# Deep renovation of buildings around the globe

## World Sustainable Energy Days
## Wels 3-4 March 2011

Jens Laustsen

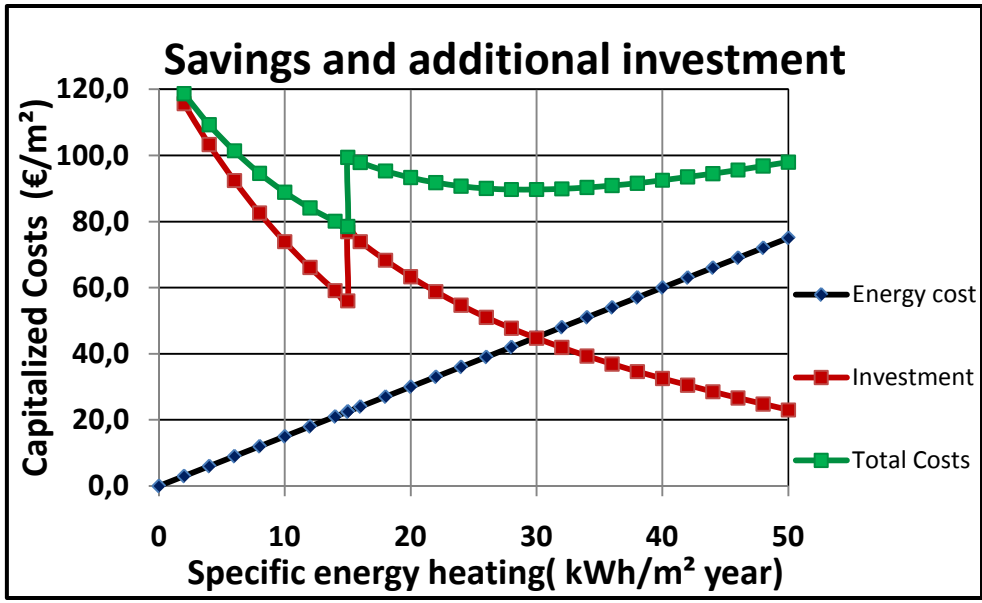
Energy Policy Analyst

# 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

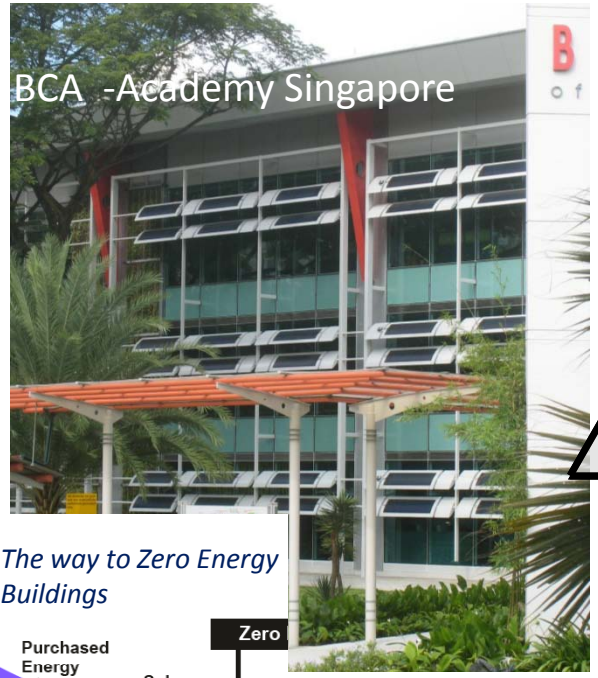
# Concepts

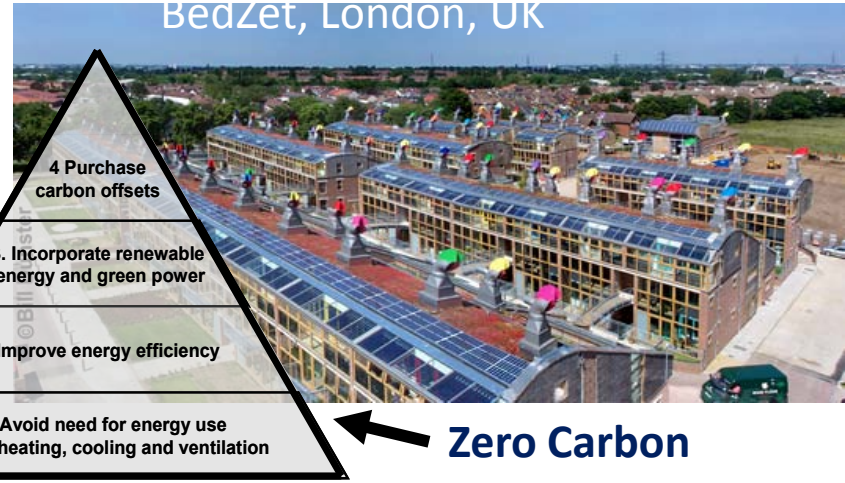
# Concept 1: Passive House



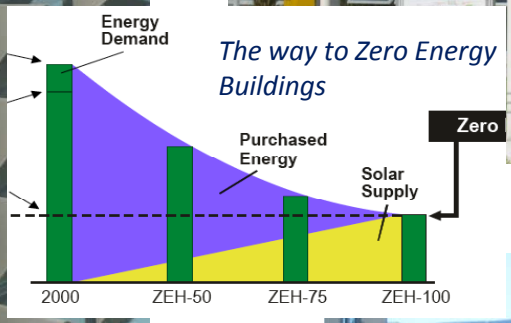
Sophienhof Frankfurt / Germany
15 kwh / m² per year
Extra costs = 3-5% of total costs
Payback = 9-10 years

