

Ecofys VII

U-Values for Better Energy Performance of Buildings

Quantifying the potential

I



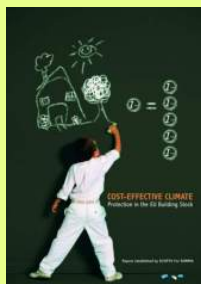
Climate Protection

II



Regulation

III



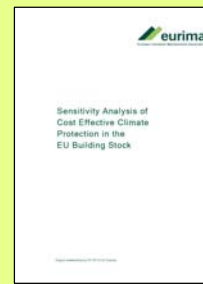
Cost Effectiveness

IV & V



Enlarged EU

VI



Price Scenario

Key figures from Ecofys studies



- 40% Energy
- € 270 billions/y
- 3.3 millions barrels/d
- 460 millions tons CO₂/y
- 530.000 jobs (based on Eurima estimate)

Trias Energetica

"the most sustainable energy is saved energy"

1st: minimise energy loss

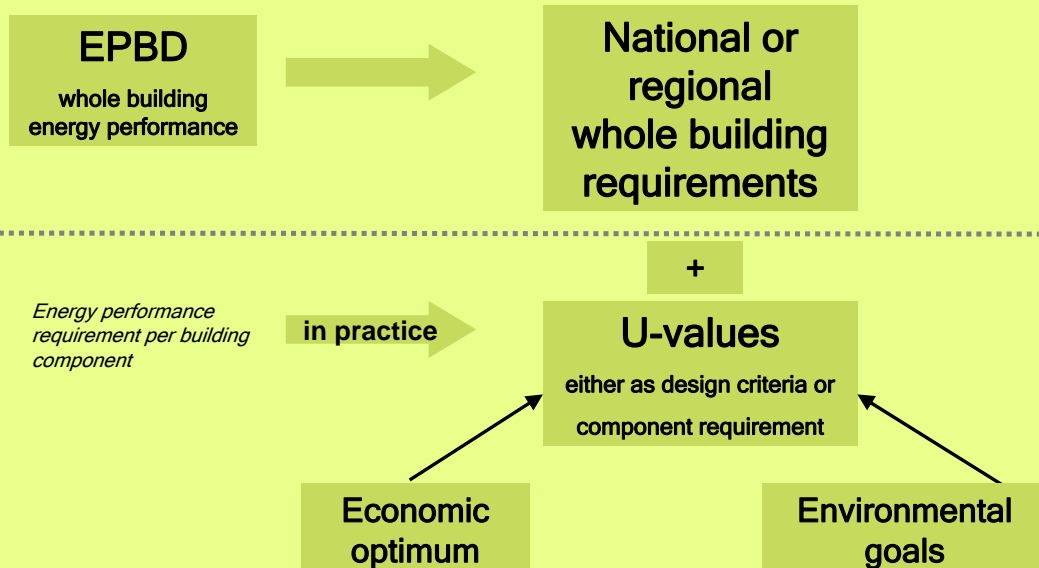
2nd: use renewable energy sources

3rd: efficient use of fossil energy sources

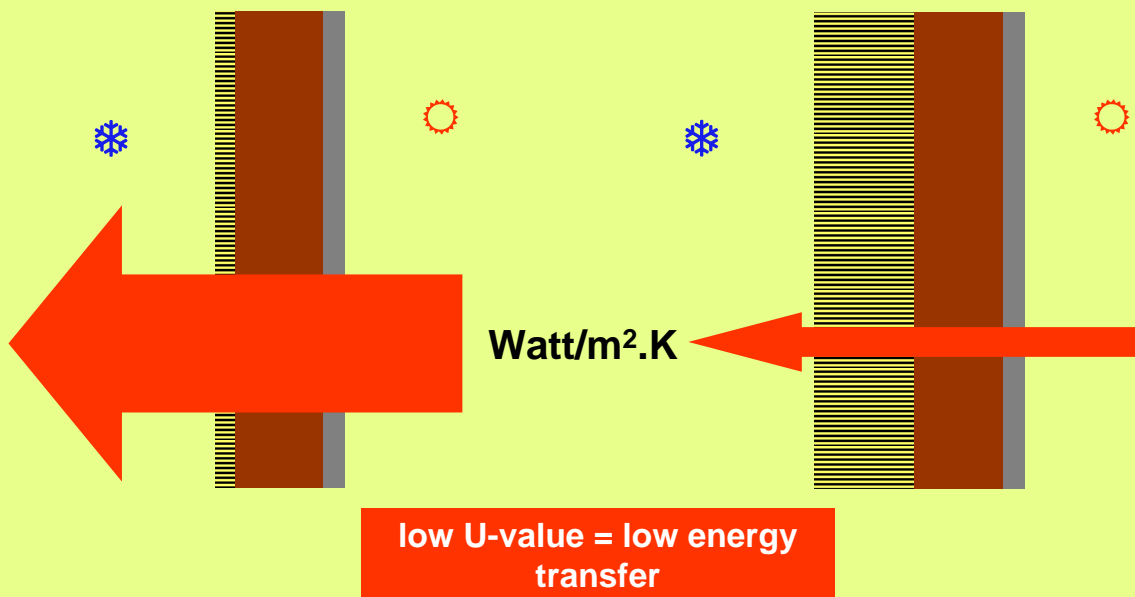
Objectives of the study

- TO DEFINE the “optimum” U-values base on **economic criteria**, and **environmental criteria**, for all countries in Europe.
