



Global Strategy for Energy Efficient Buildings

On the track to Zero Energy Buildings

EEAC Conference Évora 2007 on Energy Efficiency

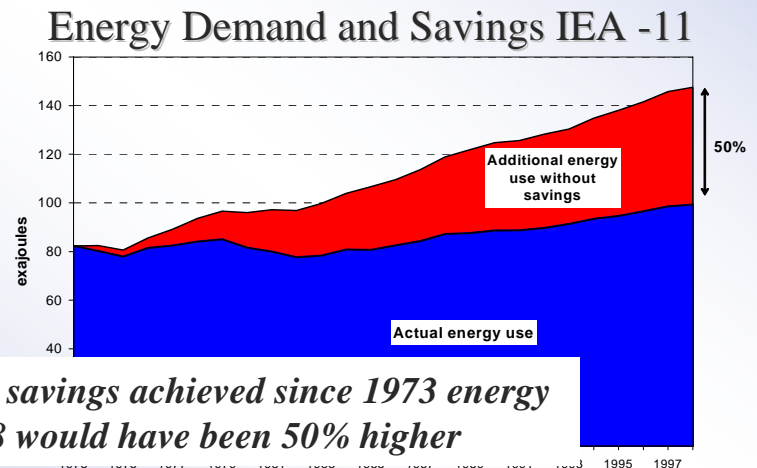
International Energy Agency IEA
Jens Laustsen

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Energy Efficiency in Buildings

- Energy efficiency in buildings is www (win win win)
- Energy Efficiency in Buildings is compelling, cost effective and can help consumers to save money in the long term
- Energy efficiency in buildings help to meet energy targets and reduce energy shortage
- Energy efficiency is good for industry and creates new jobs
- There is still so much that can be done
- But there is a need for active policies



Without energy savings achieved since 1973 energy demand in 1998 would have been 50% higher



Energy Efficiency is becoming a central part of the IEA activities

- The G8 summit in Gleneagles in 2005 asked IEA to carry out work on energy efficiency, clean technology and climate policy.
- As a part of this IEA was asked:
 - ◆ to make studies on efficiency end in the end use of energy - buildings, appliances, transportation and industry,
 - ◆ to come up with recommendations for the G8, the rest of OECD countries, plus five and other developing countries,
 - ◆ to make special out reach activities for India, China, Brazil, Mexico and South Africa (plus 5).
- Transforming the way we use energy (End-use efficiency)
- 12 recommendations were taken to Heiligendamm. This include 3 specific policy recommendations for Efficiency Policies for Buildings
- G8 endorsed these recommendations and confirmed the interest for the ongoing work on efficiency
- New requests were added including that IEA should develop a global network on Sustainable Buildings

