ANALYZING THE IMPACT OF ECO-DESIGN REQUIREMENTS ON HEATING SYSTEM

- A EUROPEAN CASE STUDY -

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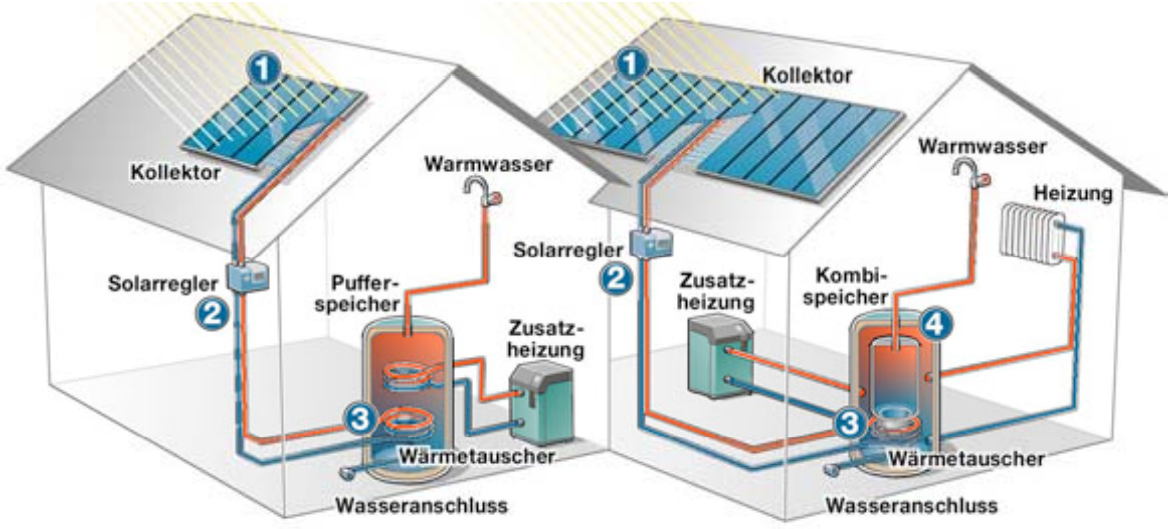

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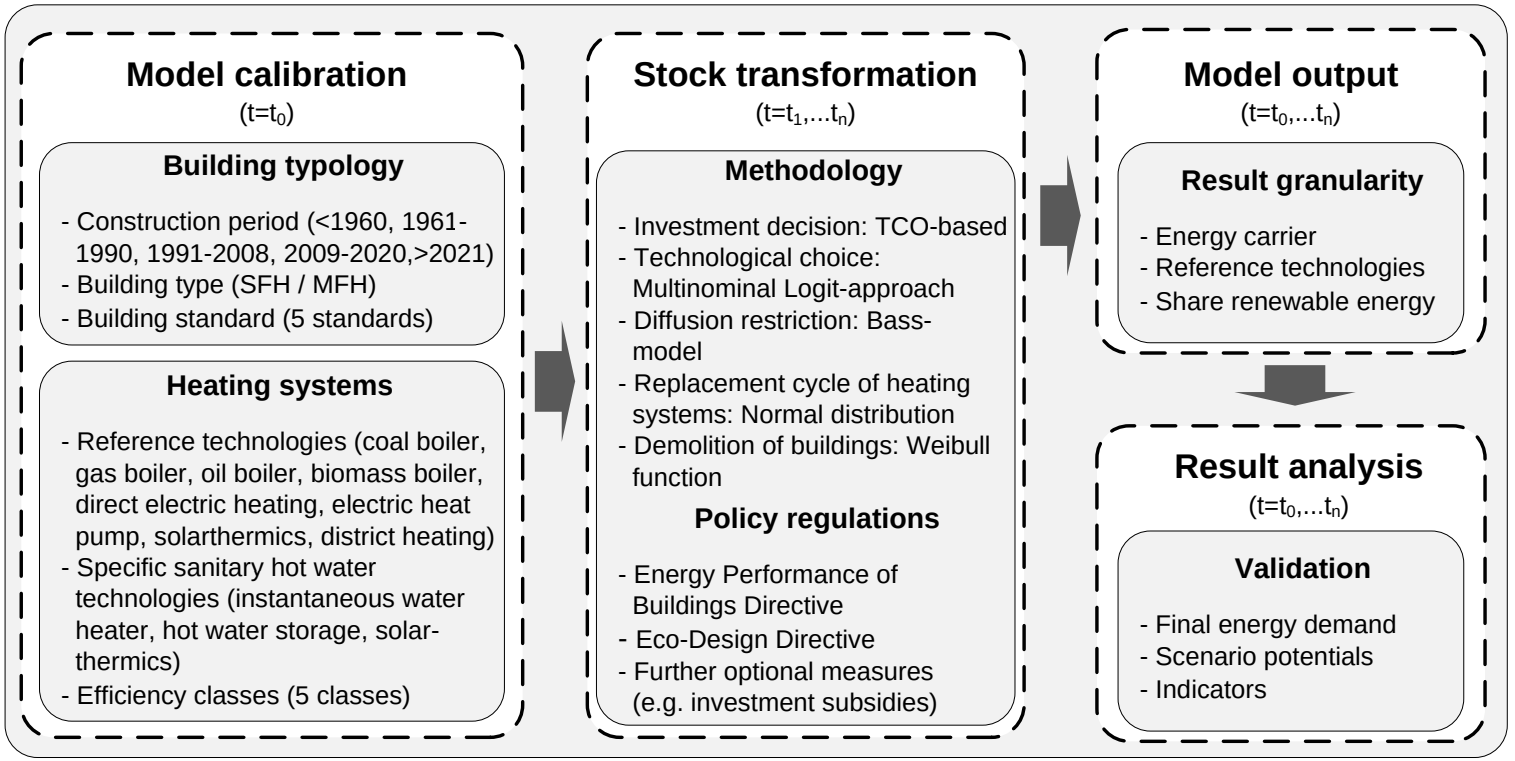
Introduction

