

JANUARY 2023

## EXECUTIVE SUMMARY

# HOW TO STAY WARM AND SAVE ENERGY

# INSULATION OPPORTUNITIES IN EUROPEAN HOMES

Since Russia's aggression against Ukraine in early 2022, the question of the EU's energy security and dependency from fuels import has been on the front of political and social debates. Paired with sky-rocketing energy prices and inflation, no one is immune to the economic and social changes made evident by this crisis.

As a result, the EU debate shifted towards secure and affordable energy supply, sometimes even at the cost of reduced or slowed down climate action. A prosperous EU will require reduced use of fossil fuels and a diversified energy supply where increased renewable energy supply is matched by reduced demand.

When considering different alternatives, it is important to set a clear list of priorities since these may have long-term effects on the planned outcomes. Although diversified energy supply may be a (relatively) fast solution, reduced energy demand should be prioritised for at least two reasons: it contributes to securing energy independence and supports EU climate targets of reducing overall GHG emissions by 55% by 2030 and achieving climate neutrality by 2050.

The challenge is two-fold: reduce the EU's dependence on fossil fuels in the short-term, and boost renovation activities to deliver the Renovation Wave and deliver a 60% reduction of GHG emissions in the buildings sector by 2030.

As part of the EU's vital infrastructure, and one of the sectors vulnerable to gas supply disruptions, buildings are a critical part of the solution. Reducing energy demand in residential buildings should be one of the priorities when planning for improvements in EU energy security: energy consumption in EU household is 21% of EU energy imports and space heating in residential buildings requires 17.3% of final energy consumed in EU<sup>1</sup>.

The purpose of this report is to show how improving energy performance of residential building envelopes in the EU contributes to EU energy security by reducing oil and gas imports for residential heating, and climate targets.

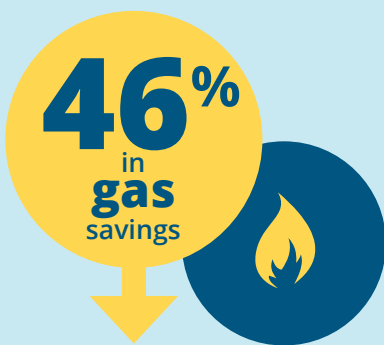
**IF ALL EXISTING  
RESIDENTIAL  
BUILDINGS IN  
THE EU WERE  
RENOVATED**



**44%**

Of final energy used for residential space heating in 2020, or 777 TWh, **COULD BE SAVED**

**INVESTING IN BUILDING RENOVATION CAN CONSIDERABLY REDUCE THE USE OF FOSSIL FUELS FOR HEATING IN BUILDINGS, POTENTIALLY REACHING**

