**Margot Grim**

**e7 Energie Markt Analyse GmbH**

INTEGRATED DESIGN

Market transformation towards nearly zero energy buildings through widespread use of integrated energy Design

ENERGIE MARKT ANALYSE

# Integrated design

## new building concepts need new ways of collaboration



INTELLIGENT ENERGY EUROPE

# e7 Energie Markt Analyse GmbH

- **Research and consulting company, Vienna, Austria**
- **Thematic fields**
  - Energy efficient and sustainable buildings
  - Energy economics
  - Climate and energy policy

# Consulting

| New Buildings<br>Renovation | Existing Buildings<br>Operation |
|---|---|
| **Certification and sustainability consulting**<br>ÖGNI, ÖGNB/TQB, klima:aktiv | |
| **Life Cycle Management und building optimisation**<br>energy, ecology, costs, comfort | |
| **Preparation of an energy efficient building operation**<br>concept of energy monitoring and commissioning | **Optimisation of the building**<br>monitoring, Recommissioning |
| | **Implementation of an energy management system**<br>ISO 50001 |

# MaTriD

## Market transformation towards nearly zero energy buildings through widespread use of integrated energy design

- **Supports**
  - the implementation of Nearly Zero Energy Buildings by 2020
  - by widespread use of Integrated Energy Design (IED)

- **Integrated Energy Design (IED) is**
  - a approach to organise the complexity of the design process and
  - facilitate the interactions between the members of the design team.

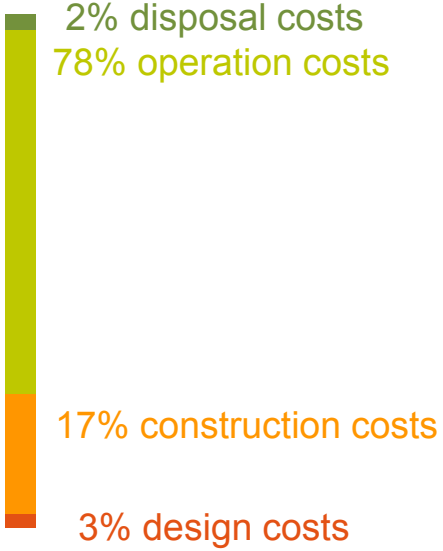
- **Participating Countries**
  - Austria, Greece, Italy, Portugal, Norway, Sweden, Slowenia, Slovakia, Poland, Latvia, UK

# Benefits of Integrated design

- Less mistakes during the design phase
- less mistakes and design changes during construction
- reduced life cycle costs of building
- higher energy efficiency and sustainability of the building
- higher satisfaction of design team members
- higher satisfaction of the building user
- better image due environmental friendly thinking

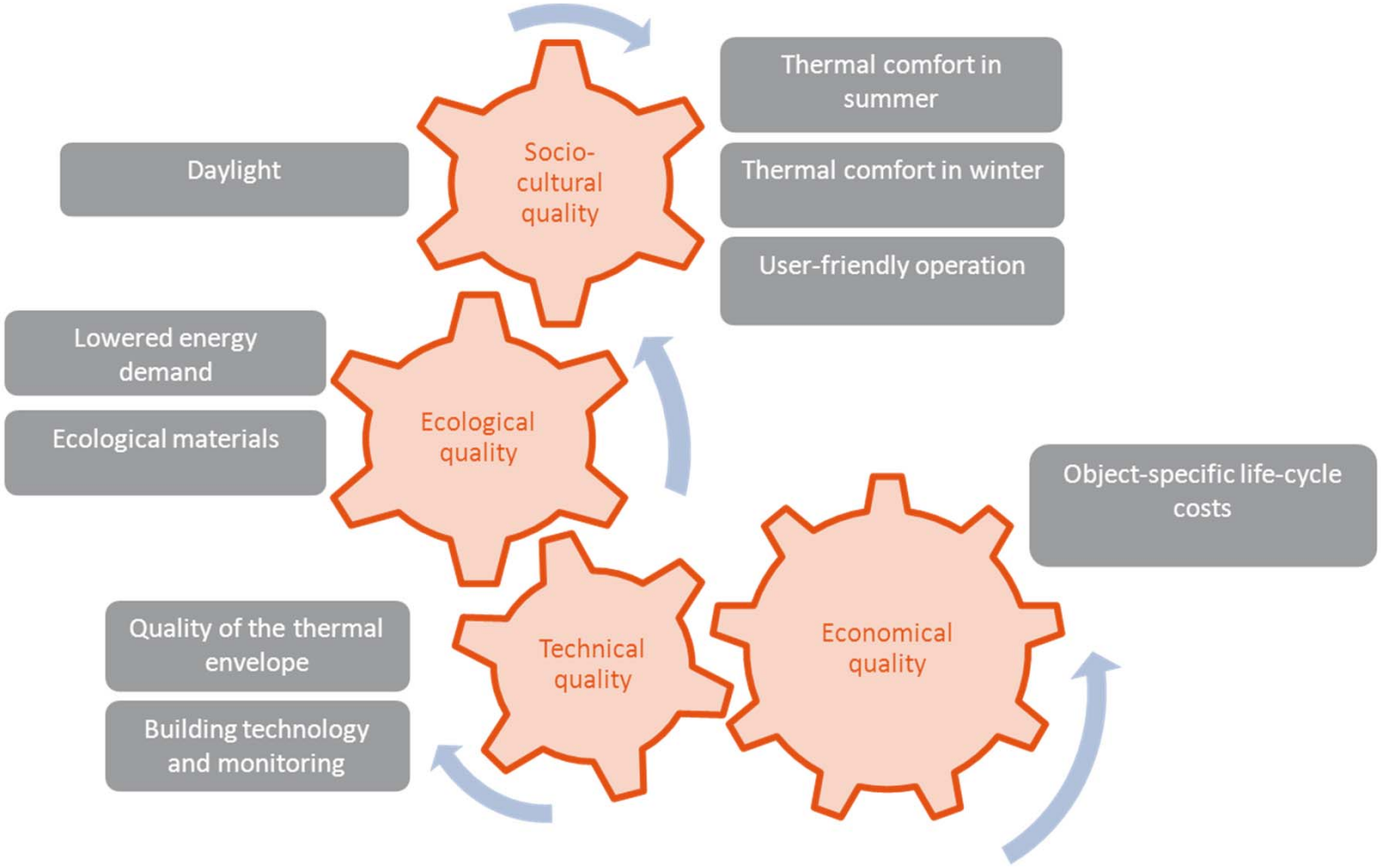
# Main barriers of Integrated Design

- **Conventional thinking**
- **Costs of Integrated Design**
- **Time constraints in initial design phase**
- **Competitive areas of expertise**
- **Missing defined goals**