- **Improving energy efficiency**
  - Key pillar in transforming the energy system
- **Residential heating systems**
  - High efficiency potential (21.5% of overall European energy demand)
- **EU implemented the Eco-Design Directive**
  - Lot 1: Space heaters and combination heaters (Sep. 2013)
  - Lot 2: Water heaters and hot water storage tanks (Sep. 2013)
  - Lot 15: Solid fuel boilers (still in process)
  - Lot 20: Local space heaters (still in process)
- **Shortage of impact assessment in preparatory studies**
  - Period of analysis rather short (partially less then lifetime of heating systems)
  - Interdependencies of heating systems are considered to a limited extend
- **Aim of this study**
  - Technology-based impact assessment of all four Lots addressing heating systems in combination with a detailed modelling of the building stock of EU27 up to 2050.

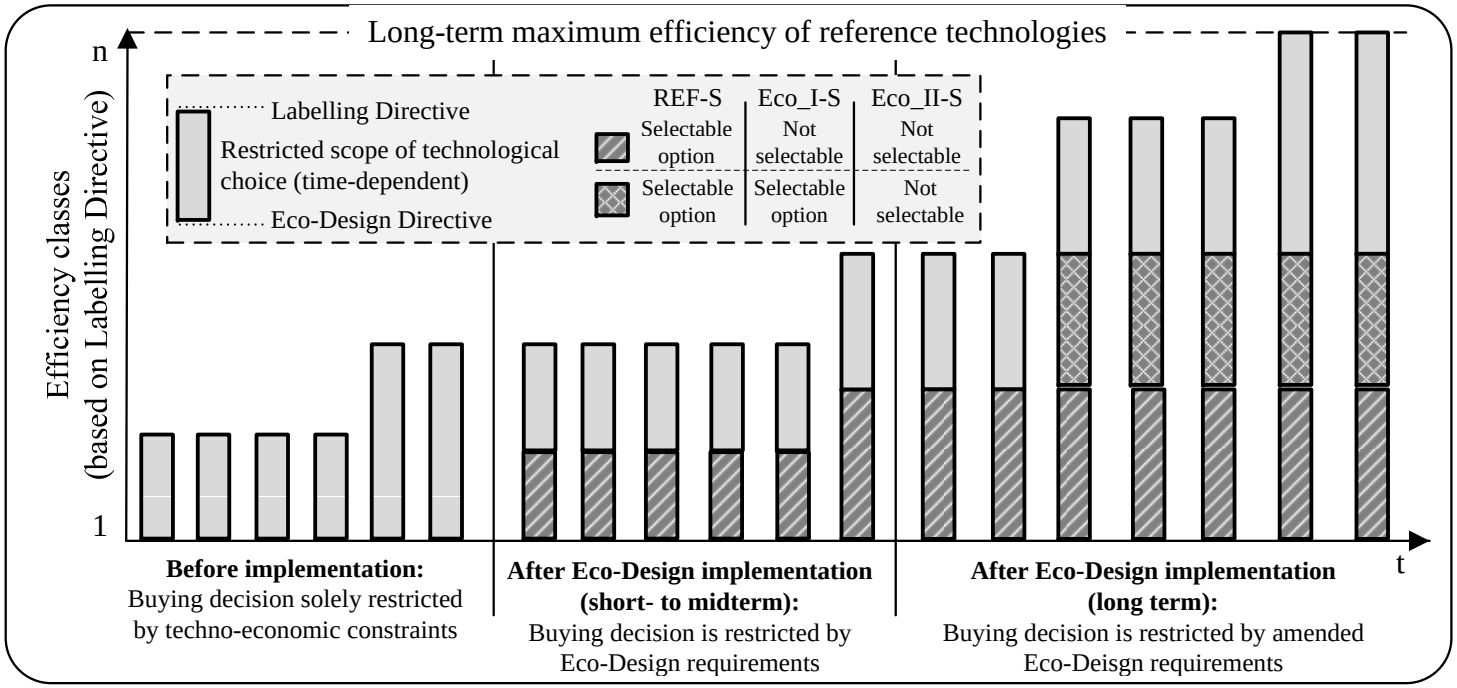
Methodological approach
- Characteristics, structural model framework and drivers