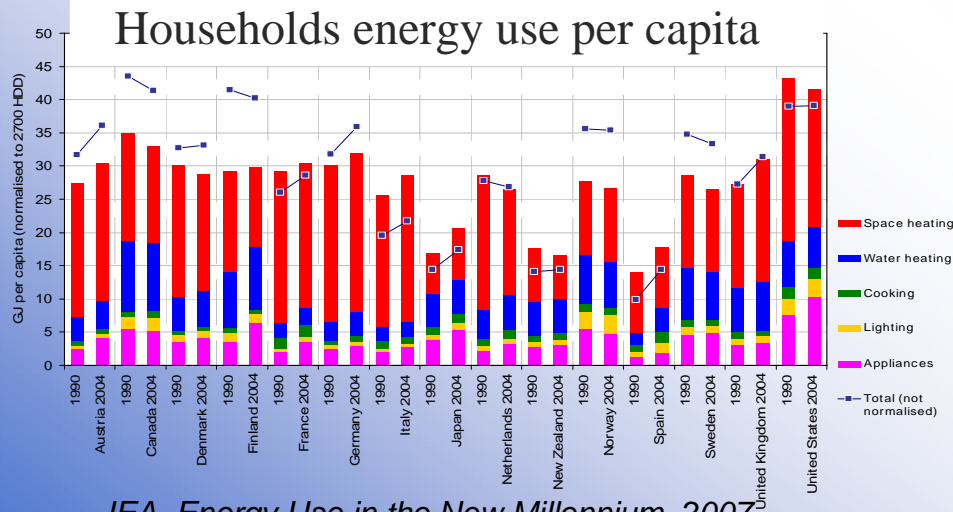


Energy Efficiency Potentials in Buildings

- Existing buildings:
 - ◆ Studies from Europe (EU 15) show that consumption in existing buildings for heating and cooling can be more than halved – (55 % reduction is feasible by renovation).
 - ◆ New 12 EU member states show larger potentials on 55 – 80 %.
 - ◆ In US it is estimated that up to 50 % of the energy in buildings is lost due to inadequate insulation.
 - ◆ Efficient HVAC systems and renewable energy can reduce use of fossil fuels even further.
- New buildings can be constructed without or with very low energy consumption:
 - ◆ Zero Energy Homes are being built in US with more than 50 % reduction compared to traditional homes.
 - ◆ Passive Houses are being built in Europe with up to 75 % reduction compared to traditional buildings.
 - ◆ Zero Energy or Zero Carbon Buildings with zero net energy use over year are possible – but more costly even over time.
- In developing countries the potentials are even larger but comfort level is growing – this reduces the savings.

Buildings are largest end use of energy

- Buildings are the largest end use of energy.
 - ◆ Buildings including installed appliances account for 40 % of the world's end use of energy.
- Most of this consumption is
 - ◆ For heating, cooling, ventilation and hot sanitary water.
 - ◆ In households heating alone accounts for more than 50 %.



IEA, Energy Use in the New Millennium, 2007

At the same time the Feasible saving potentials for energy efficiency are very large both in new and existing buildings



Barriers to Energy Efficiency

- Many barriers hamper energy efficiency improvements in buildings:
 - ◆ Many decision makers (millions of owners).
 - ◆ Lack of financing mechanisms or economic restrains.
 - ◆ Too high emphasis on construction and too little on running costs.
 - ◆ Short occupancy (< 30 years)
 - ◆ Split incentives (owner/renter or different budgets in public buildings).
 - ◆ Lack of knowledge by owners.
 - ◆ Lack of knowledge by constructors, advisers and banks.
 - ◆ Timing - The day after sale or refurbishment it is too late !
 - ◆ Efficient buildings not available on the market.
- But also initial and lifestyle issues:
 - ◆ Energy use is invisible (“Only the activity will be seen...”)
 - ◆ Noise from air conditioning shows that we care about indoor quality.
 - ◆ Savings might indicate low status (“I can afford ...”)
 - ◆ The belief that all new buildings are efficient (“Taken care of by law ...”)
- Need to address all barriers at the same time – package.



Building Codes and New Buildings

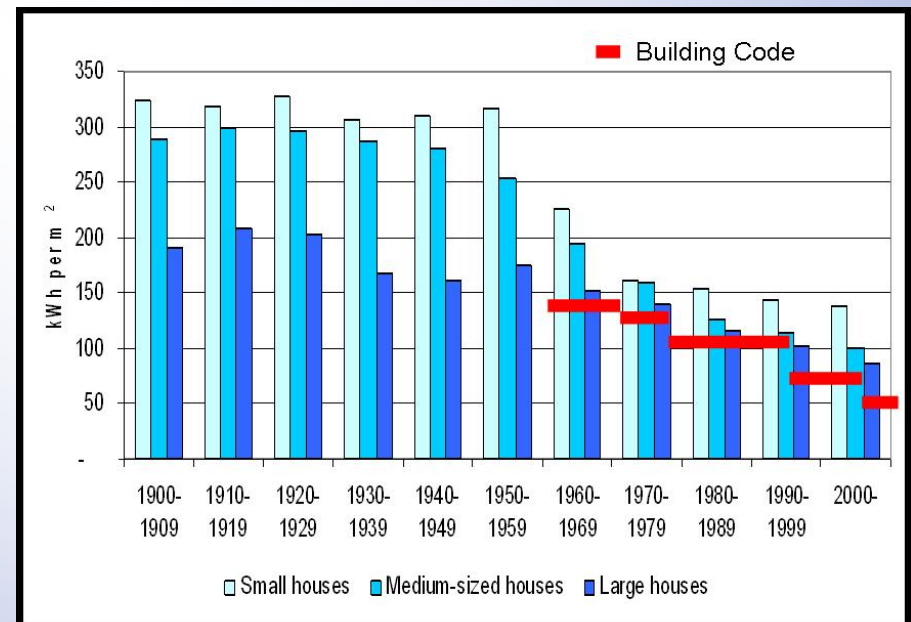
Study on Energy Efficiency Requirements in Buildings Codes, Energy Efficiency Policies for New Buildings.