- TO INVESTIGATE whether there is room for improvement in reconsidering **national requirements (U-values)** for building components.
- TO IDENTIFY the impact of insulation on **cooling energy demand** in hot climate regions.

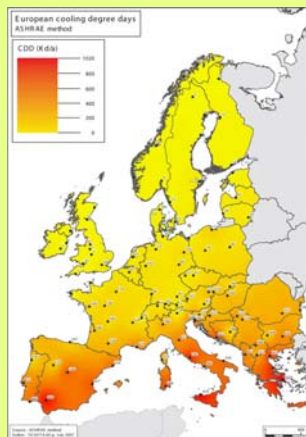
Starting point ... EPBD Energy Performance of Buildings Directive



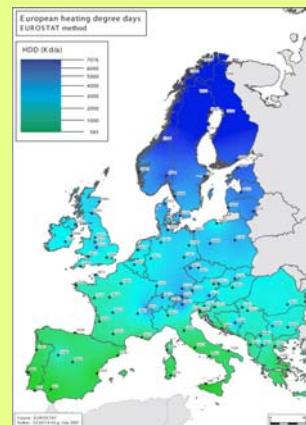
U-value - coefficient of heat transmission



Climate conditions



CDD, or
outdoor $t^{\circ}.D >$
 18.3°C

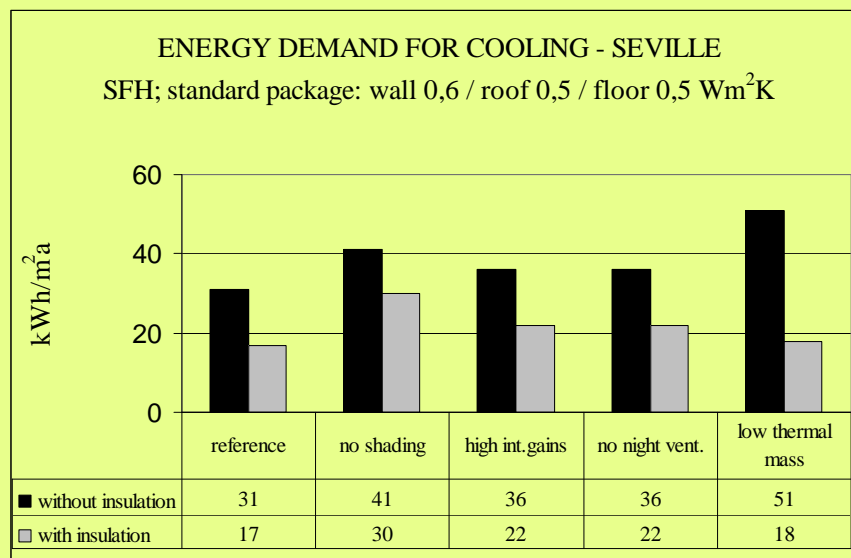


HDD, or
outdoor $t^{\circ}.D <$
 15°C

U-value - coefficient of heat transmission



Insulation & cooling demand in Seville



U-values - economic optimum



- **Economical parameters:**
 - Energy mix
 - Energy price scenario
 - WEO 2006 - Peak Price (oil: \$70 / barrel)
 - Investment costs & Interest rate



