DIW BERLIN

Nr. 9 — 13.3.2023

Accelerate thermal modernization of buildings with minimum standards for buildings and binding retrofitting targets

By Sophie M. Behr, Merve Kucuk und Karsten Neuhoff

DIW focus

The energy and climate crisis enhance the need for energy savings. In the building sector, these savings can be achieved primarily through thermal retrofitting. So far, progress in this area has been slow. To date, less than one percent of the residential building stock in Germany is retrofitted each year. The existing support programs alone offer too little reliability for the necessary investments in additional production capacities for building materials and in the construction sector to take place. In order to accelerate the energetic modernization of buildings, minimum energy performance standards (MEPS) for buildings and binding target for the annual rate of thermal building retrofitting is necessary. Low-income households in particular could be sustainably protected from future energy cost shocks and gas savings of up to 14 percent could be achieved by end of 2025.

Heating and cooling of buildings is responsible for 48 percent of Europe's final energy consumption, 36 percent of greenhouse gas emissions and 35 percent of gas consumption in the EU.[1] The thermal retrofitting of buildings can reduce this energy demand and thus both reduce fossil fuel imports and create the conditions for the remaining energy demand to be met with renewable energy sources.

Ad hoc measures insufficient to accelerate energy refurbishments

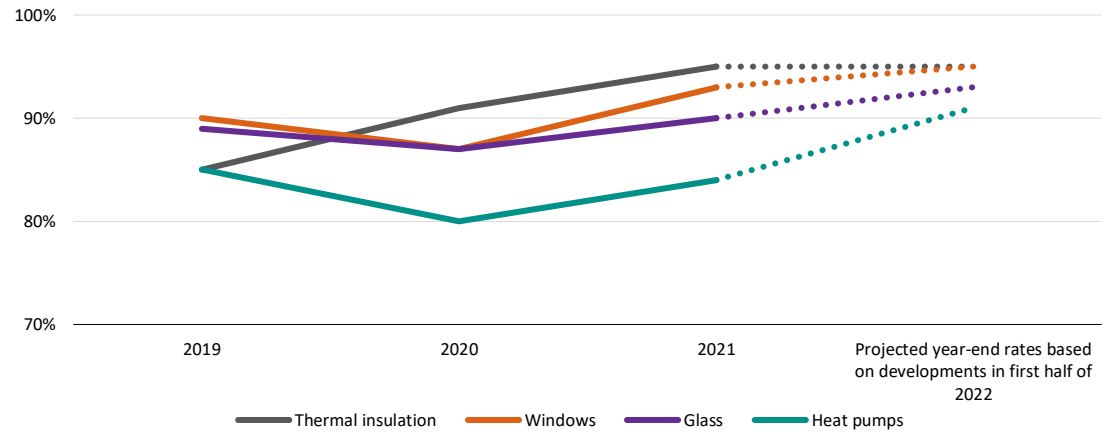
A survey of German manufacturers of thermal insulation materials, windows and heat pumps shows that capacity utilization is consistently high between 88 percent in 2019 and 94 percent in the first half of 2022 (Figure 1). An increase in energetic retrofits therefore requires investments into additional production capacities for building materials and in the construction sector.

[1] See Website von Eurostat zu den Anteilen erneuerbarer Energien (accessed on 03.03.2023); Climact (2023): Opportunities to get EU industry off natural gas quickly (available online, retrieved on 03.03.2023).

Figure 1

Utilization rates of production capacities for inputs for thermal modernization

In percentage



Note: Projected values for 2022 dashed.

Source: Survey data from Heinze GmbH.

However, these investments have been limited so far—despite the continued high utilization of production capacities for building materials triggered by attractive subsidy programs until summer 2022. One important explanation for this is likely to be the continuing uncertainty about government funding for these programs. Just last summer, the German Federal Ministry of Economics and Technology sharply reduced the level of subsidies for thermal retrofitting.[2] In response to this, the proportion of German thermal insulation and window manufacturers aiming to expand capacity fell significantly: in March 2022, 34 percent of the companies surveyed considered an expansion to be necessary whereas in September 2022, this figure was only 12 percent, companies are waiting for further developments.[3]

Public attention and political support for heat pumps over the past year, on the other hand, has led many companies to consider additional investment into their manufacturing. Some companies even announced a tripling of their capacities by 2025.[4] Companies could also use a similar boost to unlock investment in additional capacity for energy-efficient building retrofits.

