Concepts for Cost-Effective Deep Energy Retrofit

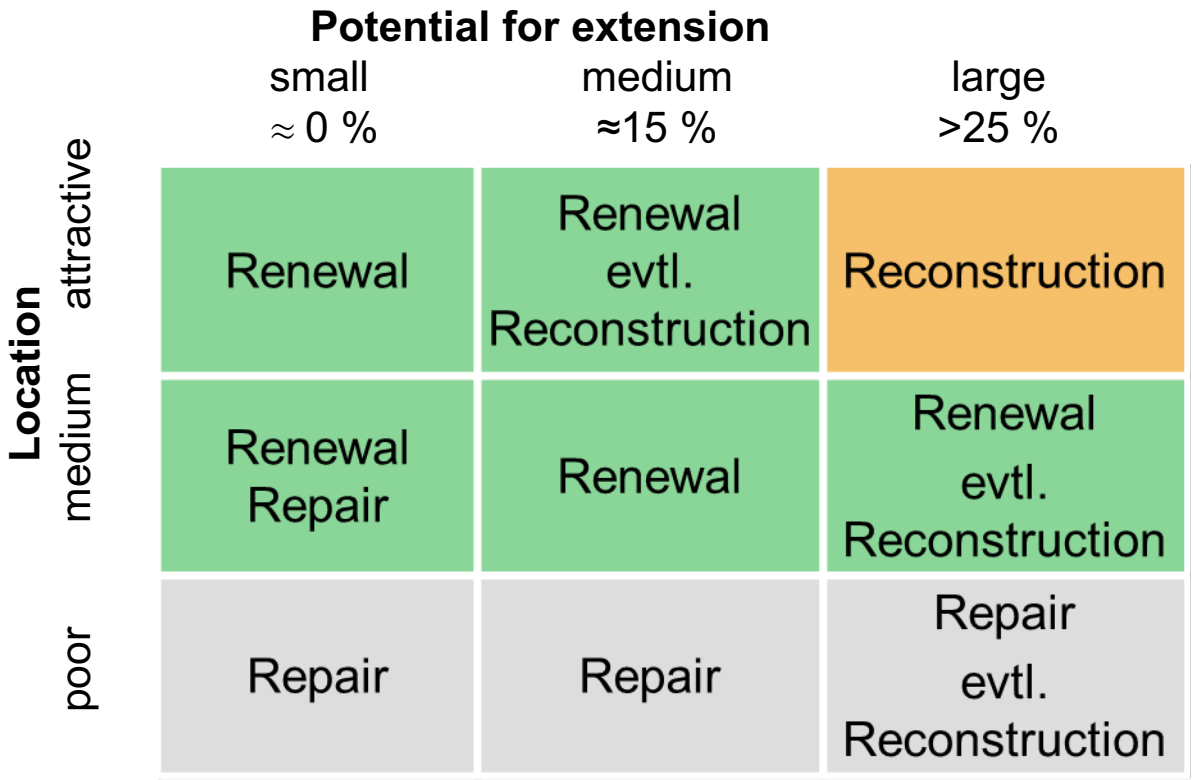
Mark Zimmermann
Switzerland

EMPA
Materials Science & Technology

Optimal renovation strategy?

Repair – Renewal – Reconstruction ?

Renewal or Reconstruction?



… also to be considered

- Usability / flexibility / Demand
- Construction quality, sound protection, earthquake safety
- Integration in neighborhood, historic value
- Tenant situation

E2ReBuild

DE EN FR

Start | Building | Finances | Repair | Retrofit | Reconstruction | Results | End

start

Project name
Address
Autor
Date 2015-10-22
Country Switzerland

Simple, detached suburban apartment building, constructed about 1930 Simple to avarage standard, relatively small apartments, normally 3 stories, raised ground floor, massive wall construction, artificial stone reveals, overhanging balconies, roof space not or little used as living space, simple staircase without elevator.

