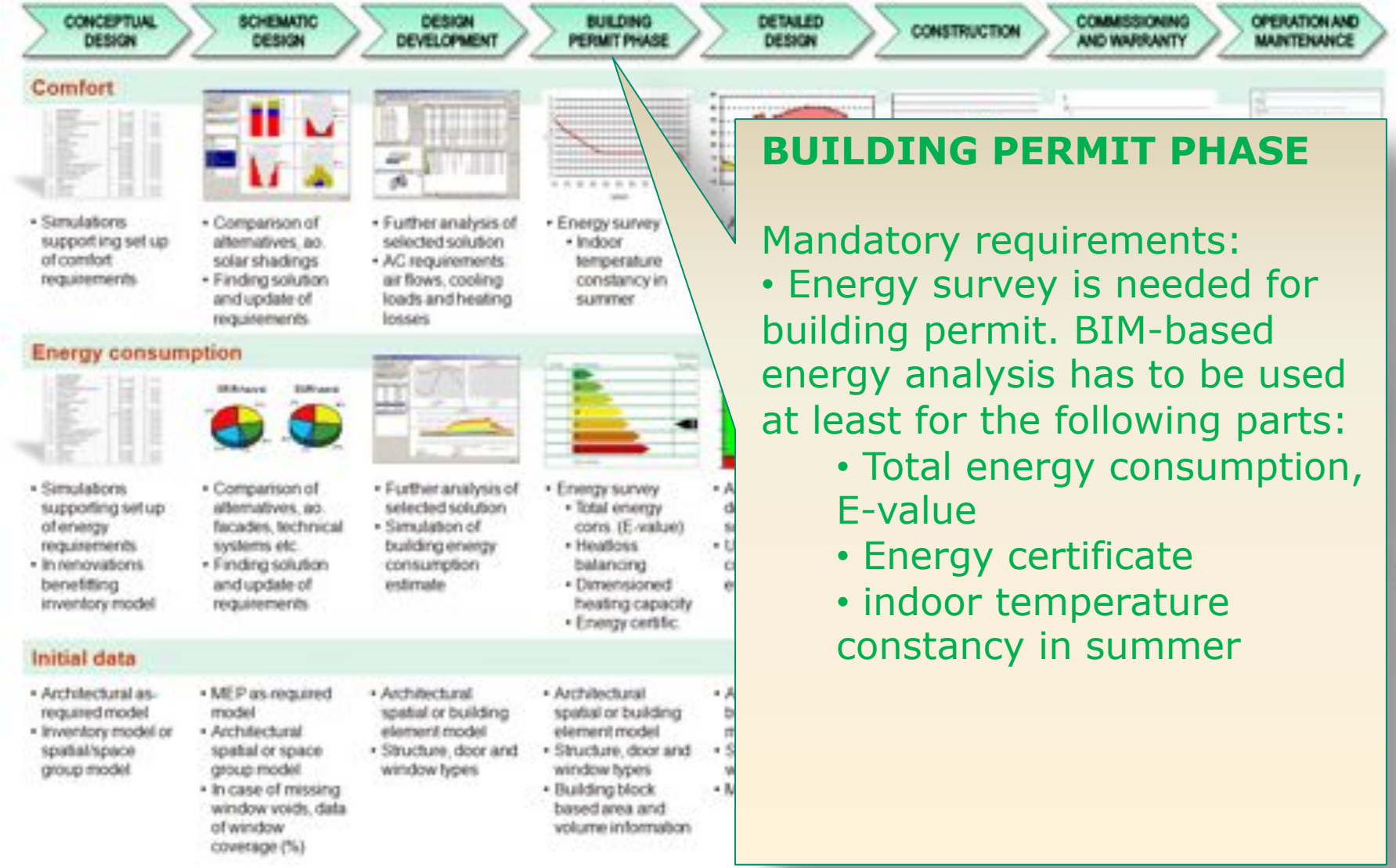
Energy analysis in different phases



BUILDING PERMIT PHASE

Mandatory requirements:

- Energy survey is needed for building permit. BIM-based energy analysis has to be used at least for the following parts:
  - Total energy consumption, E-value
  - Energy certificate
  - indoor temperature constancy in summer