# Concept 2: Zero Energy Buildings




Zero Carbon




*The way to Zero Energy Buildings*

Zero Energy

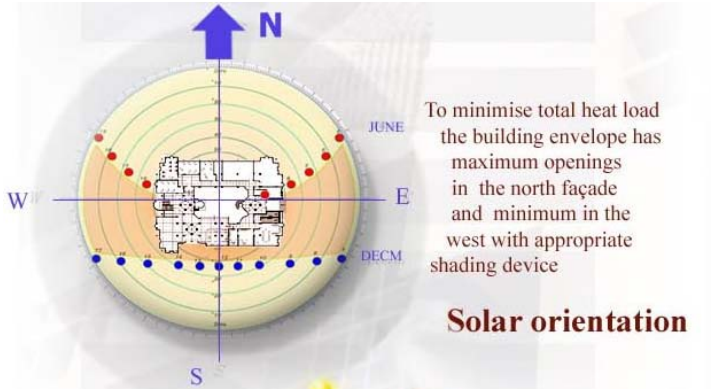
Plus Energy

# Concept 3: Intelligent Hot Climate Design

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

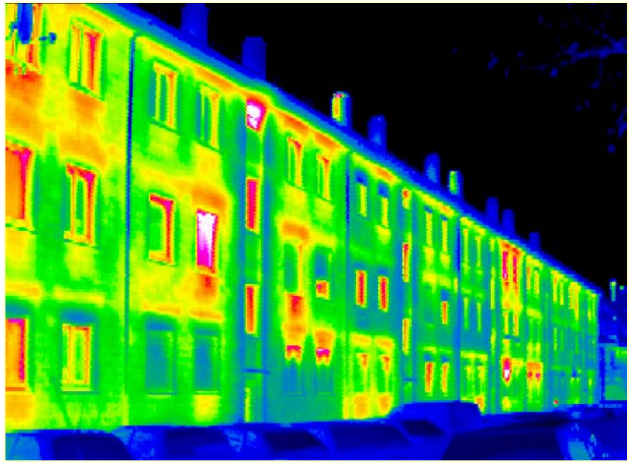


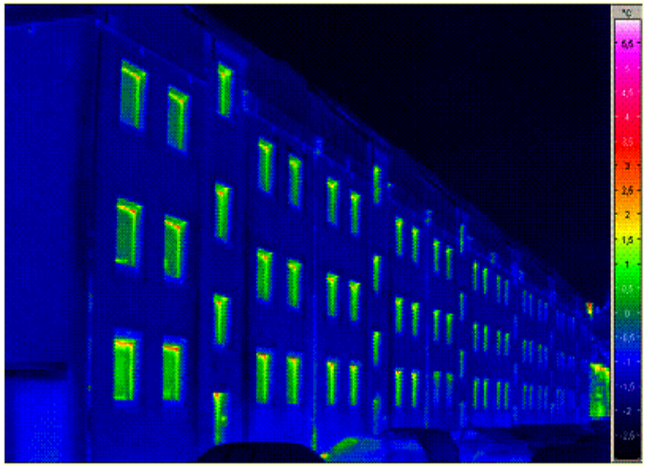
*15 degrees difference – sun / no sun – use of local heritage*
*MISR university Cairo*

© OECD/IEA, 2010

# Concept 4: Factor 10 / deep renovation

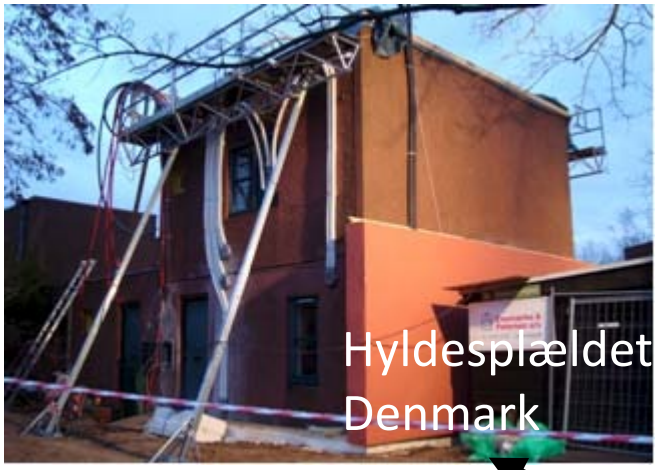
Frankfurt Teverstrasse, Refurbishment using Passive House Principles