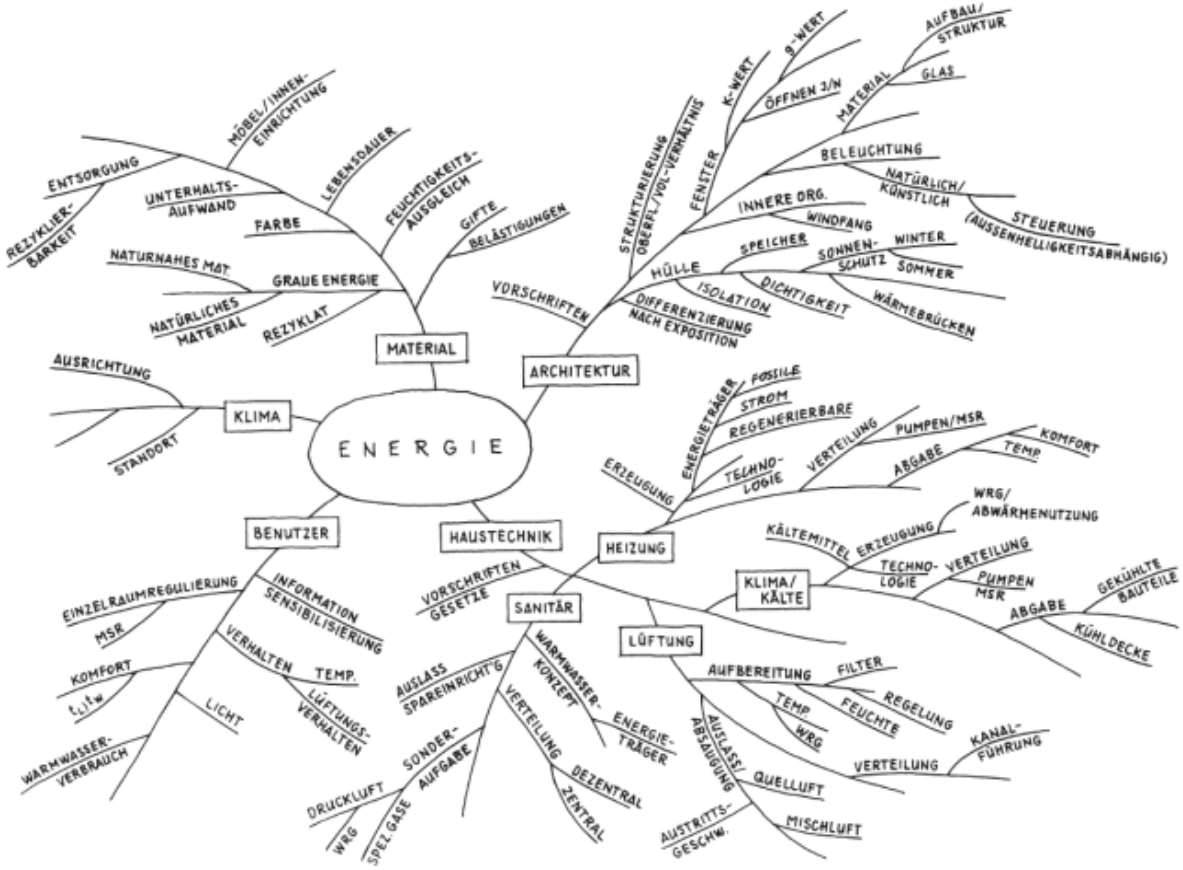


# Challenges of the design team

# Complexity of sustainability in the planning process

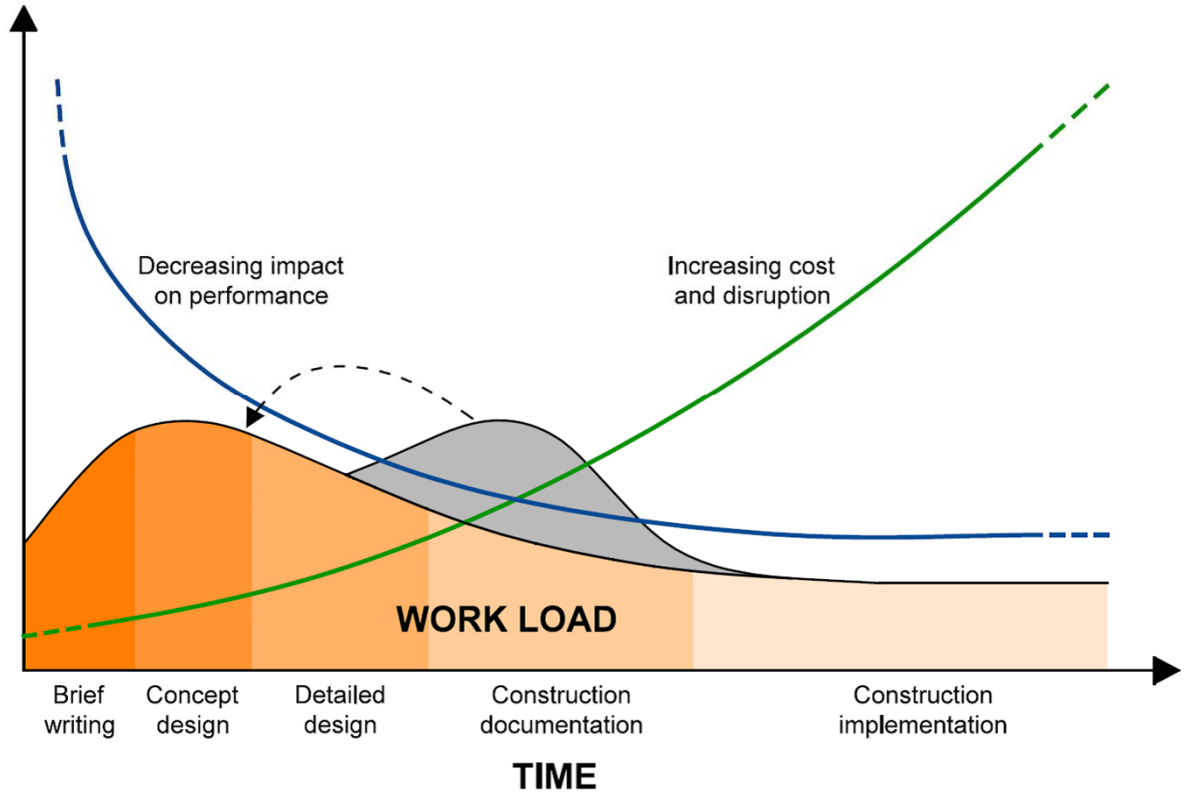


# Complexity of energy efficiency in the planning process



# Phases of the planning process

# Influence on building concept during planning process

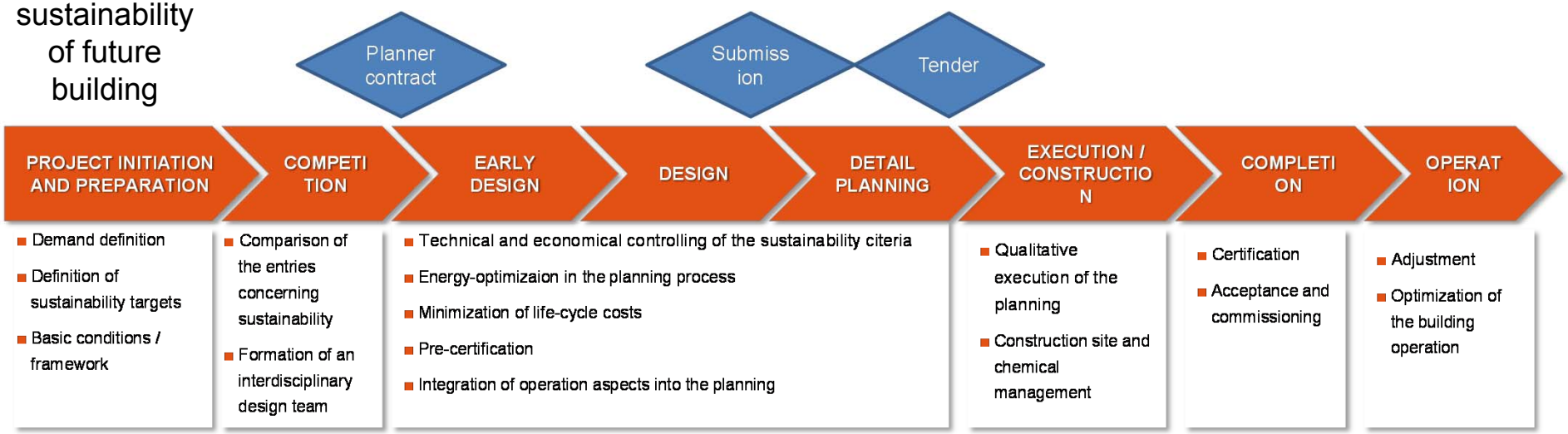



Grafik: MaTrid ID process guideline

# The project phases

## Initial phase (project preparation) as the key to success

Greatest influence on sustainability of future building



# Definition of design goals

## Relevancy depending on the project phase

| Criteria | Verifiable unit | Influencing factors | IP | CP | ED | D | DP | Pr | Co | O |
|---|---|---|---|---|---|---|---|---|---|---|
| **Energy & Supply** | | | | | | | | | | |
| Net energy | - heating demand<br>- cooling demand | - architectural concept (orientation, compactness, glazing area, shading)<br>- building physic specific values<br>- thermal mass<br>- airtighness | ■ | ■ | ■ | ■ | | | ■ | |
| End energy, primary energy demand | - end energy demand<br>- lighting demand<br>- ventilation and air conditioning demand<br>- overall energy efficiency<br>- primary energy demand<br>- energy generation | - architectural concept (orientation, compactness, glazing area, shading)<br>- building physic specific values<br>- thermal mass<br>- heating, ventilation, cooling, electrical installations (distribution and und supply systems, regulation system)<br>- renewable energy<br>- airtightness | ■ | ■ | ■ | ■ | ■ | | ■ | |
| Energy monitoring | - equipment for energy monitoring | - hardware and software<br>- Automatization concept<br>- metering structure (electricity, heat, water) | ■ | | | ■ | ■ | ■ | ■ | ■ |
| Renewable enery, CO2-emissions | - energy generation | - primary energy demand<br>- renewable energy<br>- $CO_2$ emission | ■ | ■ | ■ | ■ | ■ | | | |
| Drinking water demand | - sanitary facilities<br>- area to be cleaned and cleaning intervals<br>- use of rainwater<br>- use of grey water<br>- infiltration and leaching to groundwater | - architectural concept (glazing area)<br>- water saving taps<br>- Floor and wall coverings<br>- water use concept (use of rain- and greywater)<br>- Greening, sealing of outdoor facilities | ■ | ■ | ■ | ■ | ■ | | | |
| Systematic putting into service | - measurements and protocols for commissioning and putting into service | - Function tests of components<br>- hydraulic adjustments | | | | | | ■ | ■ | ■ |