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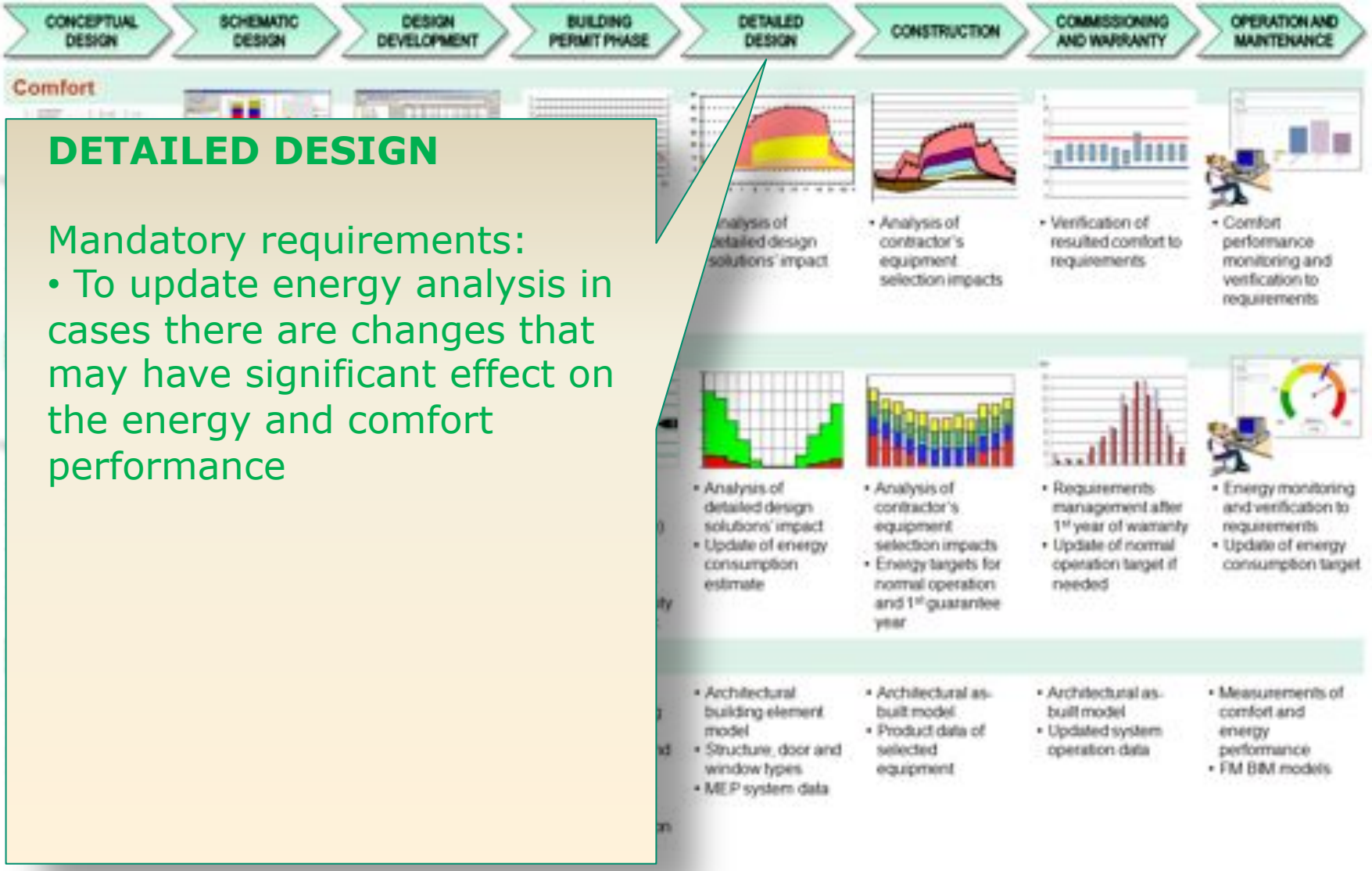
Energy analysis in different phases



DETAILED DESIGN

Mandatory requirements:

- To update energy analysis in cases there are changes that may have significant effect on the energy and comfort performance