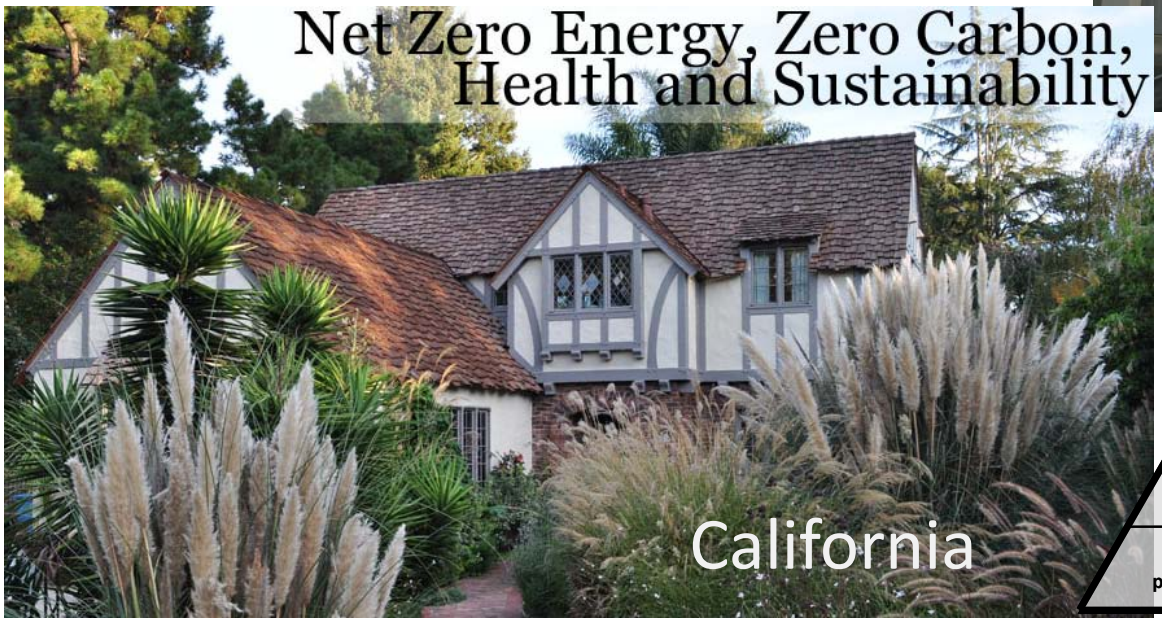
*Source: Passivehouse Institute / DENA*

# Concept 5: Zero Energy Renovation

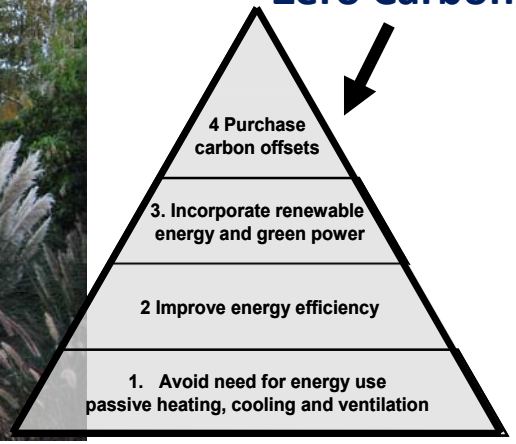


**Zero Energy Ready / Near Zero** →

