

05

VORTRAG/ LECTURE 05

HYDRONIC HEATING SYSTEMS – A FUTURE PERSPECTIVE

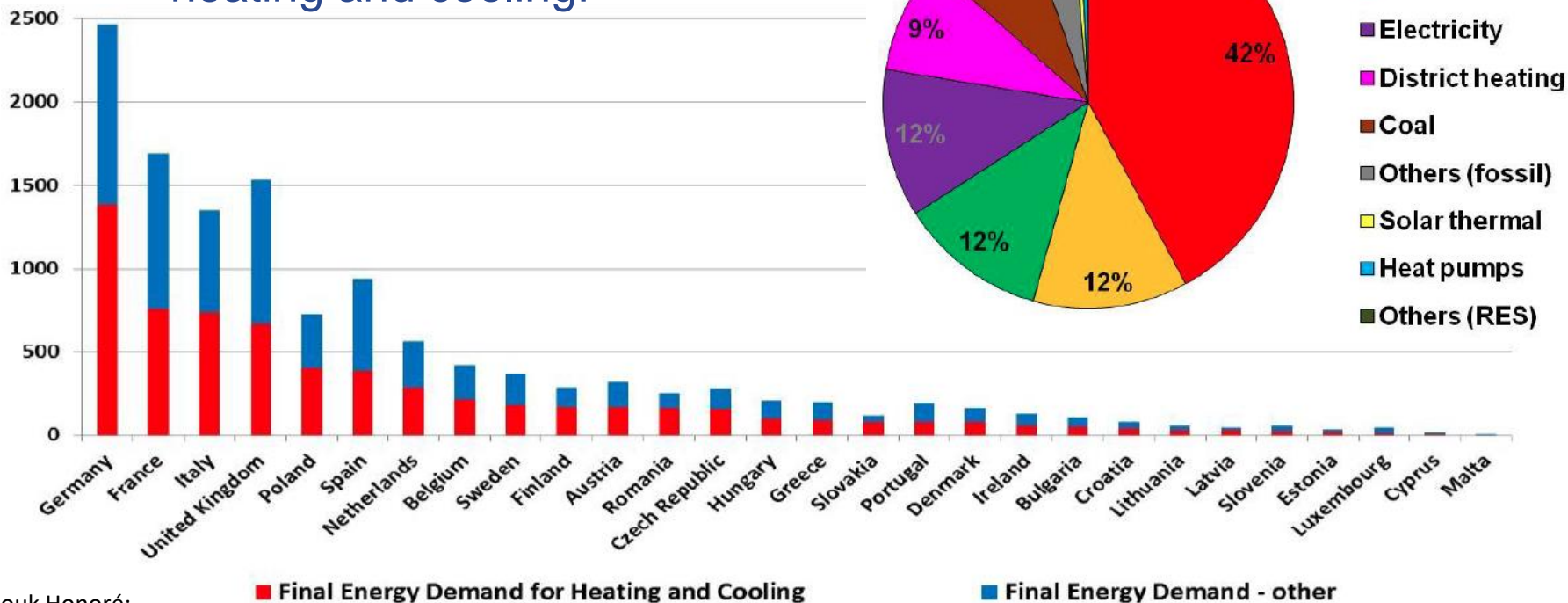
Clemens Felsmann

HEADLINE

- Will space heating in future be pure electric?
- Future perspectives of conventional hydraulic space heating systems will be highlighted
- special attention will be given to some technical and economical aspects of heat cost allocation and potable water sampling.

Share of Heating & Cooling demands

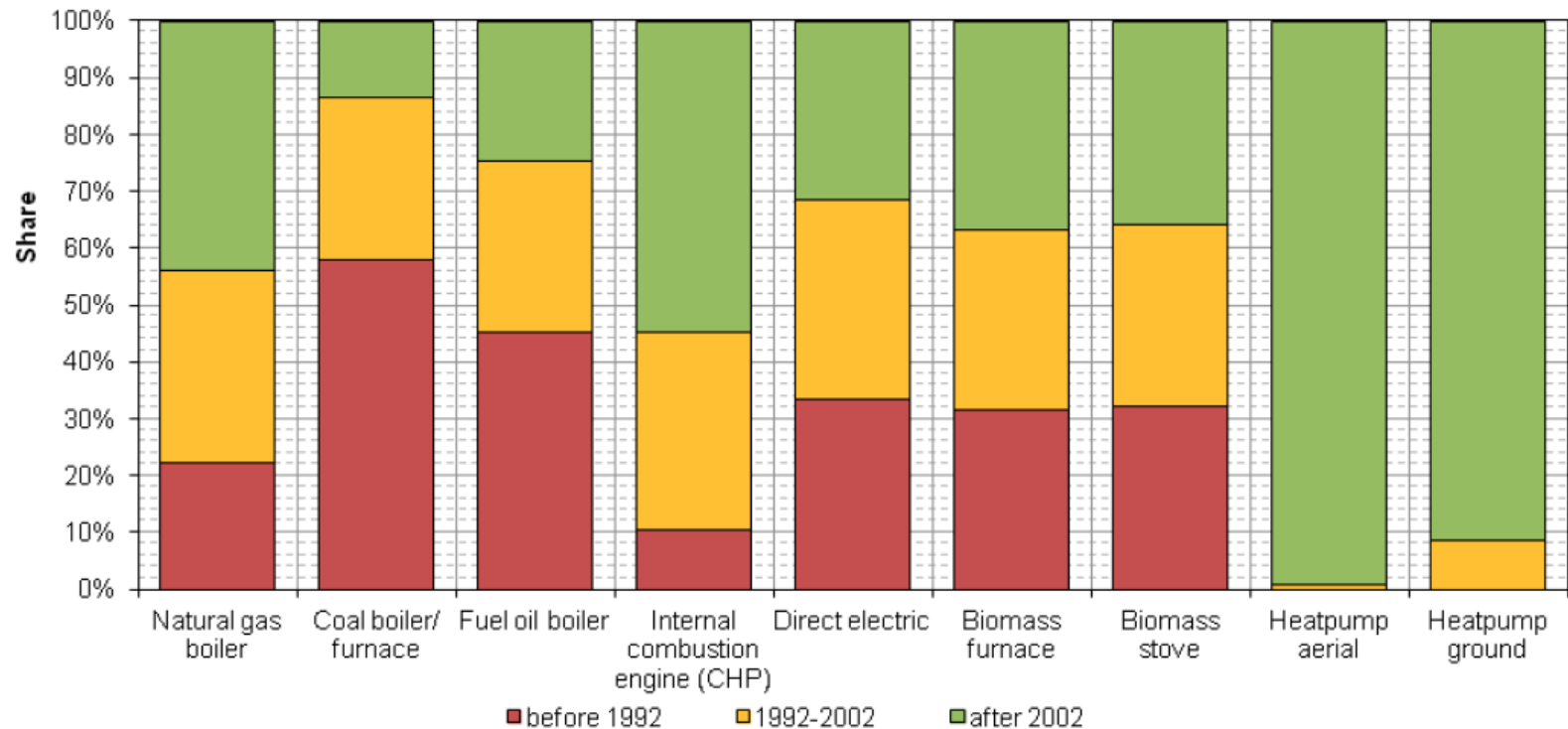
About 50% share of final energy demand in Europa dedicated to heating and cooling!