Industry and construction need a clear framework and targets

Thermal retrofitting rates in western Germany grew to 1 percent of the building stock between 1990 and 2010—but have since stagnated at this level throughout Germany. In contrast, in East Germany, after the reunification it was possible as early as 1995 to retrofit 4 percent of the building stock annually

[2] The subsidy rates for comprehensive measures on the building envelope were sharply reduced in summer 2022 for both individual measures and full retrofitting for building efficiency classes. For Efficiency House (EH) 85 from 30 to 5 percent, for AH 70 from 35 to 10 percent, for EH 55 from 40 to 15 percent and for EH 40 from 45 to 20 percent. It is true that KfW loans for comprehensive building retrofitting now offer attractive interest rate reductions compared with rising loan interest rates. However, these only conserve the status quo of favorable interest rates until last summer and thus do not compensate for the reduced subsidy rates or the increased construction costs. Cf. press release of the Federal Ministry of Economics and Climate Protection (BMWK) of July 26, 2022: Bundeswirtschaftsministerium legt Reform der Gebäudeförderung vor – Fokus auf Sanierung und Vereinfachung der Antragsstellung durch klare Zuständigkeiten (available online, retrieved on March 8, 2023). Bundesamt für Wirtschaft und Ausfuhrkontrolle (2022): BEG: Neuerungen ab March 15, 2022 (available online, retrieved on March 10, 2023).

[3] Heinze GmbH Market Research (2023). HEINZE Baukonjunktur-Klima Bau, Einrichtung, Ausstattung.

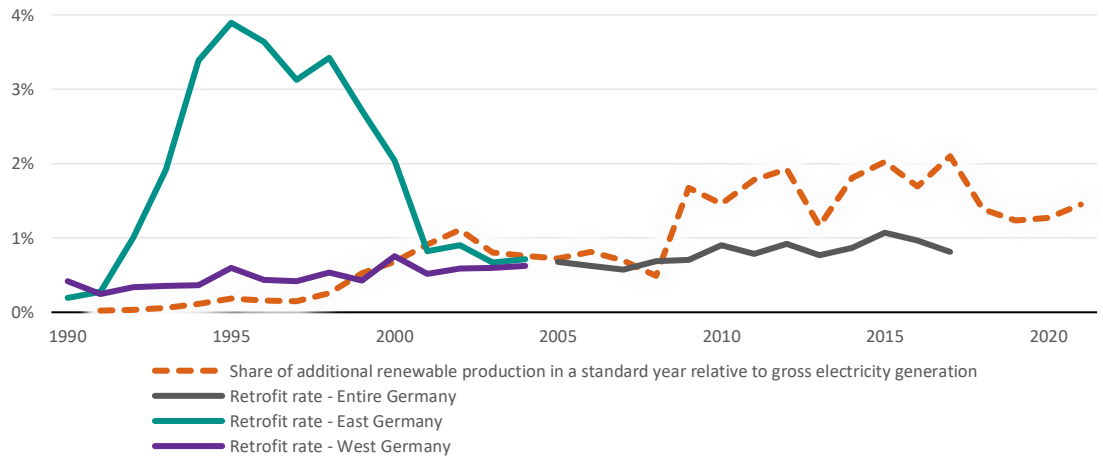
[4] Antonia Mannweiler (2022): Wer stellt die Wärmepumpen her? Tagesschau vom 12. August (available online, retrieved on March 7, 2023); BauLinks (2022): Daikin erweitert die Produktionskapazität für Wärmepumpen in Deutschland (available online, retrieved on March 7, 2023); Handelsblatt (2022): Habeck will Wärmepumpen-Besitzer finanziell entlasten (available online, retrieved on March 7, 2023); BauBlatt (2022): Hoval baut Wärmepumpen-Produktion aus (available online, retrieved on March 7, 2023).

in terms of energy and generally also comprehensively, but the rate has then fallen back below one percent since 2001 (Figure 2).

Figure 2

Share of additional electricity generation from renewables and thermal retrofitting rates in Germany

In percentage per year



Source: Own calculation[5] based on a standard year as the average of the factor capacity of wind and solar energy between 2018 and 2020 and data from ista Germany

The expansion of wind and solar energy relative to total electricity consumption grew gradually to one percent by 2008. In 2007, EU leaders committed to increasing the share of renewable energy to 20 percent of energy consumption by 2020, and in 2008, the corresponding EU Renewables Directive was adopted including national targets and pathways. On this basis, the necessary planning and permitting procedures, grid access rules, and support or remuneration mechanisms for the first wave of wind and solar investments were implemented. Subsequently, the deployment rate increased to 2 percent, and the 2020 target was met.

In the buildings sector, the aim now is to reduce emissions across Europe by 60 percent by 2030 compared with 1990 levels.[6] By 2050, the EU is to be climate-neutral; Germany by 2045.[7] These emission reductions cannot be achieved by replacing fossil-fuel heating with heat pumps alone, as there is not sufficient renewable energy capacity in the short term. In the longer term, the EU has limited land available for wind and solar energy to meet the energy needs of the overall economy. Therefore, it is essential to also achieve energy savings. This will require a higher rate of retrofits. Retrofitting all existing buildings within the next 25 years would require a gradual increase in the retrofit rate to 4 percent per year. In member states with a high proportion of well-insulated existing buildings, the rate may be lower. In turn, the rate would need to be higher if gas and energy savings are a priority or climate neutrality is to be achieved before 2050.