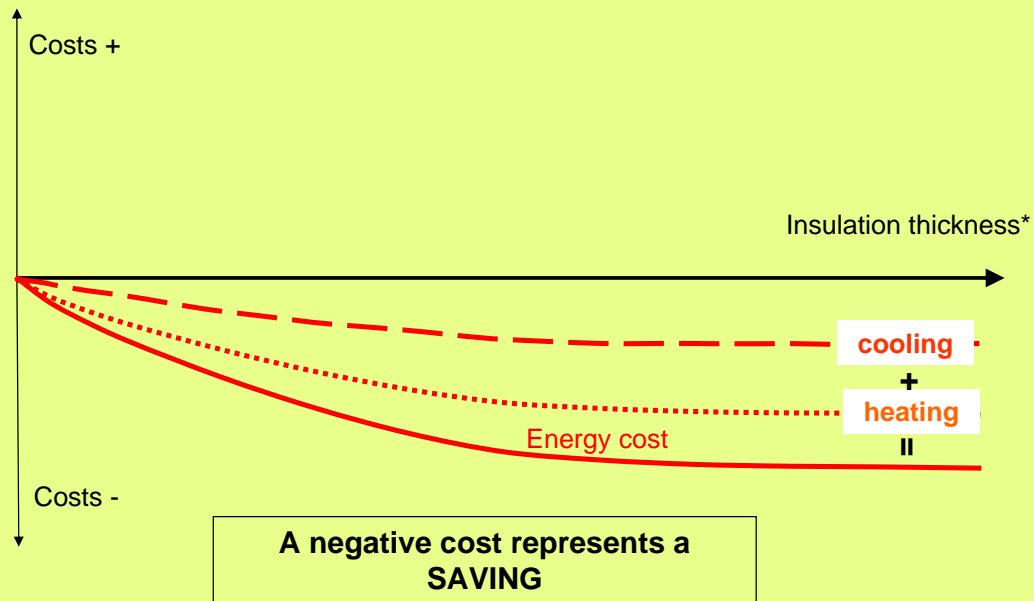
- Energy performance of existing buildings stock
- Residential buildings: Single & Multi Family House
- Climatic conditions for 100 cities characterized by HDD and CDD
- Life cycle costing over a period of 30 years

U-values - climate change



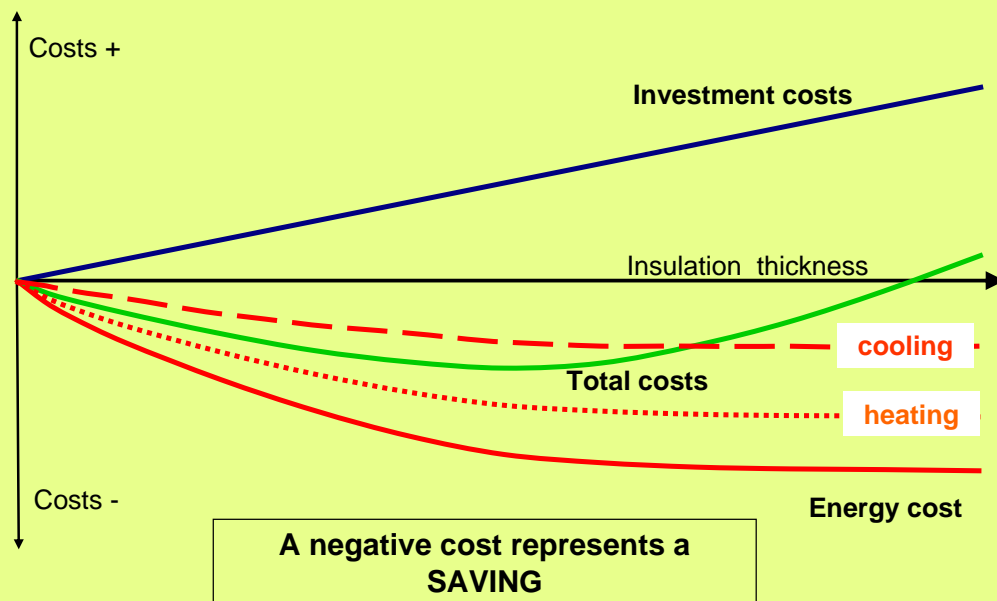
- To limit temperature increase below 2°C vs. pre-industrialized time, the IPCC reports tell us that global GHG emissions should decrease by **50% by 2050**, compared to 1990
- In this perspective, **EU commitment** is to reduce GHG emissions by **60% to 80%** in 2050 compared to 1990
- Buildings, the highest energy consumer the most cost effective CO₂ mitigation measure (Mc Kinsey), with technical solutions available, ... should contribute above average.
- It has been assumed that building contribution should be a reduction of **85% of GHG emissions by 2050** compared to 1990

