



# **Successful retrofitting with LCC-energy in focus. A primary energy perspective on Nearly Zero energy buildings**

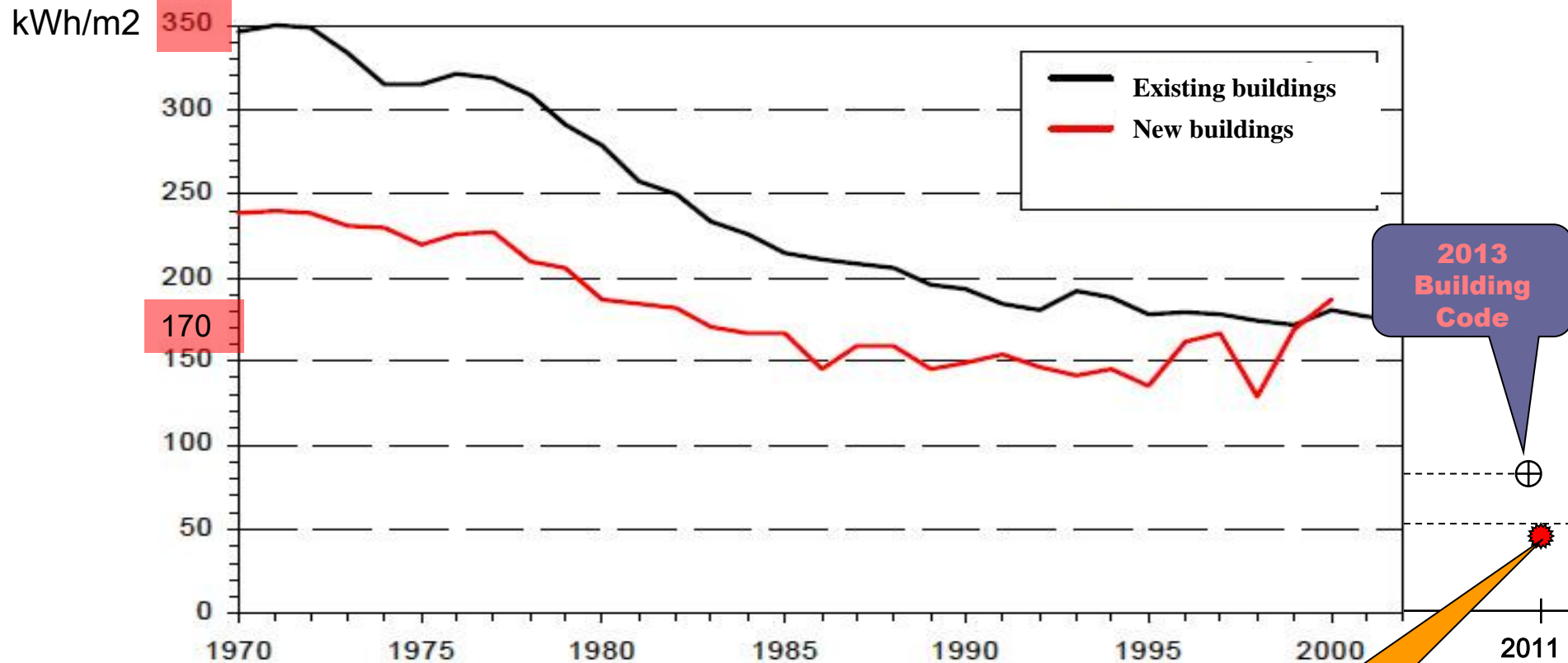
Stefan Olsson

EnercitEE Component Seminar  
23-24 October 2012  
Leipzig, Germany



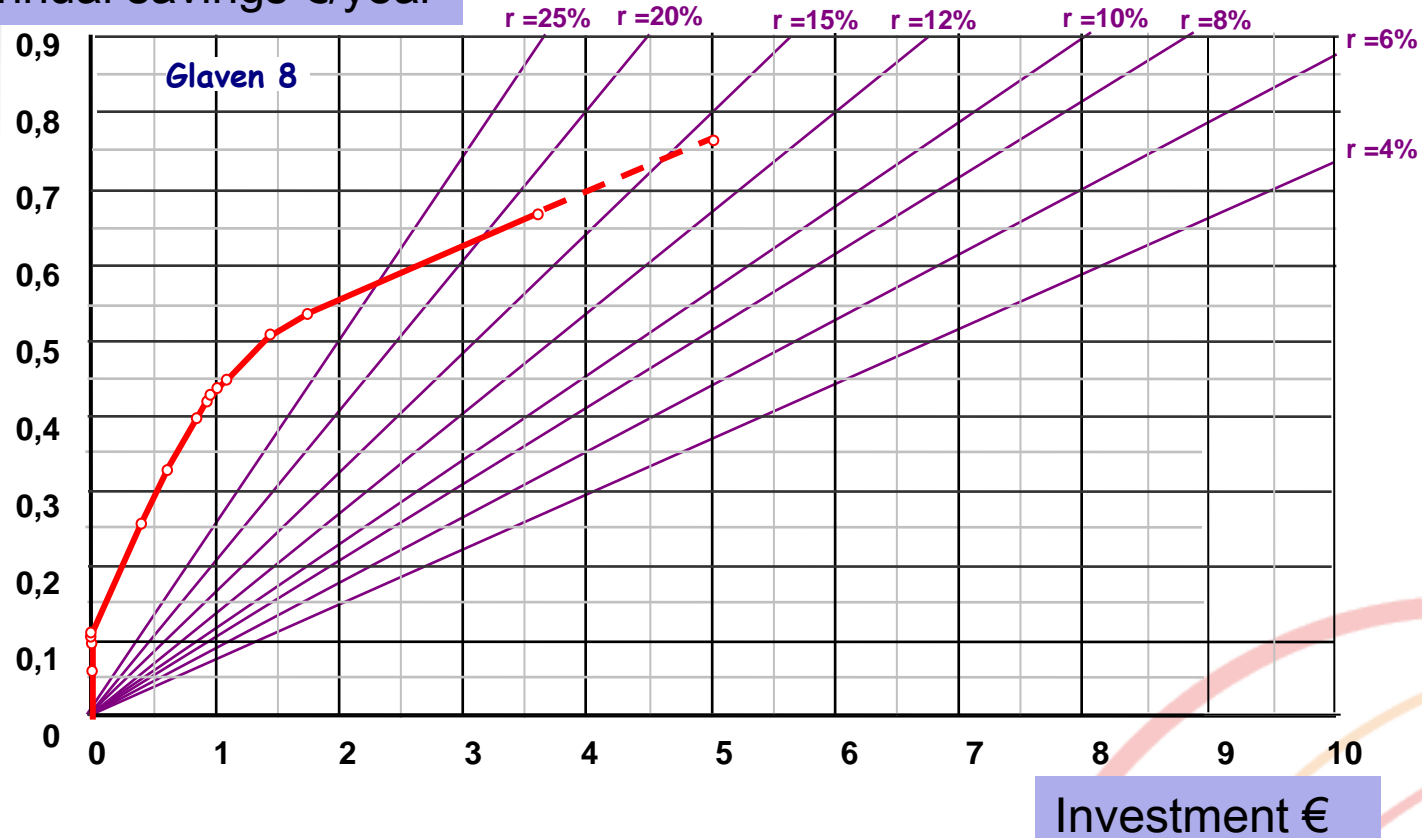
**Energikontor Sydost**  
Energy Agency for Southeast Sweden