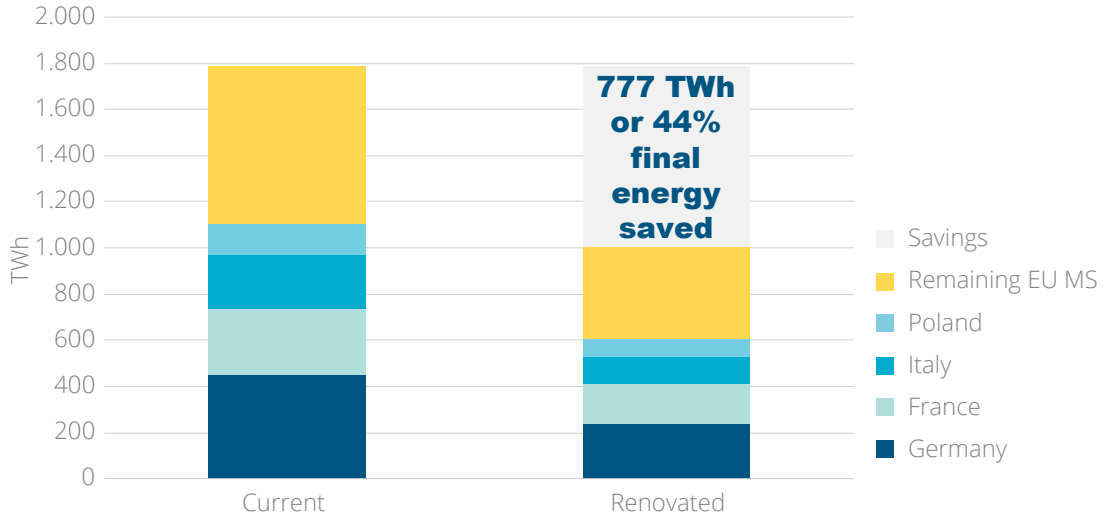


**AND CAN THEREFORE CONTRIBUTE TO ADDRESSING EUROPE'S CLIMATE AMBITIONS AND ENERGY SECURITY CONCERNS**

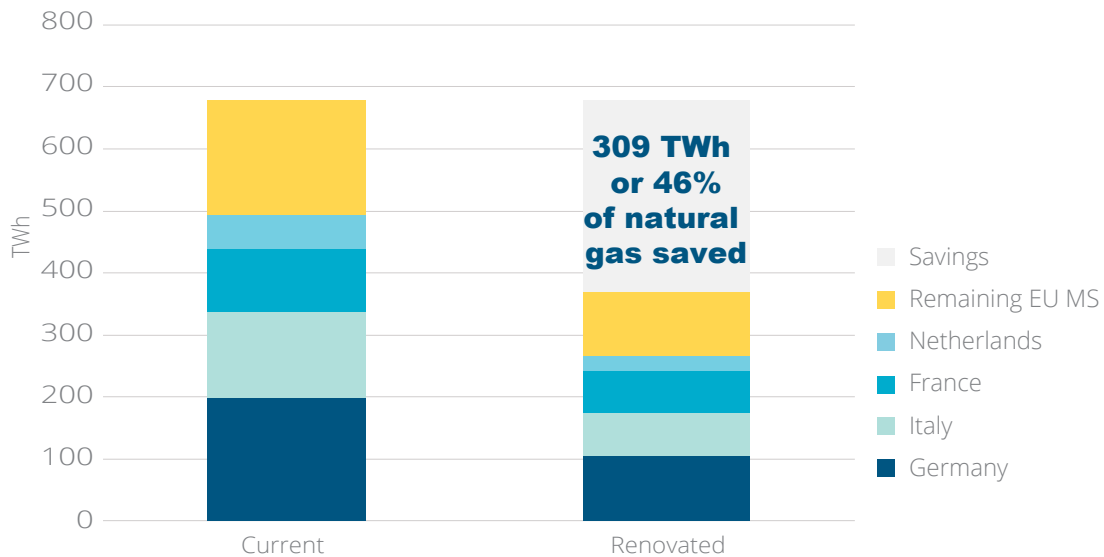
<sup>1</sup> EU 27 Energy balance, Eurostat

