IS A DECARBONISED HEATING SECTOR POSSIBLE BY 2050?

Hans-Martin Henning

Fraunhofer Institute for Solar Energy Systems ISE

DECARB HEAT

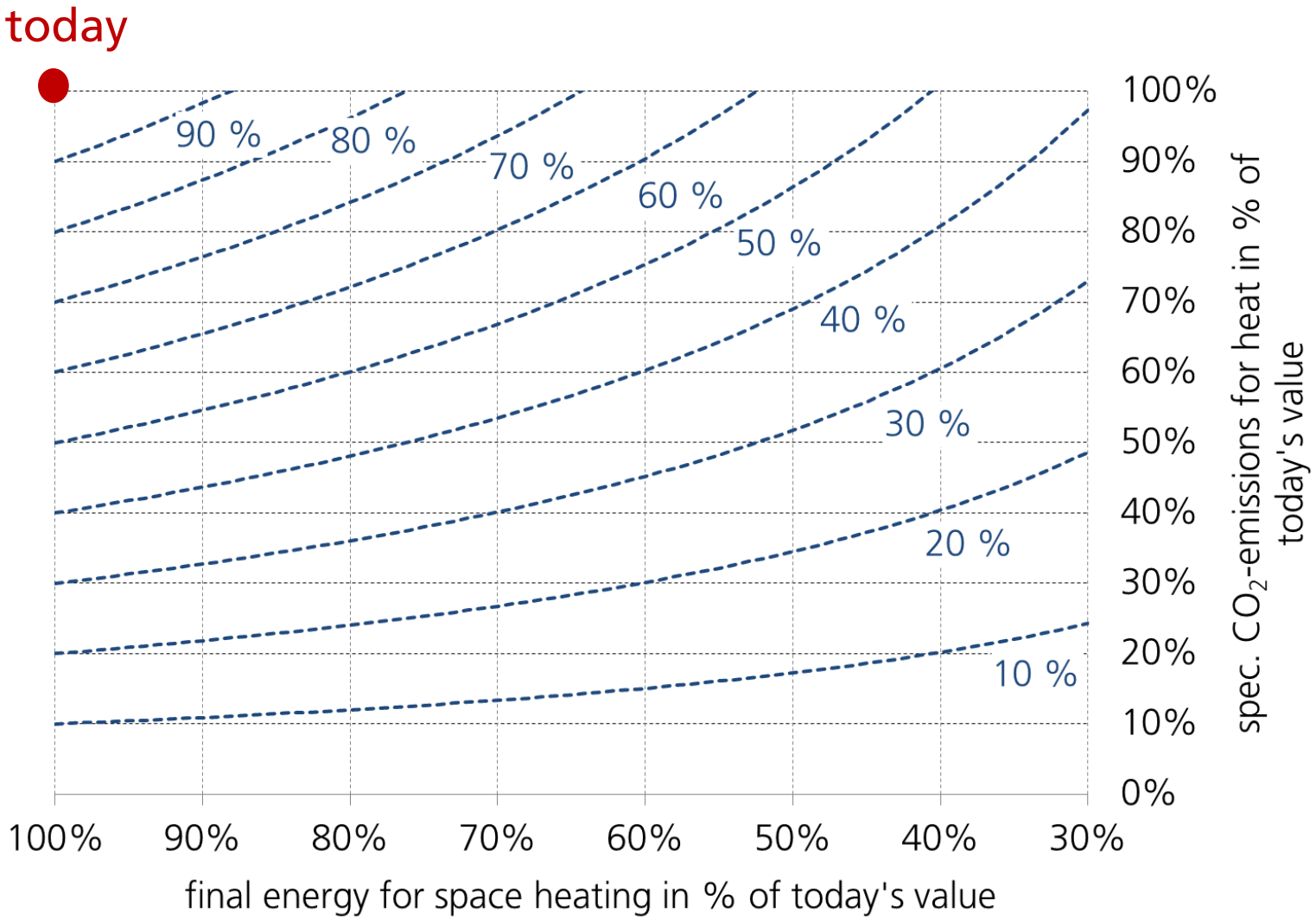
May 11-12, 2017

Brussels, Belgium

