Deep renovation of buildings around the globe

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Jens Laustsen
Energy Policy Analyst
Setting a global perspective

• Last 5 years I worked for IEA as Building Energy Efficiency Policy Analyst
• I worked with energy efficiency and renovations for almost 25 years
• Some of my conclusions are:
• A global policy for energy efficiency in buildings needs to be based on concepts
• Renovations and in particular deep renovations need to be a central part of this policy
Concept 1: Passive House

Sophienhof Frankfurt / Germany
15 kwh / m² per year
Extra costs = 3-5% of total costs
Payback = 9-10 years
Concept 2: Zero Energy Buildings

1. Avoid need for energy use: passive heating, cooling and ventilation
2. Improve energy efficiency
3. Incorporate renewable energy and green power
4. Purchase carbon offsets

The way to Zero Energy Buildings

Zero Energy

Zero Carbon

Plus Energy

Solar Siedlung Vauban
Freiburg, Germany

BedZet, London, UK

BCA Academy Singapore
Use integrated design and cultural heritage

The steps of Integrated Design Process:

- consider right building size and use;
- consider orientation, form, thermal mass;
- high-performance building envelope;
- maximize passive heating, cooling, ventilation and use of day-light;
- install efficient systems to meet remaining loads;
- use renewable energy sources as much as possible;
- ensure that individual devices are as efficient as possible; and
- ensure proper commission of systems

15 degrees difference – sun / no sun – use of local heritage
MISR university Cairo
Concept 4: Factor 10 / deep renovation

Frankfurt Teverstrasse, Refurbishment using Passive House Principles

Source: Passivehouse Institute / DENA
Concept 5: Zero Energy Renovation

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Net Zero Energy, Zero Carbon, Health and Sustainability

Prefab. SolarSystems

Hyldesplældet
Denmark

Zero Energy Ready / Near Zero

Zero Carbon

Playa del Carmen
Mexico

California
Little Experience

• The global experience with deep renovations is relative small
• With the five concepts least experience with deep renovations and zero renovations
• Still early in the learning curve
• Some of the largest experiences / studies are:
  – Better than new build in Germany
  – Zero Carbon Renovation initiatives in UK
  – Study on employment impact in Hungary
  – Projects in Austria, Switzerland, Denmark, Sweden
  – Some projects in US and a few in Mexico
  – Some individual projects around the world
Better than new!

Energy standard refurbishment

Germany

Demands refurbishment

Demands new

Minus 30%

Minus 50%

Very Best practice Renovation in Germany Factor 10

Source: DENA Besser als ein Neubau
Better than new!

Very Best practice Renovation in Germany Factor 10

Energy standard refurbishment

Existing buildings
EnEV Sanierung
EvEV New Buildings
EnEV minus 30%
S에너지 minus 50%
Passive house

Besser als ein Neubau

Source: DENA
Some Conclusions Europe

• These and other European experience show that deep renovations and even zero energy renovations can be achieved at rational costs
• In particular when:
  – Substantial renovation is needed of building structure
  – A holistic energy renovation principles are applied
  – Energy concerns are included from first moment
  – Policies are put in place to help on finance and other barriers
  – Creative ideas are included – add a new floor with passive standard
What if climates are hot?

- Most comprehensive studies are found in Europe
- What if the climate is hot?
- How will this impact deep renovation?

Just a few examples
California

- There has been a 62% reduction in energy usage plus renewable energy

Mexico

- Mexican experience with low energy and zero energy is relatively new (last 2 years)
- Most examples are new built and low income housing
- Supported with green mortgage and a zero energy home initiative
- A few projects concern renovations
- Costs were kept low
- Relative simple measures
- Shading central
- High efficiency of solar systems
- Possible to come close to zero energy:
  - Zero energy ready
  - Close by zero energy
  - (subsidized electricity)
In Hot Climates

• In warmer climates it seems to be easier to achieve zero energy or close to zero energy
  – Because low cost measures seems to have large impact
  – Because there is a better correlation between needs and production of renewable energy
  – No need for storage
  – Shading is central and can cause problems in renovation
  – In hot and dry (low night temperature) there is need for thermal mass

• In very hot climates (night temp above 25 °C) and in warm humid climates – special complexity / AC

• Experience in these areas are very scarce
Market Penetration for Energy Efficient Buildings

Policies to develop Deep Renovations

Implementation of EE in buildings takes time!
Costs for Deep Renovations

Costs as result of market penetration

When volume goes up / experience grow – costs go down
Costs for Deep Renovations

Costs as result of market penetration

When volume goes up / experience grows – costs go down
Deep renovations are needed

- Buildings are only renovated every 30 – 40 years
- If we skim the savings we will lock in a large potential for many years
- Small savings today might make large savings impossible later
- Energy efficiency and deep renovation should be a natural part of any renovation / larger improvement of a building
Sustainable buildings network

- A new network of networks to increase impact of policy advice
- Policy packages for existing buildings
- Assessment of policy packages for improving energy efficiency in existing buildings.
- What works and what doesn’t work?
- Collection of information on impact of policies and in particular combinations of policies. Looking at very best practices.
- Focus on deep renovations.
- Other key areas:
  - Building Codes
  - Zero energy buildings
  - Intelligent tropical architecture
Conclusions

• The experience with deep renovations is still very limited
• But some very promising projects have taken place
• Experience starts to grow in different areas of the world
• Shows promising results
• Some of the best practice projects are already feasible
• With more learning and standardisation prices can come down
• Need to share experience and learn fast
• Sustainable Buildings Network is an important piece of this collaboration
• Deep renovation is the future – if we skim the savings a large potential will be locked in
• I’m looking forward to learn more on this conference

Thanks for your attention
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Jens Laustsen

jens.laustsen@live.com