IP = Initiation Phase

CP = Competition

ED = Early Design

D = Design

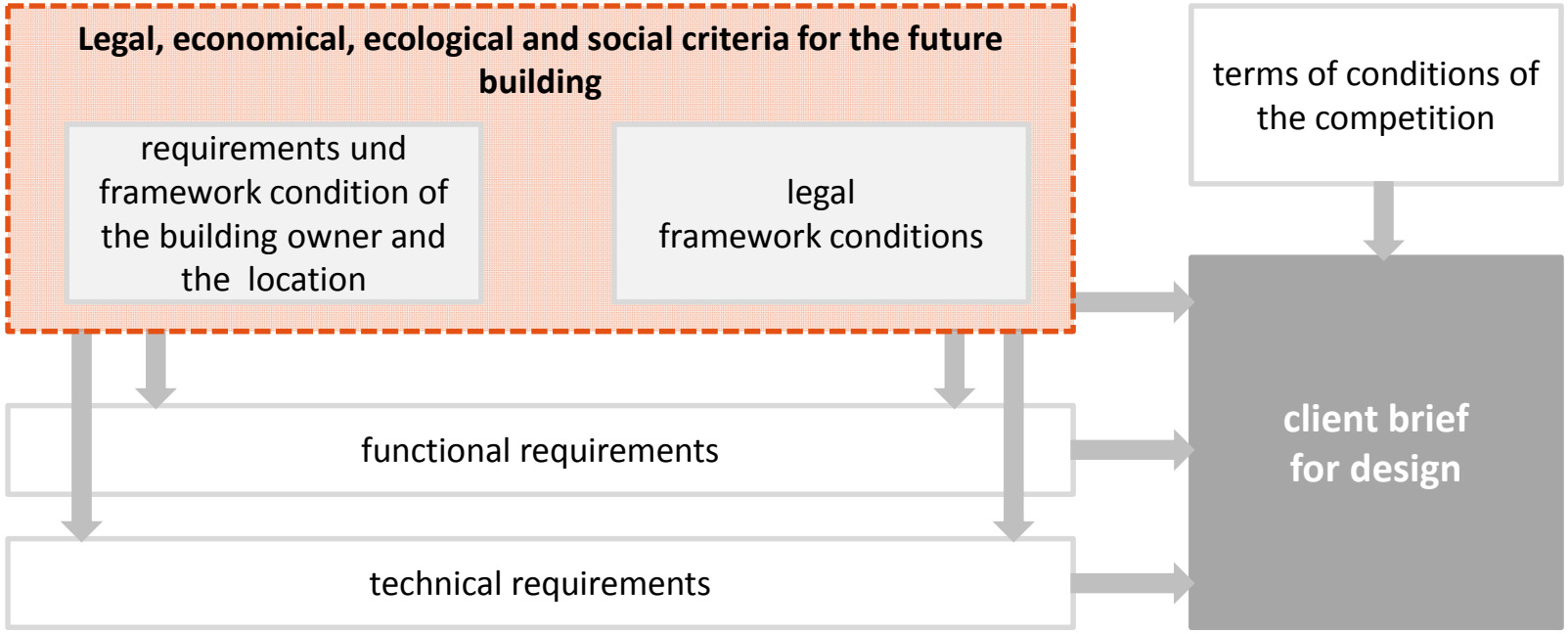
DP = Detailed Planning

P = Procurement

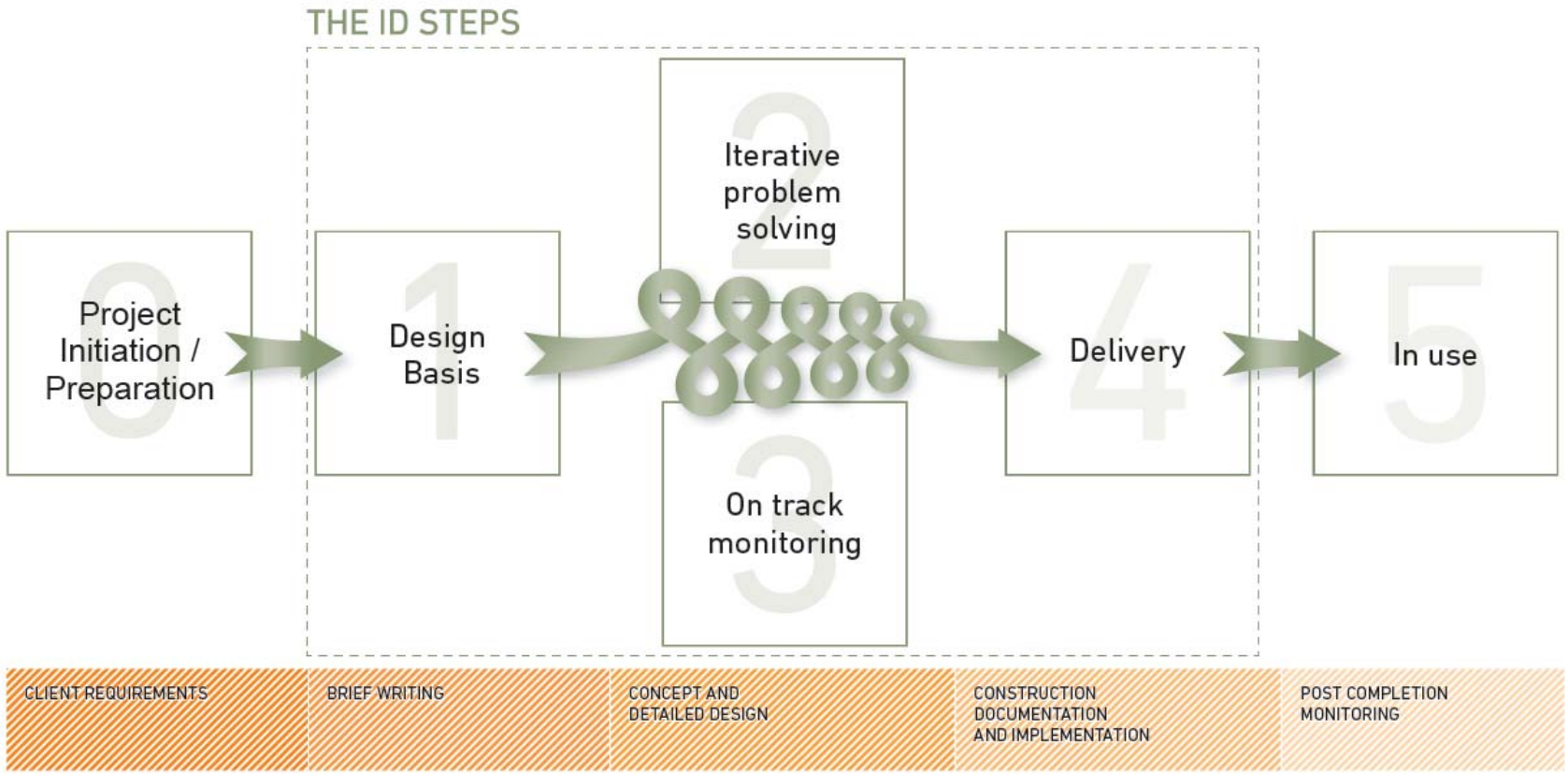
Co = Construction

O = Initial operation

# Elements of the client brief



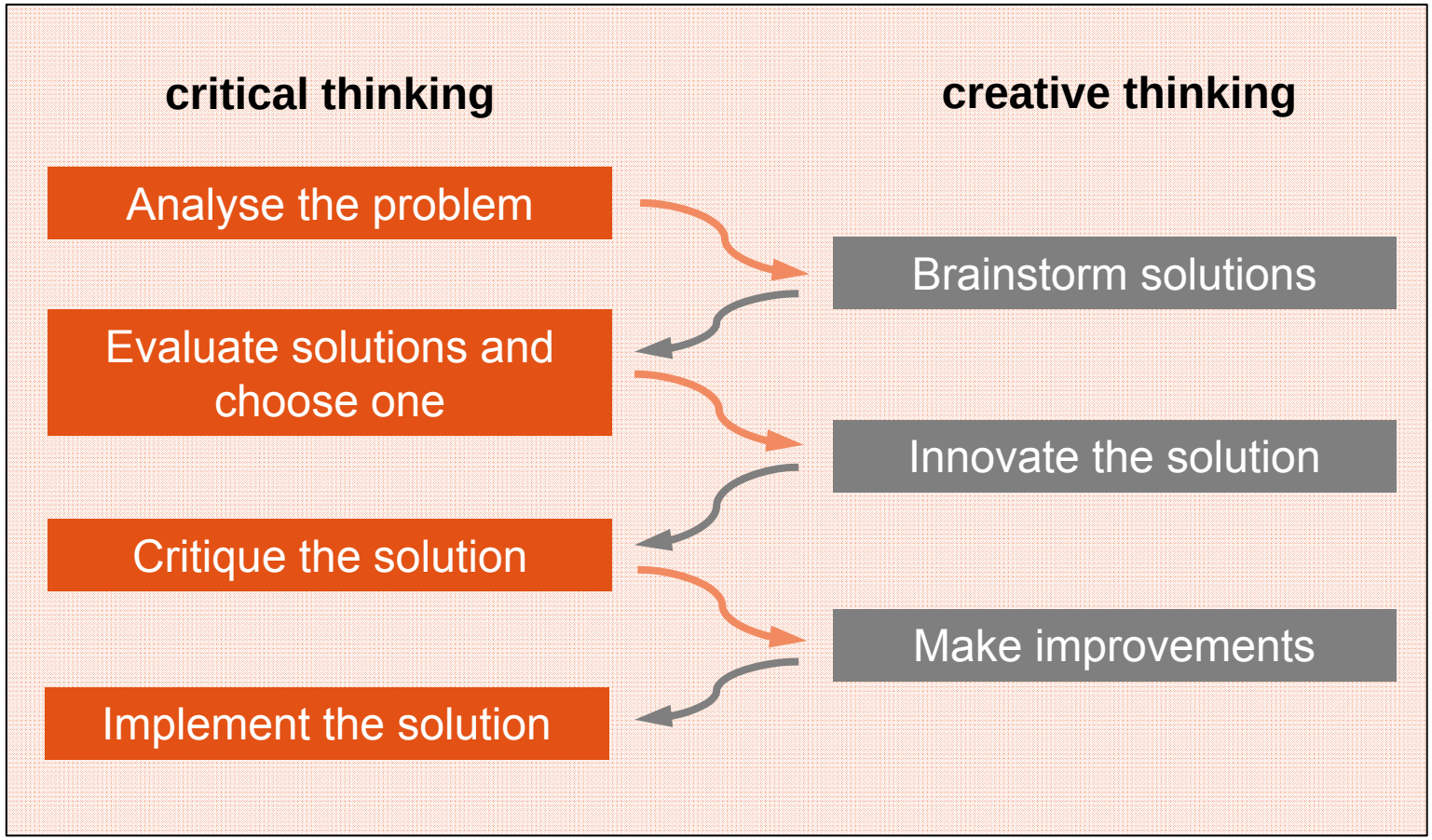
# Integrated Design – the new way of collaboration during design



# Teambuilding

- **Integrated Design Kick off**
- **Agenda**
  - Presentation of the common goals
  - Definition of integrated design
    - iterative problem solving
  - Definition of ways of collaboration
    - Interfaces between team members
    - Know-how transfer
  - Mayor barriers and how to overcome them
  - Definition of milestones and control mechanism

# Iterative problem solving
## the building design phase



# On track monitoring

- **Use goals/ targets as means of measuring success of design proposals**
- **Make a Quality Control Plan**

# Delivery

- **Ensure that the goals are properly defined and communicated in the tender documents and building contracts**
- **Motivate and educate construction workers and apply appropriate quality tests**
- **Facilitate soft landing. Make a user manual for operation and maintenance of the building**