www.ise.fraunhofer.de

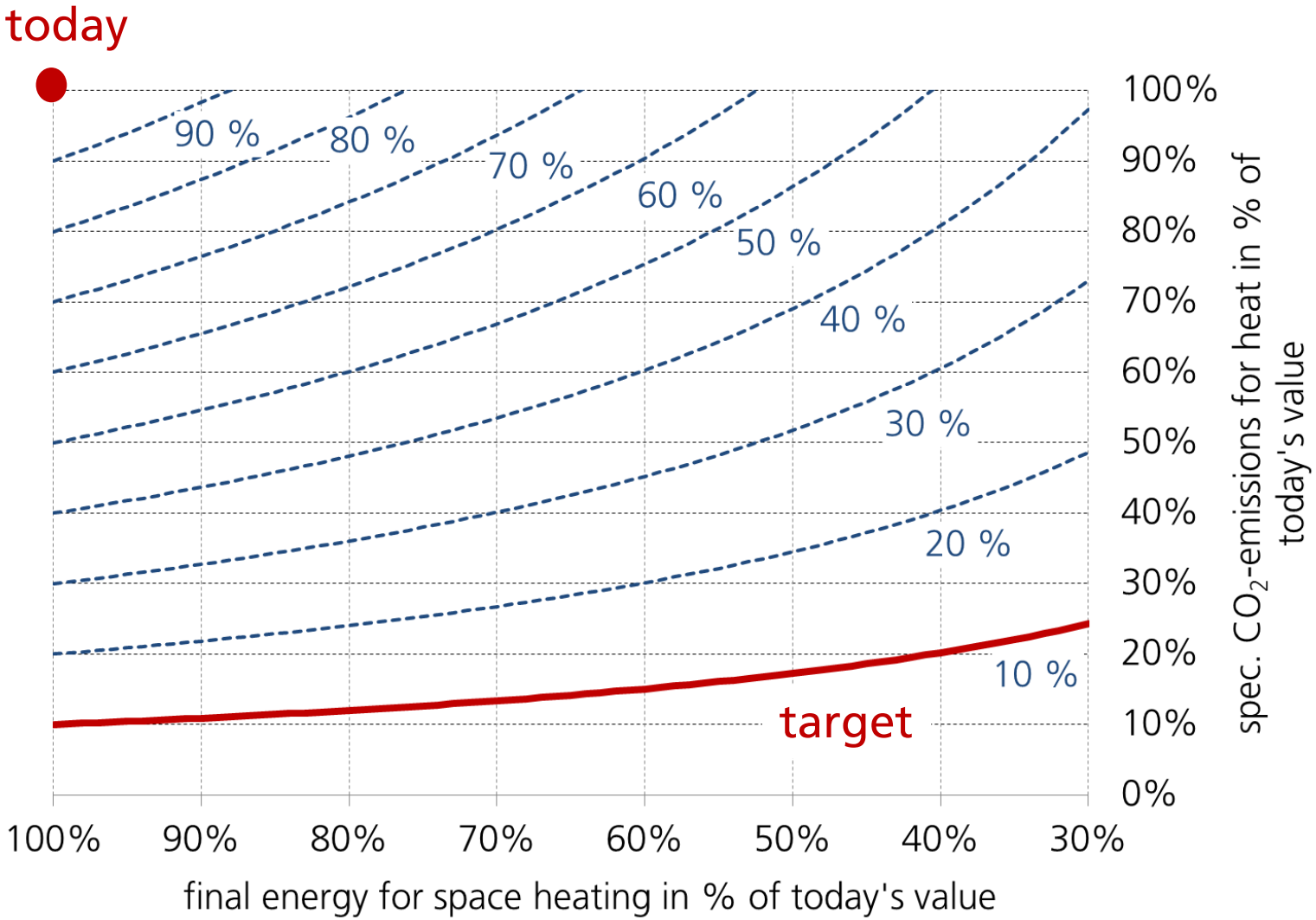
Fraunhofer ISE

How to achieve a decarbonised heat supply?



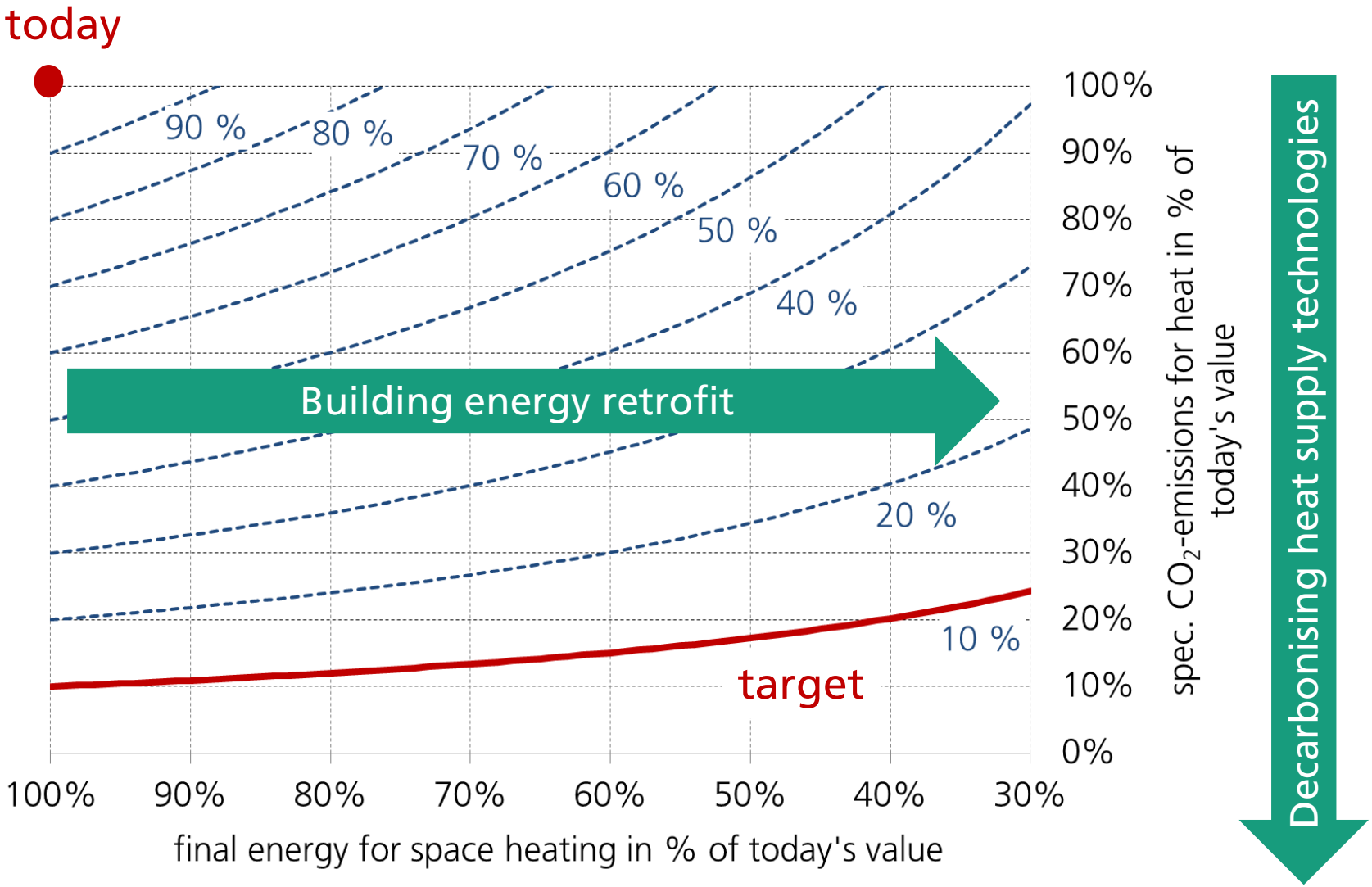
Fraunhofer ISE

How to achieve a decarbonised heat supply?