- **Aim is to compare building codes:**
 - ◆ To find best practices for Building Codes.
 - ◆ To assess the overall level for codes.
 - ◆ Including enforcement of codes and standards.
- **Find very best practices beyond building codes too such as:**
 - ◆ Low Energy Buildings.
 - ◆ Passive houses.
 - ◆ Zero Net Energy Buildings.
 - ◆ Sustainable and Green Buildings.
 - ◆ Encouragement to go further.
- **Also includes how building codes can be used for existing buildings by refurbishment etc.**
- **The work on existing buildings will continue for the rest of 2007 and 2008.**

Building Codes

- One important measure for efficiency in buildings are requirements in Building Codes or in energy efficiency standards for new buildings.
- Has a large impact on efficiency.

- Example from Denmark:
Energy consumption in existing buildings values from certification compared with requirements





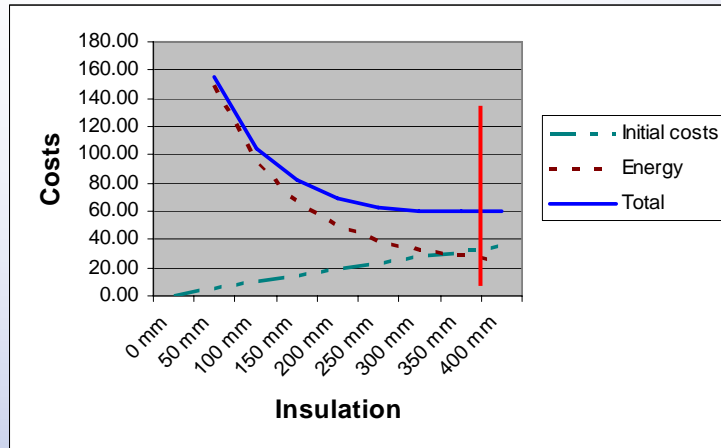
Buildings Lifetime

- Buildings have a long lifetime – many decades or even more than a century.
- Energy efficiency of new buildings determines the energy consumption for far longer than in other end-use sectors.
- Most buildings built today will still be there after 2050.
- Still projects and legislation are based on short payback times on a few years.
- Should be valuated over life time or at least over 30 years.
- Buildings are typically renovated several times.
 - ◆ Residential every 30 – 40 years
 - ◆ Commercial buildings more often
- Renovation offers a special time for improvements of EE.

