Danish Building Research Institute
Energy and Environment

Energy saving measures in existing buildings in Denmark

EE Measures in the Existing Sector
towards an energy efficient building stock in 2020

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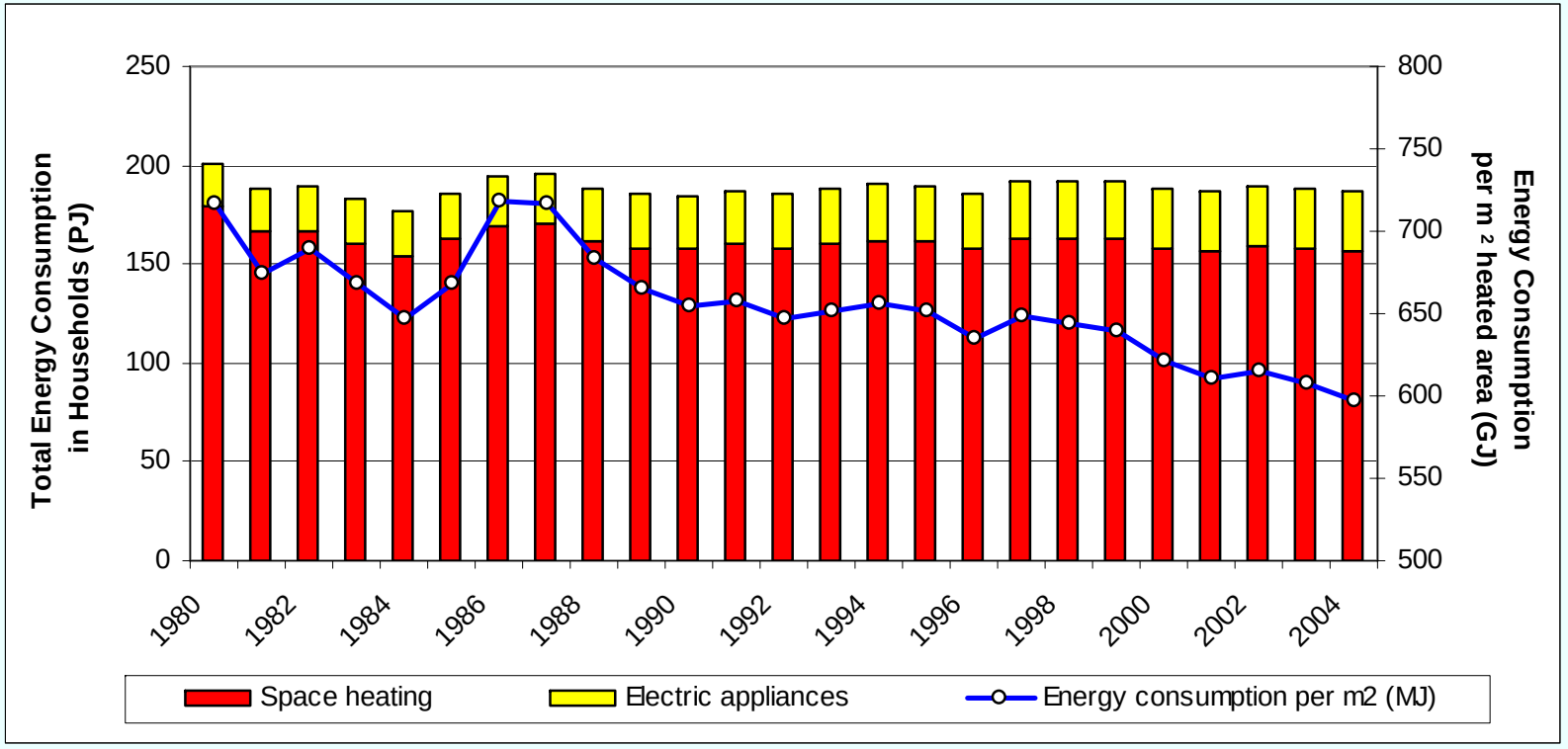
Content of the presentation

- Previous experience with existing buildings
- Implementation of the EPBD with focus on existing buildings
- Future measures regarding existing buildings

Previous experience

Energy Consumption

Total energy consumption in households and consumption per m² heated space in Denmark
Climate adjusted



Based on Energy Statistics 2003 (Danish Energy Authority, 2004

Mandatory Energy Labelling of Small Buildings (old scheme)