# The Swedish development...



Input: internal interest rate; expected increase in energy costs, number of years

Annual savings € / year



# Brogården

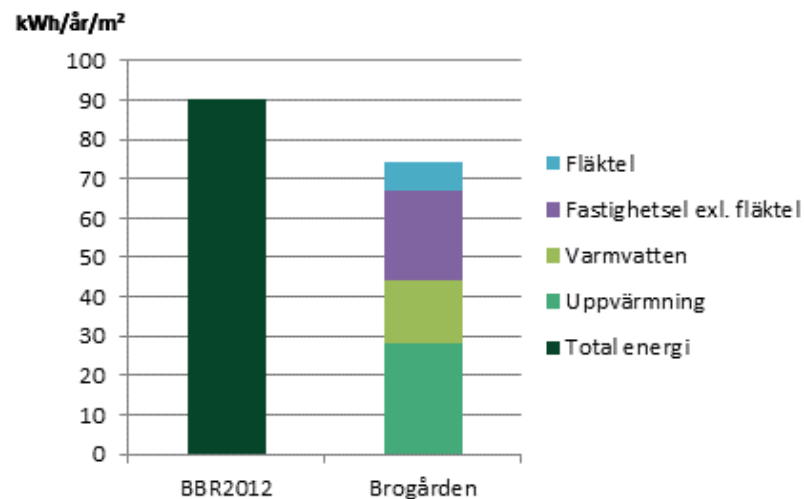
- Extra isolation
- Air tightness 0.2 l/sm<sup>2</sup>
- Windows U=0,85
- Double flux vent- 80 %heat recovery
- Cooling bridges
- District heating
- Individual metering