**Zero Energy** ↖



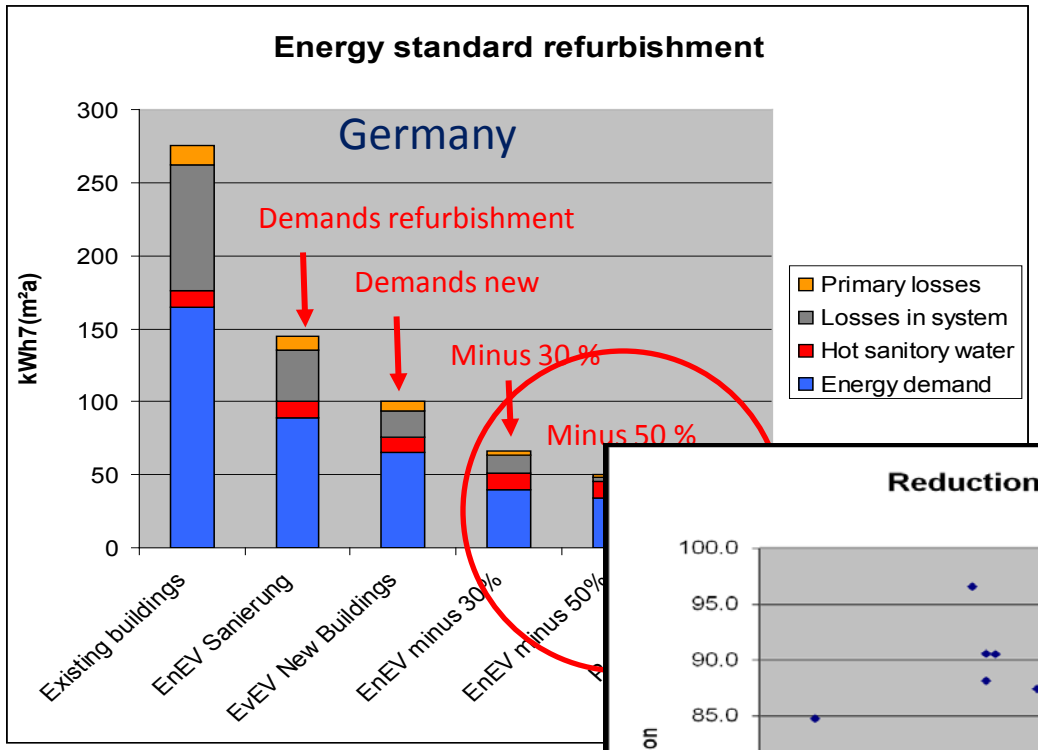

**Zero Carbon** ↓

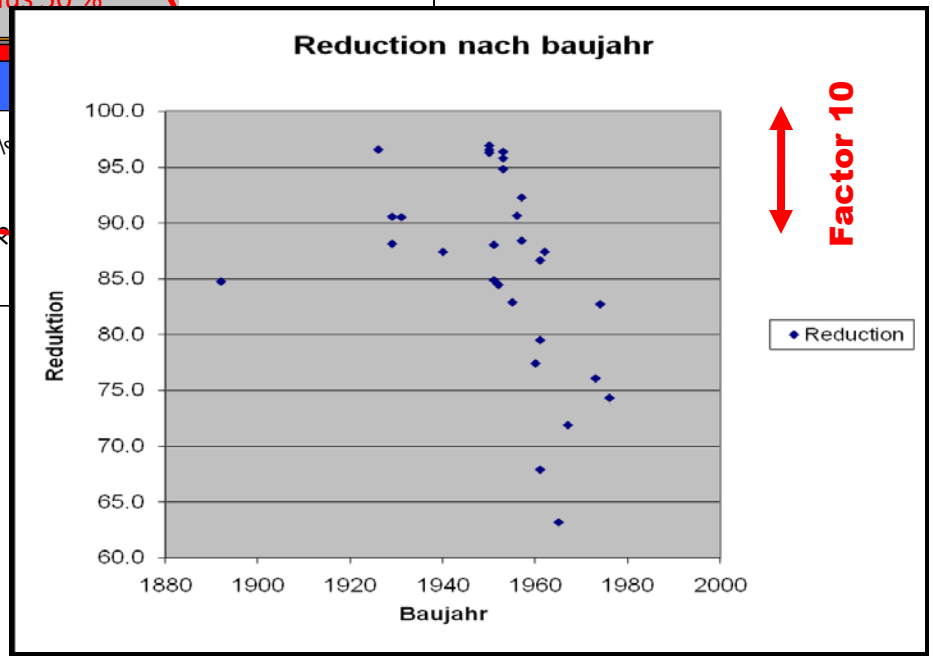


# Little Experience

- 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 !