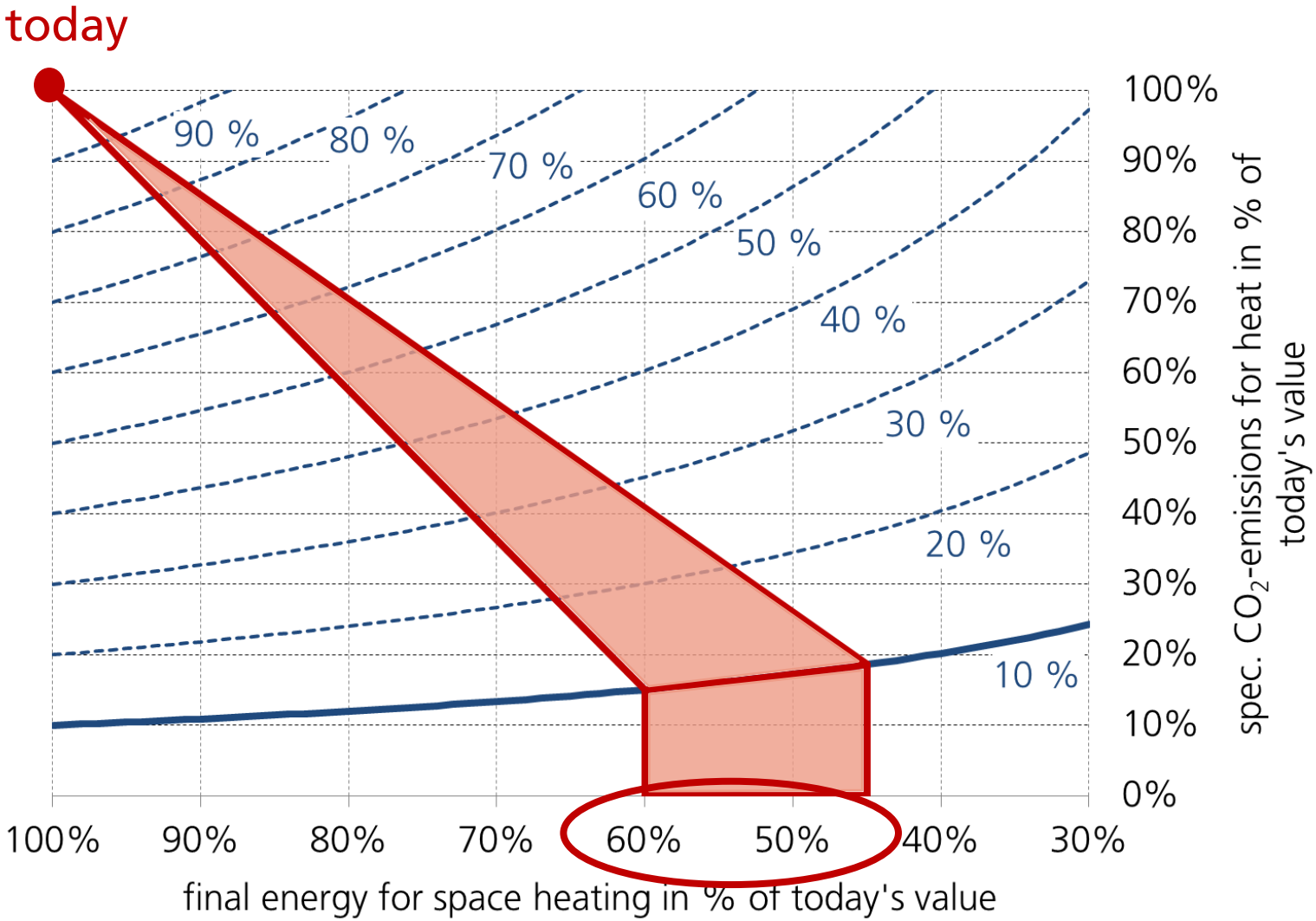
Fraunhofer ISE

How to achieve a decarbonised heat supply?