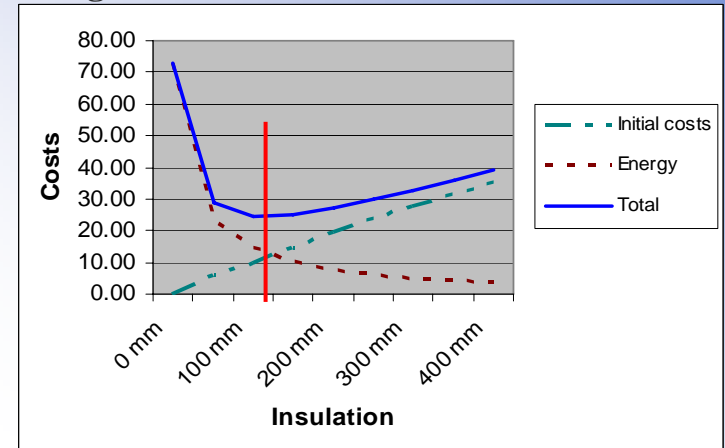


Least Cost for Insulation

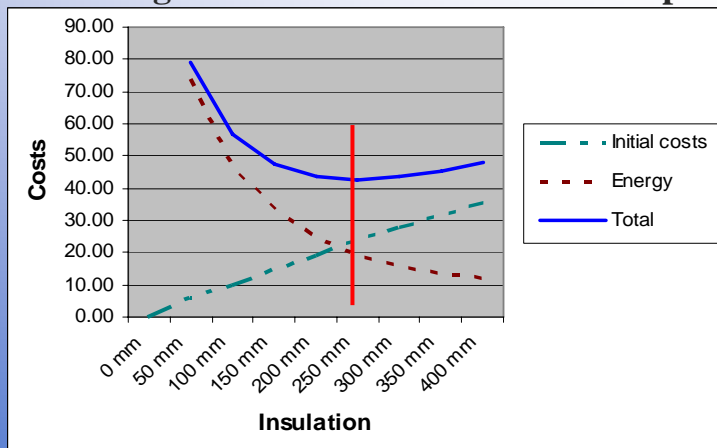
Cold Climate - Scandinavia



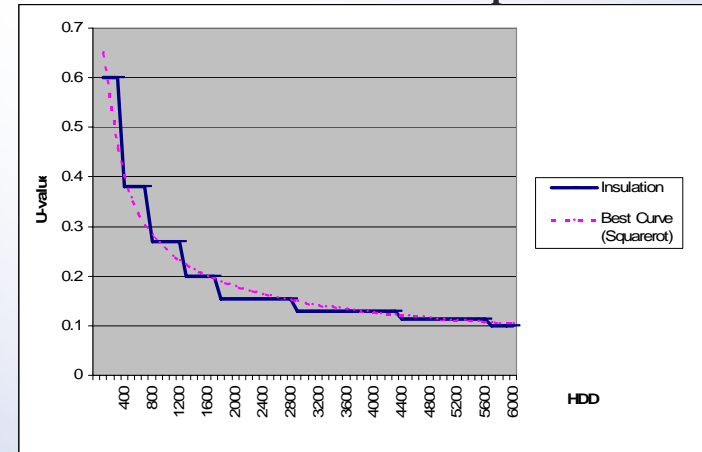
Cooling Based Climates Countries – South Europe



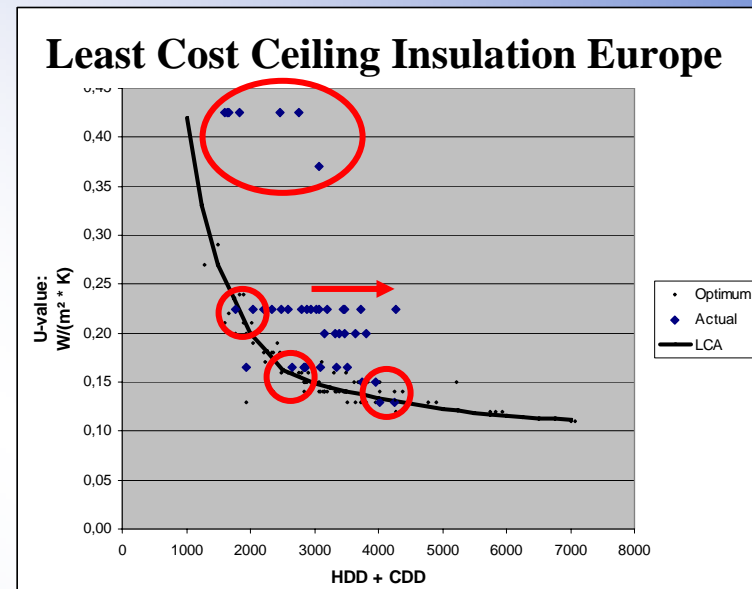
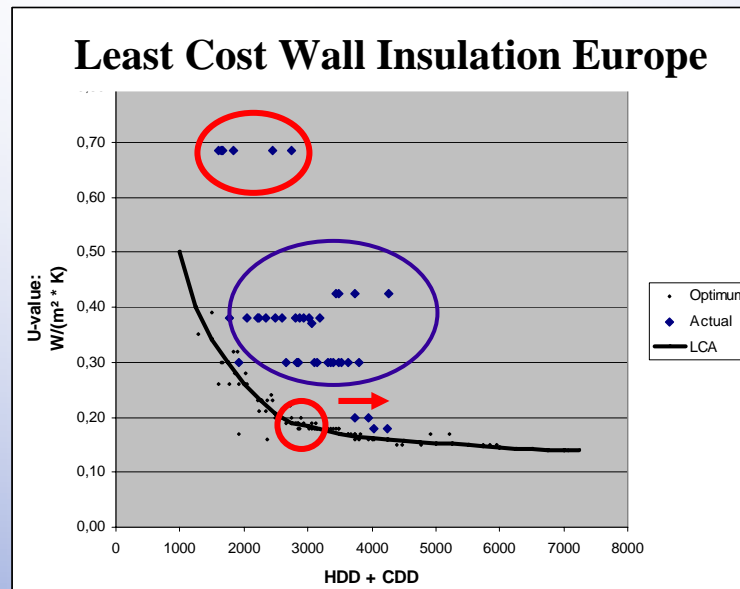
Heating Based Climate – Central Europe