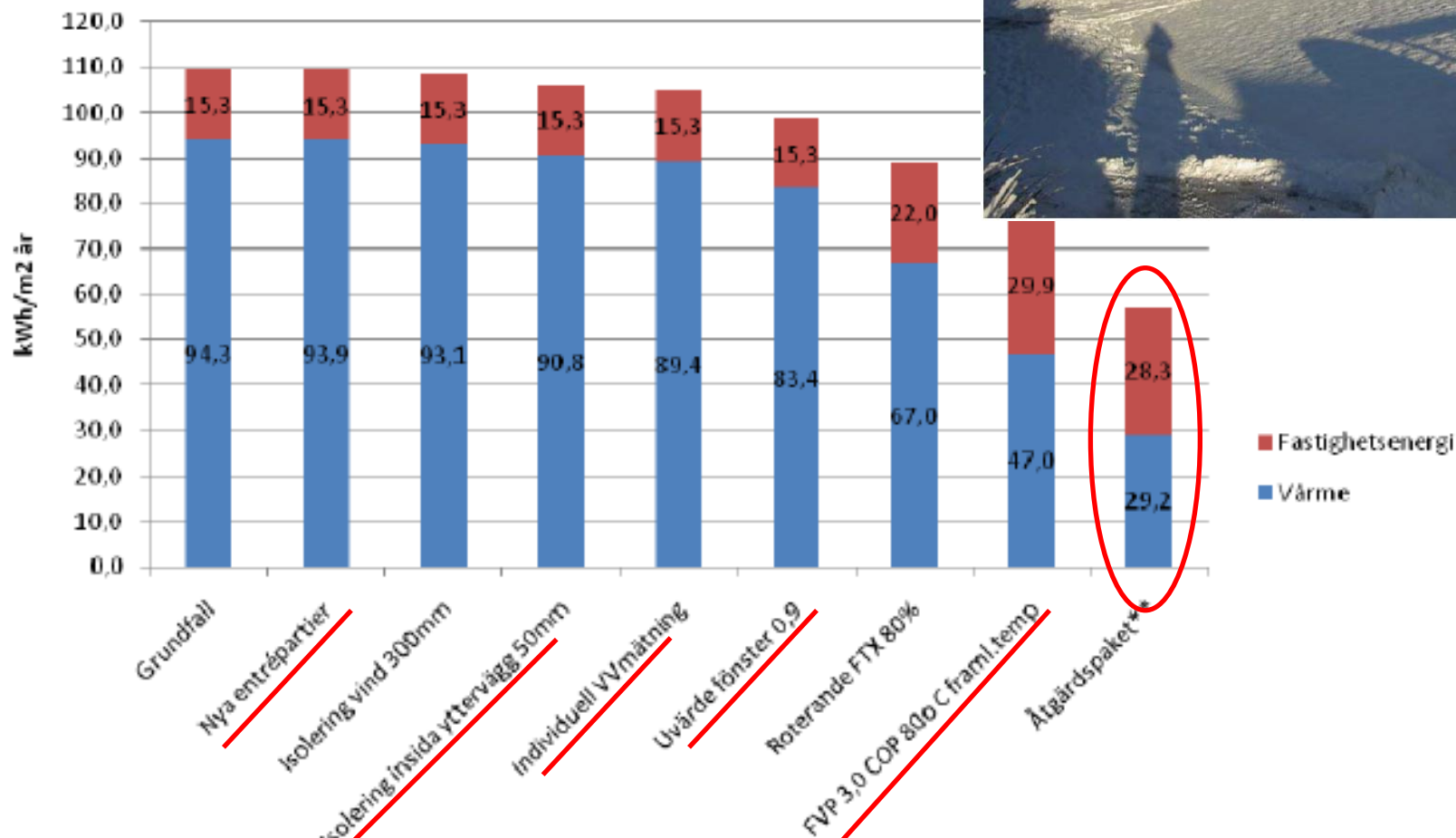
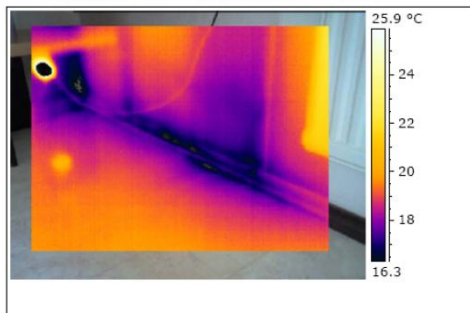
## Results:

Heating: 155 → 29 kWh/m<sup>2</sup>,a  
Dhw: 41 → 16 kWh/m<sup>2</sup>,a  
Appli: 39 → 21 kWh/m<sup>2</sup>,a  
  
Total: 175 → 74 kWh/m<sup>2</sup>,a

Cost for EE-measures: 450 € /m<sup>2</sup>



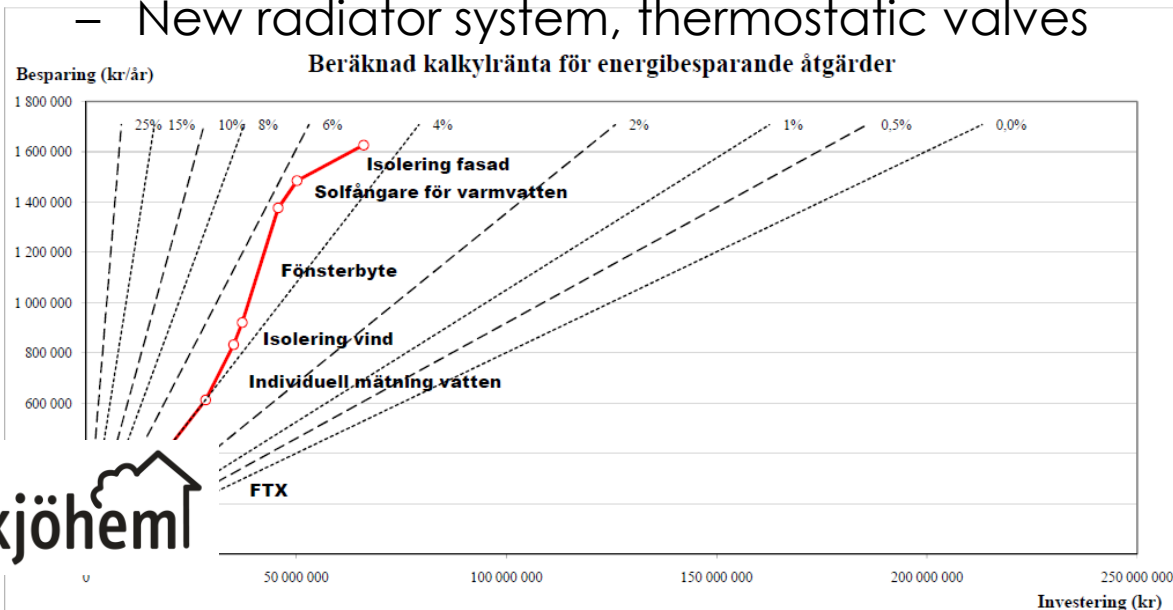
# Apelsinen



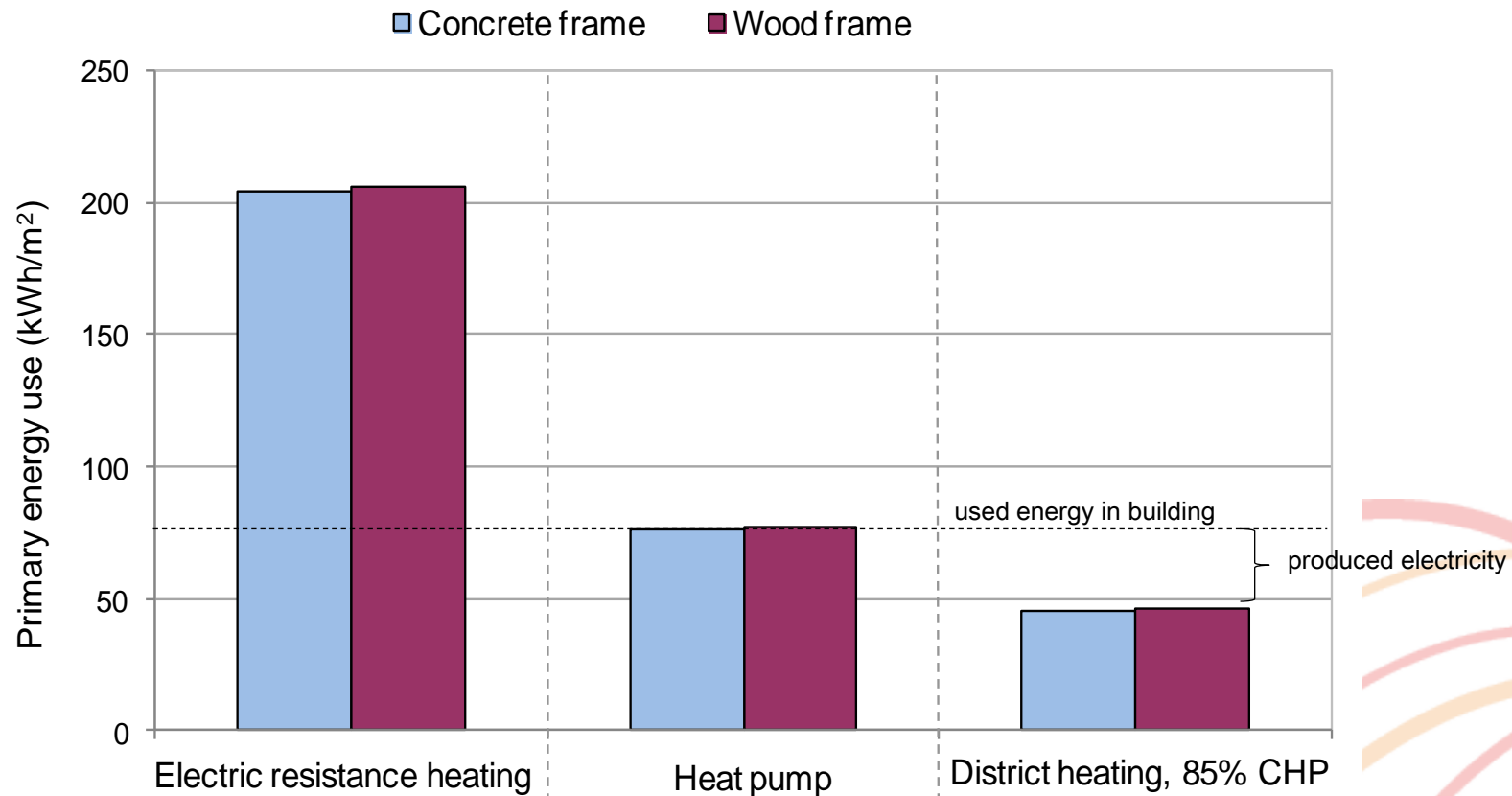


# Alabastern

- 12 apartments in test house, concrete frame
- Apartments: 78-90 m<sup>2</sup>
- Target: 85 kWh/m<sup>2</sup>,a
- Measures:
  - Extra isolation attic joists + under windows
  - New windows, U=0,9
  - New entredoor and doors to appartments
  - New double flux vent( 80%)
  - New radiator system, thermostatic valves



# Annual primary energy use for space heating of buildings with different heating systems in Växjö



Supply system: Biomass-based steam turbine

# How to achieve climate smart buildings?

1. Much isolation
2. Air tight
3. Energyefficient dhw-technology
4. Energyefficient appliances
5. Engaged tenants
6. Energyefficient supply of RES
7. Energy- and climate smart production&demolition



PORTVAKTEN  
Massive wood frame house in 8 stories with passive house technology

A wood-frame passive-house supplied with district heating and electricity from biobased CHP will give low use of primary energy and low netto mitigation of GHG.