Ref: Anouk Honoré;
<https://www.oxfordenergy.org/wpcms/wp-content/uploads/2018/05/Decarbonisation-of-heat-in-Europe-implications-for-natural-gas-demand-NG130.pdf>

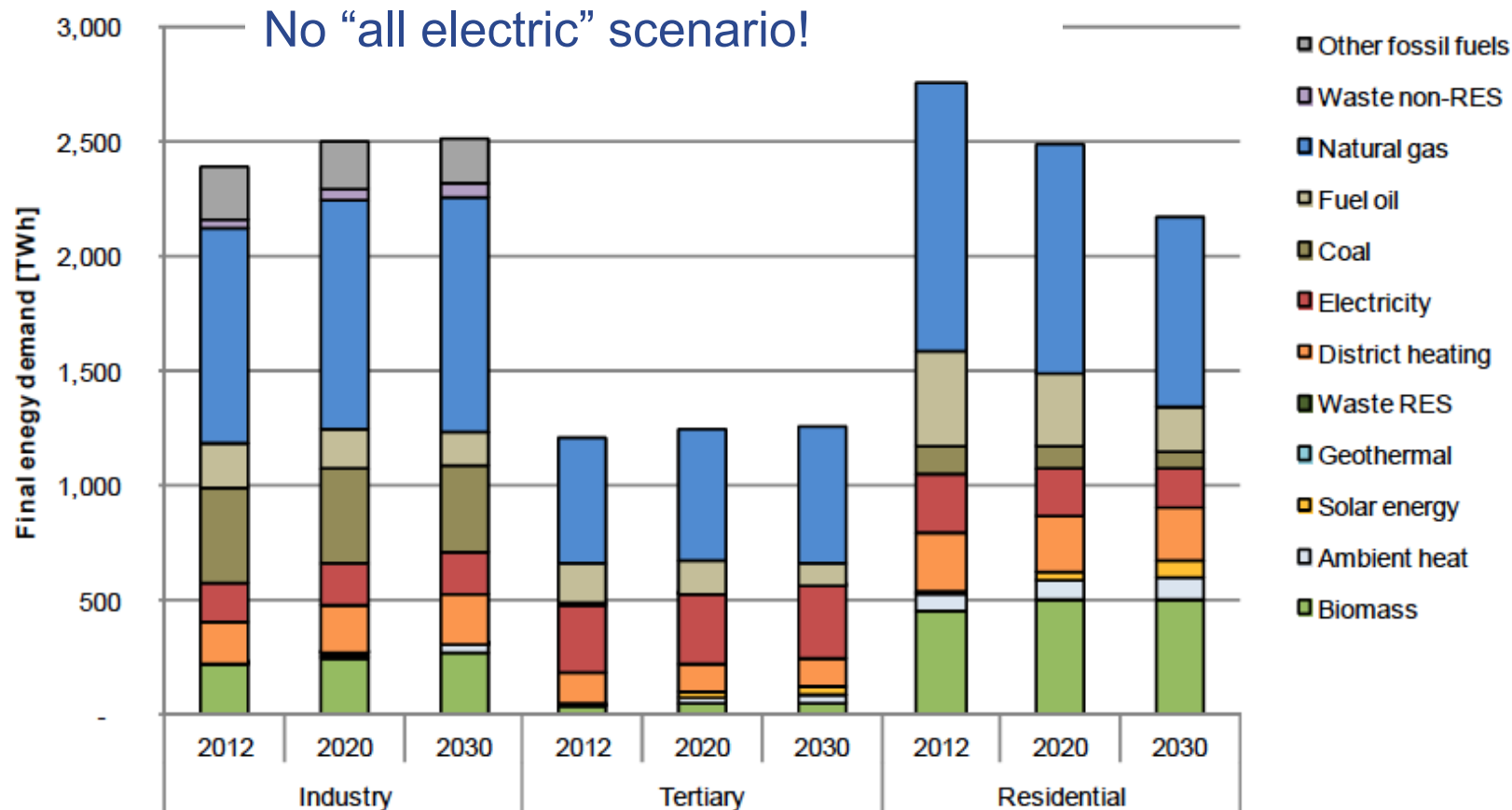
Heating Technology stock

- age in terms of installed capacity (EU-28)
- Conventional fuel combustion technologies are “old style”



Ref: https://ec.europa.eu/energy/sites/ener/files/documents/mapping-hc-final_report-wp2.pdf