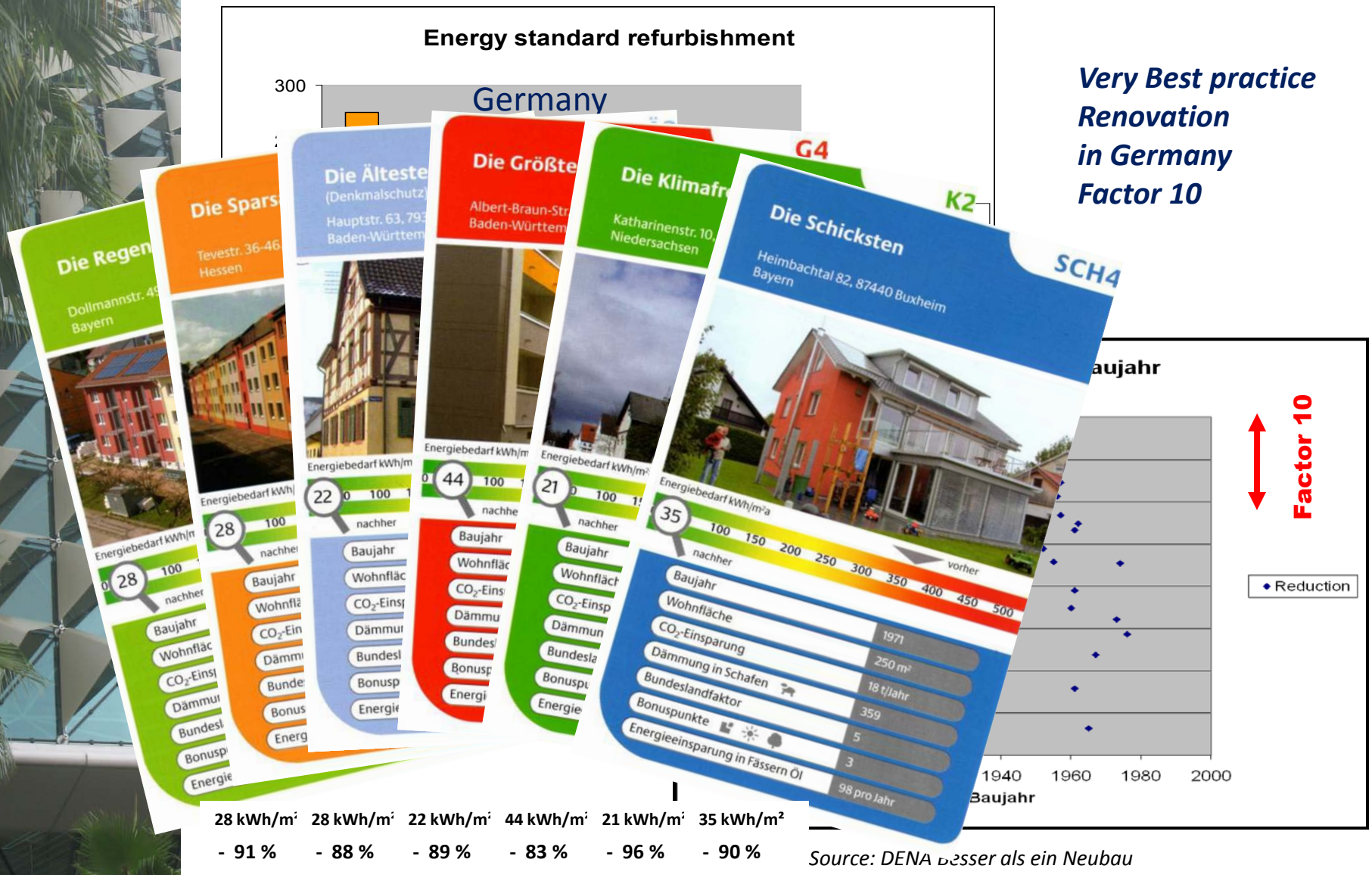



***Very Best practice Renovation in Germany Factor 10***

*Source: DENA Besser als ein Neubau*

# Better than new !




***Very Best practice***
***Renovation***
***in Germany***
***Factor 10***

| 28 kWh/m² | 28 kWh/m² | 22 kWh/m² | 44 kWh/m² | 21 kWh/m² | 35 kWh/m² |
|---|---|---|---|---|---|
| - 91 % | - 88 % | - 89 % | - 83 % | - 96 % | - 90 % |

*Source: DENA Besser als ein Neubau*

# 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

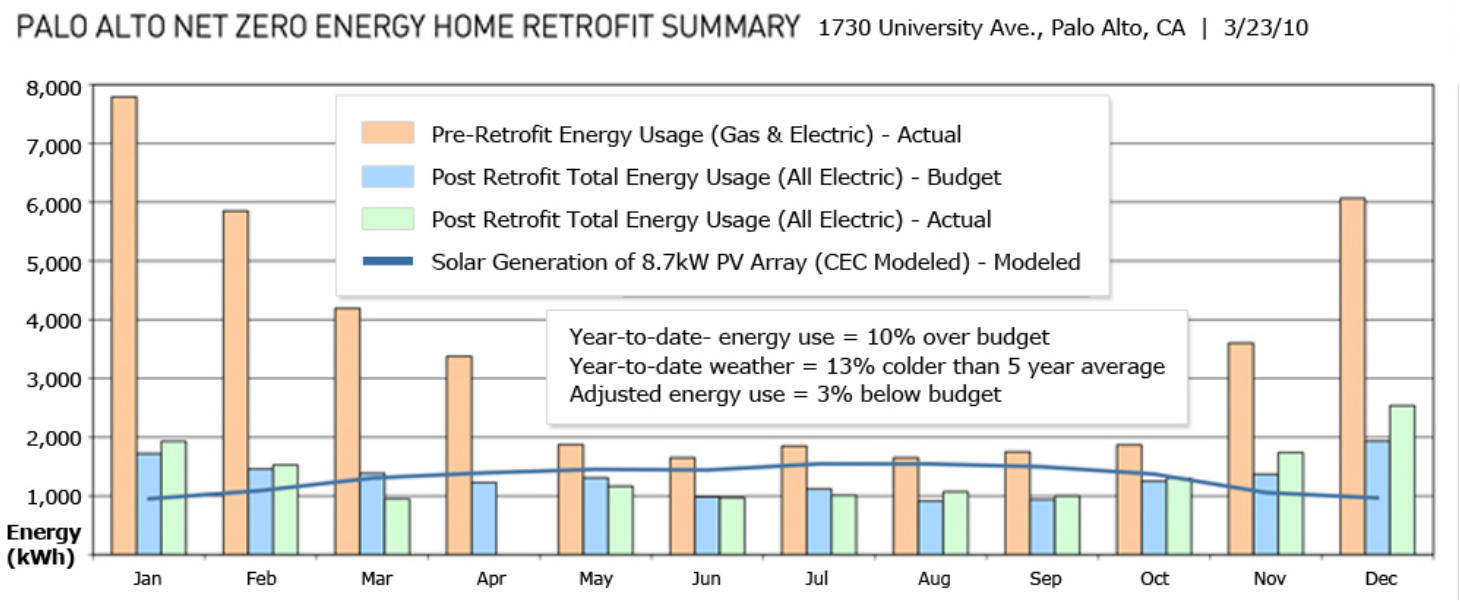
# What if climates are hot ?