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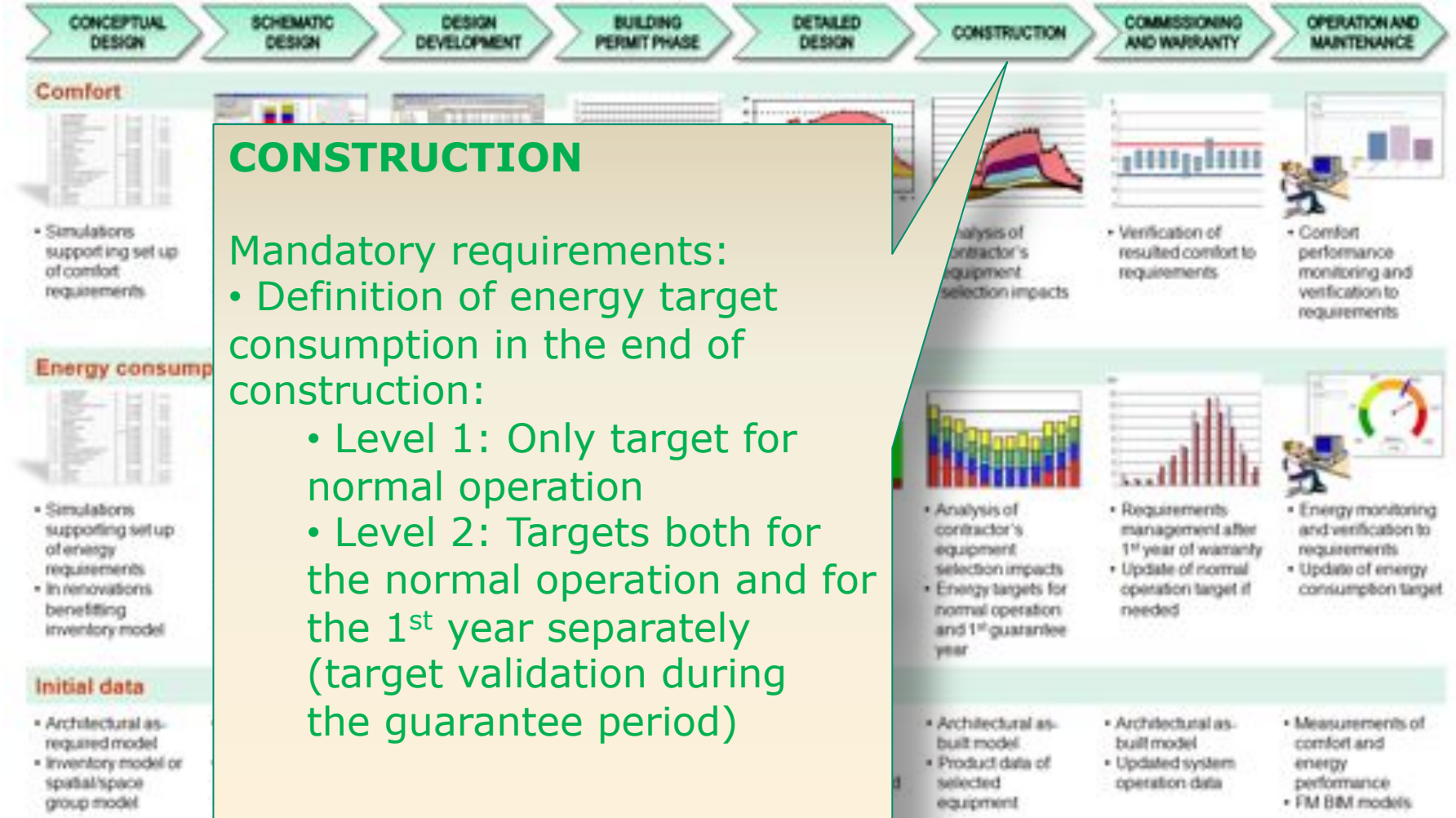
Energy analysis in different phases



CONSTRUCTION

Mandatory requirements:

- Definition of energy target consumption in the end of construction:
  - Level 1: Only target for normal operation
  - Level 2: Targets both for the normal operation and for the 1st year separately (target validation during the guarantee period)

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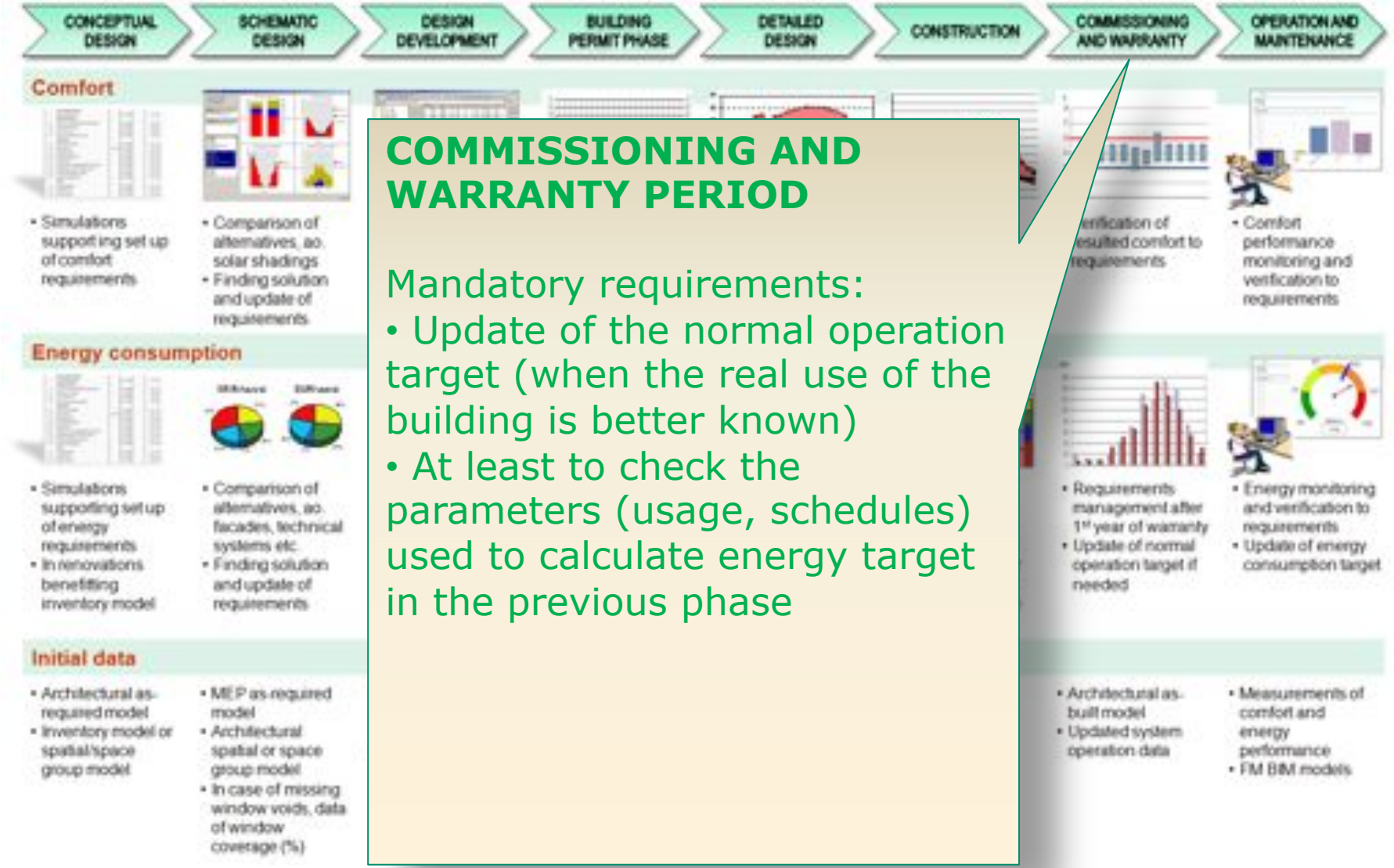
Energy analysis in different phases