European Retrofit Advisor: era.empa.ch

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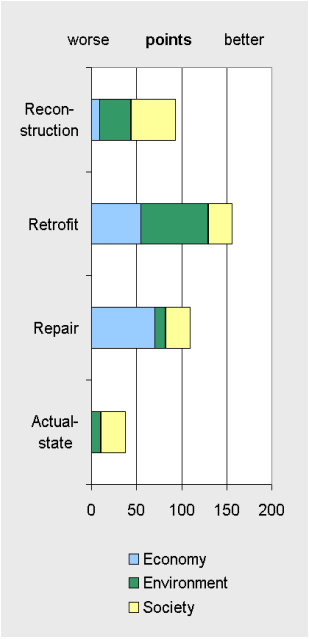
European Retrofit Advisor

Prefab Retrofit with Room Extension



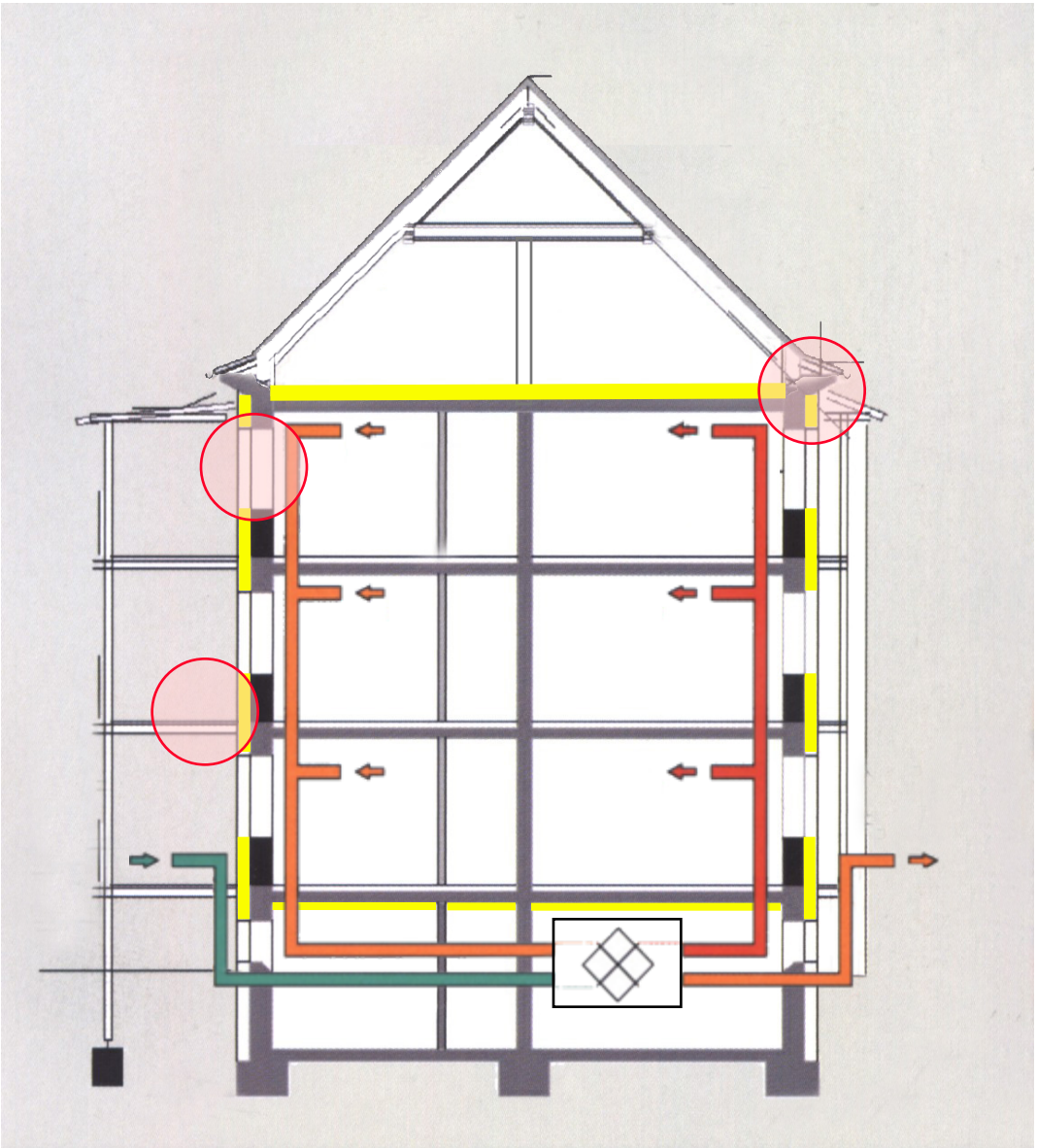
Deep Building Renovation