# Field report

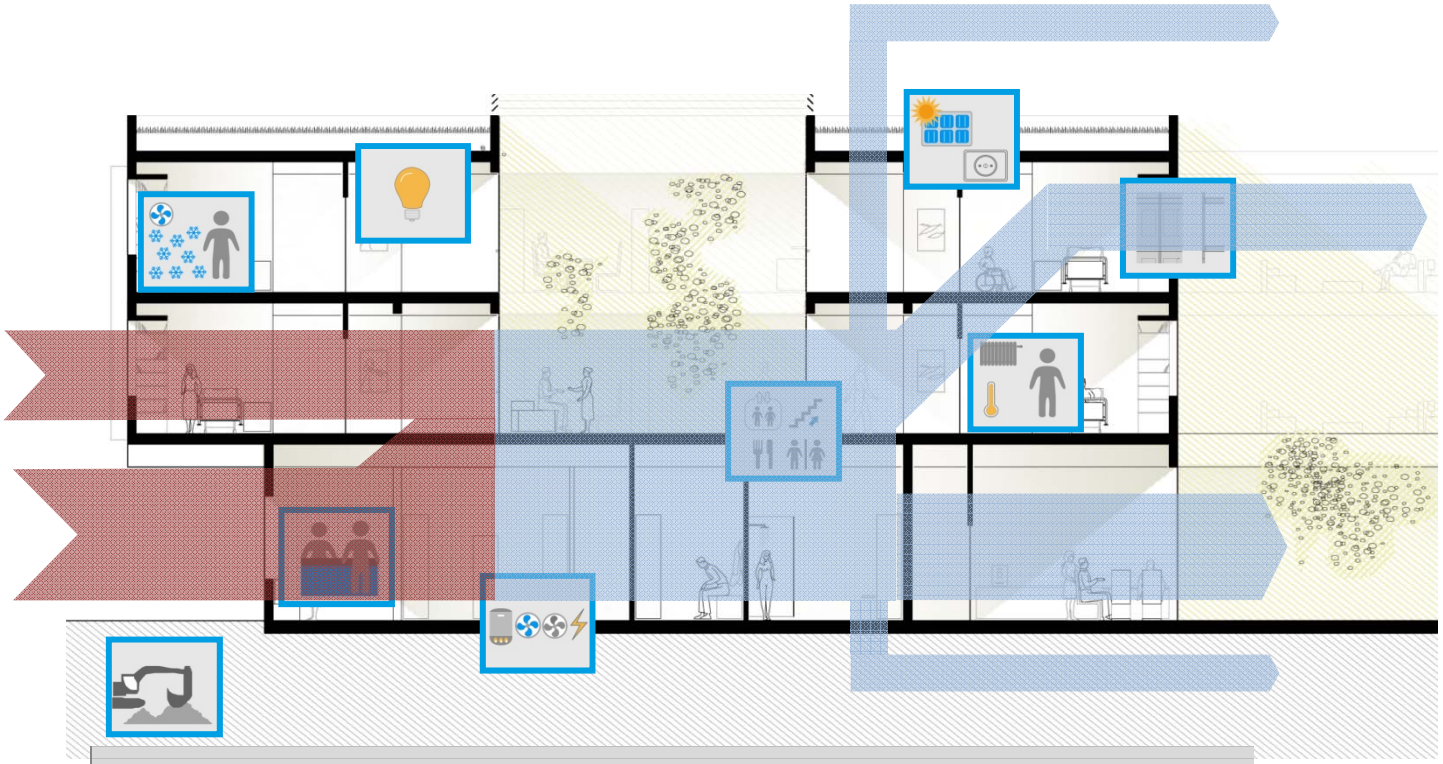
# Competition for a full design package Nursing home Mautern (Styria)