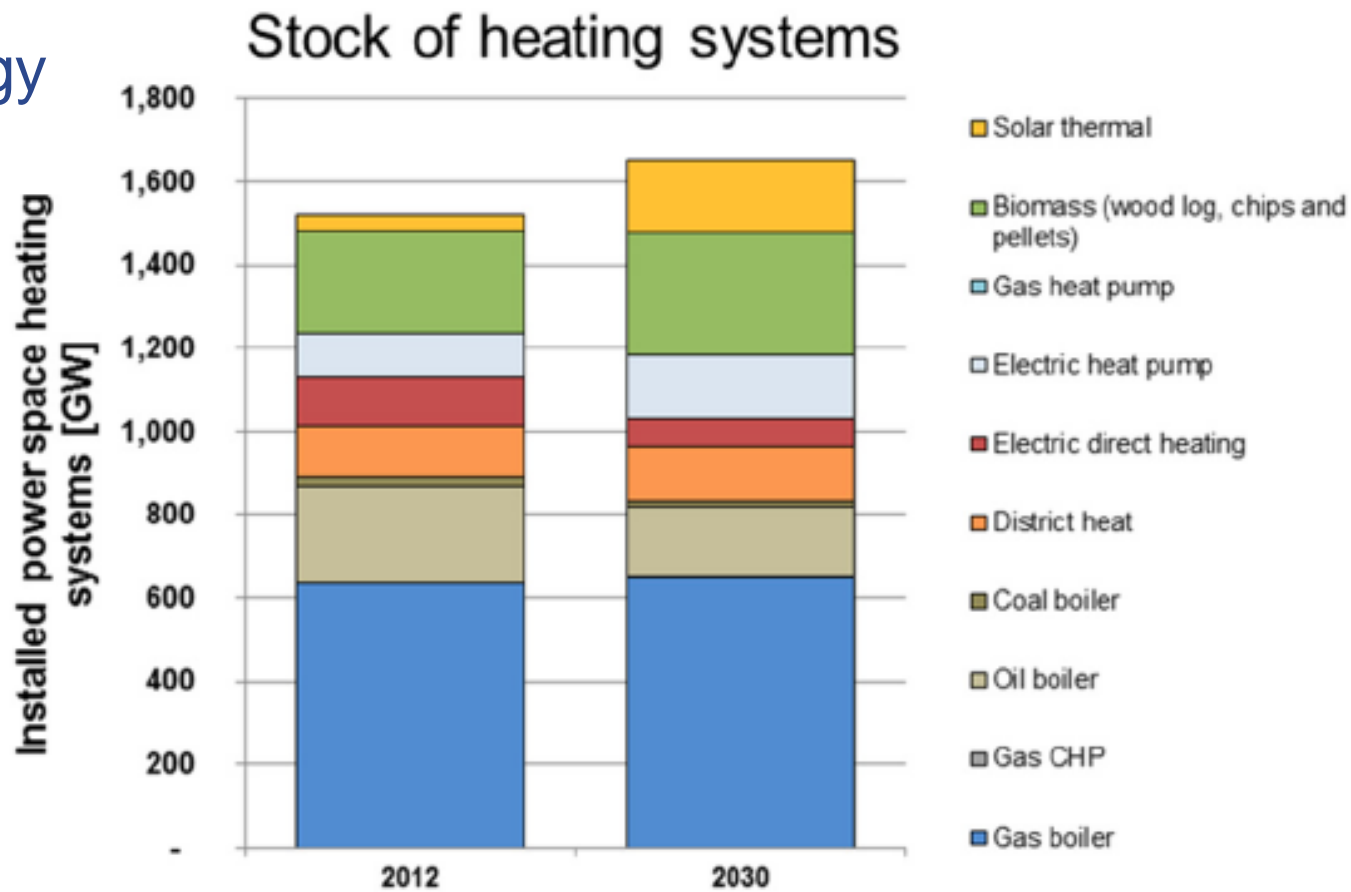
“Current policy” H & C Scenario



Ref: https://ec.europa.eu/energy/sites/ener/files/documents/mapping-hc-final_report-wp3-wp4.pdf

“Current policy” H & C Scenario

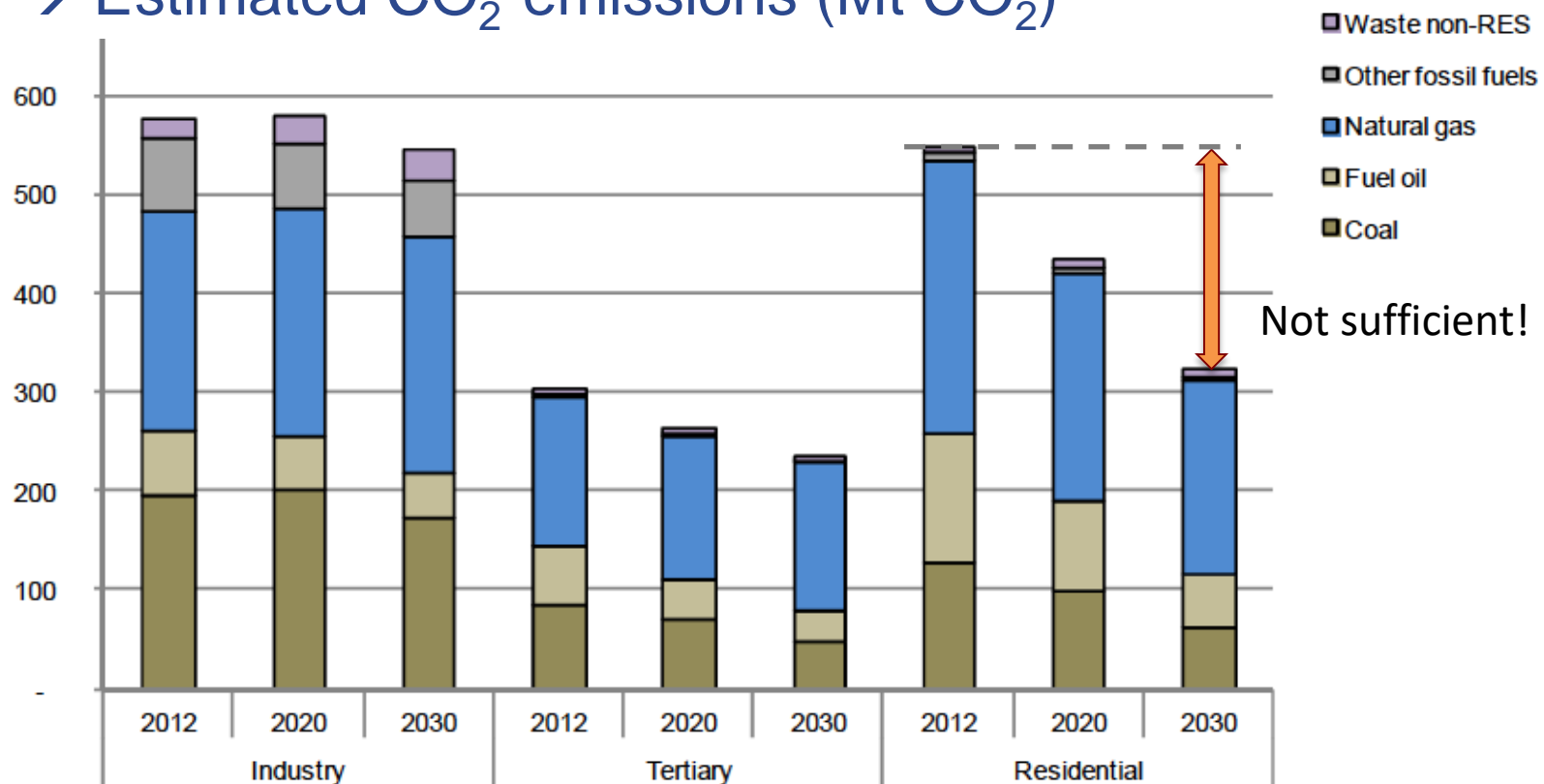
→ Technology stock



Ref: https://ec.europa.eu/energy/sites/ener/files/documents/mapping-hc-final_report-wp3-wp4.pdf