This raises the question of what is needed for manufacturers of building materials and construction companies to invest in additional capacity to carry out the necessary retrofits. Experience with renewable energies shows: Clearly defined and mandatory national targets as basis for effective

[5] Additional RE capacity (in MW) × 24 (hours) × 365 (days) × capacity factor = Additional production in a standard year (in MWh) divided by gross electricity production, this is the relative additional production. For calculations of thermal retrofit rate see DIW Thermal retrofit rate as in Zu Berechnungen der energetischen Sanierungsrate siehe DIW Weekly report 36/2019 (link)

[6] European Energy Agency (EEA) (2022): Greenhouse gas emissions from energy use in buildings in Europe (available online, retrieved March 2, 2023).

[7] European Parliament press release, February 9, 2023: Energy performance of buildings: climate neutrality by 2050 (available online, retrieved on March 2, 2023).

implementation for policy instruments are a crucial success factor.[8] Accordingly, at the European and national level, a target for the thermal retrofitting rate should be agreed in the political discourse[9], with progress reported annually as part of the EU 2030 governance and national climate protection laws. This way, specific and thus market-relevant regulation, professional development, advisory and support programs can be geared towards achieving this target. In a recent survey, ¾ of German companies manufacturing building materials identified clear political framework conditions as a prerequisite for investments in capacity expansion.[10]

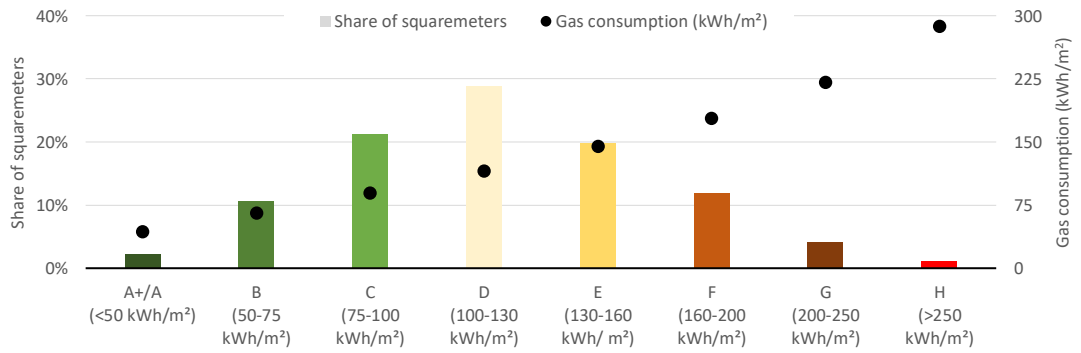
Minimum energy standards reduce energy costs for low-income households

The efficiency of the building stock varies greatly. Some uninsulated buildings require more than 300 kilowatt hours (kWh) of energy per year and square meter of living space (energy efficiency class H), while in modern buildings less than 50 kWh per year and square meter of living space is sufficient (energy efficiency class A).[11]

Figure 3

Average square meterage and average energy consumption in German residential buildings by energy efficiency class for gas-heated buildings

Shares in percent (left axis); gas consumption in kilowatt hours per square meter (right axis)



Source: ista Germany; own calculations.

These large discrepancies have become very apparent in the current energy crisis—as energy price increases have had a far greater impact on households living in buildings that require up to ten times more energy per square meter than the most efficient buildings. The effect was amplified by the fact that low-income households disproportionately live in the most inefficient buildings. [12]

For this reason, priority should be given to the energetic retrofitting of the worst-insulated buildings. In this way, the households most affected could be protected from high energy costs and energy cost shocks. As recommended by the German Expert Commission on Gas and Heat, "state support should be designed in such a way that landlords can implement an almost rent-neutral retrofitting" (own translation from German) and the modernization levy should be adjusted accordingly.[13]

[8] See, for example, the analysis of successes in different sectors in Heiner von Lüpke and Karsten Neuhoff (2019): Ausgestaltung des deutschen Klimaschutzgesetzes: Grundlage für eine bessere Governance-Struktur. DIW Weekly Report No. 5 (available online).
[9] Consideration must be given, for example, to how to evaluate buildings that have been partially retrofitted.
[10] Heinze GmbH Market Research (2022): Herstellerbefragung zur Entwicklung von Produktionskapazität in Fokusbranchen, commissioned by the German Corporate Initiative on Energy Efficiency e.V. (DENEFF).
[11] The average energy consumptions of the respective energy efficiency classes are as follows: A+/A (<50 kWh/m2), B (50–75 kWh/m2), C (75–100 kWh/m2), D (100–130 kWh/m2), E (130–160 kWh/ m2), F (160–200 kWh/m2), G (200–250 kWh/m2), and H (>250 kWh/m2).
[12] Maximilian Longmuir et al. (2022): The Cost of Natural Gas dependency: Price Shocks, Inequality, and Public Policy. DIW Discussion Paper Nr. 2010 (available online).
[13] BMWK (2022): ExpertInnen-Kommission Gas und Wärme, Sicher durch den Winter, Abschlussbericht (available online, retrieved on March 10, 2023).