Savings from heating and cooling for one element of the construction

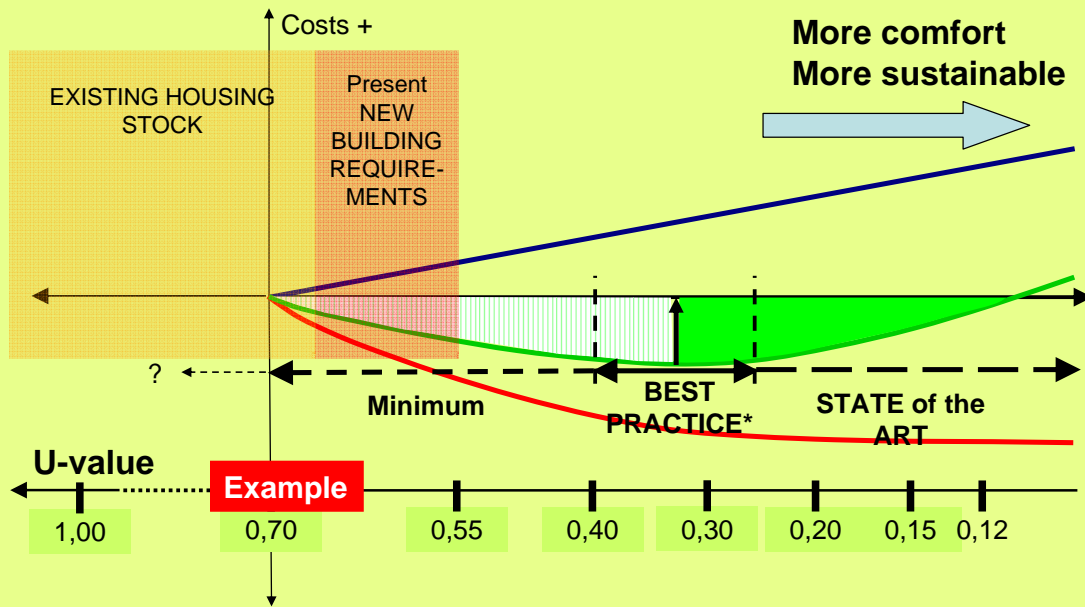


*Indication of the thermal performance of the element.