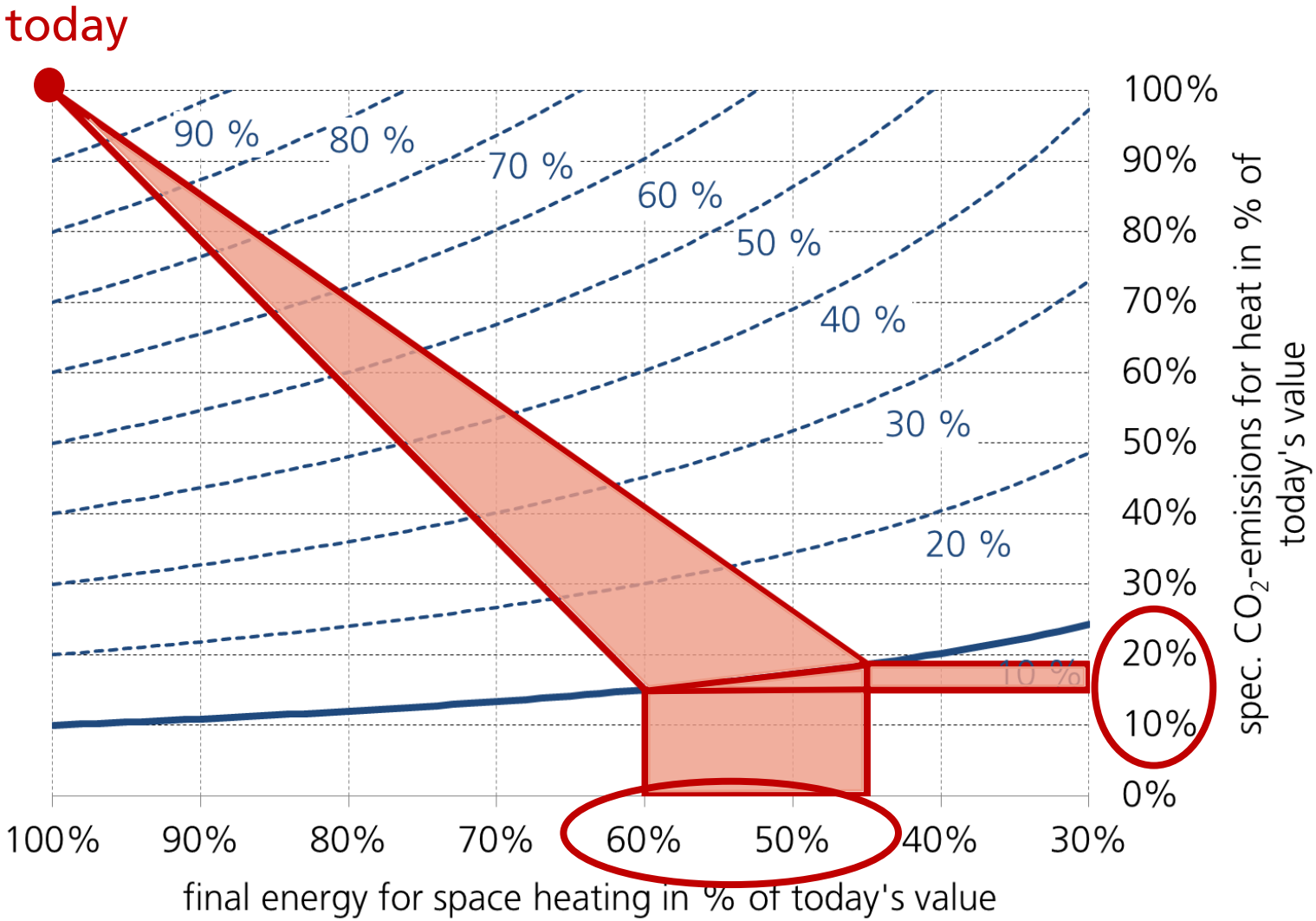
Fraunhofer ISE

How to achieve a decarbonised heat supply?



Fraunhofer ISE

How to achieve a decarbonised heat supply?



Fraunhofer ISE

Which technical solutions do we have available?