“Current policy” H & C Scenario

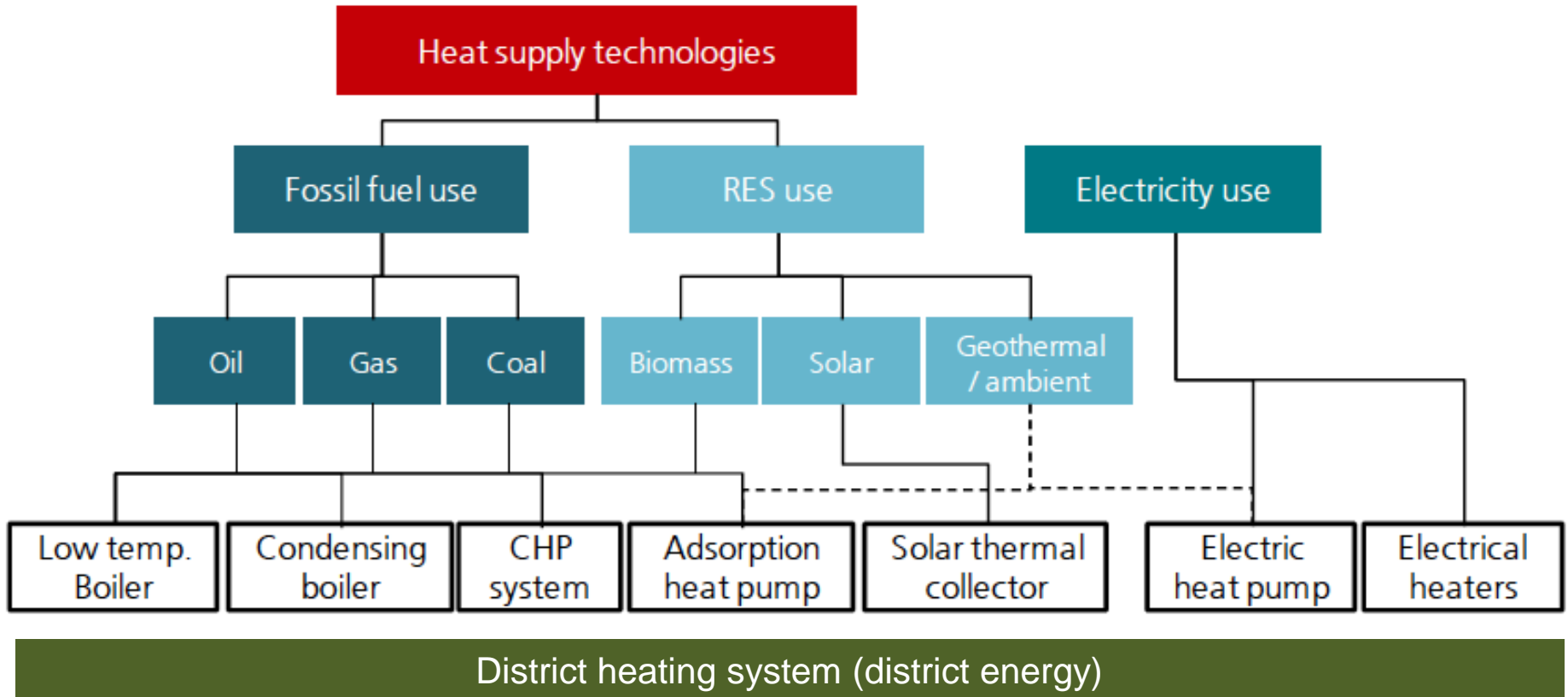
→ Estimated CO₂-emissions (Mt CO₂)



Not sufficient!

Ref: https://ec.europa.eu/energy/sites/ener/files/documents/mapping-hc-final_report-wp3-wp4.pdf

Heat supply technology matrix



Ref: according to https://ec.europa.eu/energy/sites/ener/files/documents/mapping-hc-final_report-wp2.pdf

Electric space heating stock

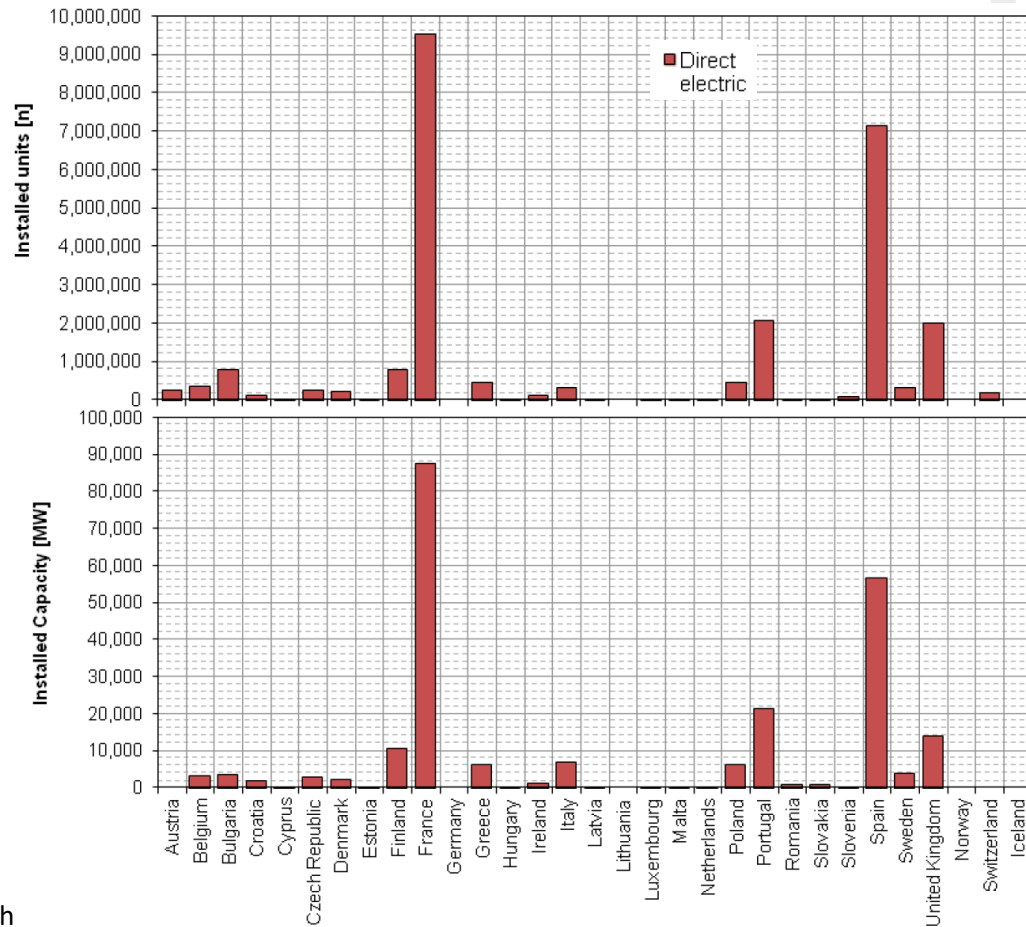
Direct heaters:

- Electric radiators
- Electric under floor systems
- Electric boilers
- Electric storage tank