Linear investment for one element of the construction

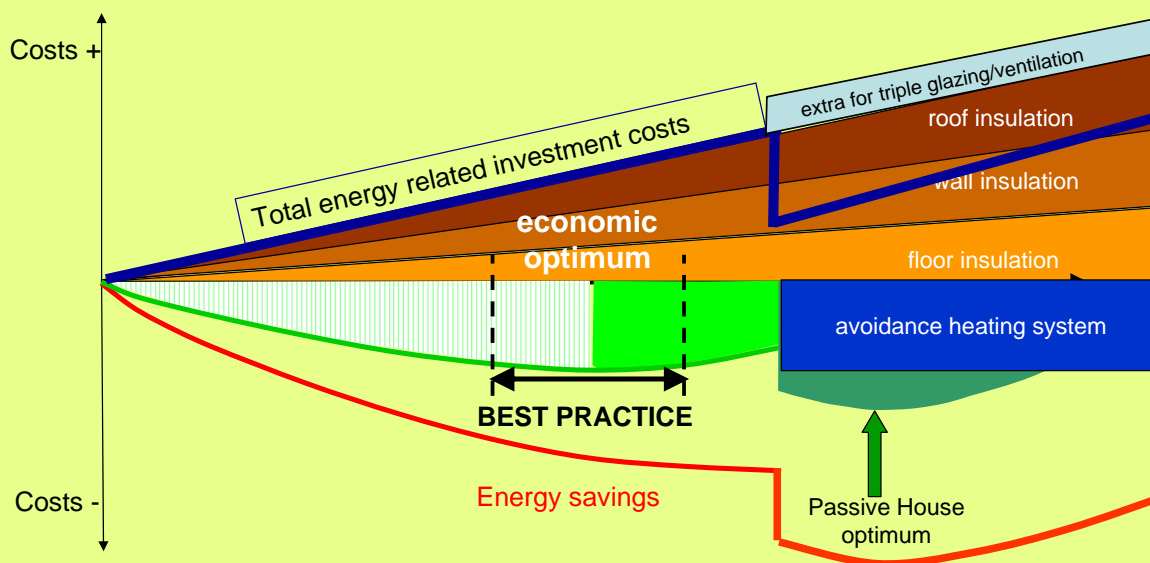


From cost optimum to U-values

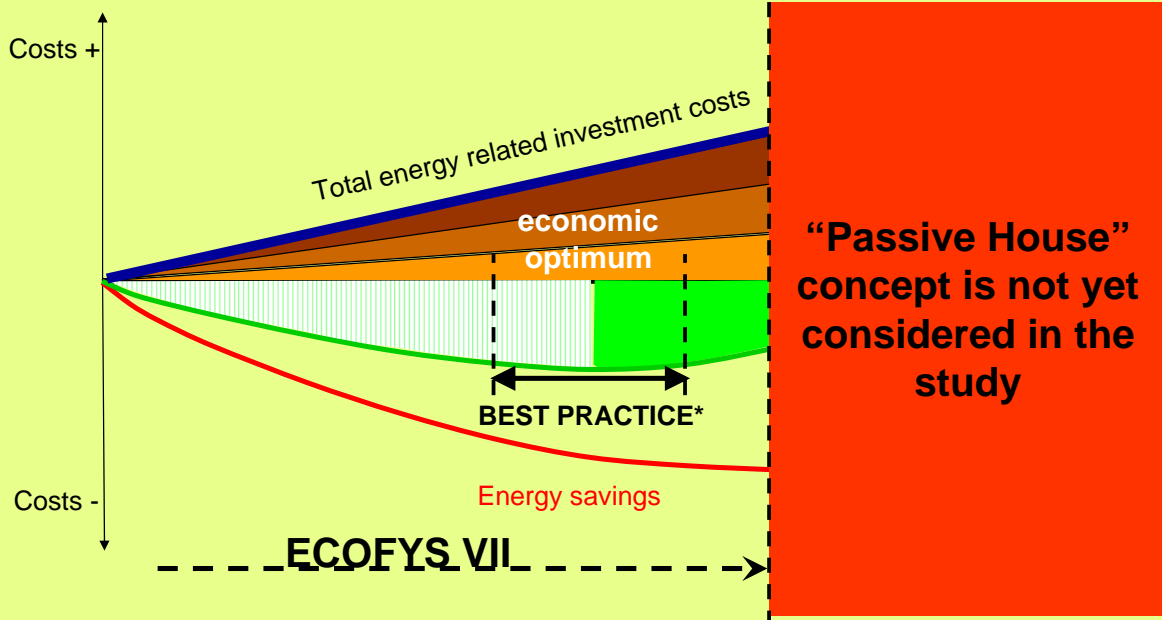


*Based on oil price study hypothesis

Whole building approach & Passive House