- 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




*Source: [http://www.paloaltonetzero.com/](http://www.paloaltonetzero.com/) and 5th US Passive house conference*

# Cancun 2010

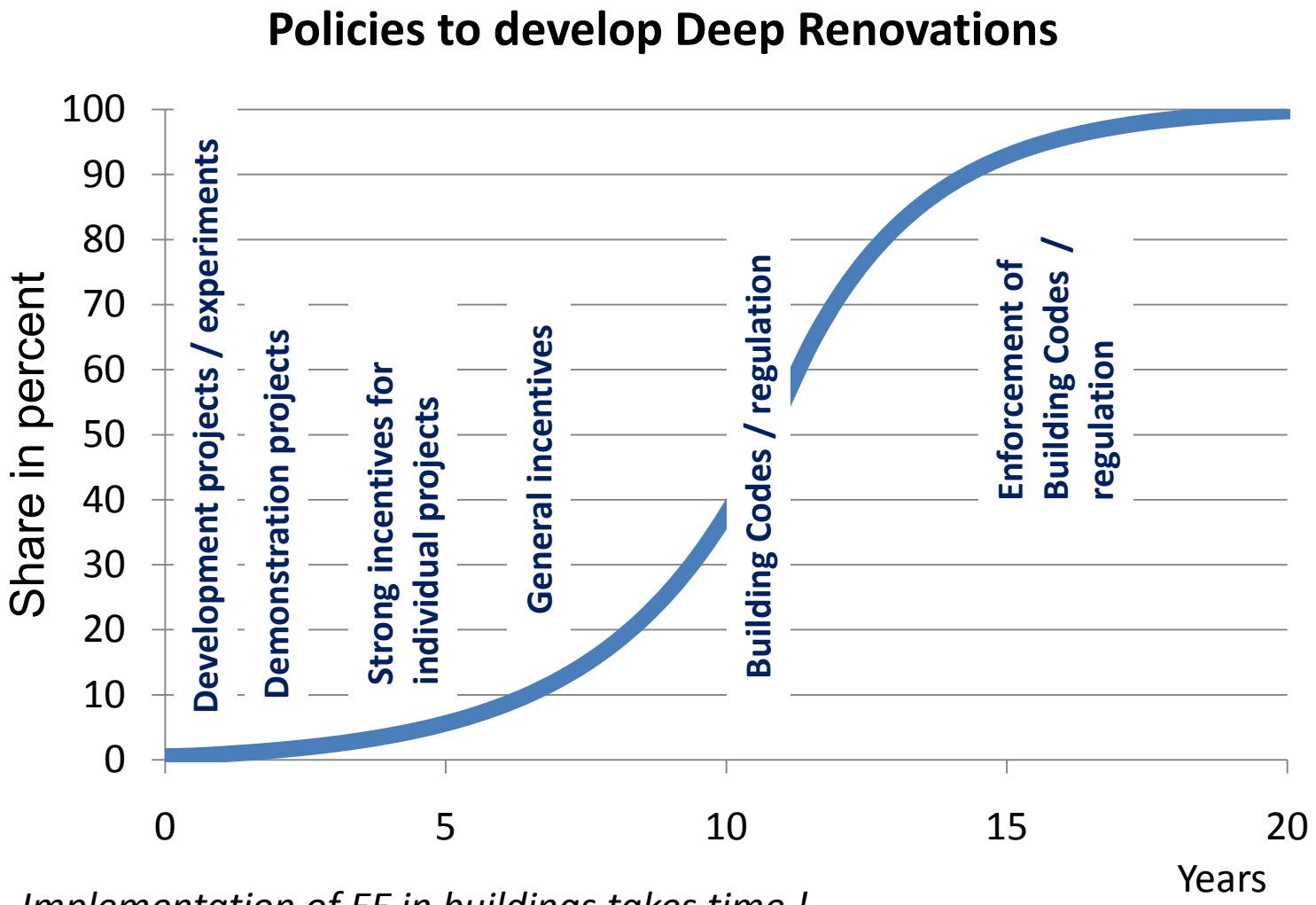
# Mexico

- Mexican experience with low energy and zero energy is relative 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 concerns renovations
- Costs were kept low
- Relative simple measures
- Shading central
- High efficiency of solar s.
- Possible to come close to zero energy:
  - Zero energy ready
  - Close by zero energy
  - (subsidized electricity)