**Thankyou for your attention**



**Stefan Olsson**

[www.energikontorsydost.se](http://www.energikontorsydost.se)

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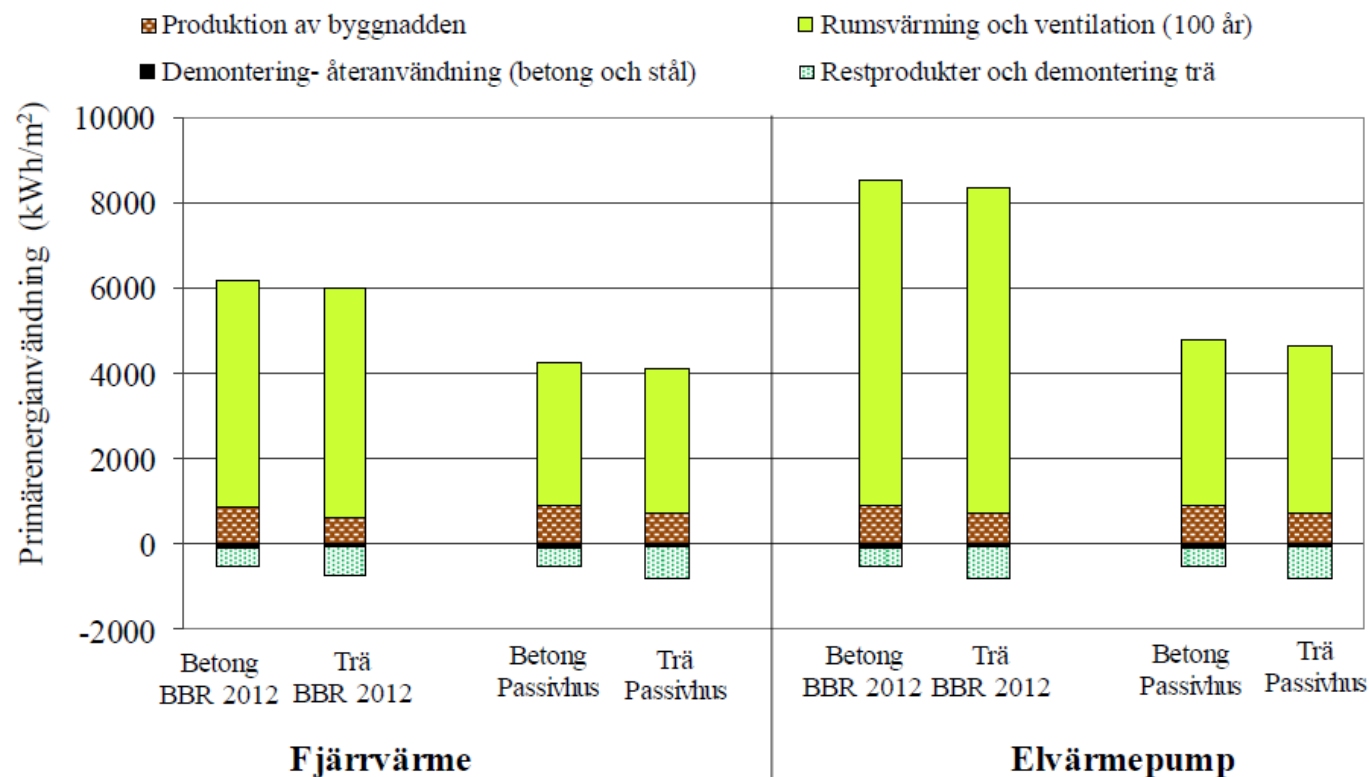
## Primary energy use over the whole life-cycle --- an example

- Located in Växjö, Sweden
- Constructed in the mid 1990s
- Climate zone III / South
- 4 stories
- 16 apartments
- 1190 m<sup>2</sup> usable floor area
- Wood framed
- **Reference**