Electric heat pump

Building installations:
1 ... 400 kW
Efficiency 95...100%

DH applications
0.5 ...1xx MW



Ref: <https://ec.europa.eu/energy/sites/ener/files/documents/mapping-h>

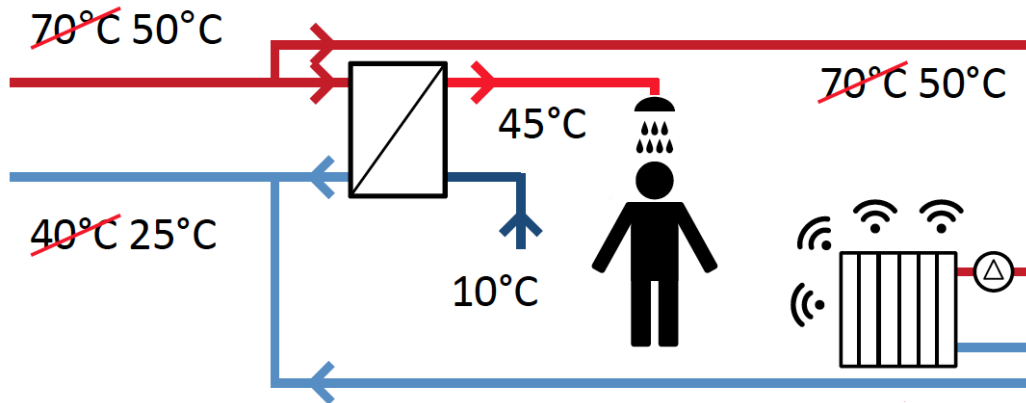
Electric space heater

- integrated battery
- Easy manual and remote control
- Plug & play
- Power consumption optimization
- Bill optimization
- Real time monitoring

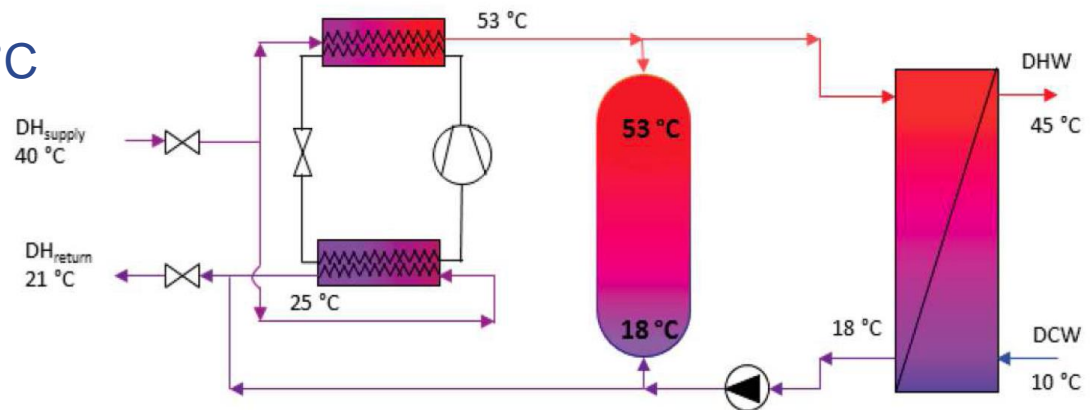
Are those features really limited to electric heaters only ?



Low temperature District heating



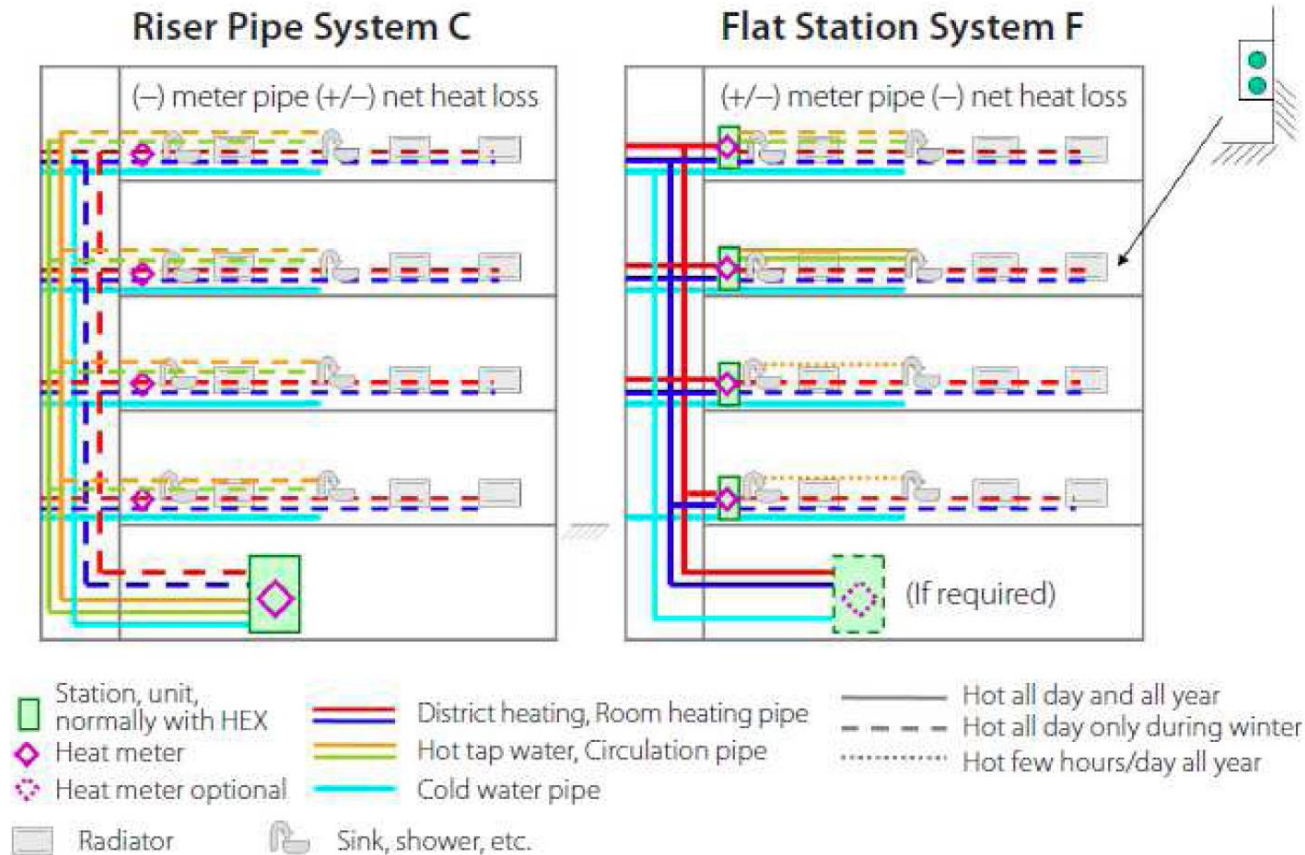
- Supply temperatures 40...45°C
- μ HP for DHW
- more efficient DHW distribution (no circulation)