## POTENTIAL SAVINGS IN RESIDENTIAL SPACE HEATING

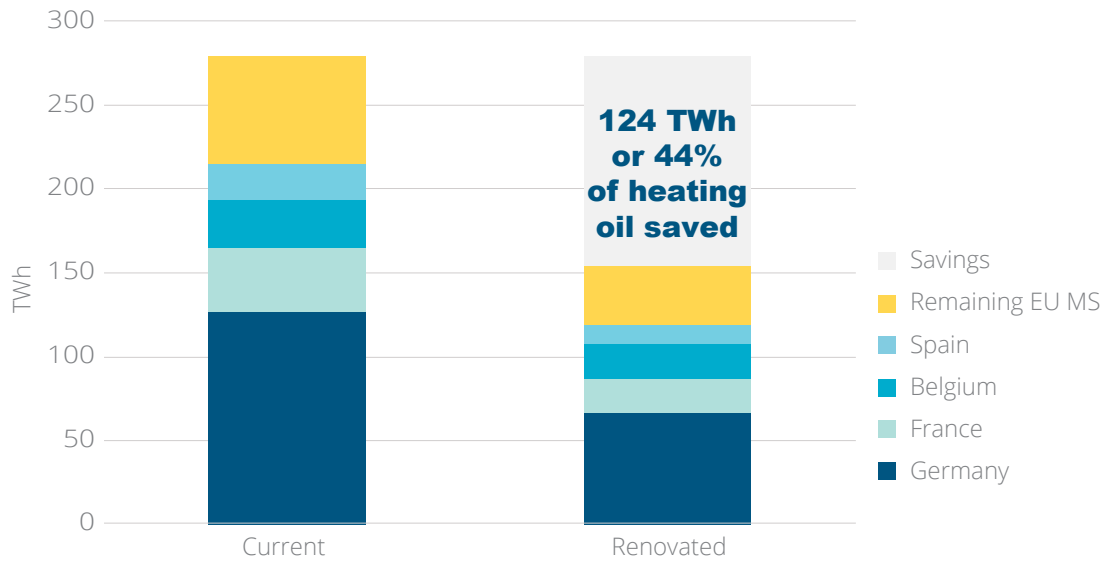
**Figure 1:** Final energy consumption for residential space heating in current and renovated buildings (in TWh) and final energy saved in EU 27



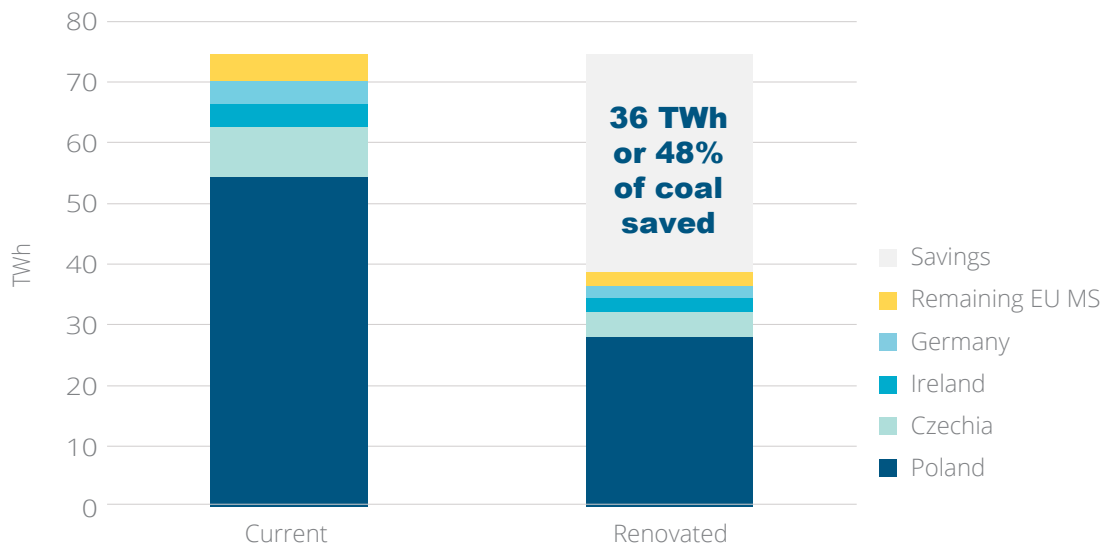
**Figure 2:** Final gas consumption for residential space heating in current and renovated buildings (in TWh) and gas saved in EU 27



**Figure 3:** Final heating oil consumption for residential space heating in current and renovated buildings (in TWh) and heating oil saved in EU 27



**Figure 4:** Final coal consumption for residential space heating in current and renovated buildings (in TWh) and coal saved in EU 27



## ENERGY SAVINGS PROJECTIONS BASED ON PRE-DEFINED LEVELS OF RENOVATION

Two renovation scenarios were developed to project energy savings to predefined levels of renovation by 2050 and are summarised below. The starting point for defining renovation scenarios is the current renovation rate, commonly assumed to be at the level of 0.9 – 1.0%<sup>2</sup>. It is further foreseen that the renovation rate in both scenarios will linearly grow until doubled in 2030, which would fulfil the EU renovation targets set in the EU Renovation Wave<sup>3</sup>. The difference between the two scenarios is visible in the renovation rates assumed for after 2030.