Least Cost Curve Europe



Least Costs over time

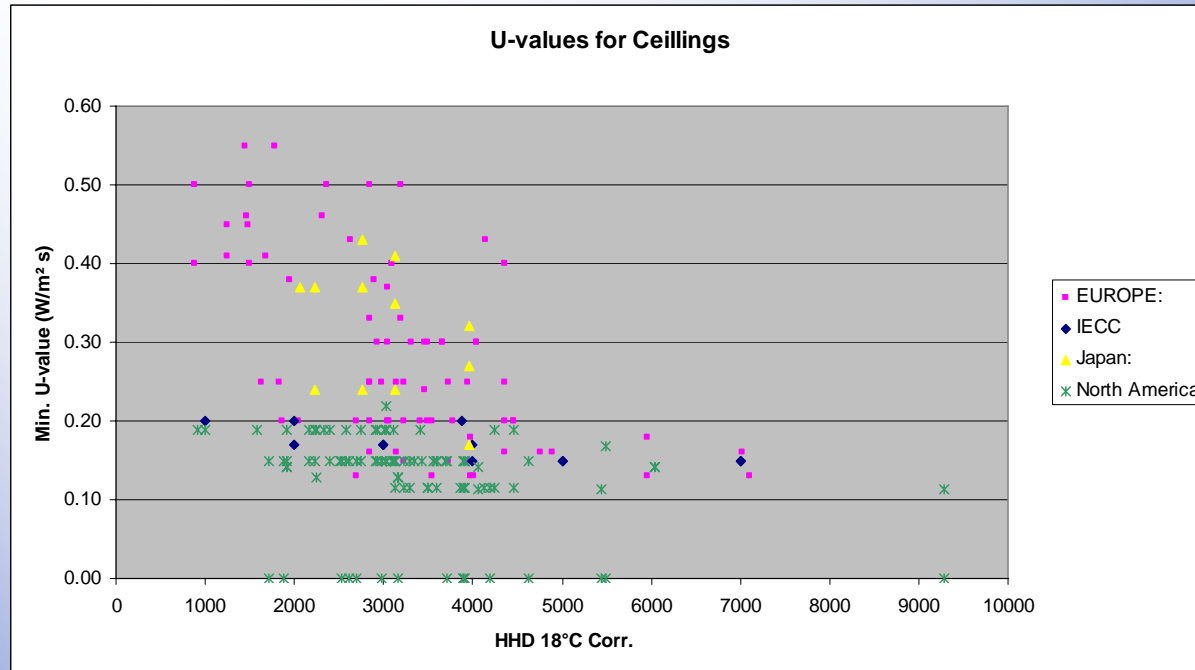


U-values in European Building codes compared to Least Cost over 30 years.

Most building codes are far from the Least Cost over Lifetime values.

In a few countries with a wide climatic variation some values comes close – but there is a need for differentiation in the requirements.