- Characteristics of FORECAST-Residential:
  - Bottom-up-model / Vintage stock design
  - Simulation / Investment decision based on a myopic approach



Case study
- Scenario definition and Eco-Design modelling

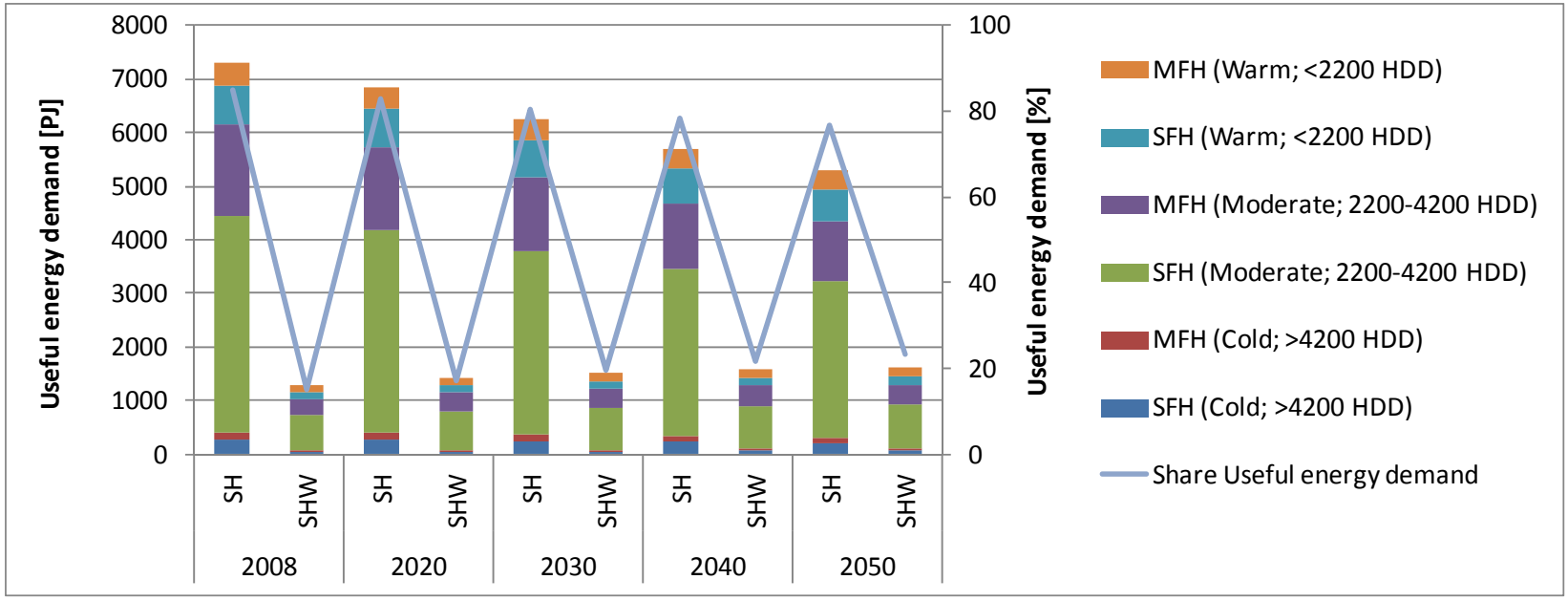
- **Explorative scenario set**:
  - Reference scenario (REF-S): Eco-Design requirements are not considered
  - Eco-Design scenario I (ECO_I-S): Implementation of Lot 1,2,15,20 without amendment
  - Eco-Design scenario II (ECO_II-S): build upon ECO_I-S with amendment
- **Coverage**: EU 27 for the time horizon 2008-2050