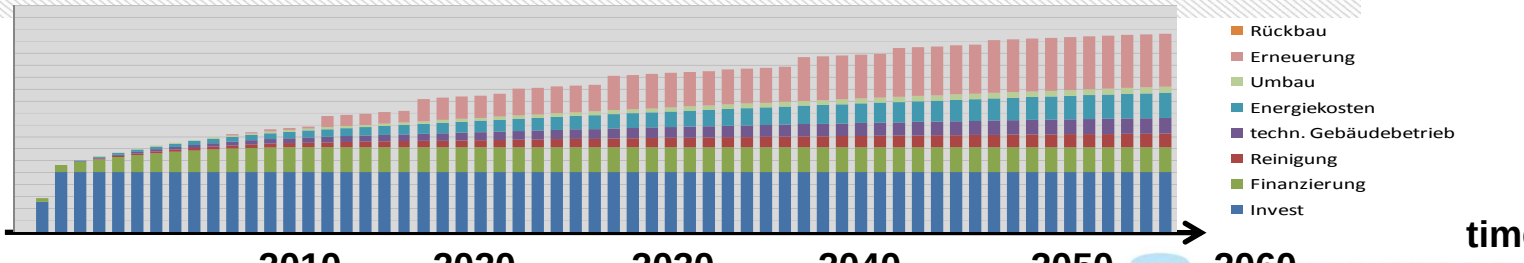
## Competition entries

lig landes immobilien gesellschaft steiermark

# Life-cycle-cost calculation

## from building elements to total building

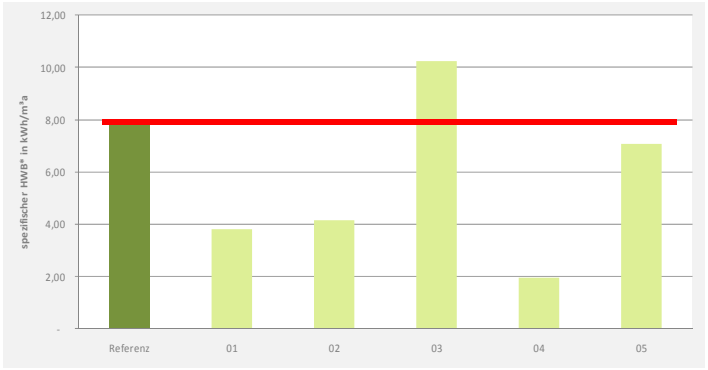




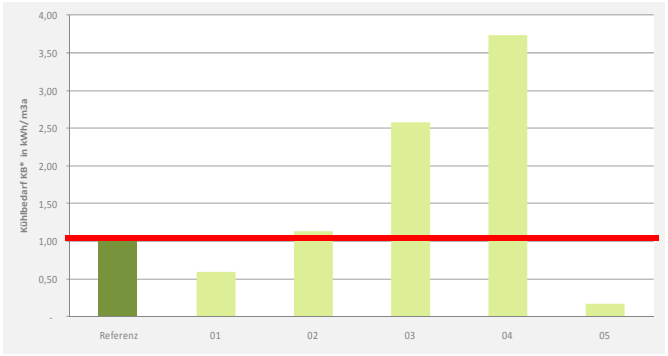
# Comparing the different projects

- **Energy efficiency**

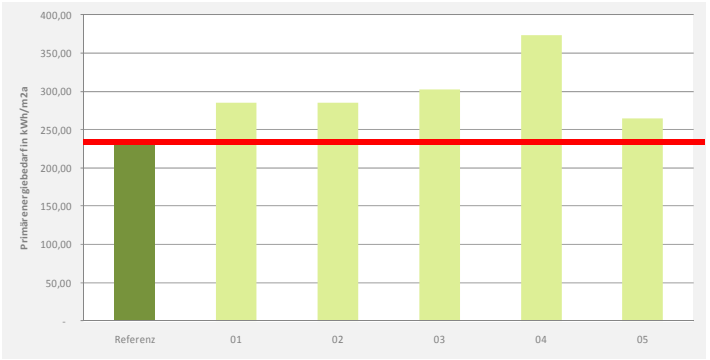
Specific heating demand



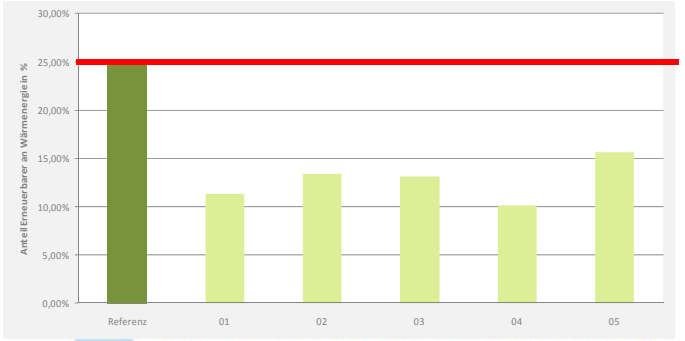

Cooling demand




Primary energy demand



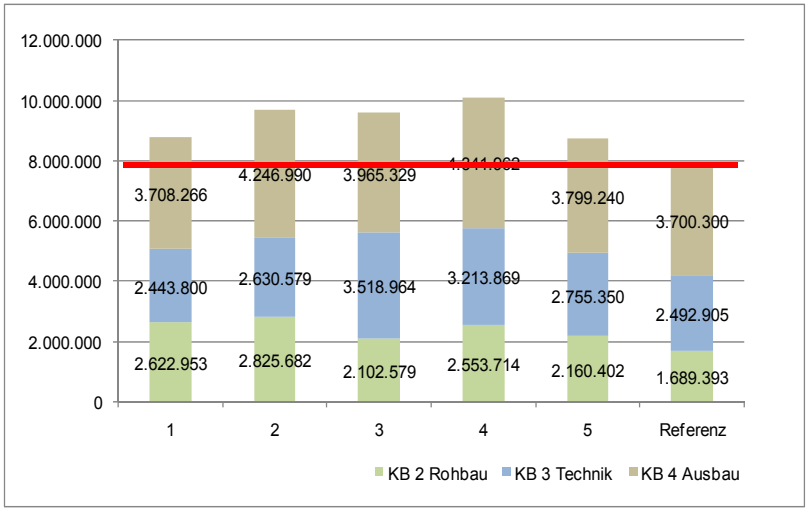

Solar coverage



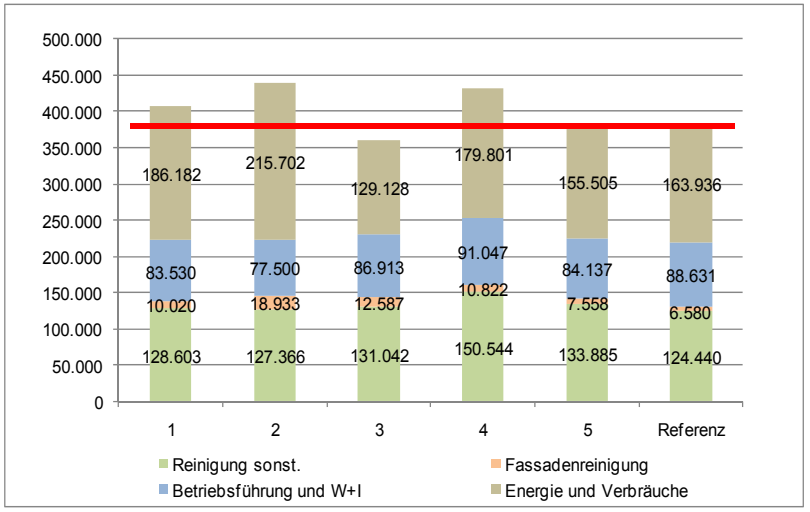
# Comparing the different projects

- **Life-cycle cost evaluation**

Construction costs