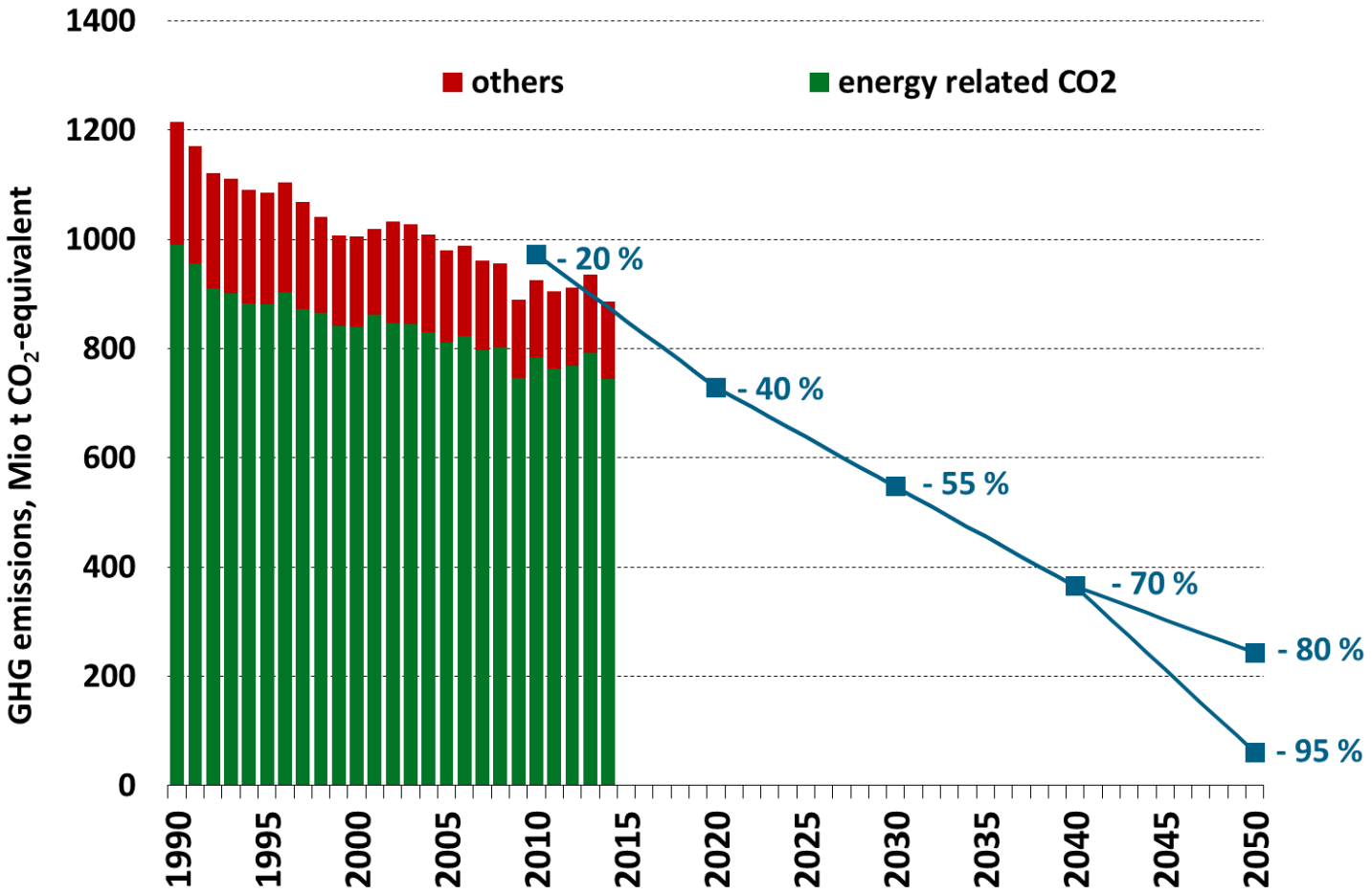
Reduction of energy use

- Energy retrofit of the building stock

Decarbonising heat supply technologies

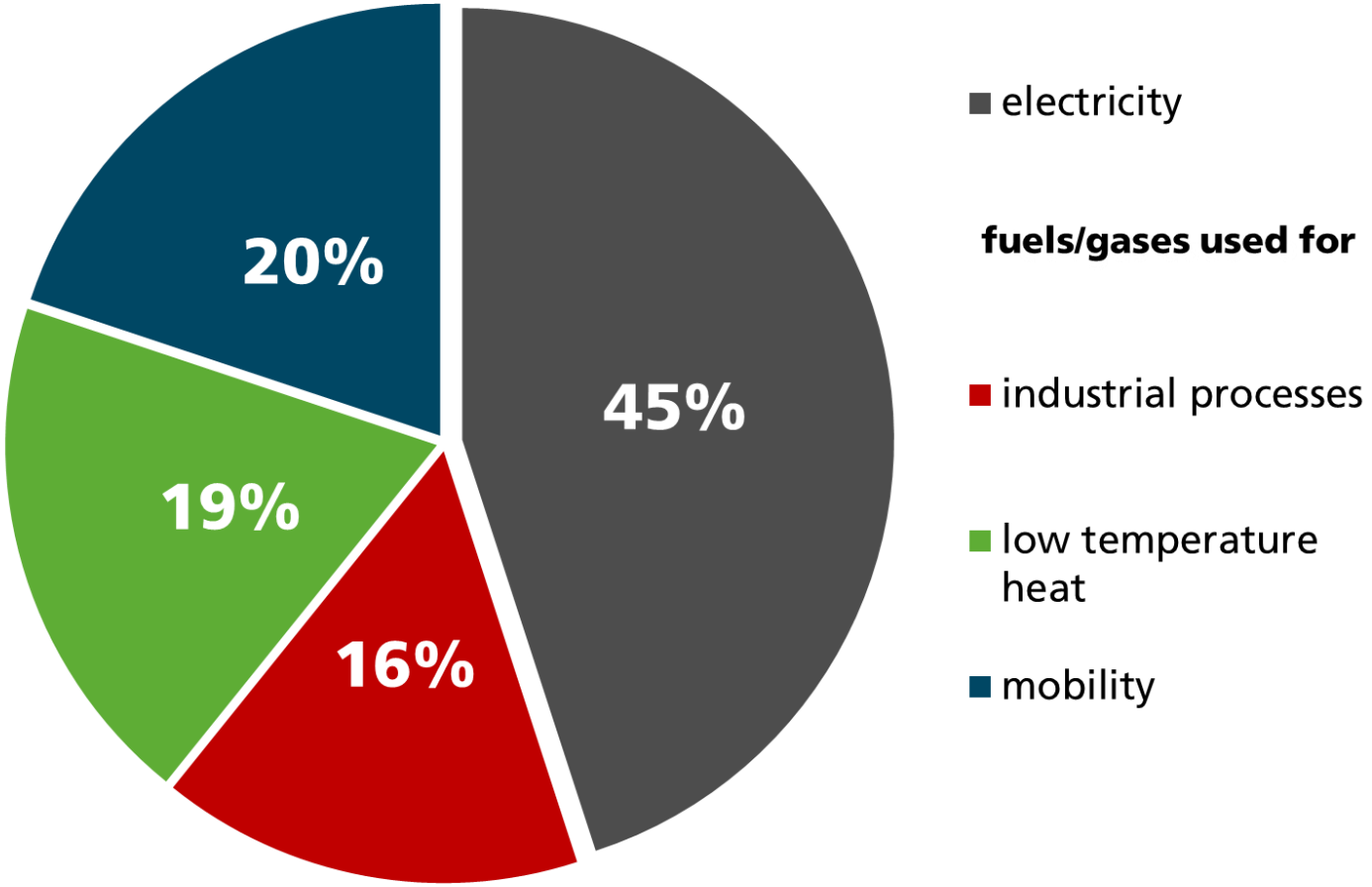
- More efficient use of (fossile) fuels
  - combined heat & power ➔ mainly for large capacity
  - gas heat pumps ➔ still very small market shares
- Renewable energies for direct heat supply
  - solar thermal ➔ seasonal mismatch
  - biomass ➔ limited potential; competition with other energy and non-energy uses
- Environmental heat used with electric heat pumps driven by electricity with high shares of renewables (locally, grid)

Example Germany – greenhouse gas emissions



Based on data from: Nationale Trendtabellen für die deutsche Berichterstattung atmosphärischer Emissionen. Umweltbundesamt (UBA) Dessau, 29.5.2015

Germany's energy related CO_2 emissions



Based on data from: Nationale Trendtabellen für die deutsche Berichterstattung atmosphärischer Emissionen. Umweltbundesamt (UBA) Dessau, 29.5.2015