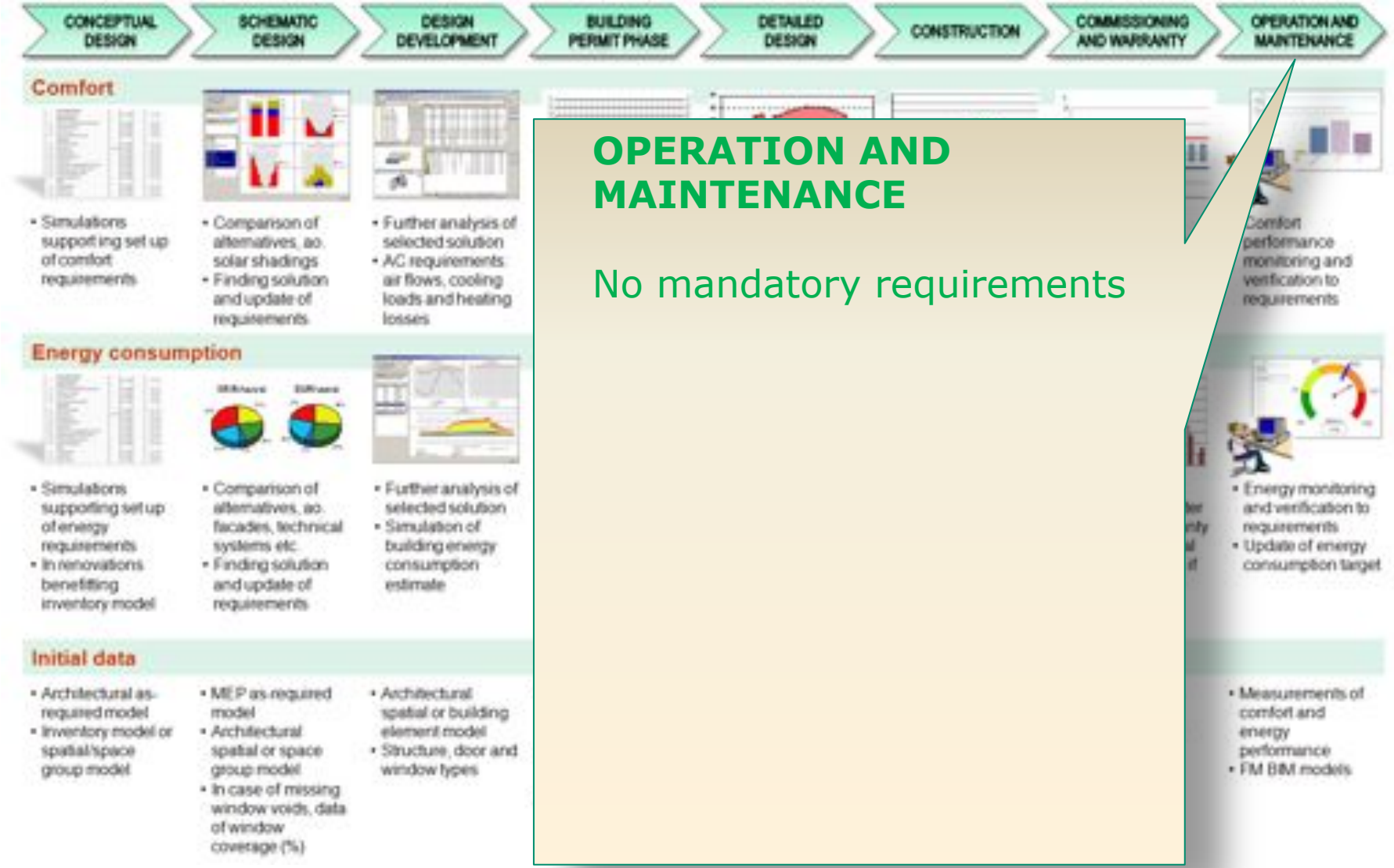


COMMISSIONING AND WARRANTY PERIOD

Mandatory requirements:

- Update of the normal operation target (when the real use of the building is better known)
- At least to check the parameters (usage, schedules) used to calculate energy target in the previous phase

Energy analysis in different phases



OPERATION AND MAINTENANCE

No mandatory requirements

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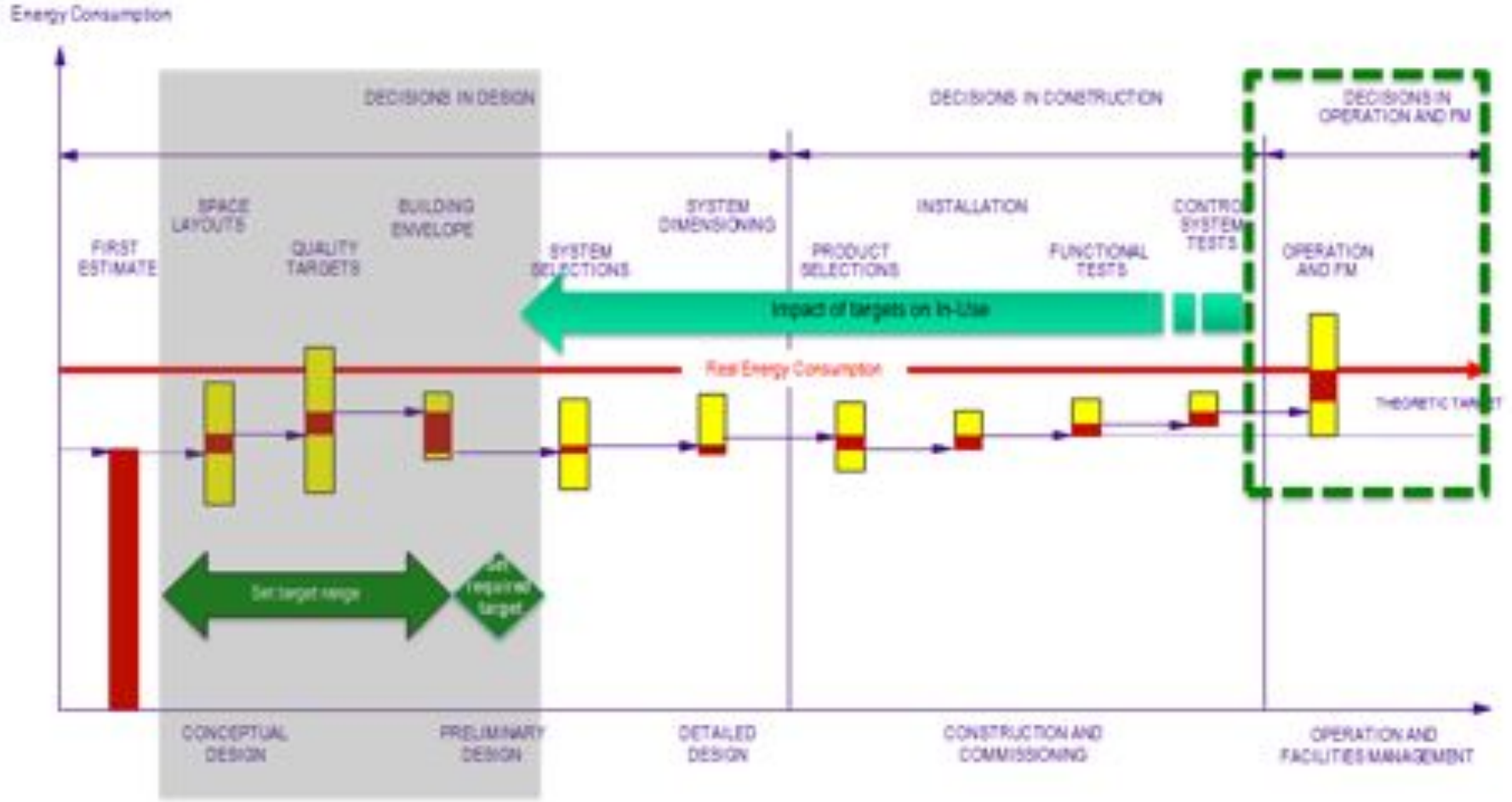
Potential effects of decisions