Ref: Marek Brand „Heating and Domestic Hot Water Systems in Buildings Supplied by Low-Temperature District Heating“; PhD Thesis DTU 2014

Low temperature District heating

- Separate heat transfer station for each flat
- Easy metering and billing

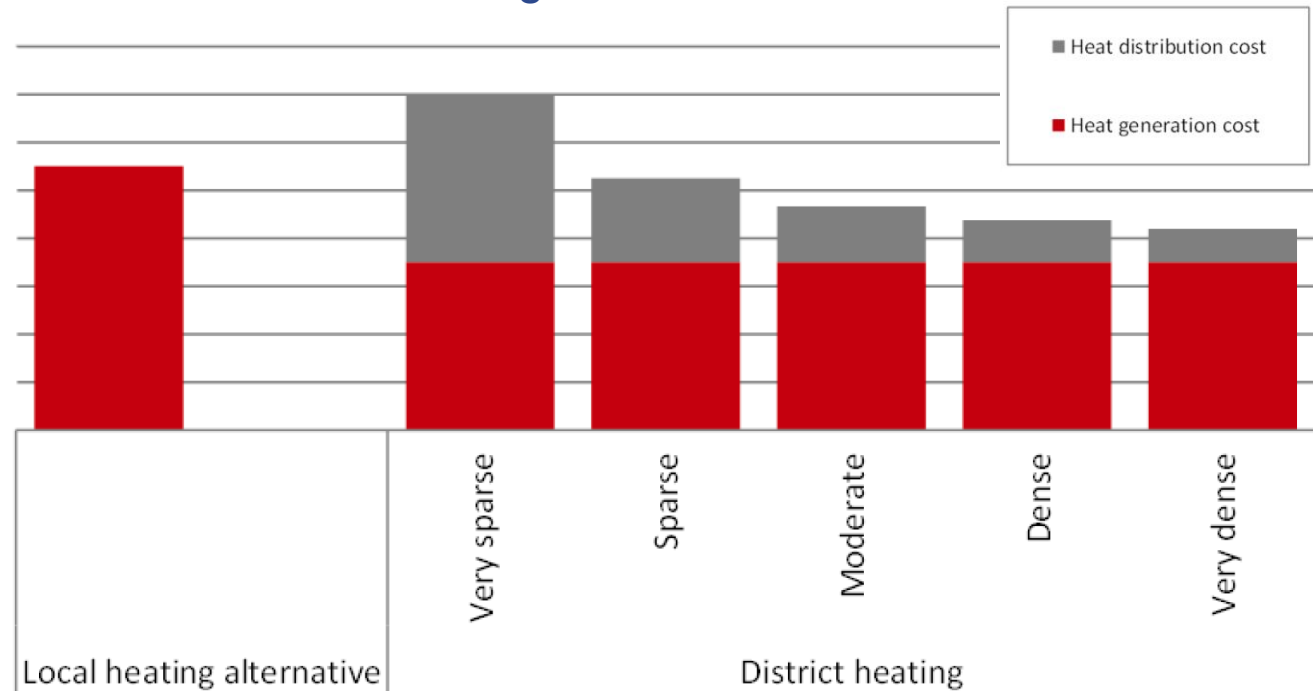


Ref: Marek Brand „Heating and Domestic Hot Water Systems in Buildings Supplied by Low-Temperature District Heating“; PhD Thesis DTU 2014

Costs of District heating

Qualitative comparison of total customer costs for local heat generation alternatives and district heating

→ Urbanisation?



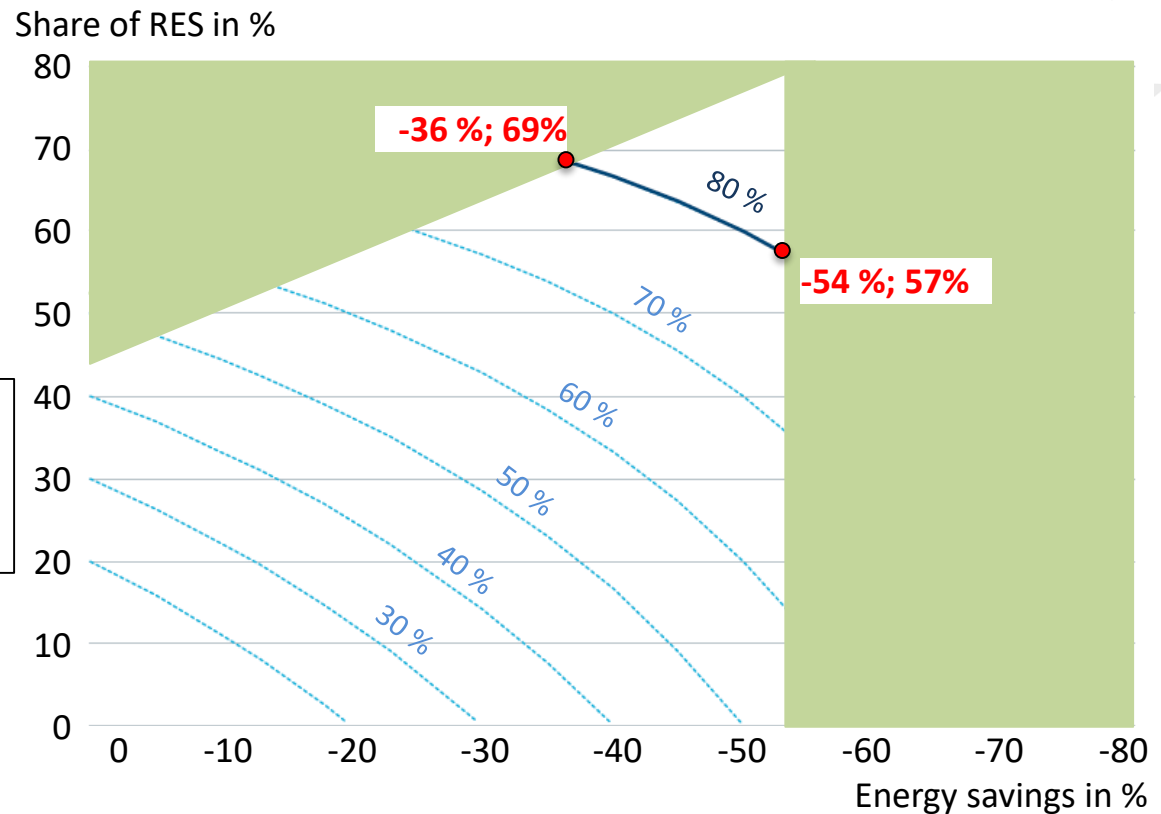
Ref: U. Persson "District heating in future Europe: Modelling expansion potentials and mapping heat synergy regions. PhD Thesis, Gothenburg, Sweden, 2015

How to reach energy efficient buildings ?