Fraunhofer ISE

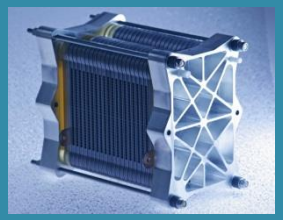
Renewable Energy Model »REMod«

Mimimize total annual costs →

Strictly model-based *techno-economic optimization of energy system transformation pathways* based on comprehensive simulation of national energy systems (hourly time scale) including all end-use sectors

Electricity generation and storage

Fuels (including biomass and synthetic fuels from RE)

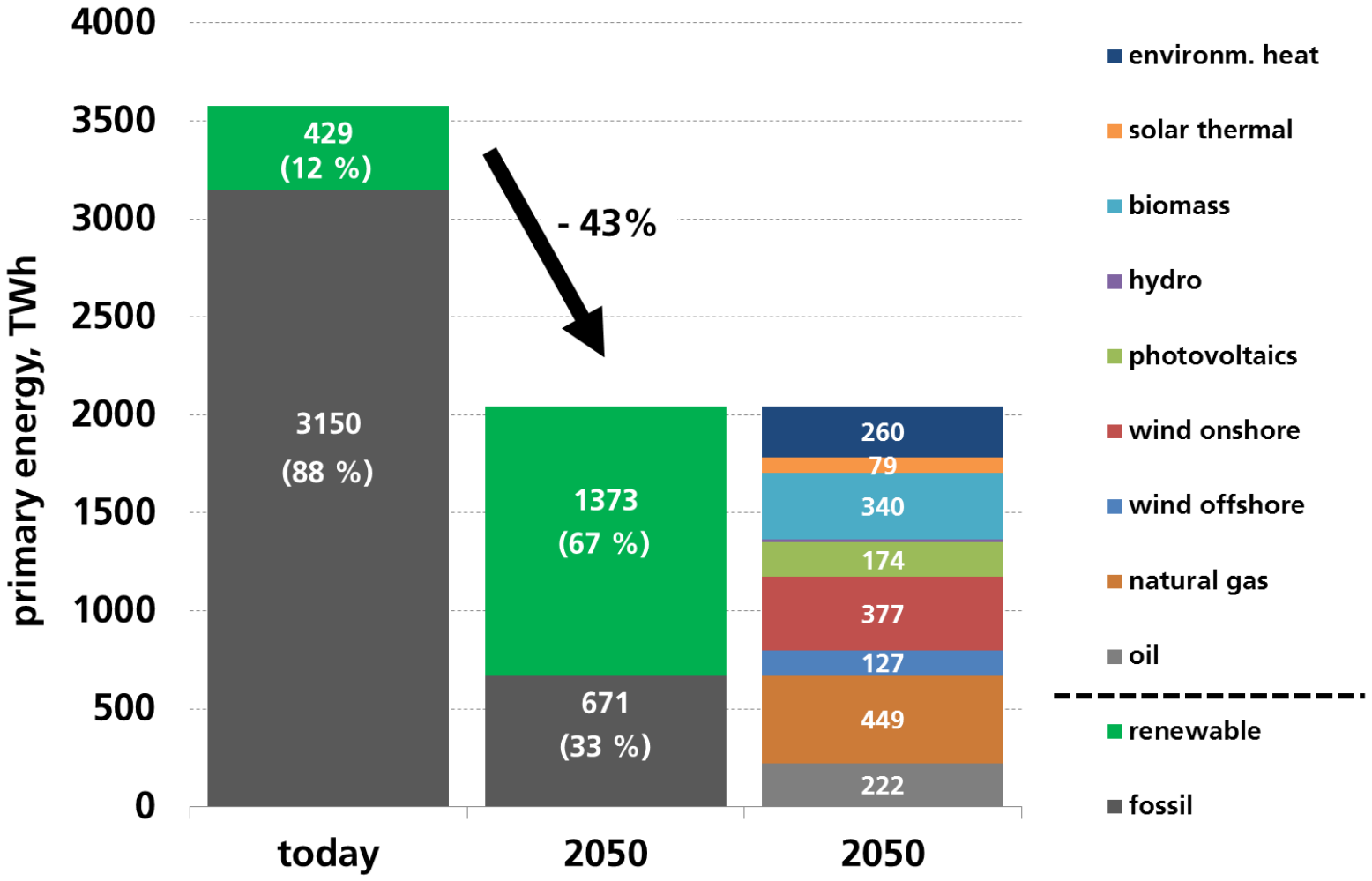


Mobility (incl. all possible concepts including hybrid)

Heat (buildings, incl. Storage and district heating)