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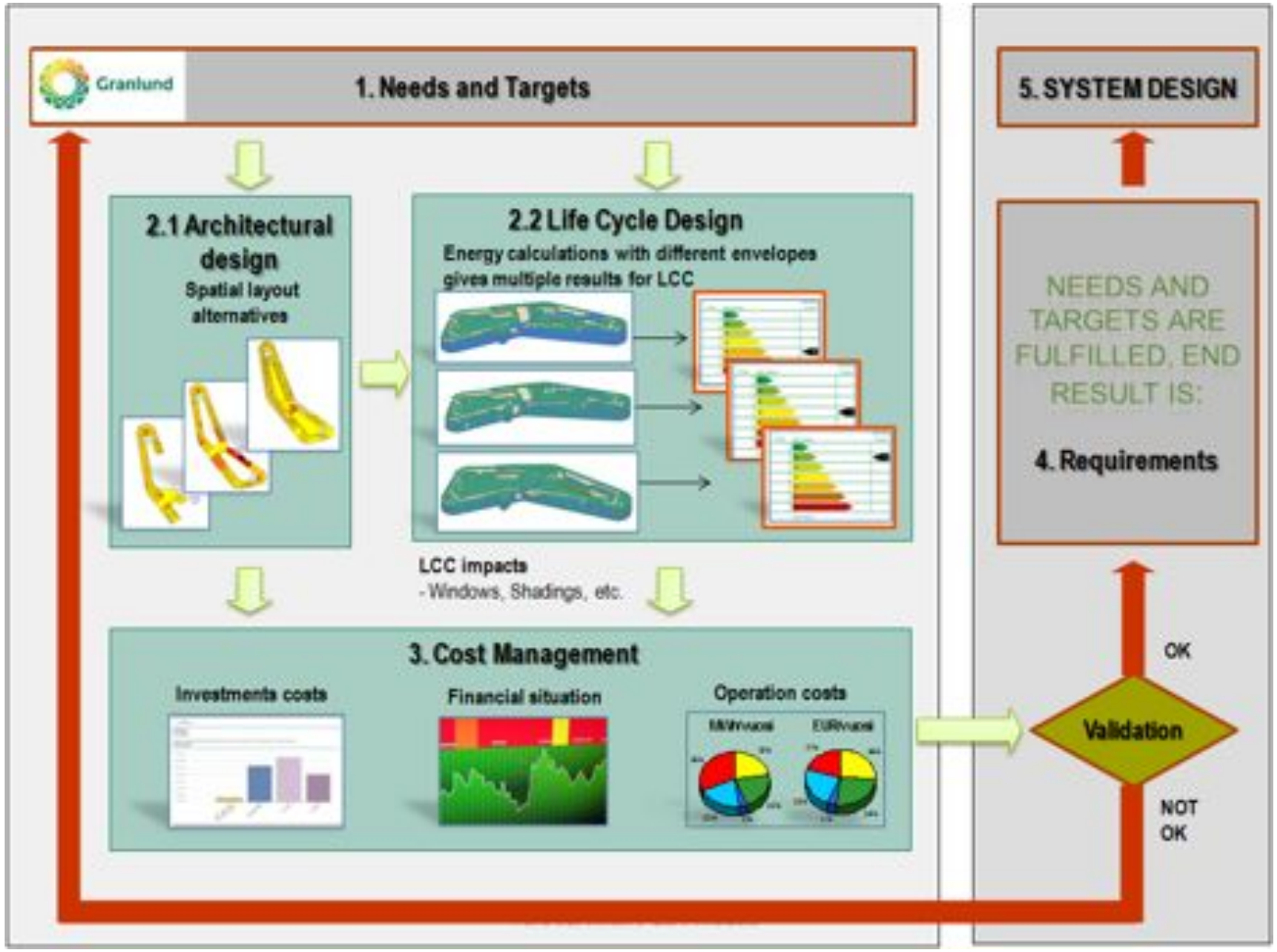
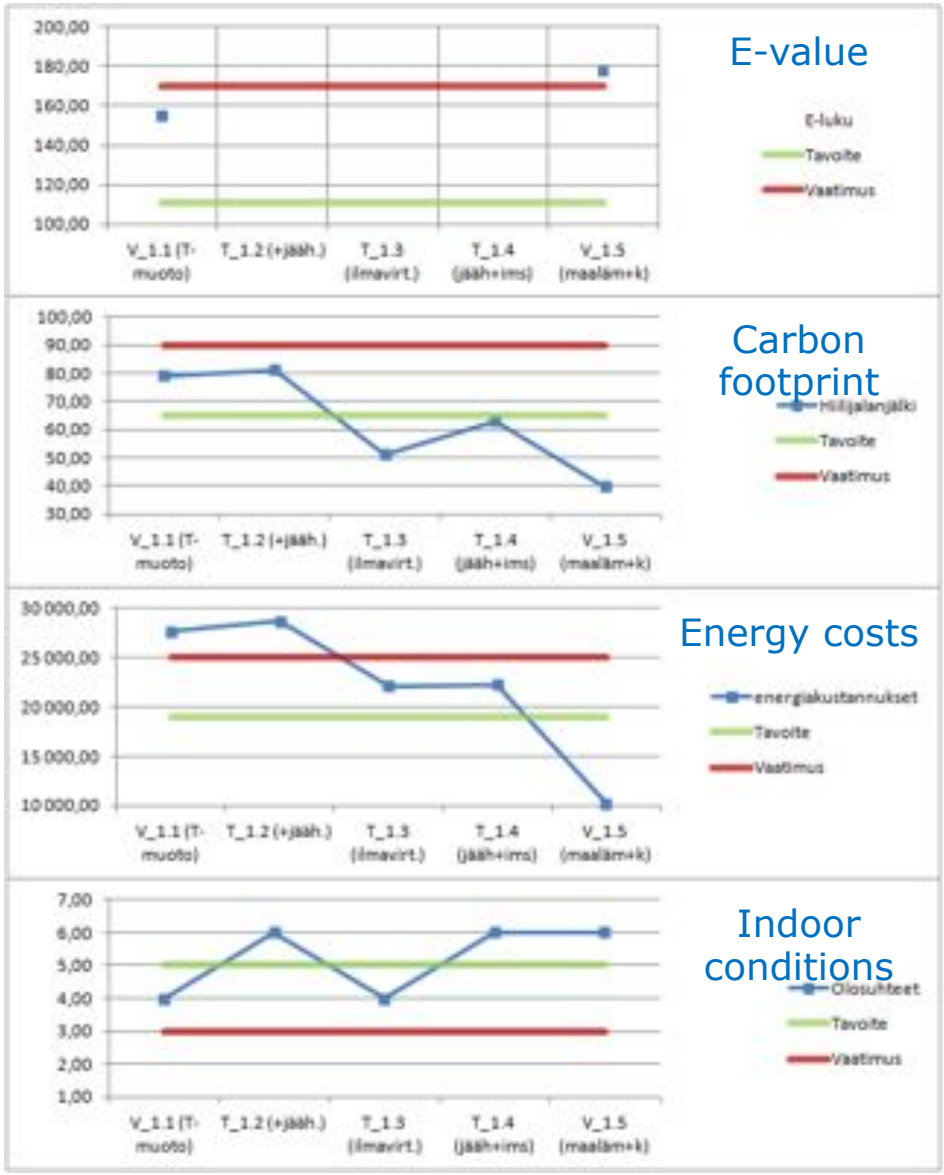
Solution development during early design