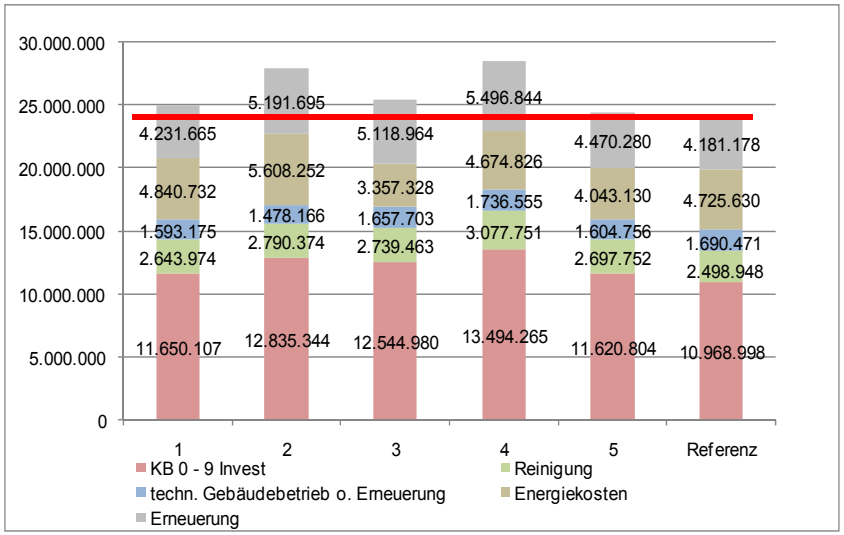

Operation costs

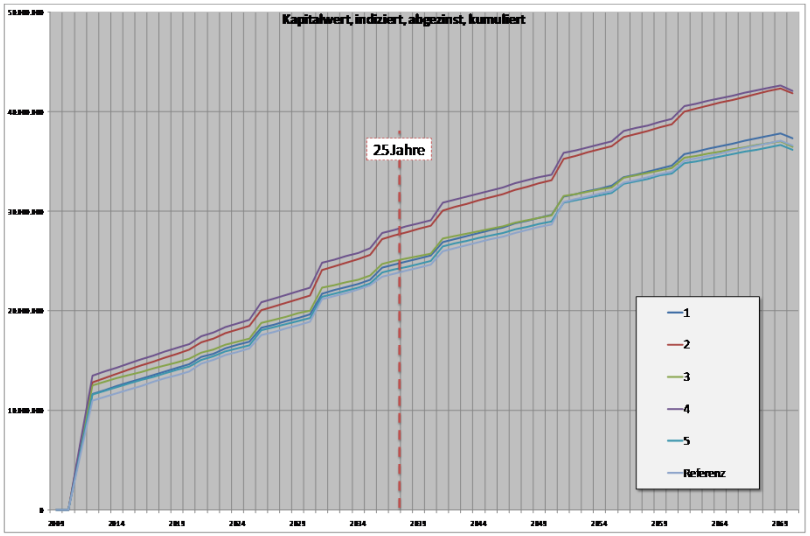


# Comparing the different projects

- **Life-cycle cost evaluation**

Life-cycle costs after 25 years



# Decision making for the winning project

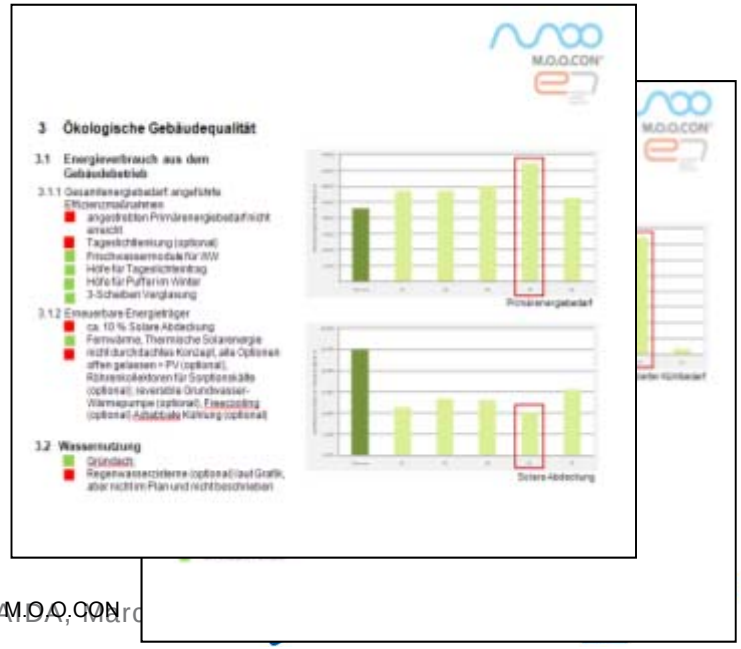
| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Technical quality | | | | | |
| Socio-cultural quality | | | | | |
| Ecological quality | | | | | |
| Economical quality | | | | | |

Abstract from the record:

Submitted building technology concept reduces the cooling demand

High cooling demand – Verification of summer comfort and non-overheating by optimising the concept of the atrium