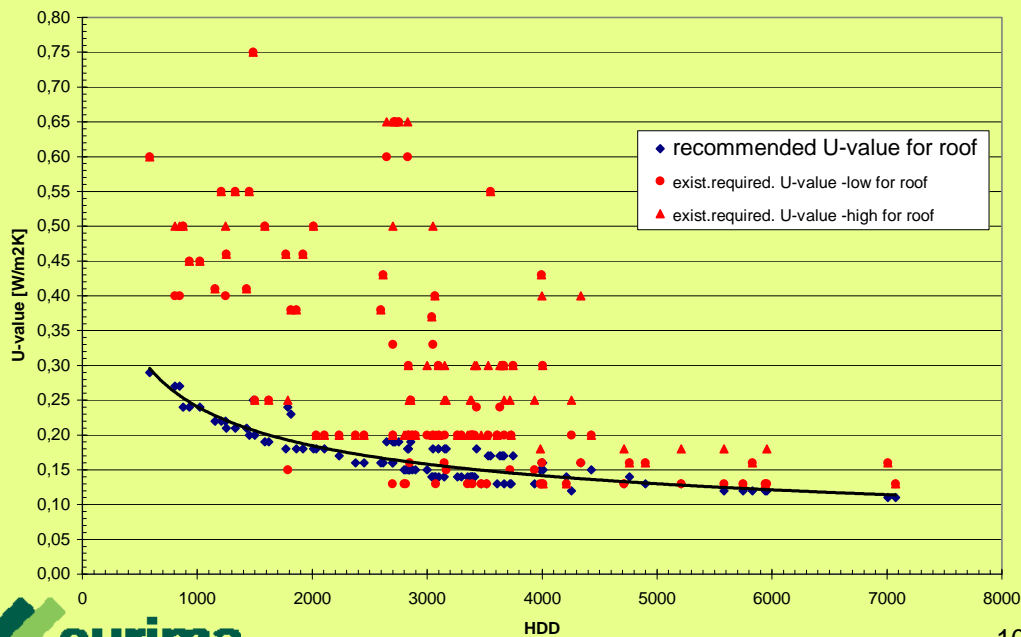
Boundaries of the study



*Based on oil price study hypothesis

Recommended U-values - Roof

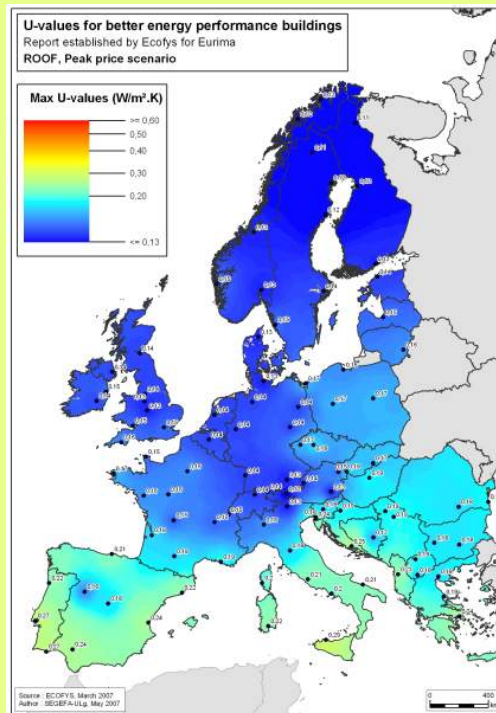
Peak price - roof



How blue are U?