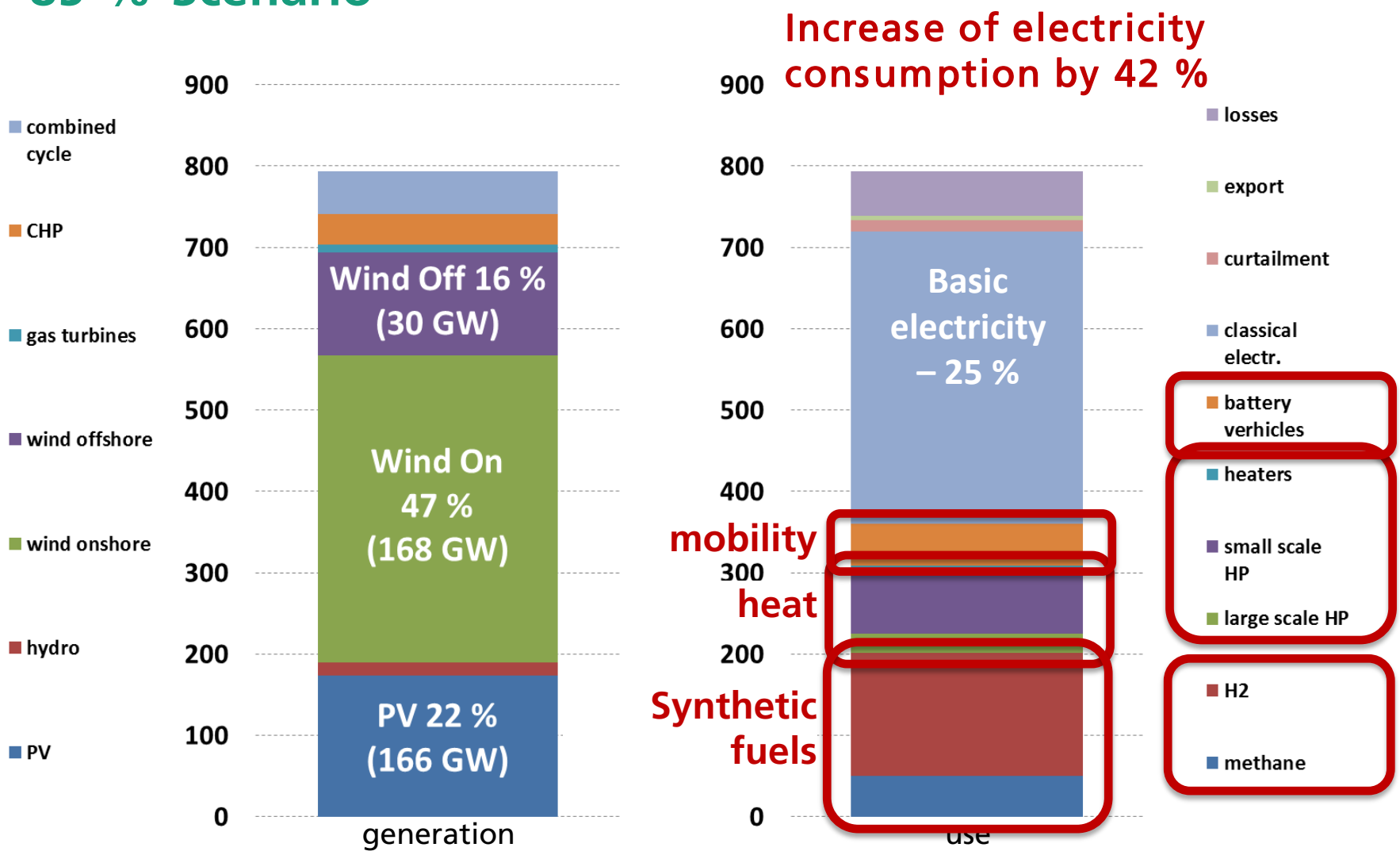
Processes in industry and tertiarty sector