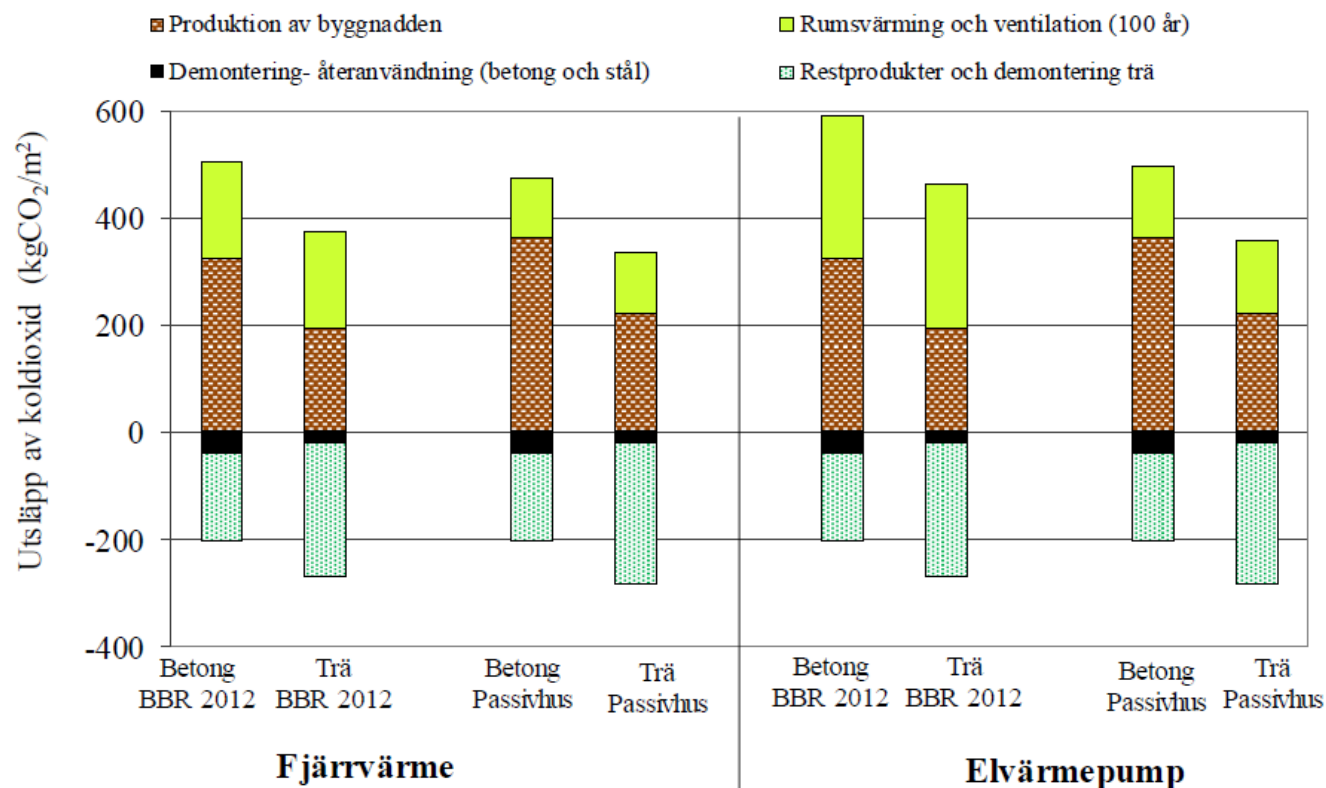
We compared versions of this building designed to the **Swedish building code (BBR 2012)** and to the **Swedish Passive house standard**

# Primärenergibalans för produktion, byggnadsuppvärmning med fjärrvärme eller värmepump och demontering av byggnaden





# Koldioxidbalans för produktion, byggnadsuppvärmning med fjärrvärme eller värmepump och demontering av byggnaden



# Klimatsmarta hus – hur bygger vi dem?

1. Mycket välisolerade
2. Lufttäta
3. Energisnål varmvattenarmatur
4. Energisnåla apparater och vitvaror
5. Energieffektiv tillförsel av förnybar energi
6. Energi- och klimatsmart produktion av hus

**Ett passivhus med trästomme försörjt med kraftvärmebaserad biofjärrvärme (värmepumpsteknik och solenergi) ger låg primärenergianvändning och låga nettoutsläpp av växthusgaser**