Present U-values

< 0,14 W/m²K



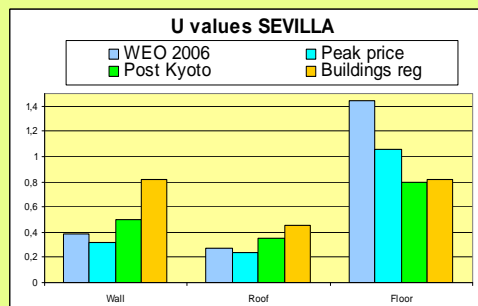
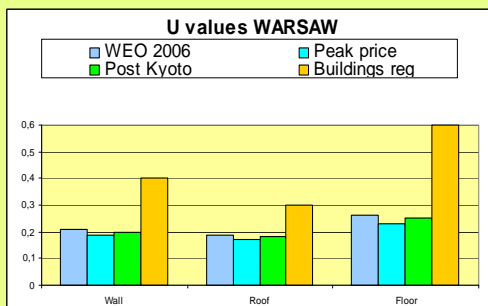
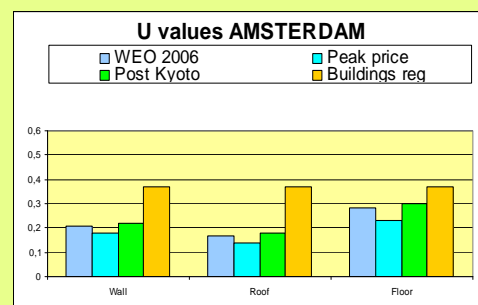
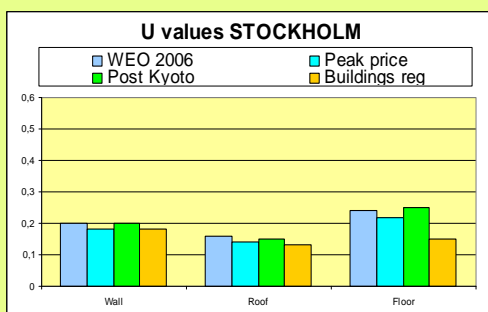
U-values based on WEO2006 price

>0,59 W/m²K

U-values based on peak-price



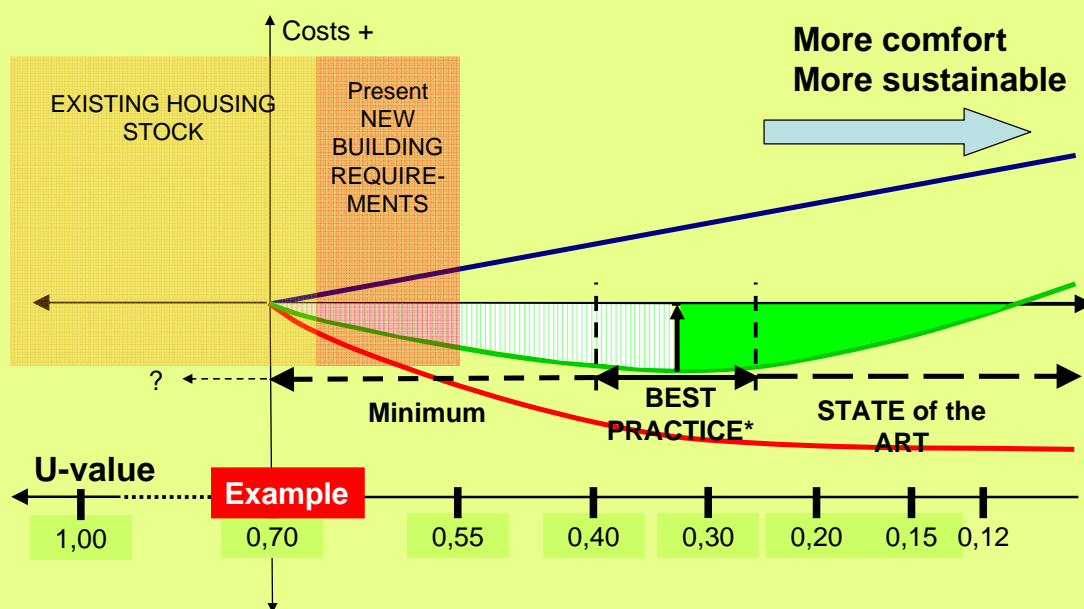
U-values comparison



Conclusions (1/2)