E

80-90 % **tment)**

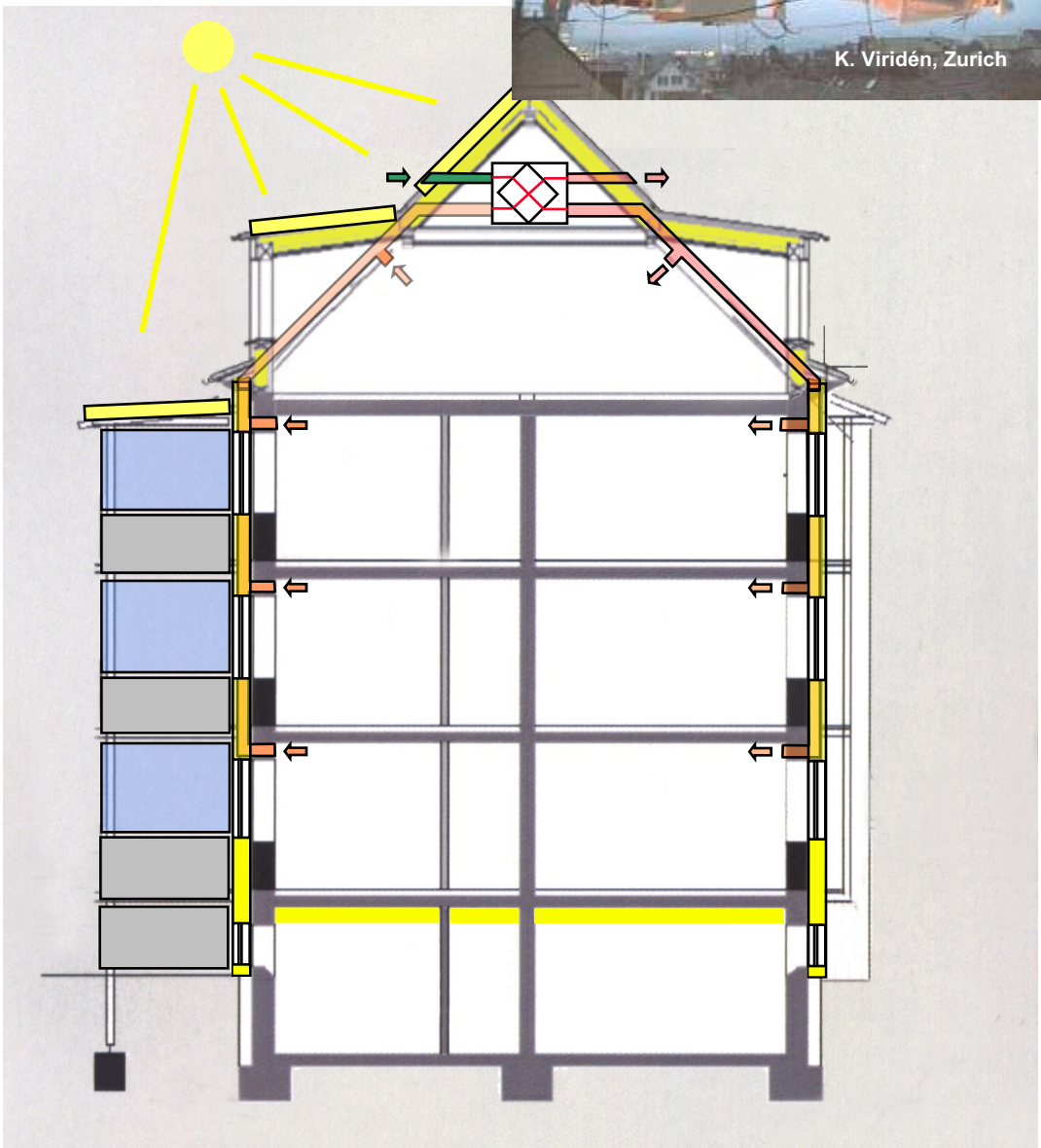
Traditional Renovation

- hardly future oriented
- too many technical compromises
- to many craftsman involved
- poor coordination on site
- low quality level
- inefficient construction processes