Case study
- Useful energy demand for heating purposes

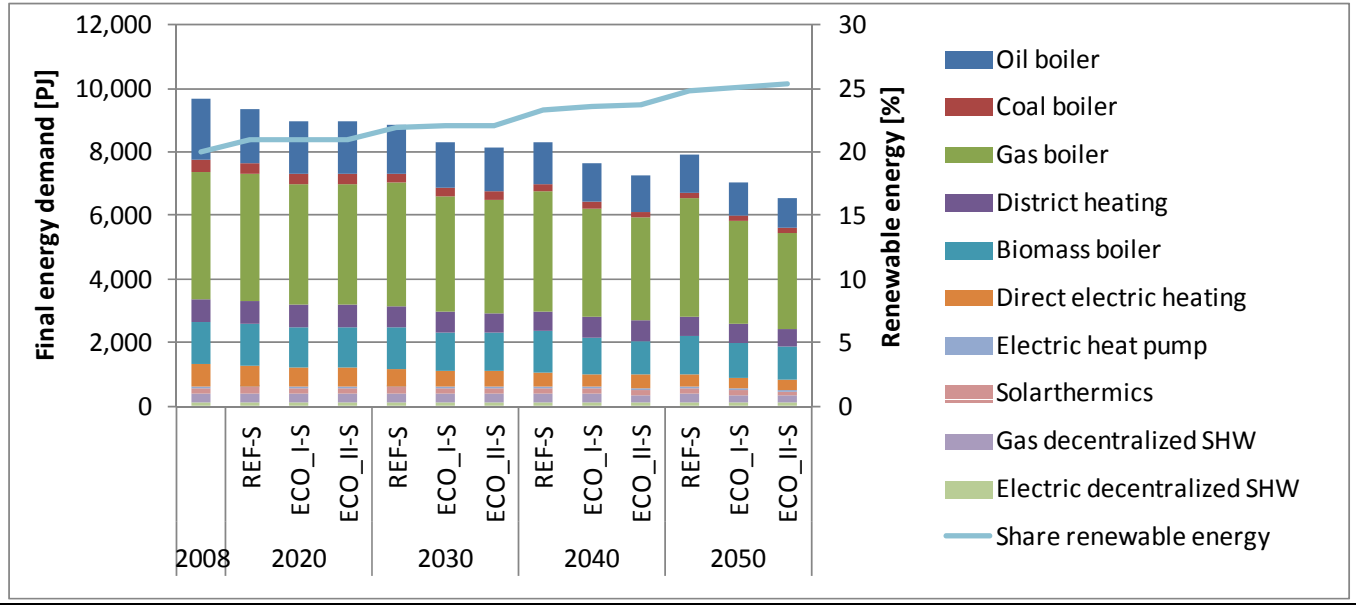
- Space heating (SH) decreases by 1,985 PJ (-27.2%) by 2050 due to
  - demolition of old buildings with low thermal efficiency and
  - refurbishment of existing buildings.
- Sanitary hot water (SHW) increases by 322 PJ (+25.1%) by 2050 due to
  - changes in the building stock

➢ Relative share of SHW increases: from 15.0% (1,284 PJ) to 23.3% (1,607 PJ).