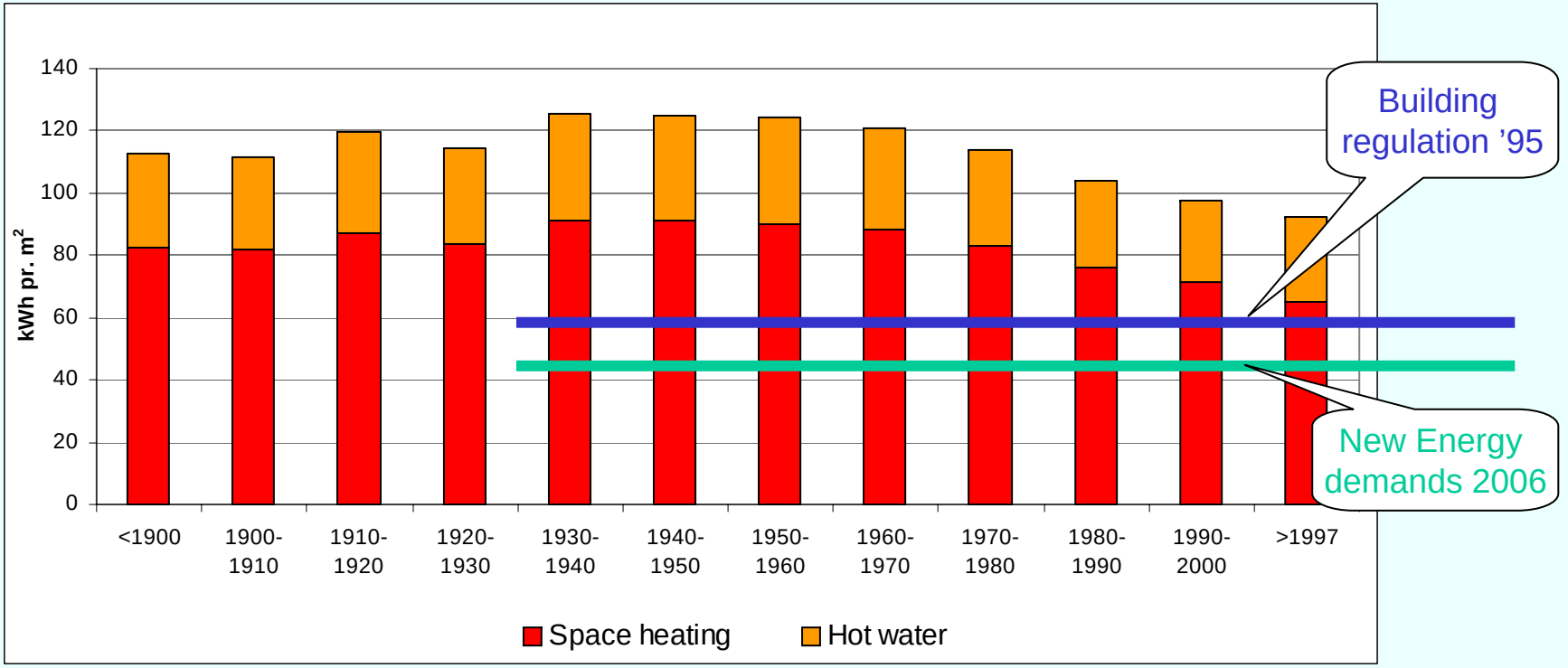
- 40-45.000 houses was labelled every year
- Nearly 400.000 houses labelled (20-25 %)
- Every year new investments for more than 200 million EURO are proposed in the energy plans.
- Possible to reduce energy costs with more than 20 million EURO per year.
- **But difficult to make house owners invest**

Mandatory Energy Labelling of Large Buildings (old scheme)

- The scheme was evaluated 2000 - 2001
- The coverage of the label was 50-60%
- Profitable investments for more than 720 million EURO was identified
- The saving potential was 3.6 PJ/year heating, 170 GWh/year electricity and 5 million m^3 water per year

Heat Consumption

Actual heat consumption in Danish blocks of flats
- distributed over the decades of building



Based on data from the Danish energy labelling scheme

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Implementation of the EPBD

New requirements to existing buildings in the Building regulations

- The requirements to existing buildings in case of renovation (EPBD article 6) is in an addendum to the Building regulations.
- In multi-family houses and non-domestic buildings the 25 % rule (EPBD preamble 13) in the EPBD is implemented to all buildings independent of floor area.
- The requirement is to perform all cost efficient energy saving measures

Rebuilding and other significant changes

- If the rebuilding exceeds 25 pct. of the building value or involves more than 25 pct. of the climate envelope **all** cost-effective energy saving must be performed.

$$\text{Cost-effectiveness} > 1.33 : \frac{\text{Value of annual saving} * \text{Lifetime}}{\text{Investment}}$$

Cost-effective energy measures

- The cost-effectiveness criteria from the energy labelling certificate is used
- This mean that the energy saving measures stated in the energy labelling certificate has to be performed
- If no certificate is available the same cost-effectiveness criteria are used anyhow
- By default the requirements to thermal insulation to the extension to building and to installations has to be fulfilled

Insulation of building components

	U-value W/m² K
External walls	0,20
Partition walls	0,40
Ground slap	0,15
Ground slap with floor heating	0,12
Ceiling and roof constructions	0,15
Windows and external doors	1,50
Roof windows and skylights	1,80

Linear thermal bridges

	W/m K
External wall foundations	0,15
Ext. wall found. if floor heating	0,12
Joint between ext. wall and window	0,03
Joint between roof and window	0,10

Change of windows in a facade

- Special rules for Dannebrog-windows and other windows with small panes
  (U-value < 2,30 W/m²K until end 2007
  U-value < 2,00 W/m²K from 2008)
  [alternative "efficient" U-value, solar corrected]
- Also rules if improvement of existing windows in a facade using secondary frames (U-value < 1,80 W/m²K)
  - The same rule for roof windows and skylights

Boilers

- Oil boilers must have an efficiency of at least 91 pct. by CE-labelling at both part and full load.
- Gas boilers must have an efficiency by CE-labelling of at least 96 pct. at full load and at 104 pct. at 30 pct. part load.
- Boilers for firing bio mass must at least have an efficiency fulfilling boiler class 3 in EN 303-5.

