

Press release

Carbon reduction in buildings: heating first, then insulation

For the third time in a row, the building sector missed its climate targets in 2022. Many homeowners face the challenge of making existing buildings more efficient and climate-friendly, whereby the biggest lever for cutting carbon in buildings is the heating system. The problem is that more than 80 percent of heat energy demand are still covered by fossil fuels. Meanwhile, poor insulation and outdated heating systems not only result in above-average energy consumption, but also in higher costs.

According to the results of the CO₂-Optimist study conducted by the Swiss research institute EMPA on behalf of E.ON, a change of heating system in combination with the replacement of doors and windows can reduce the carbon emissions of a single family house by more than 80 percent. The heating system with the lowest emissions is the heat pump with ground collector coupled with a photovoltaic system. Heat pumps use electrical energy to make heat stored in the earth available, and with a photovoltaic system a considerable part of the electricity required for this can be generated from solar energy. This means greater independence in the supply of energy and lower electricity costs.

Patrick Lammers, who is responsible for customer solutions on E.ON's Board of Management, had this to say: "The energy crisis has clearly shown us that the building sector has been neglected for far too long in the energy transition. Many homeowners now want to take their energy supply into their own hands and rely more on climate-friendly technologies, but policymakers need to provide financial incentives for this. The demand for advice on renewable heating and heat pumps is greater than ever before. We provide assistance and guidance to customers in making the switch and at the same time conduct research into innovative concepts to effectively drive the heat transition in the future."

In 2021, there were around 19.4 million residential buildings in Germany, 16.1 million of which were single-family homes. At the same time, almost two thirds of all buildings were built before 1979, while the average age of heating systems in 2019 was around 17 years. Using the example of a typical single-family home from the 1960s, E.ON and Empa have investigated the costs and CO₂ emissions that arise in various renovation and new construction scenarios. As one of the first in this field to do so, the study also takes into account the building materials used. For new replacement structures, the researchers compared different construction methods with regard to their carbon emissions over the entire life cycle of the building.

The scientists also investigated which renovation measures are worthwhile from

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an emissions point of view when owners have to make a decision due to a lack of financial or labour resources. Here the results of the study show that replacing an outdated heating system is usually worthwhile before refurbishing the building envelope, unless both are possible at the same time. The optimal solution – although significantly more cost-intensive and time-consuming – is a complete replacement. Depending on the building materials used, it is even possible to realise negative emissions here. According to the results of the study, natural gas-based technologies achieve the lowest CO₂ savings among the combinations considered.

“In order for the building sector to achieve its climate targets, substantial investments must be made in the short term. Modern heat pumps are indispensable for the heating transition in existing buildings, but district heating solutions and green gases will also play an important role in decarbonising the heating sector,” adds Lammers. E.ON points out, for example, that in terms of CO₂ avoidance, stronger subsidy incentives for geothermal heat pumps and PV systems as well as for low-carbon district heating are crucial for the acceleration of the heating transition in the building sector. Green gases were not examined as part of the study, but the growing use of green gas can usefully complement the electrification and expansion of heat pumps.

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