# In Hot Climates

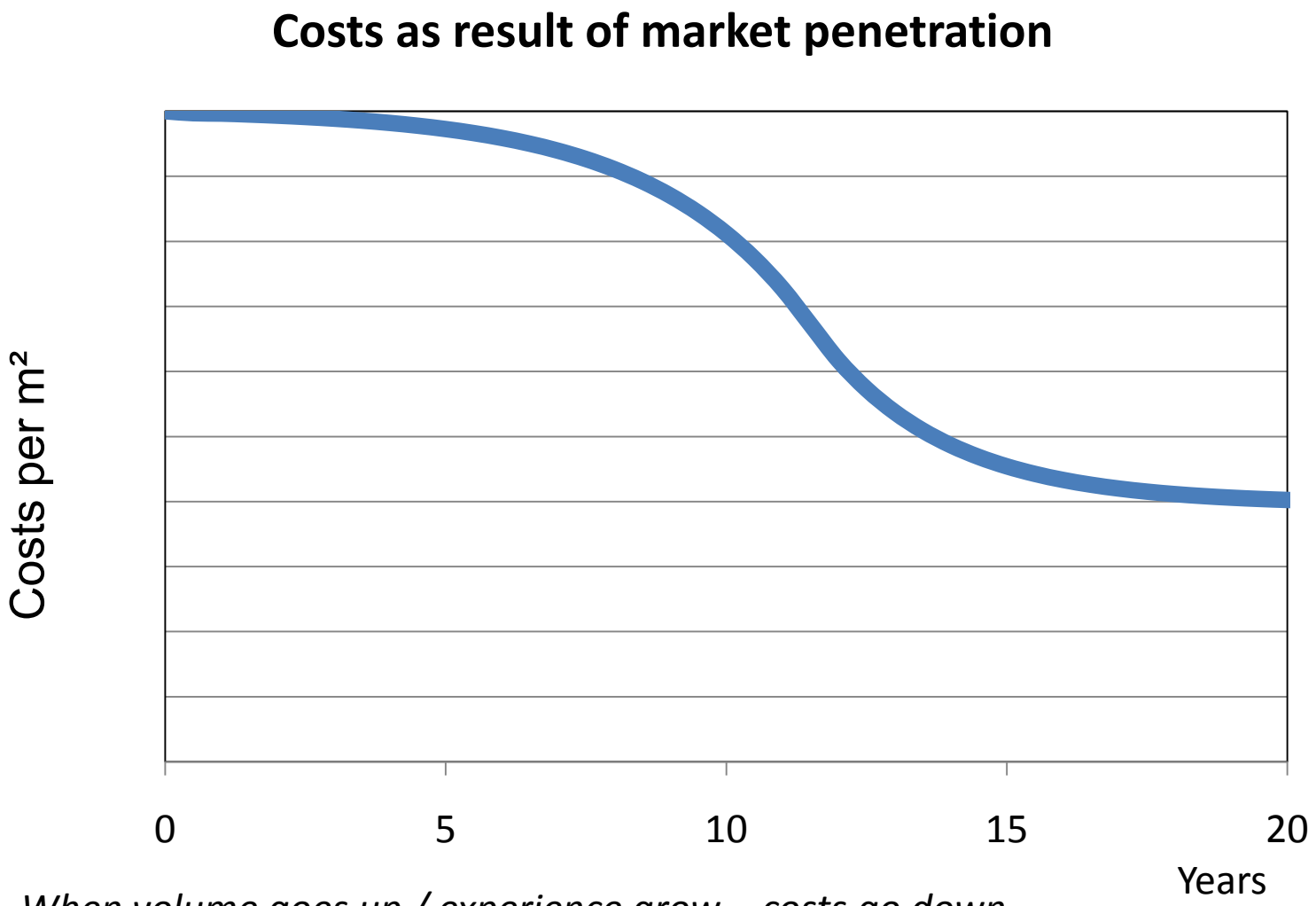
- In warmer climates it seems to be easier to achieve zero energy or close to zero energy
  - Because low cost measures seems to have large impact
  - Because there is a better correlation between needs and production of renewable energy
  - No need for storage
  - Shading is central and can cause problems 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