Two scenarios:

- Energy saving measures
→ x-axis
- Integration of renewable energies
→ y-axis

Less energy supply to buildings, if RES is gained on demand side



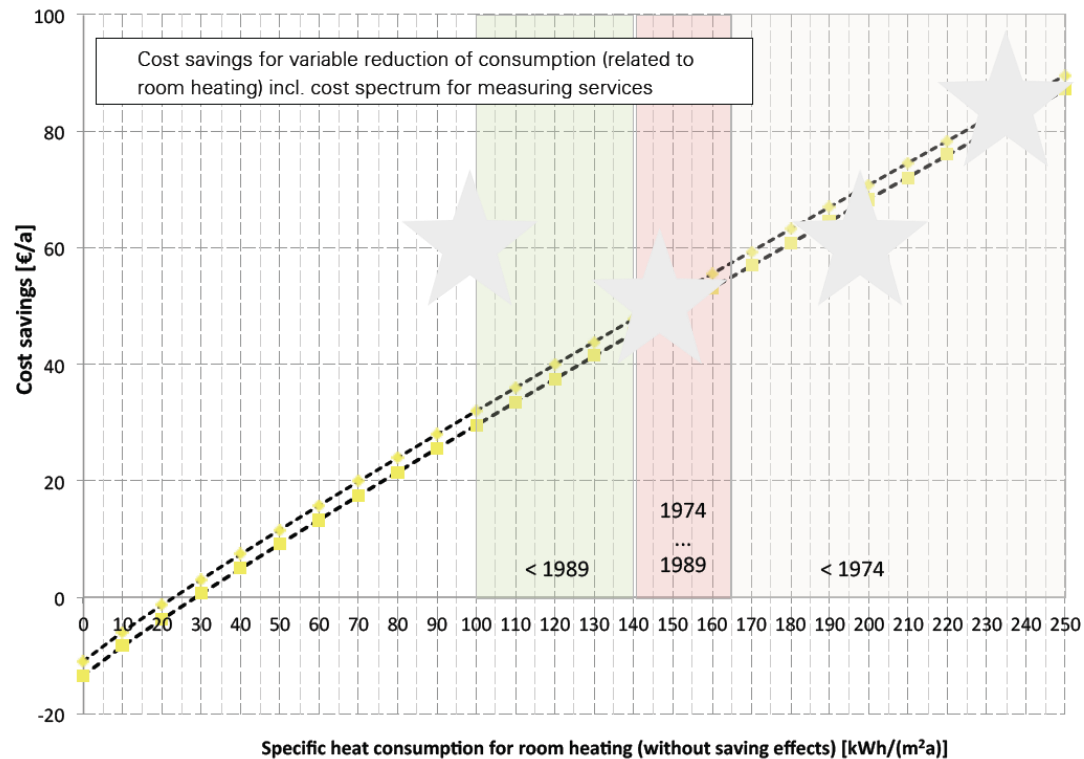
*Share of RES accounts for the contribution to the decarbonisation of energy supply

Ref: Energieeffizienzstrategie Gebäude, BMWi 2015

How to reach energy efficient buildings ?

Heat cost allocation contributes!

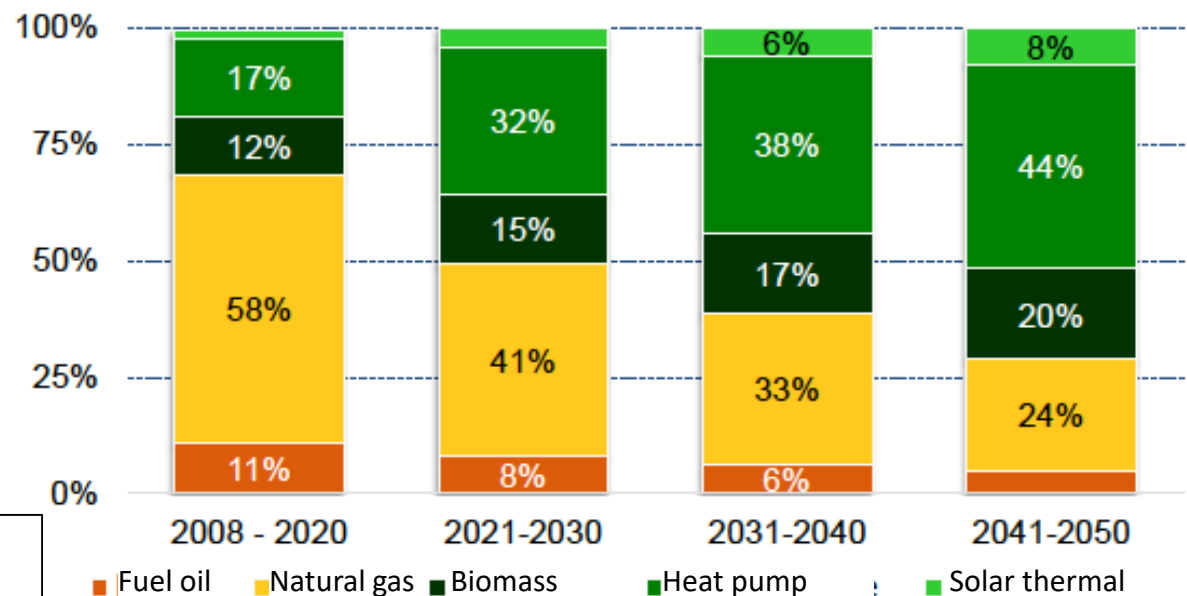
- up to 20% energy saving potential
- cost efficient
- potential in EU MS has been estimated



Ref: C. Felsmann, J. Schmidt, T. Mróz: "Effects of Consumption-Based Billing Depending on the Energy Qualities of Buildings in the EU. Potential assessment for member states; Dresden/Poznan 2015