Decisions need different metrics



By team working and using of BIM and efficient simulation it was possible to analyze 15..20 design solutions (renovation and new building) during 2 days workshop (School/daycare building in Syväniemi, Kuopio, Finland)

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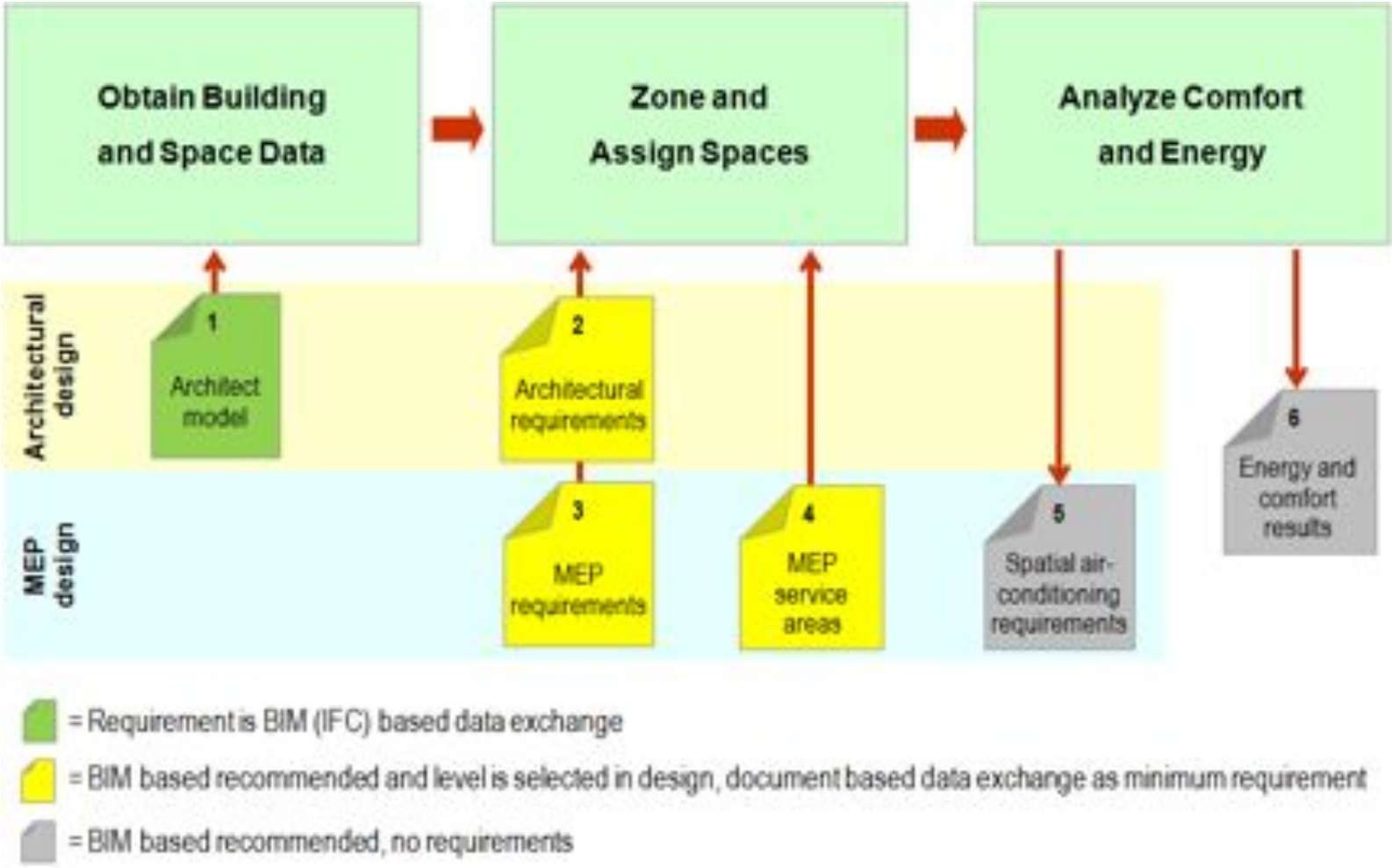
PRE Model Nova