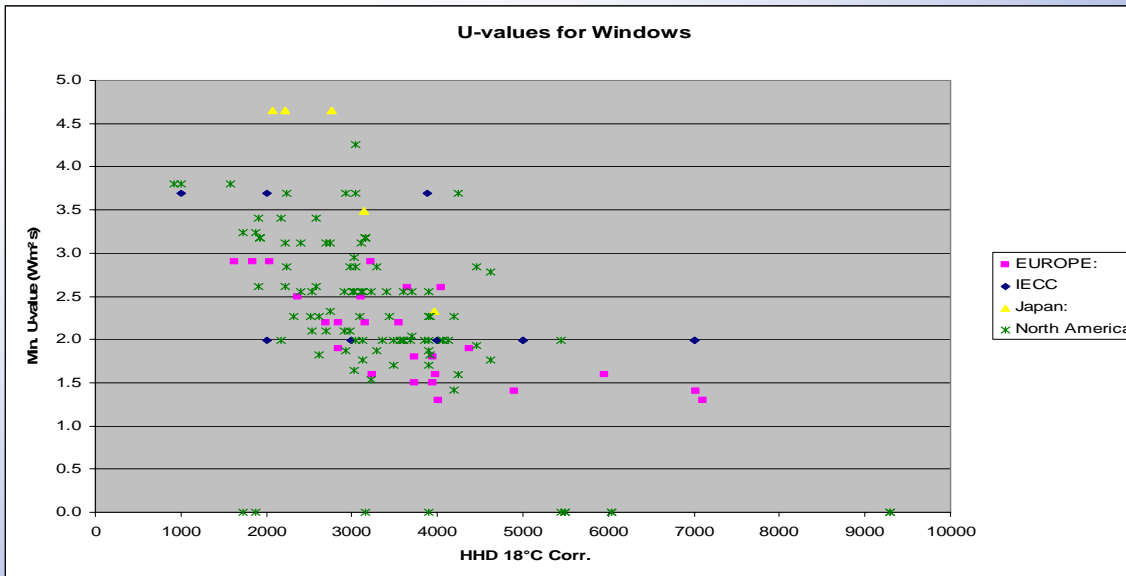
Comparing U-values for Ceilings



Temporary Values !
Will be checked by FEWP

- U-values for North America are relative low and homogenous. This is probably due to the standards IECC and ASHREA.
- Values for South Europe and Japan are diverse and rather high. Large potential for improvements.

Comparing U-values for Windows



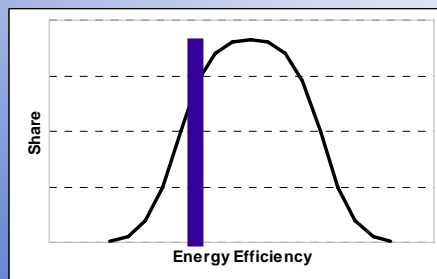
Temporary Values !
Will be checked by EEWTP

- U-values for windows are generally lower in Europe than in North America and Japan. Especially in the Northern Part of Europe.
- In general the values are diverse even for similar regions. This indicates that there are large potentials for improved energy efficiency of windows.

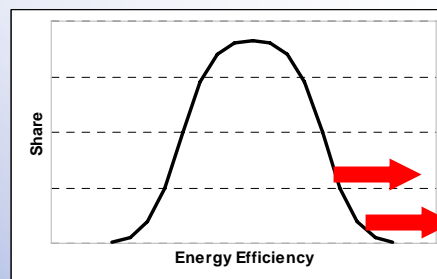
Efficiency in new Buildings

There is a need to increase energy efficiency in new buildings:

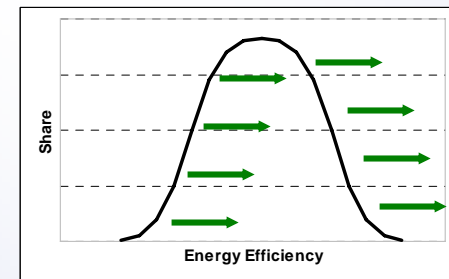
- By increasing the requirements for new buildings regularly in building codes or standards.
- By encouraging buildings and owners to go further than the minimum requirements.