To reflect on the existing EU targets, the **Full Renovation scenario** assumes that after 2030 the renovation rate will continue to grow at the speed needed to renovate all existing residential buildings before 2050 (resulting in rates going up to 4% in 2045).

The **2% Renovation scenario** covers the possibility that after 2030 the renovation rate will stabilise at 2% and assumes a constant renovation rate from 2030 onwards. We assume that no building is renovated twice.

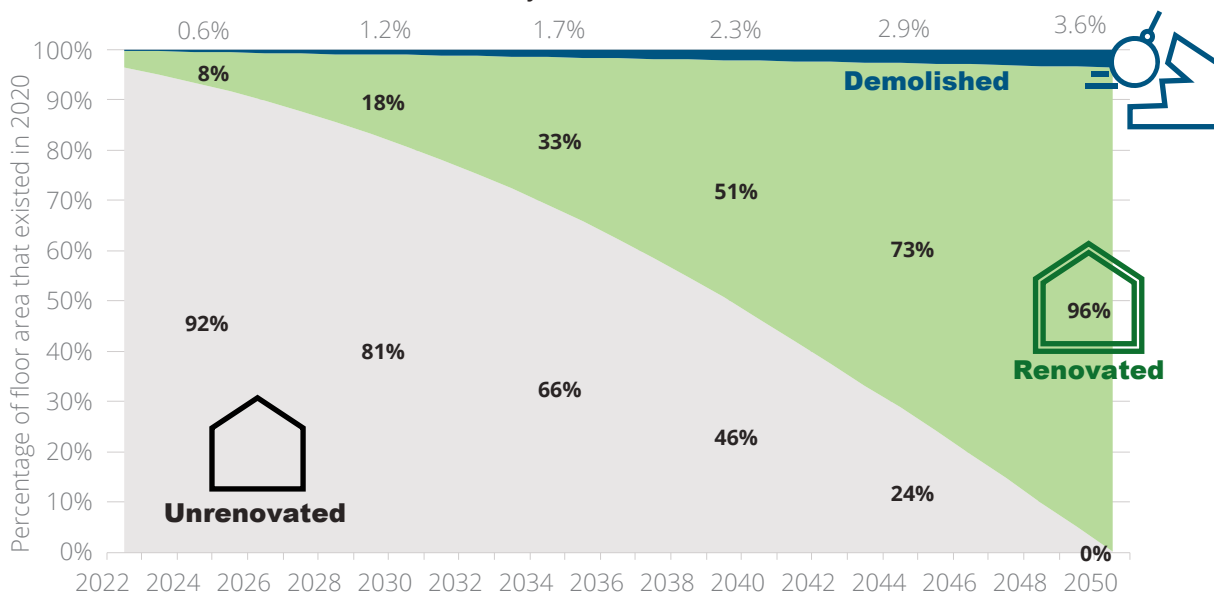
**Table 1:** Renovation scenarios

| Scenarios              | Current renovation rate | Renovation rate in 2030 | Renovation rate in 2050                                     |
|------------------------|-------------------------|-------------------------|---|
| <b>Full Renovation</b> | 1%                      | 2%                      | Up to 4%, reaching 100% of renovated building stock by 2050 |
| <b>2% Renovation</b>   |                         |                         | 2%  |

Under the suggested renovation rates for the **Full Renovation scenario** and the **2% Renovation scenario**<sup>4</sup>, it is estimated that respectively **96%** and **66%** of the total estimated energy savings potential can be realised by 2050.

In the **Full Renovation scenario**, the renovation activity will have affected 18% of the floor area by 2030, 51% of the floor area by 2040, and 96% by 2050.