High cleaning demand for atriums – Optimization needed



# Contact

**Margot Grim**
**e7 Energie Markt Analyse GmbH**
Theresianumgasse 7/1/8
1040 Wien

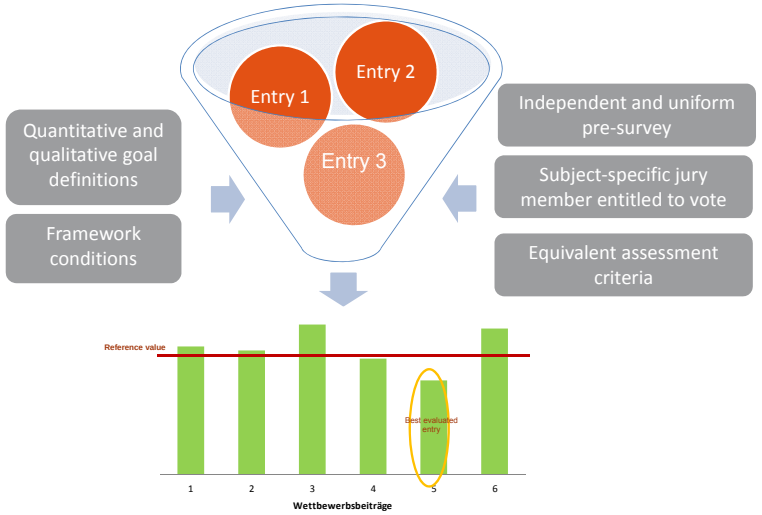
T +43 1 907 80 26 - 51
F +43 1 907 80 26 – 10
margot.grim@e-sieben.at
www.e-sieben.at

Download the manual „Schritt für Schritt zum Nullenergiegebäude“
www.sep.wien.at

*“The sole responsibility for the content of this presentation lies with the authors. It does not necessarily reflect the opinion of the European Union. Neither the EACI nor the European Commission are responsible for any use that may be made of the information contained therein.”*

# Architectural competition
## Assessment criteria

- **Pre-qualification**
  - Experience of the design team
- **Urban planning, mass studies**
  - Compactness
  - Orientation
- **Highly elaborated contributions**
  - Energy indexes
  - Natural lighting and ventilation
  - Comfort in winter & summer
  - Quality of the building technology concept
  - Energy supply
  - Life-cycle costs



# Effects of the first desing desicions

## Heavy vs. Light construction

**Framework conditions**
- south facade
- outside shading
- internal gains: 2 people, 2 PC-s
- Schwer: massiv walls, floor and ceiling
- Mittelschwer: light walls, massiv floor and ceiling
- Leicht: light walls, ceiling and floor coated

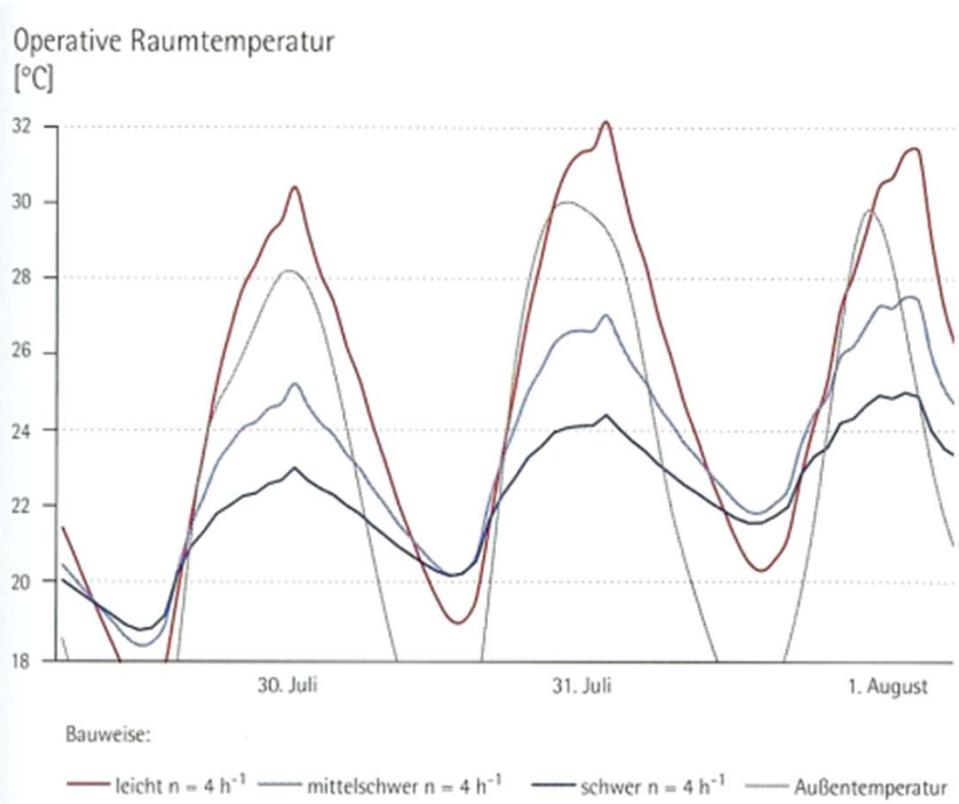



*Abb. 5.3.9* **Einfluss der nutzbaren Speichermasse auf das Raumklima**
Die Speichermasse ist Grundvoraussetzung für eine effiziente Nachtauskühlung. Die Bauweise muss mindestens mittelschwer sein.

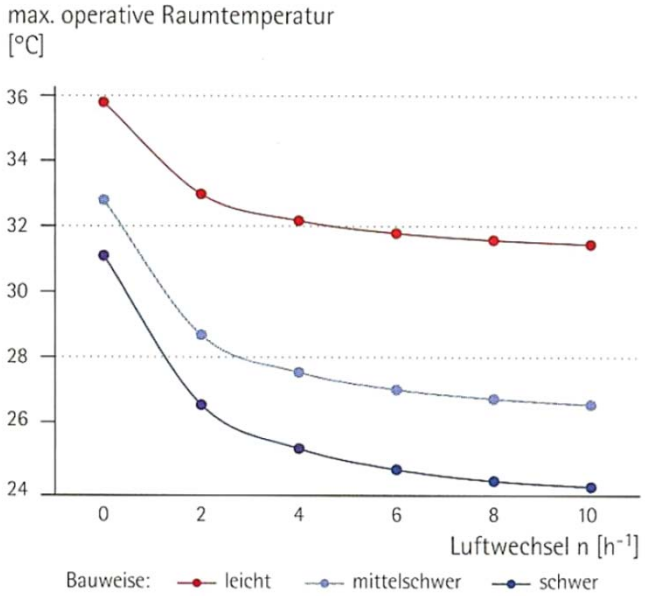


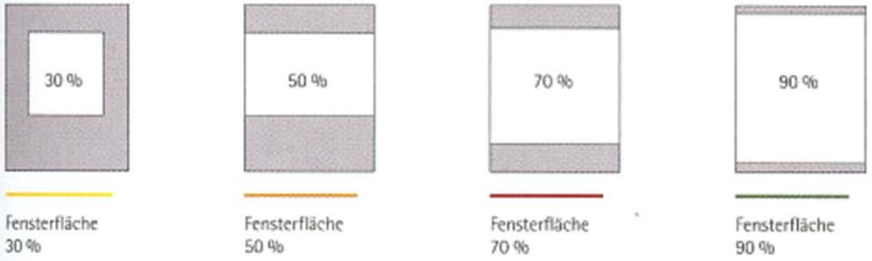

*Abb. 5.3.8* **Einfluss der nutzbaren Speichermasse und des Luftwechsels n auf die maximale operative Raumtemperatur nach mehreren heißen Sommertagen**

Quelle: Hausladen G. et al. (2005). ClimaDesign. Lösungen für Gebäude, die mit weniger Technik mehr können. München: Callwey.