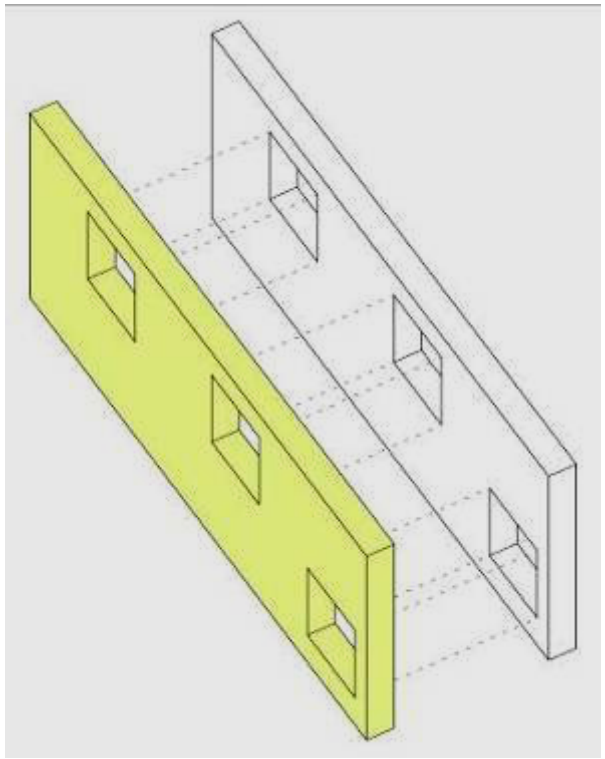
Prefab Building Renovation

- whole building concept
- no technical compromises
- few companies involved
- well coordinated modules
- quality assurance
- rapid construction processes



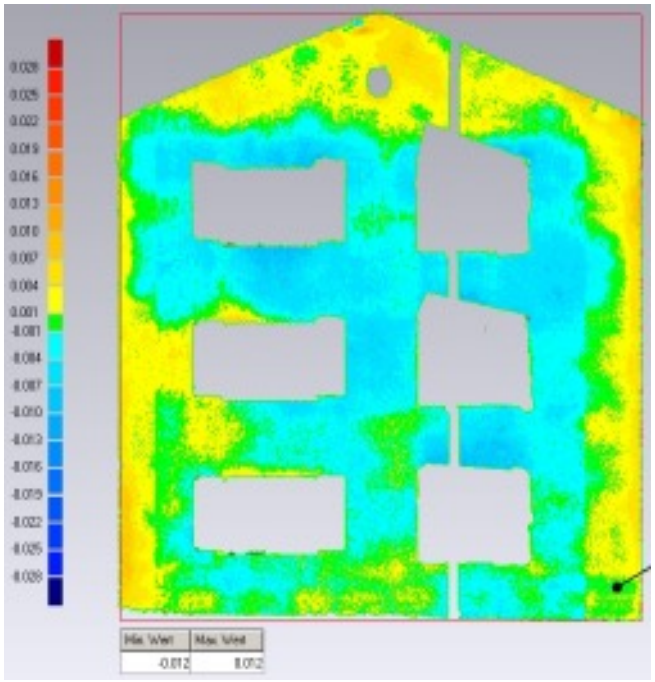
Challenge of Pre-Fabrication

Pre-fabrication of large elements has to ensure that the elements will fit to the existing building

