

Decarbonisation of Buildings

UBA researches on the state of the energy transition regarding the building stock as well as measures for its decarbonisation.

Status quo

Key characteristics of the building stock in Germany are:

- GHG emissions have been decreasing, however, more slowly since 2014 (**fig. 1**). Similar for the final energy consumption, which remains constant since 2014.
- Refurbishment rate remains constant at about 1 %/a.
- Increase of heated space per person from 40 m² (2000) to 46.7 m² (2018) erases savings of energy and green house gases.

Goal: Decarbonisation

The goals in relation to the building stock and their recent states are:

- **2020** – Reduction of heat consumption by 20 % compared to 2008: By 2018, only -13.6 % has been realised.
- **2030** – Reduction of direct GHG emissions to 70 Mt (**fig. 1**): Agreed measures in the Climate Action Programme are estimated to deliver only 4.4 Mt instead of requested 20 Mt.
- **2050** – Greenhouse gas neutrality of Germany (to be in line with 2015 Paris Agreement): As the remaining emissions are already blocked by industrial processes, this goal results in 100 % reduction for energy use in general but also for buildings.

Measures: How to decarbonise?

Decarbonisation is achieved by improving energy efficiency and using renewable energies.

- Increase the renovation rate to 2.75 %/a.
- Improve energy standards for both new buildings, major renovations and renovation of single parts of the building envelope.
- Stop using fossil fuels for heating and ensure efficient operation of HVAC equipment.

These measures can reduce the energy consumption of buildings in the EU from about 5,500 to about 3,200 TWh (**fig. 2**) and the GHG emissions of buildings from about 710 Mt to 0 in 2050.

A strong focus on energy efficiency takes off pressure on extension of renewable energies (wind, PV) but needs deeper renovations and vice versa. Acceptance of both key figures is estimated to be challenging. General awareness needs to be raised and social balance ensured.

Open issues for research

Socio-ecological research on building refurbishment is needed:

- Identification and activation of key actors to engage in refurbishment efforts while considering social impacts.
- Analysis of mechanisms and instruments to ensure a fair distribution of costs and benefits in the decarbonisation process.

Figure 1: CO₂-emissions of buildings (heat consumption) across sectors - according to fields of application and groups of energy sources