**Figure 5:** Projection of renovation and demolition activity of buildings existing in 2020 until 2050 in the Full Renovation scenario (all stock renovated by 2050)

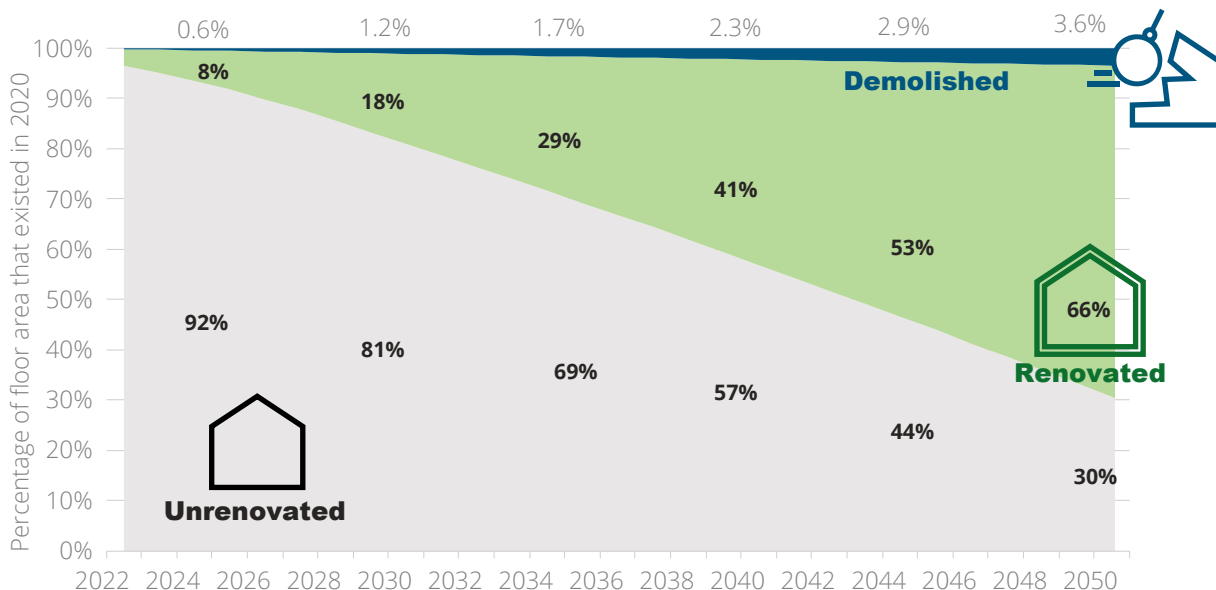


<sup>2</sup> As noted by [4] p.58, [6] p.103, [7] p.62[2]

<sup>3</sup> A Renovation Wave for Europe – Greening our buildings, creating jobs, improving lives (European Commission, 2020)

<sup>4</sup> Linear increase of the renovation rate to 2% in 2030 and then remaining constant.

**Figure 6:** Projection of renovation and demolition activity of buildings existing in 2020 until 2050 in the 2% Renovation scenario (2% renovation rate from 2030 onwards)