Requirements in Building Codes



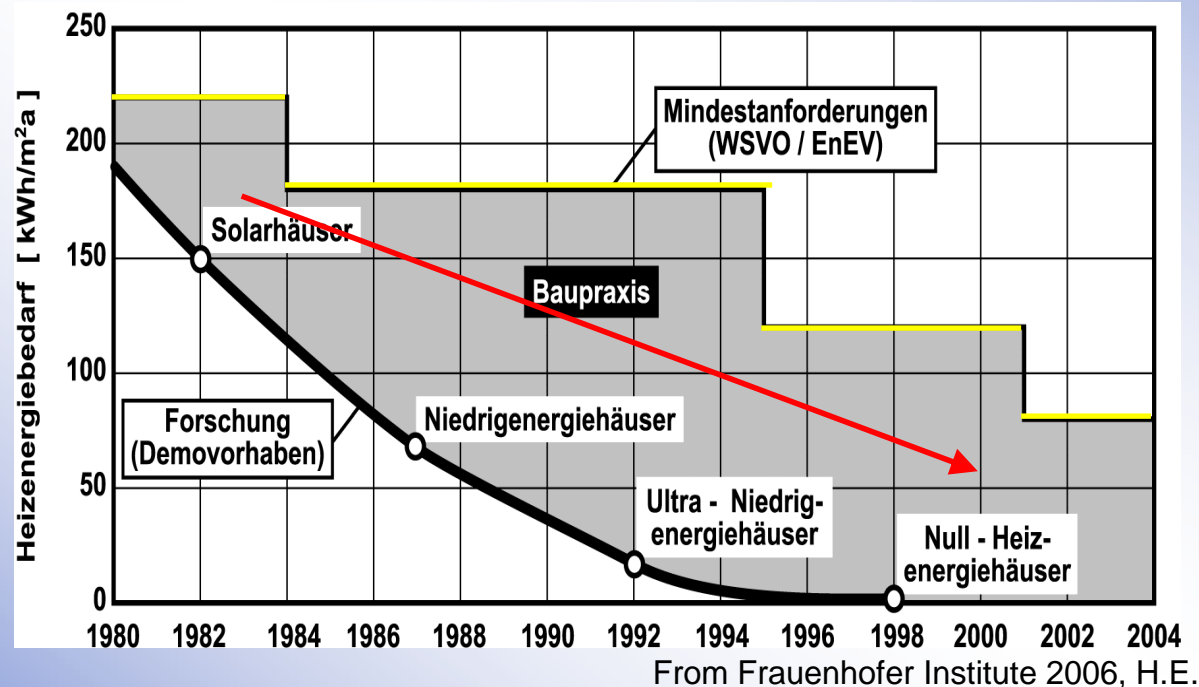
Very Best Practice – PH or ZEB



Result

Synergy

Figure 12. Development of ultra low buildings and building codes in Germany.



- Development brings increase energy efficiency in best practice buildings
- Building regulation is then used to drive increase efficiency in all new buildings.



Existing Buildings

- Largest potential exists in existing buildings.
- Most buildings in developed countries are built before the oil crisis in the early 1970'ies
- Yearly added or renewed buildings in OECD countries only account for less than 1 % of the building stock.
- Will take more than 100 years to replace the building stock.
- Higher energy consumption than in new buildings.
- Construction activity are larger and replacement goes faster in developing countries.
- But there are also large potentials in these countries.
- Energy efficiency is especially feasible and large potentials by refurbishment.
- Many barriers to energy efficiency.

- Every day compelling opportunities are lost !