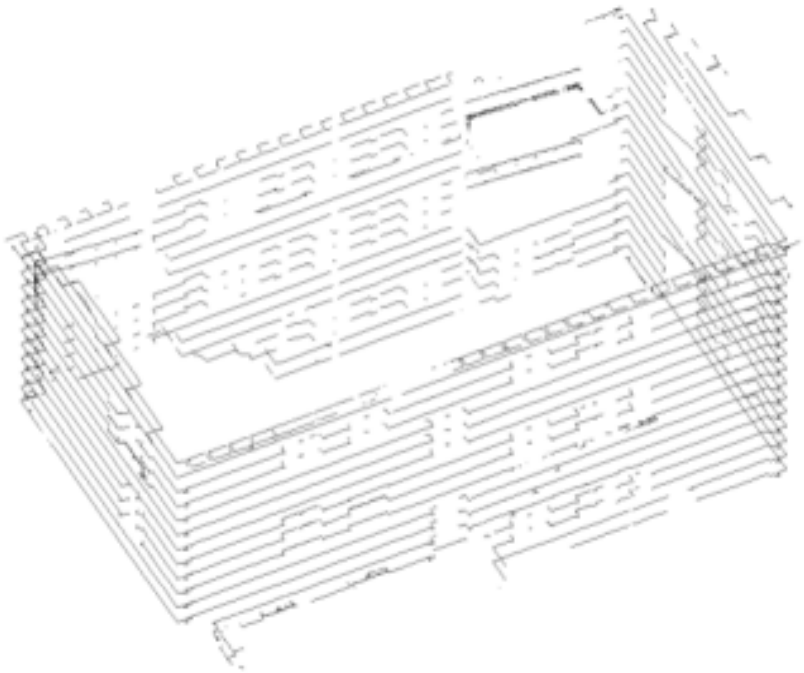


Picture: Wood-Wisdom, TES-EnergyFaçade

Laser Scanning – Design Support

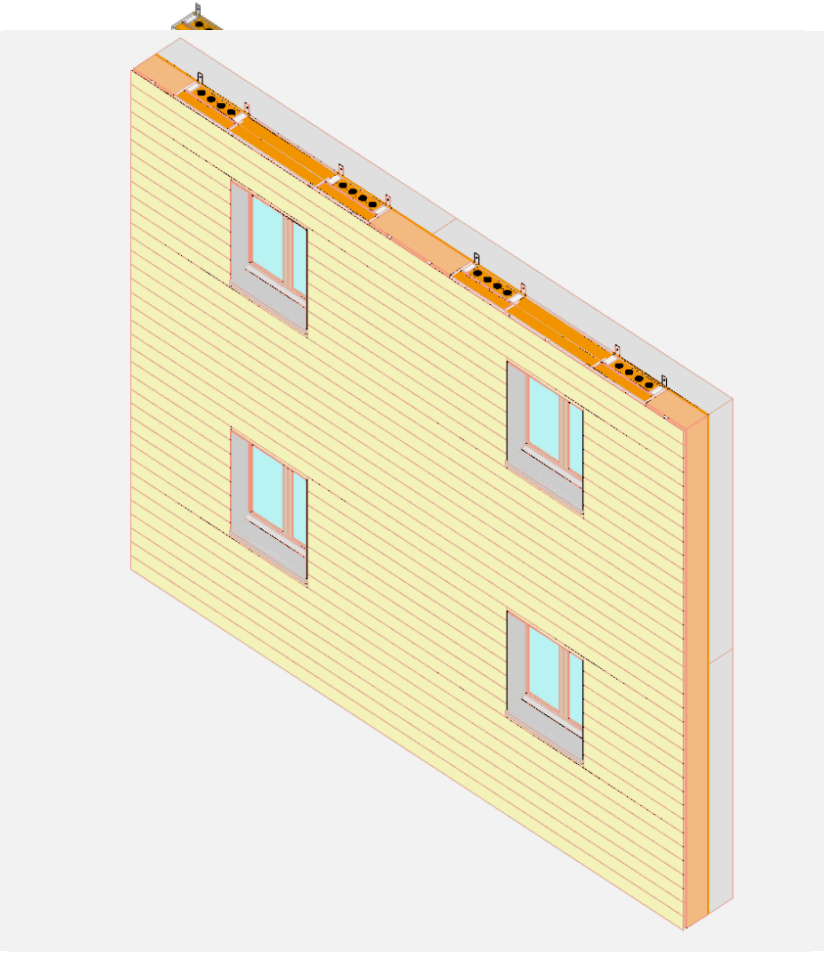


Planarity of façades



Horizontal sections

Modular approach



Contractors generally prefer to work with large size modules!

Small or large size module developed by Swiss team

Pre-fabrication of Façade Elements

Mounting of Façade Elements

Krummbach School and Caretakers Building

Austrian Demonstration Buildings

Renovation of 3 apartment buildings (1959) completed 2008,
GAP-Solution / AEE INTEC

German Demonstration Building

Renovation of 60 apartment buildings (1966) in Augsburg
completed 2013, Frank Lattke / TU Munich