BIM helps in E-value calculation

- E-value measures the relative, primary energy weighted energy efficiency – not the real energy consumption of the building
  > both simulations are needed
- In E-value calculation
  - Real building/spatial geometry (from BIM)
  - All spaces have equal use: schedules, loads, air flows (from energy analysis library)
  - Standardized weather (from energy analysis library)
  - Includes coldbridges (types and lengths from BIM)

What is really required?



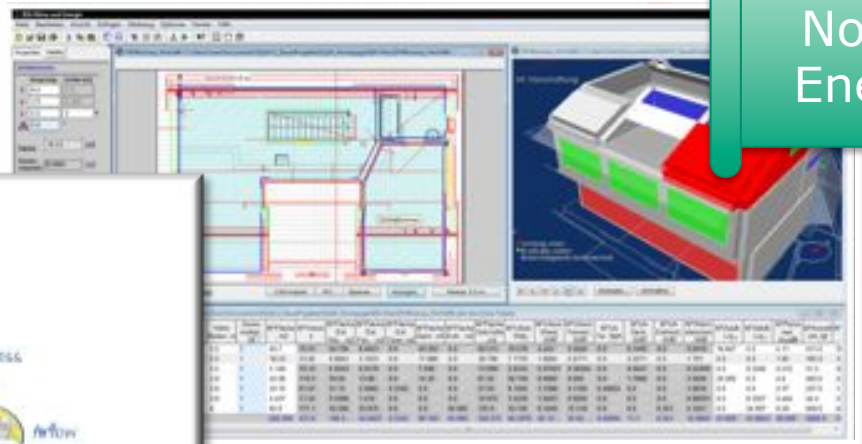
Energy analysis software

Requirements:

- IFC import (v. 2x3 or newer), when the model includes:
  - Coordination view
  - Space boundary add-on view (defines the surfaces surrounding the space and their connections to structures, openings etc.)
- Dynamic simulation (as in 7/2012 regulations)
- Alternatively allowed if required quality architectural model is not available because of software or justifiable modeling reason:
  - Energy analyst may create a separate geometry model, which fulfils the requirements
  - The space names and codes must equal to the architectural model
  - Working method shown to keep also the original space GUIDs

COBIM compatible analysis software

IDA ICE



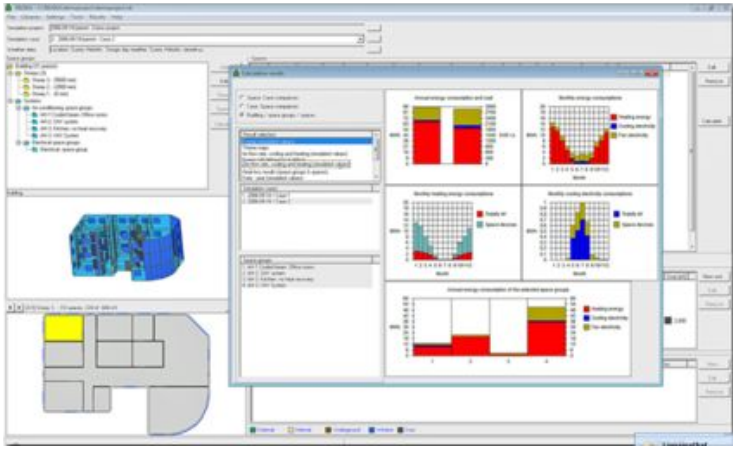
Nordic Energy

IES VE

INTEGRATED ENVIRONMENTAL SOLUTIONS

EQUA

RIUSKA



MagiCAD Comfort & Energy

GRANLUND SOFTWARE BSPro

Nordic Energy

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Thank You

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