Different quality assurance concepts for Deep Energy Renovation
The role of EPC

## Starting point: Renovation backlog in public buildings

<table>
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<tr>
<th>Crash-Maintenance</th>
<th>step-by-step renovation</th>
<th>comprehensive refurbishment according to legal requirements</th>
<th>comprehensive refurbishment with high energy and sustainability targets</th>
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</thead>
<tbody>
<tr>
<td>replacement only if required because of urgent repair need (= unplanned stepwise renovation)</td>
<td>subsequent renovation of parts of the building; longer time-periods between each refurbishment step</td>
<td>complete renovation of envelope and building systems according to required engineering practice</td>
<td>complete renovation of envelope and building systems with high energy and sustainability performance</td>
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</table>

prevailing maintenance strategy

mainly if functional changes are required; 1-2% per year?
Economic reasons for renovation backlog? (1)

- LCCA for several example buildings → typical result
- Economic effectiveness of comprehensive refurbishment is highly probably
- Energy savings and maintenance savings
Economic reasons for renovation backlog? (2)

- higher (discounted) savings at comprehensive refurbishment approach
- higher investment potential: approx. € 1.7 mln. for this example
Barriers and approaches for increasing „activity levels“

- lack of staff for the preparation of comprehensive refurbishment projects
  - outsourcing to external experts
  - **BUT:** strategic project management needs to remain at the side of the client

- financing limits for public bodies
  - **PPP-models / Third Party Financing as part of EPC**
  - **BUT:** high uncertainty
  - **Eurostat guidance notice** reduces uncertainty but restricts the potential application fields
Approach A: Energy Performance Contracting

- successful approach in many EU countries for energy optimisation

- improvement of strategy of crash-maintenance

- little success in boosting EPC towards comprehensive refurbishment – WHY?
Approach B: Integrated Design (ID) for comprehensive refurbishment projects

- If a client decides to implement a comprehensive refurbishment project (usually) a design process is initiated
  - well-defined structure of design processes
  - clients’ organisations are used to implement design process

- ID is a way
  - to foster collaboration between stakeholder of design processes
  - to overarch the interfaces between design, implementation and operation

| Crash-Maintenance | step-by-step renovation | comprehensive refurbishment according to legal requirements | comprehensive refurbishment with high energy and sustainability targets |
Approach B: Integrated Design
Focus on early design phases

- Decreasing impact on performance
- Increasing cost and disruption

TIME
- Brief writing
- Concept design
- Detailed design
- Construction documentation
- Construction implementation

WORK LOAD
The creative problem solving process (2) runs parallel in time with monitoring the progress according to the goals (3). This is rarely a straightforward process, and the phase should be kept open long enough for all necessary information to be integrated in the design.
Approach B: Integrated Design
Linking ID to the operation phase

- Implementation of a quality management feedback loop
- Ensuring commissioning of system operation as planned
- Clear target values for regular operation
Conclusions for discussion

● Both EPC and ID are approaches that rather improve the quality of comprehensive refurbishment projects than the activity level.

● ID is closer to standard processes of comprehensive refurbishment projects → higher probability of application.

● When applied to comprehensive refurbishment EPC resembles to the model of “total contractor”
  ▪ commissioning of design, implementation and operation (potentially including financing) to 1 single contractor
  ▪ very little experience → little probability of application

Thank you for your attention!