Wood-Wisdom,
TES-Energy
Façade

Dutch Demonstration Buildings

Renovation of residential area by DAT archiecten / Trecodome

Swiss Demonstration Buildings

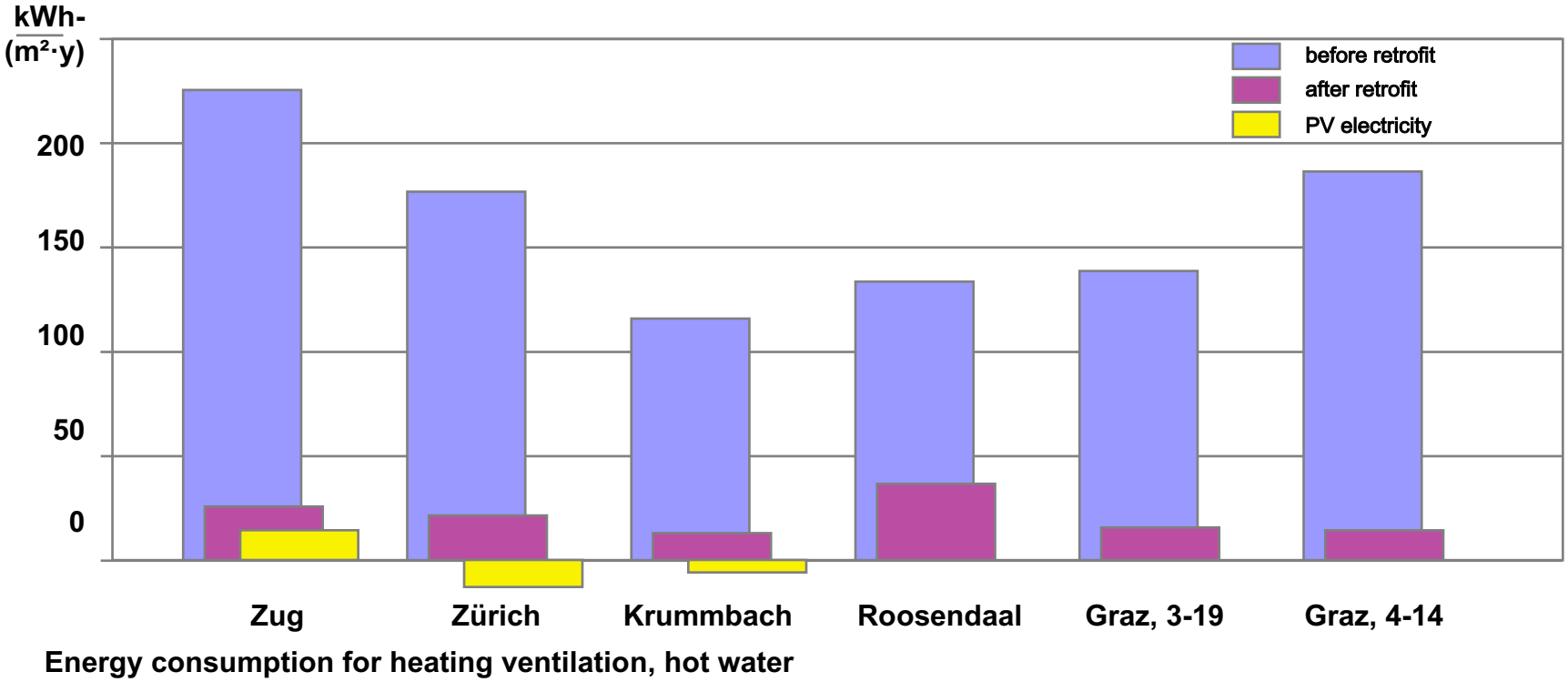
Renovation of apartment building (1952) completed 2009, Miloni Architects