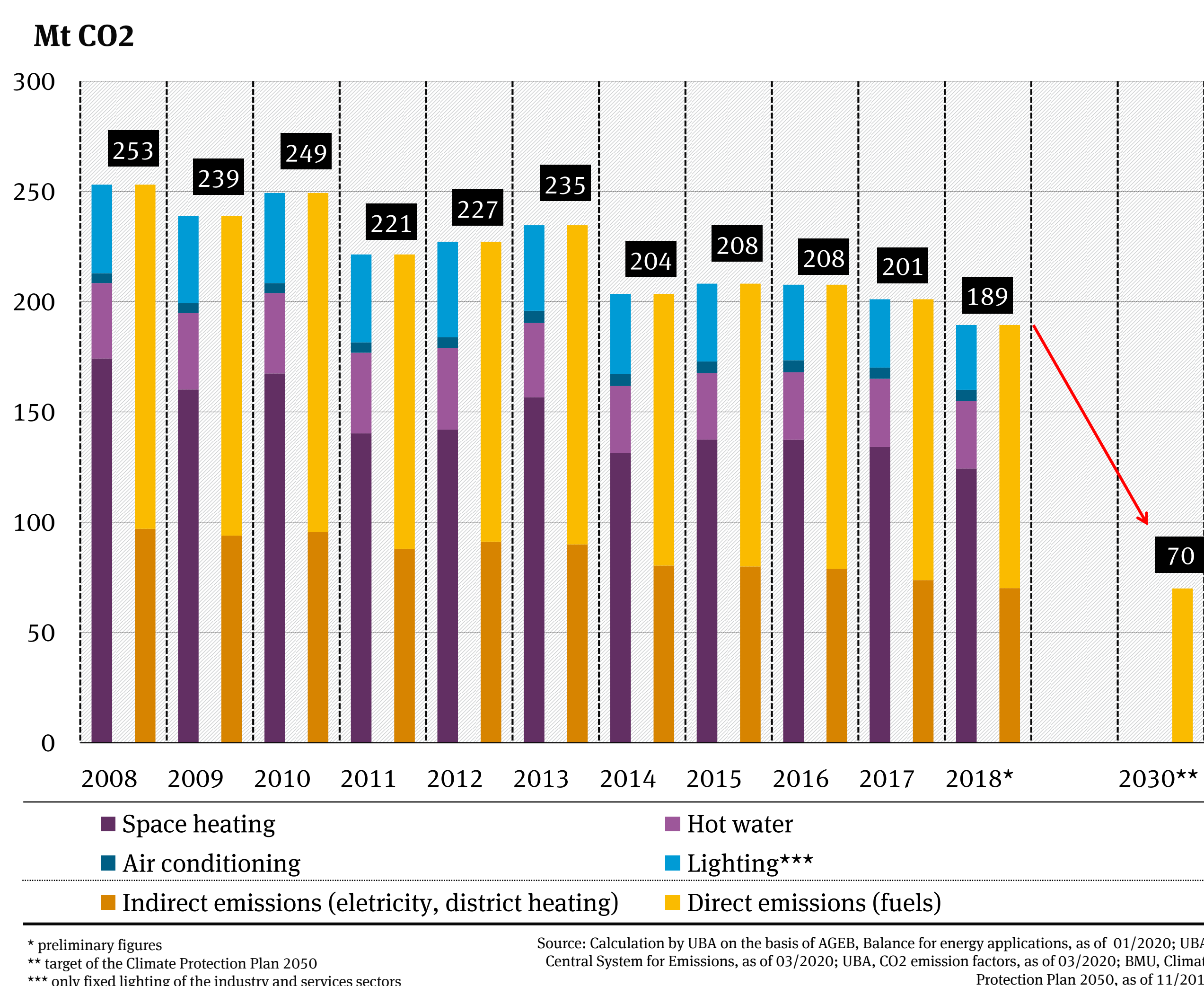
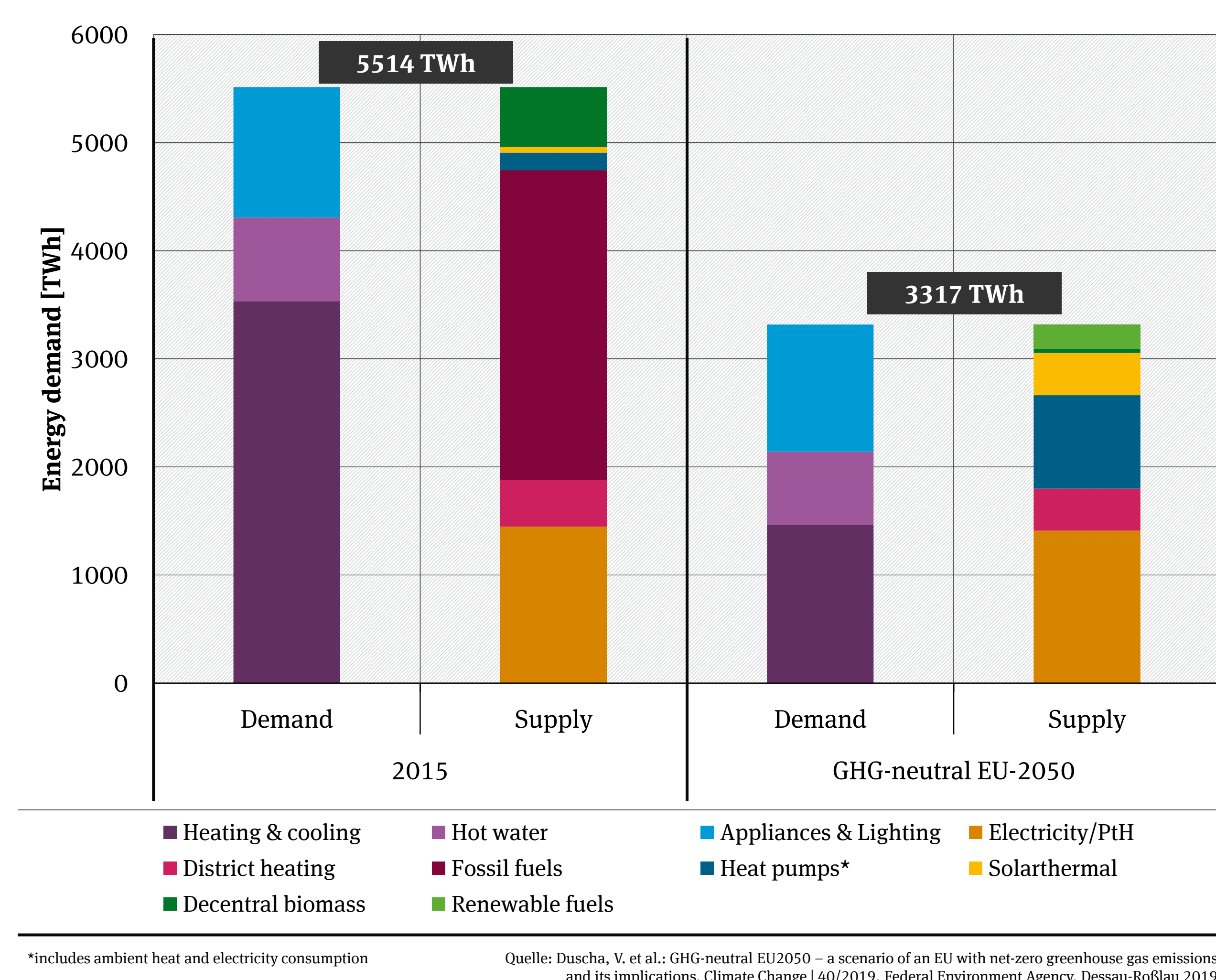


Fig. 2: Final energy demand of the EU buildings & appliances sector in 2015 and in the scenario "GHG-neutral EU-2050"



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