Primary energy 2050 (compared with 2013)
– 85 % - Scenario



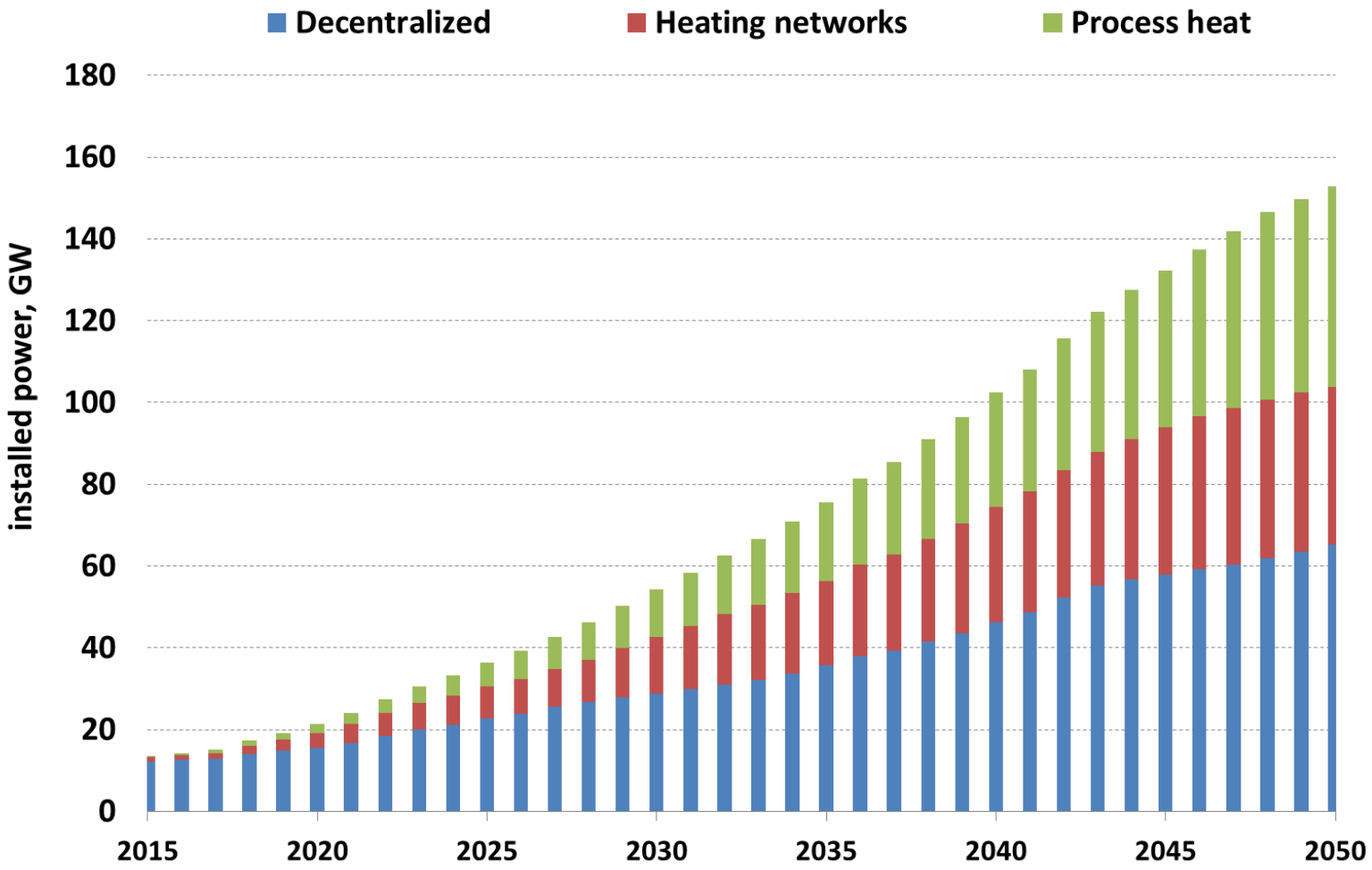
Fraunhofer ISE

Electricity generation and use
– 85-%-Scenario



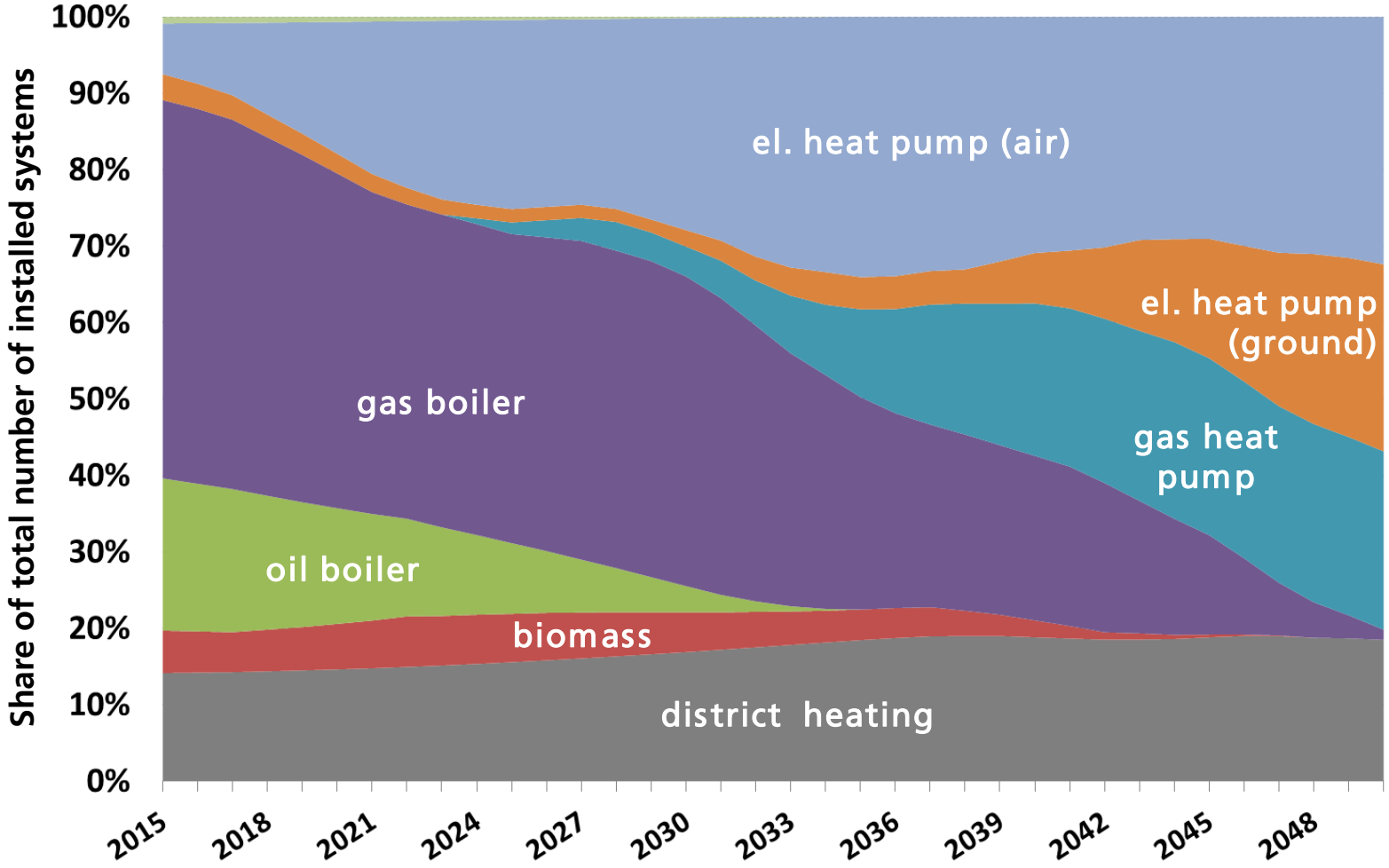
Fraunhofer ISE

Low temperature solar thermal
– 85-%-Scenario



Fraunhofer ISE

Heating technologies
– 85-%-Scenario



Fraunhofer ISE

Is a decarbonised heating sector possible by 2050?

Yes, it is. What we need to achieve this…

- Reducing space heating demand by energy retrofit of the building stock
- Solar thermal energy, mainly for domestic hot water
- High share of renewable energies for electricity generation
- Increased integration of energy sectors, i.e. electrictiy & heat
- Heat pumps will play a dominant role in the heat sector. Therefore, solutions adapted to various needs and applications must be provided
  - Heating, cooling, hot water
  - Different building types, sizes and energy standards
  - Large scale heat pumps for district heating networks
  - Different heat sources (air, ground, waste heat in industry)
  - Gas based high efficient solutions (beyond just burning ➔ gas HPs)
  - Smart solutions reacting on electr. grid needs (e.g. storage, hybrid HPs)
  - Solutions responding to phase-down of HFCs