Swiss Demonstration Buildings

Renovation of apartment building (1952) completed 2009,
Beat Kaempfen Architects

IEA Demonstration Buildings

- 6 Demonstration sites with totally 363 apartments and 1 school



Energy consumption for heating ventilation, hot water

Historical Buildings

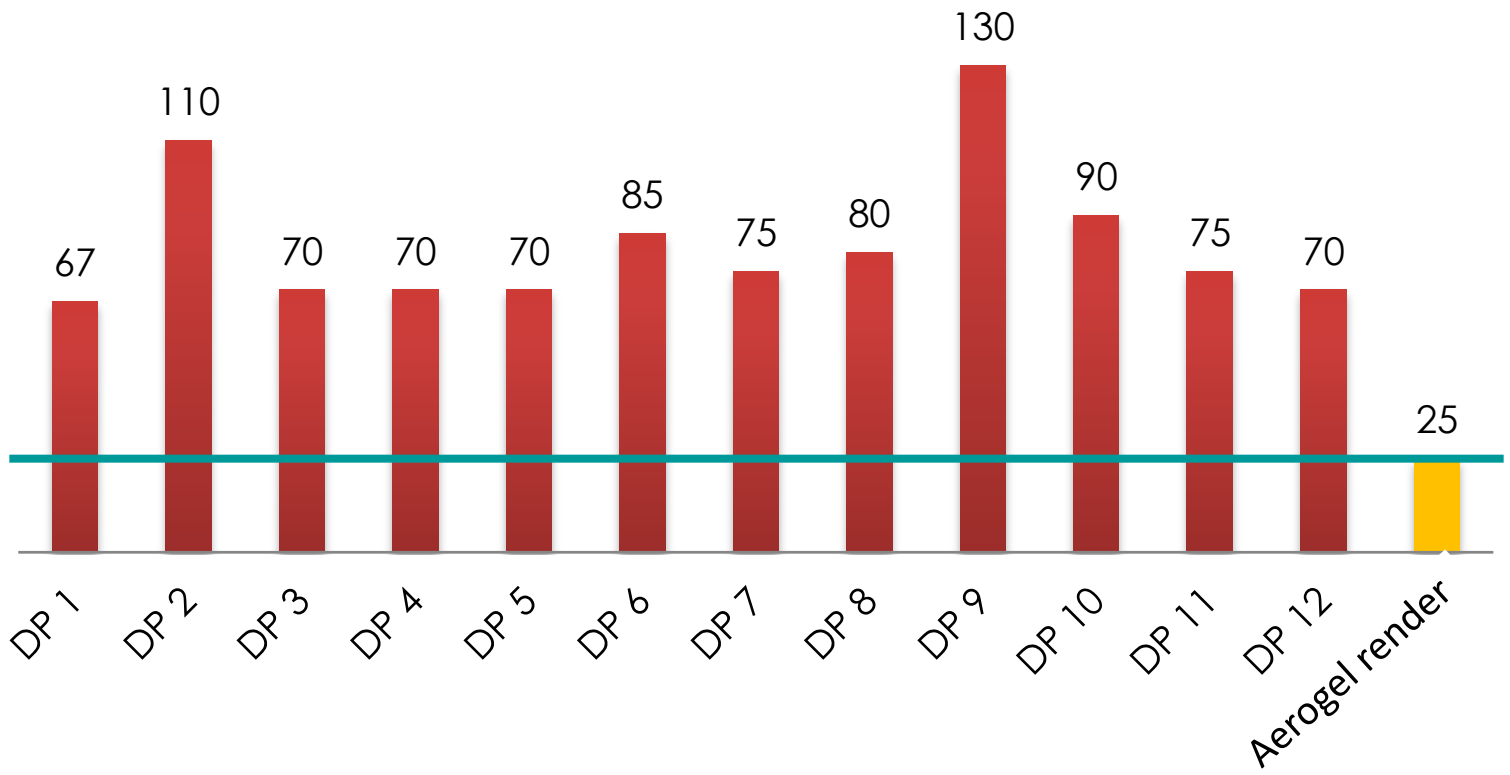
Traditional buildings should be refurbished with traditional methods

New Insulation Rendering

- Purely mineral
- Thermal conductivity < 30 mW / (m·K) in real application
- 60 – 80 mm thickness in one layer
- Sprayable with available rendering machines
- Very low vapour resistance μ < 5
- Applicable in- and outside

Thermal Conductivity of Insulation Renderings

Thermal conductivity of insulating rendering systems in mW/(m·K)



International Energy Agency
Secure Sustainable Together

EBC
Energy in Buildings and Communities Programme

US Army Corps of Engineers

ASHRAE

U.S. DEPARTMENT OF ENERGY

GSA

Summary Building Repair and Restauration

- Building repair mainly for low income housing with low attractiveness
- Building restauration for historical buildings
- Energy savings potential lower but still >60%
- Aerogel rendering is an interesting new solution

Summary Prefab Building Retrofit

- Prefab Retrofit suitable for deep renovation with energy savings > 80% - Technologies available
- Deep renovation has additional legal requirements (earthquake, fire, sound, energy, water management, electrical installations)
- Energy savings measures are hardly cost effective > added values needed
- Expected service life > 50 years

Thank you for your attention!

era.empa.ch

www.iea-ebc.org/projects/completed-projects/ebc-annex-50/