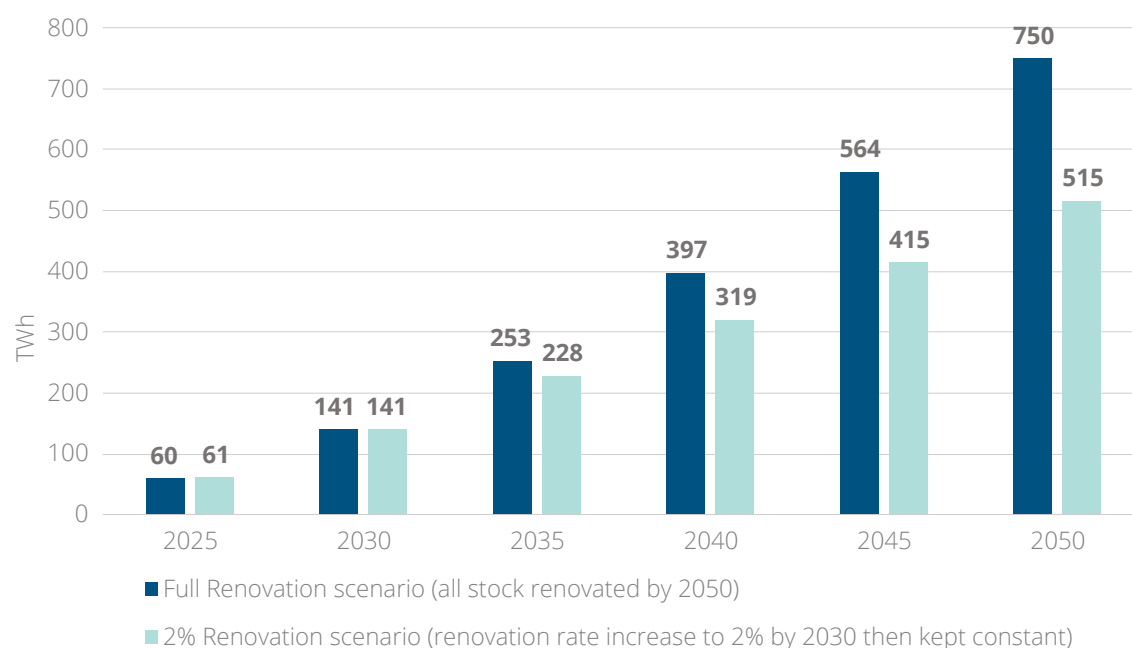


## ENERGY SAVINGS PROJECTIONS AT EU LEVEL

Based on the development of the building stock defined under our two scenarios, cumulative energy savings are projected until 2050. In both scenarios, by 2030 EU residential buildings can save 141 TWh in residential space heating and more than twice that amount by 2040, i.e., 397 TWh and 319 TWh respectively. It is worth noting that a doubling of savings for space heating is possible before 2030. In the decade between 2040 and 2050, the savings could grow by about 90% in the Full Renovation scenario to reach 750 TWh, and by about 60% in the 2% Renovation rate scenario (515 TWh).



**Figure 7:** Final energy savings realized in space heating in residential buildings by 2050



## ENERGY SAVINGS PROJECTIONS BY COUNTRY

By renovating only roofs and walls to the target U-values<sup>5</sup>, about 60% of EU countries can save between 8% and 11% of final energy used for residential space heating by 2030, compared to 2020 values (Table 2). By 2050, under the Full Renovation Scenario, seven countries (NL, RO, HU, BG, LU, CY, MT) can save at least 50% of their final energy consumption with these measures, and 16 countries can achieve savings of more than 40%.



**Table 2:** Cumulative absolute and relative savings in final energy for residential space heating in EU 27, compared to 2020 values