# Effects of the first desing desicions

## Size of glazing

**Framework conditions**
- south facade
- outside shading
- massiv ceiling, light walls
- internal gains: 2 people, 2 PC-s




Legende zu den Abb. 3.1.9 und 3.1.10

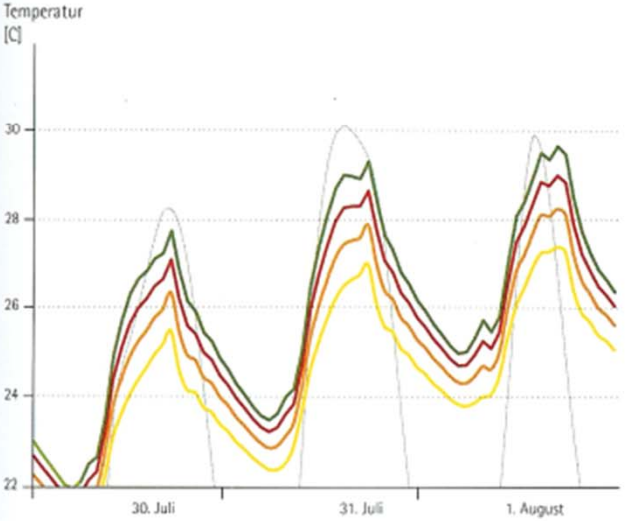



*Abb. 3.1.9* Operative Raumtemperaturen an drei sehr warmen Sommertagen in Abhängigkeit vom Fensterflächenanteil (Südfassade)

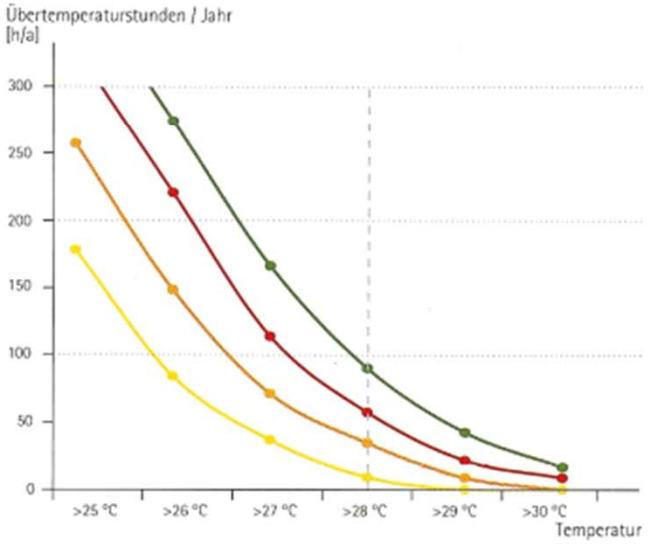


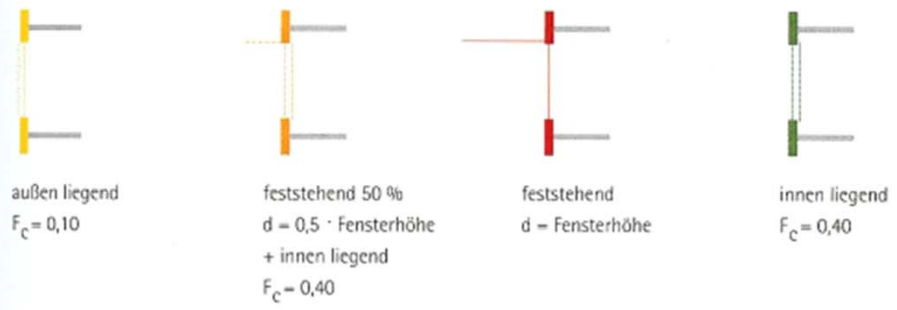

*Abb. 3.1.10* Übertemperaturstunden während der Nutzungszeit in Abhängigkeit vom Fensterflächenanteil

Quelle: Hausladen G. et al. (2005). ClimaDesign. Lösungen für Gebäude, die mit weniger Technik mehr können. München: Callwey.

# Effects of the first desing desicions

## Shading System

**Framework Conditions**
- South facade
- 70% glazing
- massive ceiling, light walls
- internal gains: 2 people, 2 PC-s




**Legende zu den Abb. 3.1.7 und 3.1.8**
$F_c$ = Abminderungsfaktor für Sonnenschutz
d = Auskragungstiefe

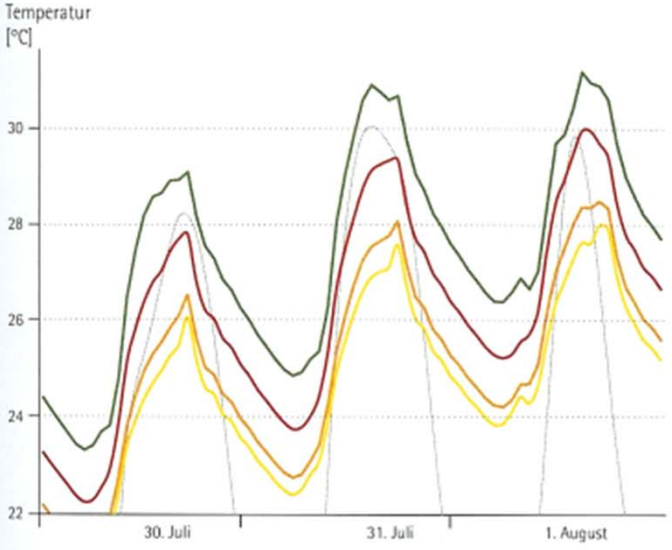



*Abb. 3.1.7* **Operative Raumtemperaturen an drei sehr warmen Tagen in Abhängigkeit von der Ausbildung des Sonnenschutzes (Südfassade)**

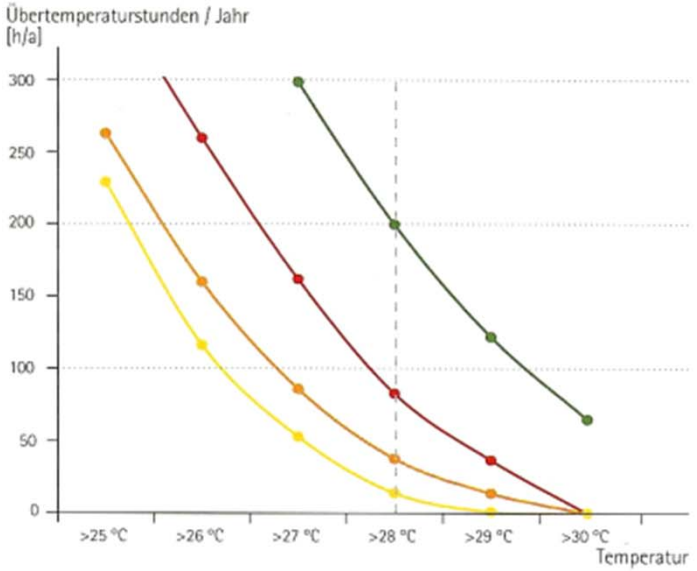



*Abb. 3.1.8* **Übertemperaturstunden während der Nutzungszeit in Abhängigkeit vom Sonnenschutz**

Quelle: Hausladen G. et al. (2005). ClimaDesign. Lösungen für Gebäude, die mit weniger Technik mehr können. München: Callwey.

# Auswirkungen der ersten Entscheidungen

## Tageslichtnutzung

- **Größe der Verglasungsfläche**
- **Verschattung durch Umgebung**
- **Eigenverschattung (Auskragungen)**
- **Trakttiefe**
- **Anordnung der Fenster/Sturzhöhe**