Policy for Existing Buildings

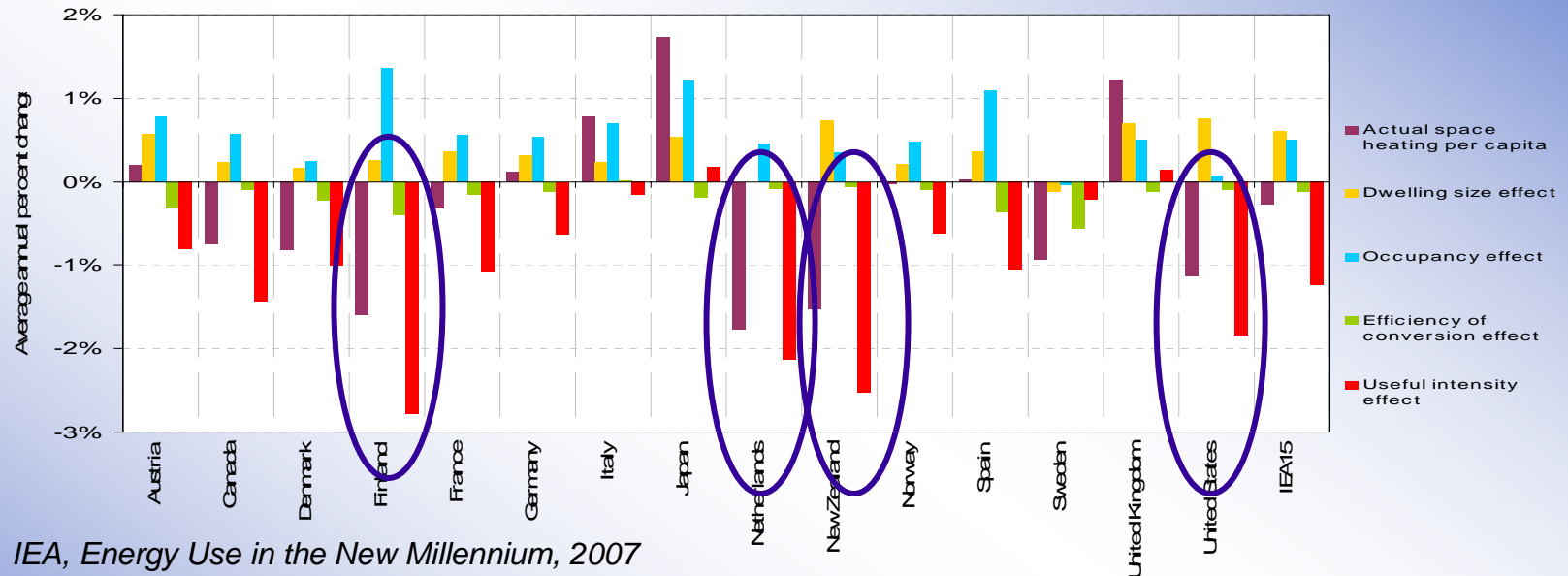
To increase efficiency in existing buildings there is:

- Need for setting demands for buildings by renovation or refurbishment. (*in many countries/states/EPBD-directive*)
- Need for making energy efficiency more visible.
- Need to study the existing building stock better and setup a comprehensive policy for each country.

- Study for existing buildings will go on for at least another year.
- More recommendations for existing buildings will come next year.

Changes in Space Heating

Decomposition of Change of Space Heating Per Capita



IEA, *Energy Use in the New Millennium*, 2007

- There is a large difference between countries
- Some countries have been able to achieve 2-3 percent improved energy efficiency per year
- Strong energy efficiency policies



Conclusion

- There are compelling opportunities for energy savings in buildings, but many barriers hamper energy efficiency.
- There is a need for active policies.
- Recommendations new buildings:
 - ◆ Countries should set, enforce and regularly update energy efficiency requirements for new buildings (in Building Codes) at national or regional level. Existing requirements should be substantial increased.
 - ◆ Energy efficiency standards for new buildings should aim to minimize total costs over a 30-year lifetime.
 - ◆ Countries should support and encourage the construction of buildings with very low (PH) or no net energy consumption (ZEB), ensure that such buildings are commonly available in the market. Countries should set targets for market share.
 - ◆ PH or ZEB should be used as target for future Building Codes.
- On longer term only buildings with very low or no energy consumption are sustainable !



Conclusion (2)

- **Recommendations existing buildings:**
 - ◆ Governments should systematically collect information on energy efficiency in existing buildings and on barriers to EE.
 - ◆ Governments should construct a package of initiatives to address the most important barriers.
 - ◆ This package should include requirements to ensure energy efficiency during the refurbishment of all buildings.
 - ◆ The package should increase awareness of efficiency in the building sector and raise the market profile of a buildings' energy performance.
 - ◆ Standardized indicators should be calculated for energy efficiency in buildings for international comparison, monitoring and selection of best practices.

- **More recommendations will come**



Thank you !

**Read more about the IEA work for G8 on:
<http://www.iea.org/G8/index.htm>**