This prioritization can also ensure that not only high CO_2 savings are achieved quickly, but also that a lot of gas is saved in the years to come.[14] This saves money by reducing the need to sign long-term LNG import contracts and invest in gas production and LNG infrastructure. For example, if the historic retrofitting rate of just under one percent were gradually increased to two percent this year, three percent in 2024 and four percent in 2025, and these upgrades were initially targeted at the most inefficient buildings, about 14.4 percent of gas demand in the building sector could be saved by the end of 2025.[15]

The European Commission has proposed a minimum energy performance standard for buildings (MEPS), which is currently discussed in the EU Parliament and Council. The EU Commission's proposal would apply to buildings in the two lowest of seven new EU efficiency categories and allow owners until 2033 to perform a thermal retrofit. The EU Parliament wants to include the three lowest categories. In both cases, various exemptions are included, so that only about half of the targeted buildings are covered. According to this estimate, the EU Commission's proposal would mean that around 15 percent of the building stock would be retrofitted by 2033, while the EU Parliament's proposals would mean approx. 25 percent.[16] This would require an annual retrofitting rate of 1.5 percent and 2.5 percent, respectively, which remains well below the required rate of about four percent.

It is conceivable that building owners will only meet the minimum requirements to the extent that they merely improve the building sufficient to leave the worst performance classes. This runs the risk of requiring two energetic retrofits on the way to climate neutrality, and would thus result in additional costs. Therefore, it is important to ensure that public support for building efficiency improvements is only granted to measures that in sum result in a comprehensive energetic retrofit.

Conclusion: Binding refurbishment target and minimum standards for inefficient buildings

To save gas and costs in the short term and facilitate the transition to a climate-neutral building sector, a combination of thermal retrofitting and a switch to non-fossil energy sources is needed. A gradual increase in the retrofitting rate would address both objectives. This increase must be credible to both the manufacturing industry, which produces inputs such as insulation material or glass, and the construction industry, which trains and hires people to deliver the thermal retrofit. Ad hoc measures without such credibility will not release the investments and therefore will not lead to the desired retrofitting rate.

Two policy measures in particular can work together to contribute to the necessary investment framework. First, a clear political commitment to a mandatory retrofitting target. This would have to be anchored in the EU 2030 governance and in the national climate protection law. Based on a binding rate, public training, advisory and support programs can be aligned with this target. The second measure are minimum energy efficiency standards (MEPS) for buildings: prioritizing the retrofitting of the most inefficient residential buildings could sustainably protect low-income households in particular from energy cost shocks while achieving the highest gas and CO_2 savings. Both measures together create a robust perspective to trigger the necessary investments in additional capacity in the building materials and construction sector.

Sophie M. Behr ist wissenschaftliche Mitarbeiterin der Abteilung Klimapolitik im DIW Berlin | sbehr@diw.de

Merve Kucuk ist wissenschaftliche Mitarbeiterin der Abteilung Klimapolitik im DIW Berlin | mkucuk@diw.de

Karsten Neuhoff ist Leiter der Abteilung Klimapolitik im DIW Berlin | kneuhoff@diw.de

[14] Altermatt, Pietro P., Jens Clausen, Heiko Brendel, Christian Breyer, Christoph Gerhards, Claudia Kemfert, Urban Weber, and Matthew Wright. "Replacing gas boilers with heat pumps is the fastest way to cut German gas consumption." Communications Earth & Environment 4, no. 1 (2023): 56.

[15] It is assumed that the retrofit starts with the most inefficient buildings in energy efficiency classes H, G and F and that the retrofitted buildings fall into efficiency class B with a gas consumption of 70 kWh/m2. Own calculation based on data from ista Germany.

[16] Press release of the European Parliament from February 9, 2023, a.a.O.; Royal Institute of Chartered Surveyors (RICS) (2020): Energy efficiency of the building stock in EU (available online, retrieved on March 8, 2023).

Imprint

DIW Berlin—German Institute
for economic research
Mohrenstrasse 58, 10117 Berlin

Phone +49 (30) 897 89-0
Fax +49 (30) 897 89-200
http://www.diw.de
Editorial:
Press Office of DIW Berlin
Press contact:
Petra Jasper
Tel.: +49 (30) 89789-152
Mail: presse@diw.de

ISSN: 2567-3971