Ventilation systems

Heat recovery: (only if both supply and exhaust)	Min. 65 %
Specific power consumption for fans (total for air stream)	Max. SEL J/m³
Mechanical exhaust	1.000
Mech. vent. in single dwelling	1.200
CAV	2.100
VAV	2.500

Small dwellings and the 25 % rule

- The implementation of the 25 % rule has been the most discussed issue during the implementation of the EPBD in the Danish Building Regulations.
- It was planed also to implement the 25 % rule in the Building Regulations for Small Dwellings. This was dropped in the late phase due to severe problems regarding legal responsibility
  - e. g. if a local carpenter is asked to put a new roof on a single family house

Requirements to components

- To all buildings (also to small dwellings) there is a requirement to perform cost efficient energy saving measures to the specific component in the case of
  - renovation of roof,
  - renovation of climate shield on external walls,
  - renovation or change of windows,
  - installation of a new boiler,
  - change of heat supply.

Requirements to existing building in the Building regulations

- If people can't find out implementing cost-effective energy saving measures by them self, the new energy requirements in the Building regulations will "help" them
- But no "Building permit" needed and no public control

Why do it - if no public control ??

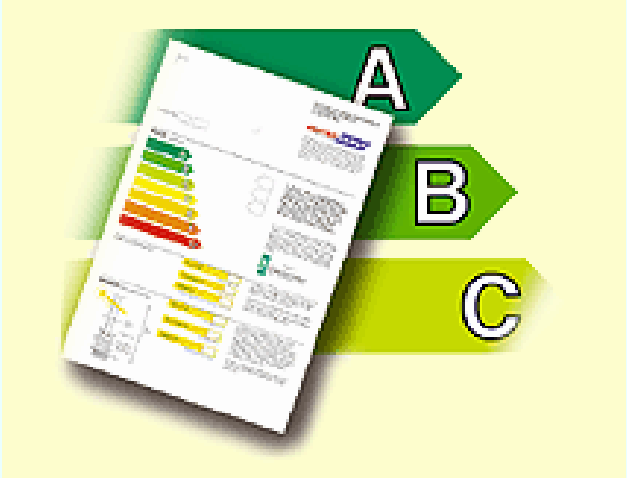
(Beside the sense in doing it)

Typical problem: divided economic: establishing and operation

- In many relation the professional needs to follow the rules to avoid ending up in a situation where they have to pay compensation - if being sued after.
- In the case of rented dwellings the renter will probably keep the owner "on the track" (because they have to pay the energy bill).

New energy labelling scheme in 2006

Based on use of building -not on size of building



- one family houses
  - many each year
  - keep it simple
- buildings with flats
  - whole building incl. typical flats
- public buildings – trade and services
  - different buildings
  - can be very complicated

Energy saving measures

- The energy consultant has to identify two types of energy saving measures:
- Energy saving measure that are immediate feasible
- Energy saving measure that are only feasible if carried out as supplement to a renovation

Improvement of the labelling scheme

- Focus more on the quality and cost-effectiveness of the scheme itself, to make labelling a god offer.
- The real estate agent has to tell the buyer of the house that the energy labelling can be performed on the cost of the seller if not available.
- Facilitate the action of the building branch and the suppliers in relation to the realisation of the energy saving potential.

Future measures

Future energy saving in buildings

- Danish government has for many years had ongoing plans for energy savings.
- According to plans further energy saving must be achieved in new building by 2010 and 2015. The target is additional 25 % and 50 % savings.

- **The aim is also to achieve further savings in existing buildings.**

Agreement between government and energy supply companies

Energy savings 2006 - 2013 under negotiation:

Power suppliers	1.4 PJ/year
Natural gas suppliers	0.5 -
District heating suppliers	0.9 -
Heating oil suppliers	0.2 -
Energy suppliers	3.0 PJ/year
Public initiative	4.5 PJ/year
Total	7.5 PJ/year

Agreement between government and energy supply companies

- The energy savings must be specific and proved.
- All initiatives in relation to the end user are allowed also external to own supply network.
- Everything from information campaigns to technical savings inclusive of savings in the supply network.
- Framework agreement with the building branch on standard package solution.
- The effort should be related to all type of energy consumers.

Thanks you for your attention !

Questions ?