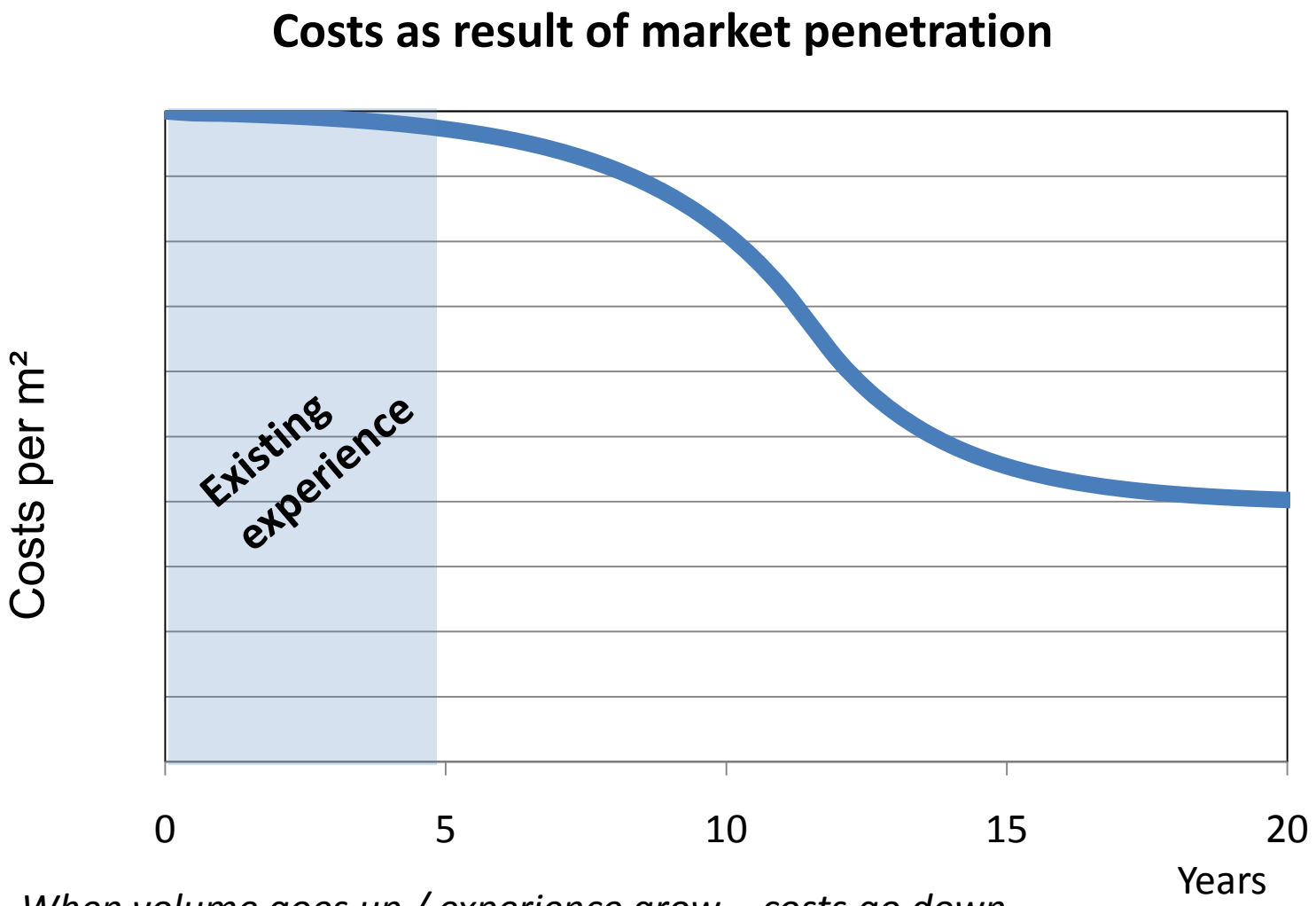

*Implementation of EE in buildings takes time !*

# Costs for Deep Renovations




*When volume goes up / experience grow – costs go down*

# Costs for Deep Renovations



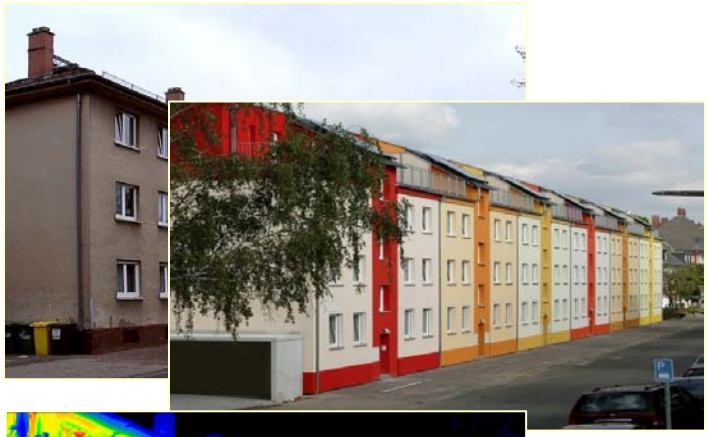

*When volume goes up / experience grow – costs go down*

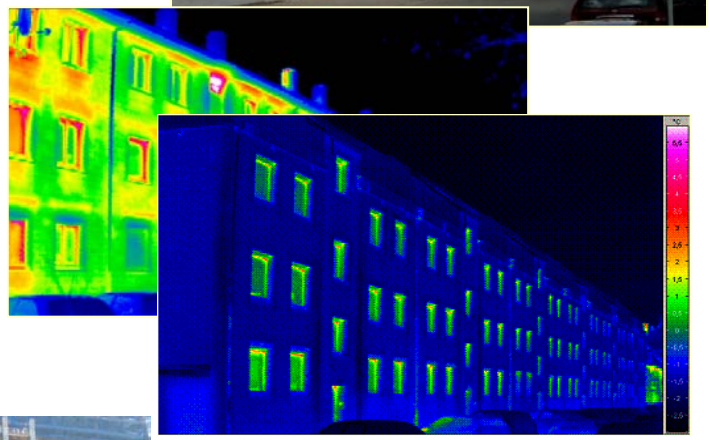
# Deep renovations are needed

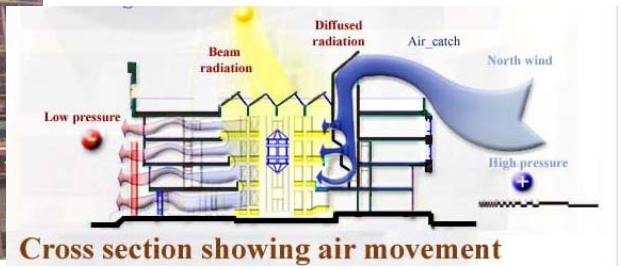
- Buildings are only renovated every 30 – 40 years
- If we skim the savings we will lock in a large potential for many years
- Small savings today might make large savings impossible later
- Energy efficiency and deep renovation should be a natural part of any renovation / larger improvement of a building

# 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







Cross section showing air movement

# 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

Thanks for your attention

Jens Laustsen

jens.laustsen@live.com