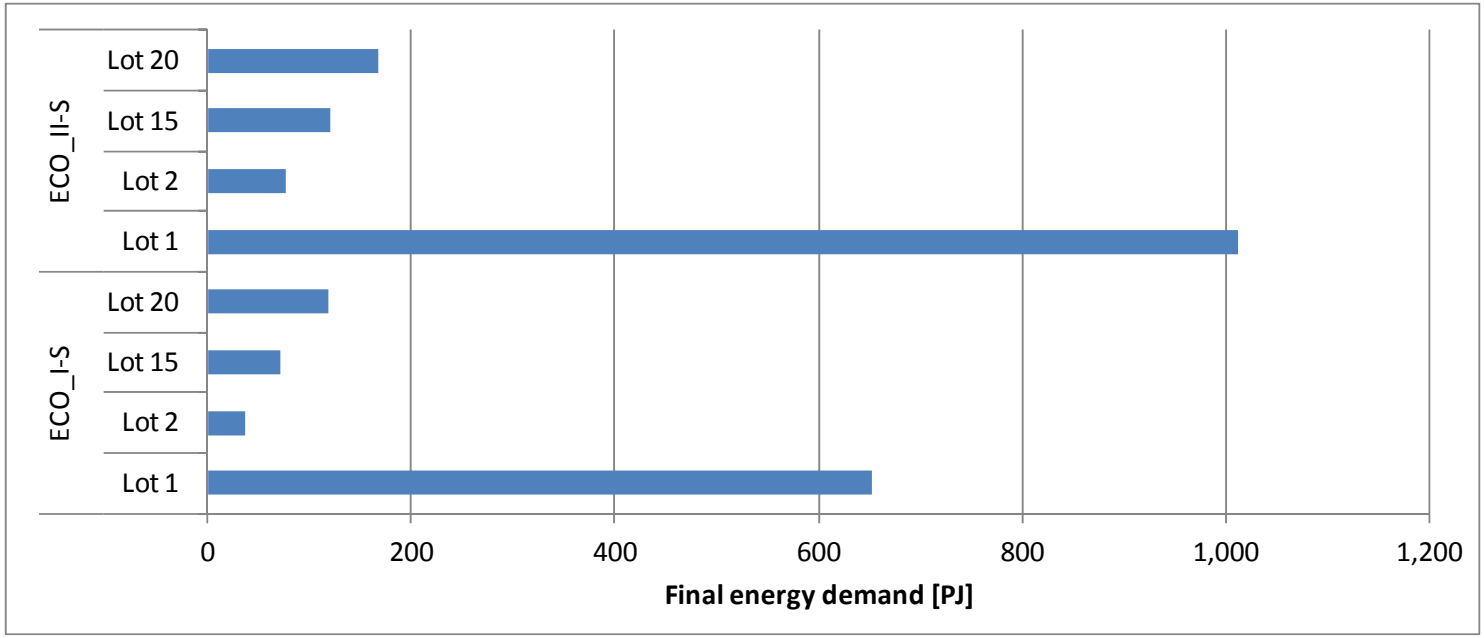
Case study
- Final energy demand for heating purposes

- REF-S: -1,719 PJ (-17.8 %) by 2050
- ECO I-S: additional -879 PJ (-9.1 %) by 2050
  - 2030: additional savings are mainly due to gas boilers (-267 PJ)
  - 2030 vs. 2050: dynamic potential improvement stagnates prior to 2030.
- ECO II-S: additional -497 PJ (5.2 %) by 2050
  - 2050: additional savings are mainly due to gas boilers (-257 PJ)
  - Renewable energies: share increases up to 25.4 % in 2050



Case study
- Saving potential of the Lots

- Lot 1: replacement by condensing boilers and strong heat pump diffusion
- Lot 20: phasing out of electricity-based heaters
- Lot 15 & Lot 2:
  - Strong diffusion of solar thermal
  - Replacing instantaneous water heaters by hot water storage systems



Conclusions and outlook

- **Conclusions**
  - Reduction of final energy demand by an additional 1,376 PJ by 2050 (-17.4 %) compared to the reference scenario
  - Largest saving potential:
    - replacement of constant and low temperature boilers by condensing boilers and
    - due to strong diffusion of heat pumps.
  - Methodological issues:
    - Combined analysis of heating system and building stock modelling
    - Analysis avoids neglecting changes to long-lived heating systems
    - Consideration of infrastructure related restrictions
- **Outlook**
  - Strong enforcement is assumed → not the case in reality
    - ➢ Analysing the impact on non-compliance (approx. 20-30%).
  - Inclusion of micro CHP in the analysis

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Thank you for your kind attention

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