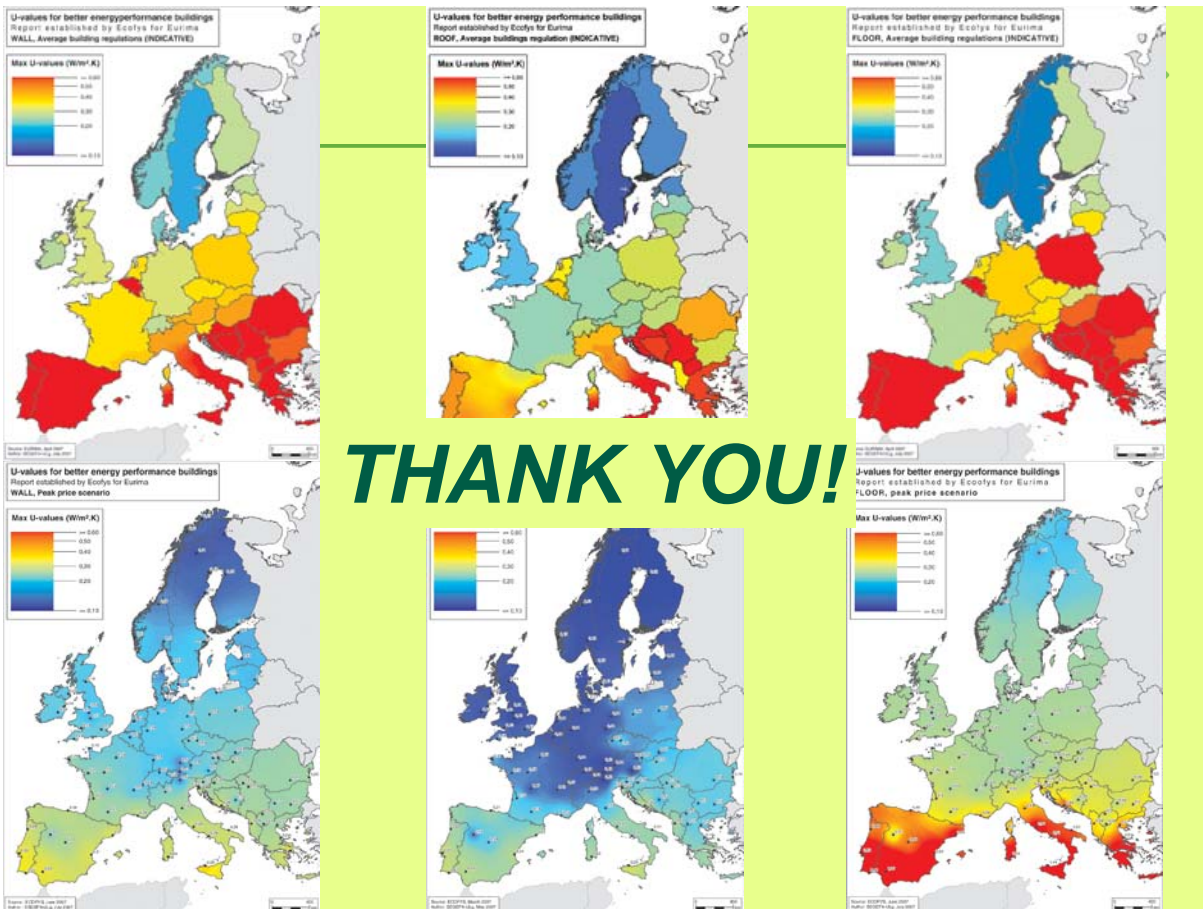
- In 2007, most requirements for U-values for wall, roof and floor in new buildings are far from the economic optimum. **This means that cash is being wasted for households as well as for society**
- U-values recommended in the study are valid for **new as well as for existing buildings**. **While regulations for new buildings are changing, not much is happening yet for existing buildings.**

From cost optimum to U-values



Conclusions (2/2)

- Almost identical recommended U-values, whether calculated base in cost effectiveness or post Kyoto target. **If we want to meet our environmental objectives by 2050, with milestones in 2020, we better start NOW!**
- Insulation (especially roof and wall) **reduces energy demand for cooling of residential buildings, in Southern and Central Europe. Much is to be done in these warm climate regions.**





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