Another H & C Scenario

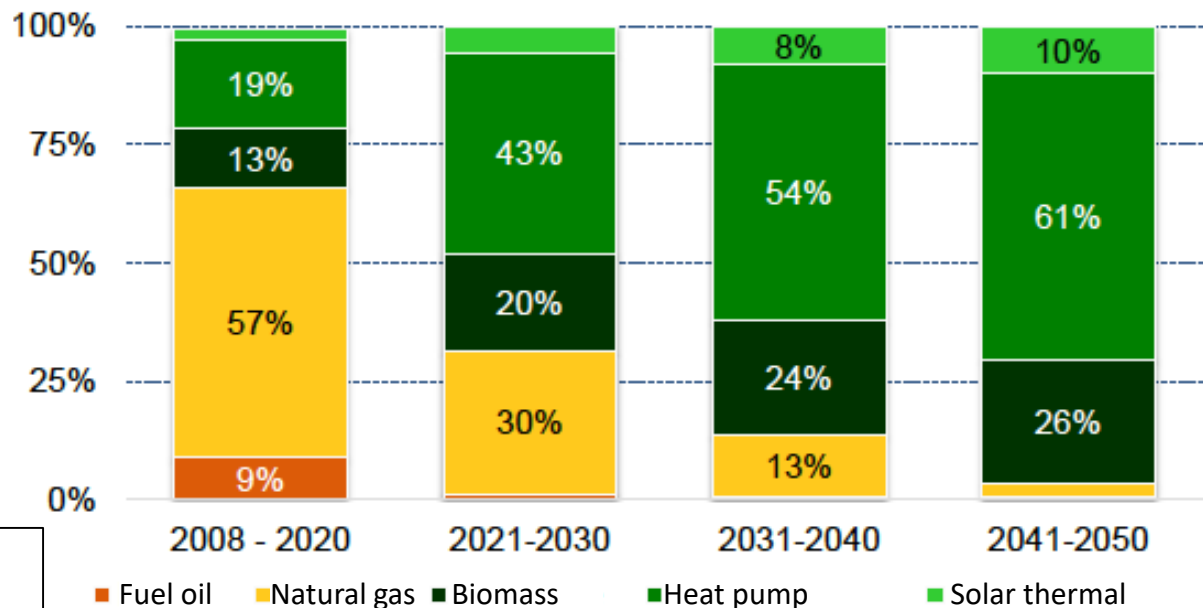
- **Energy efficiency first**
- Some fossil fuels will remain in the supply
- Lot of heat pumps



Ref: Hintergrundpapier zur Energieeffizienz-Strategie Gebäude, Prognos/ifeu- Institut für Energie- und Umweltforschung Heidelberg GmbH/IWU-Institut für Wohnen und Umwelt. Berlin/Heidelberg/Darmstadt, 2015

Another H & C Scenario

- Renewable Energies first
- Heat pumps and biomass will dominate the market

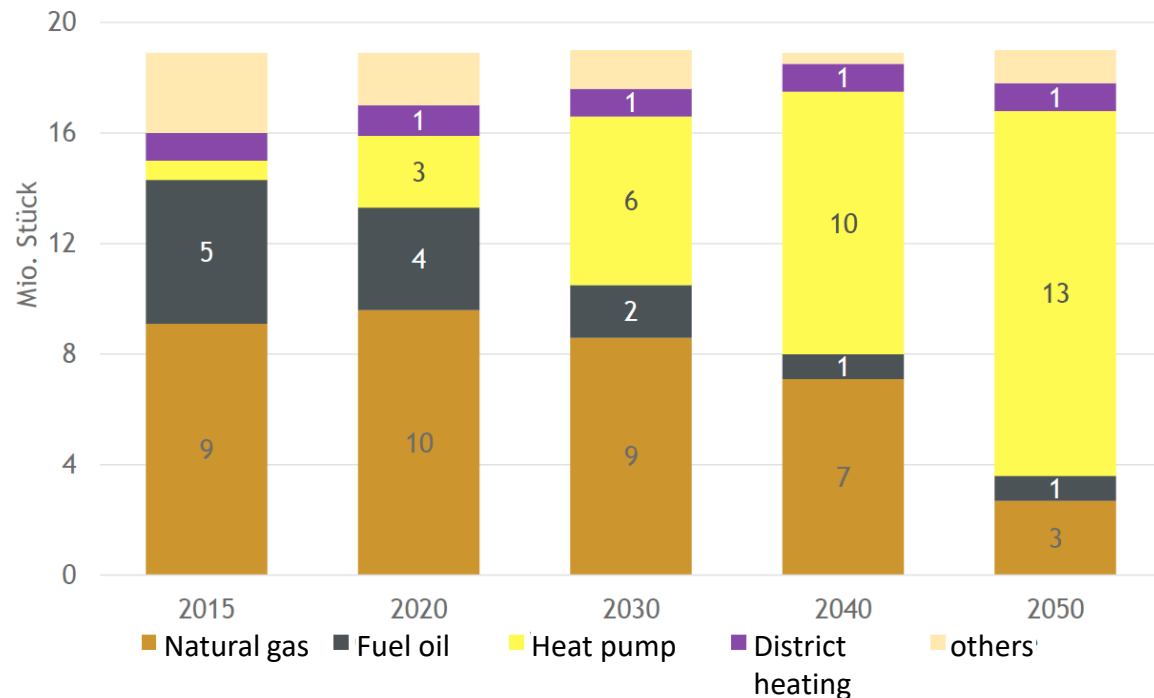


Ref: Hintergrundpapier zur Energieeffizienz-Strategie Gebäude, Prognos/ifeu- Institut für Energie- und Umweltforschung Heidelberg GmbH/IWU-Institut für Wohnen und Umwelt. Berlin/Heidelberg/Darmstadt, 2015

Another H & C Scenario

Primary heating systems in residential buildings assuming an accelerated use of electric heating systems

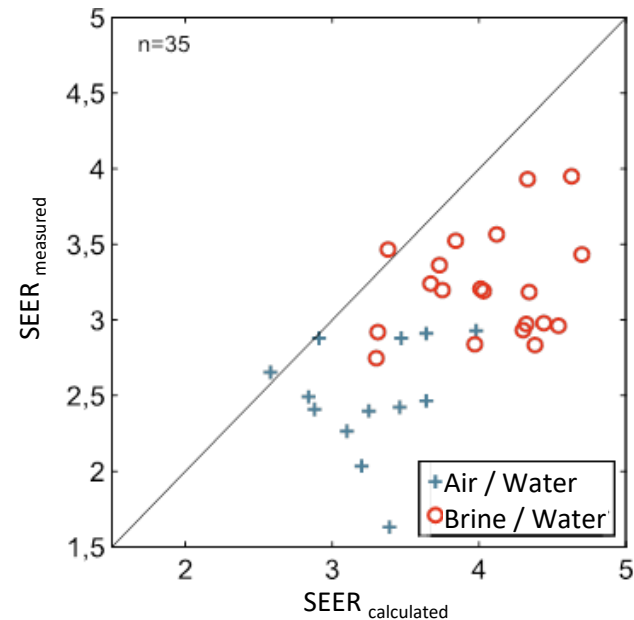
→ „Revolution“



Ref: Energiemarkt 2030 und 2050 – Der Beitrag von Gas- und Wärmeinfrastruktur zu einer effizienten CO2-Minderung; ewi Energy Research & Scenarios gGmbH Endbericht, 2017

Reliability of Efficiency Predictions

Do you trust the nominal efficiency ratios based on standardized laboratory tests?
→ e.g. SEER of heat pumps



Ref: K. Huchtemann „Supply Temperature Control Concepts in Heat Pump Heating Systems“, PhD Thesis, RWTH Aachen, 2015
Picture: <https://www.edie.net/news/11/European-lawmakers-back-limited-reduction-in-car-emissions/29720/>

DANKE FÜR IHRE AUFMERKSAMKEIT /
THANK YOU FOR YOUR ATTENTION