| Country            | Absolute savings (TWh)                            |            |                          |            |                             |            | Relative savings                                  |           |                          |            |                        |            |
|--------------------|---|------------|--------------------------|------------|-----------------------------|------------|---|-----------|--------------------------|------------|------------------------|------------|
|                    | Full Renovation Scenario / 2% Renovation Scenario |            | Full Renovation Scenario |            | 2% Renovation rate scenario |            | Full Renovation Scenario / 2% Renovation Scenario |           | Full Renovation Scenario |            | 2% Renovation Scenario |            |
|                    | 2025  | 2030       | 2040                     | 2050       | 2040                        | 2050       | 2025  | 2030      | 2040                     | 2050       | 2040                   | 2050       |
| <b>Germany</b>     | 16  | 39         | 109                      | 207        | 88                          | 142        | 4%  | 9%        | 24%                      | 46%        | 19%                    | 31%        |
| <b>Italy</b>       | 9   | 21         | 59                       | 111        | 47                          | 76         | 4%  | 9%        | 25%                      | 47%        | 20%                    | 33%        |
| <b>France</b>      | 9   | 20         | 57                       | 109        | 46                          | 75         | 3%  | 7%        | 20%                      | 38%        | 16%                    | 26%        |
| <b>Poland</b>      | 4.0   | 10         | 27                       | 51         | 22                          | 35         | 3%  | 7%        | 20%                      | 37%        | 16%                    | 26%        |
| <b>Netherlands</b> | 2.9   | 6.8        | 19                       | 36         | 15                          | 25         | 4%  | 10%       | 29%                      | 55%        | 23%                    | 38%        |
| <b>Spain</b>       | 2.6   | 6.0        | 17                       | 32         | 14                          | 22         | 4%  | 9%        | 25%                      | 47%        | 20%                    | 32%        |
| <b>Romania</b>     | 2.5   | 5.9        | 17                       | 31         | 13                          | 22         | 4%  | 10%       | 29%                      | 54%        | 23%                    | 37%        |
| <b>Czechia</b>     | 2.2   | 5.1        | 14                       | 27         | 12                          | 19         | 4%  | 9%        | 25%                      | 47%        | 20%                    | 32%        |
| <b>Austria</b>     | 2.1   | 5.0        | 14                       | 27         | 11                          | 18         | 4%  | 9%        | 26%                      | 49%        | 21%                    | 34%        |
| <b>Hungary</b>     | 1.4   | 3.3        | 9                        | 17         | 7                           | 12         | 4%  | 9%        | 26%                      | 50%        | 21%                    | 34%        |
| <b>Belgium</b>     | 1.2   | 2.9        | 8                        | 16         | 7                           | 11         | 2%  | 4%        | 12%                      | 23%        | 10%                    | 16%        |
| <b>Greece</b>      | 1.01  | 2.4        | 7                        | 13         | 5                           | 9          | 4%  | 8%        | 24%                      | 45%        | 19%                    | 31%        |
| <b>Slovakia</b>    | 0.88  | 2.1        | 6                        | 11         | 5                           | 8          | 4%  | 9%        | 25%                      | 47%        | 20%                    | 32%        |
| <b>Ireland</b>     | 0.67  | 1.6        | 4                        | 8          | 4                           | 6          | 3%  | 7%        | 20%                      | 38%        | 16%                    | 26%        |
| <b>Bulgaria</b>    | 0.65  | 1.5        | 4                        | 8          | 3                           | 6          | 4%  | 10%       | 29%                      | 54%        | 23%                    | 37%        |
| <b>Finland</b>     | 0.61  | 1.4        | 4                        | 8          | 3                           | 5          | 2%  | 4%        | 10%                      | 19%        | 8%                     | 13%        |
| <b>Croatia</b>     | 0.57  | 1.3        | 4                        | 7          | 3                           | 5          | 3%  | 7%        | 21%                      | 39%        | 17%                    | 27%        |
| <b>Sweden</b>      | 0.55  | 1.3        | 4                        | 7          | 3                           | 5          | 1%  | 3%        | 8%                       | 15%        | 6%                     | 10%        |
| <b>Denmark</b>     | 0.48  | 1.13       | 3                        | 6          | 3                           | 4          | 2%  | 4%        | 11%                      | 20%        | 9%                     | 14%        |
| <b>Portugal</b>    | 0.40  | 0.95       | 3                        | 5          | 2                           | 3          | 4%  | 9%        | 25%                      | 47%        | 20%                    | 32%        |
| <b>Lithuania</b>   | 0.26  | 0.62       | 2                        | 3          | 1                           | 2          | 2%  | 5%        | 15%                      | 29%        | 12%                    | 20%        |
| <b>Slovenia</b>    | 0.26  | 0.62       | 2                        | 3          | 1                           | 2          | 3%  | 8%        | 23%                      | 43%        | 18%                    | 29%        |
| <b>Luxembourg</b>  | 0.22  | 0.51       | 1                        | 3          | 1                           | 2          | 5%  | 11%       | 31%                      | 58%        | 25%                    | 40%        |
| <b>Estonia</b>     | 0.18  | 0.43       | 1                        | 2          | 1                           | 2          | 2%  | 5%        | 15%                      | 29%        | 12%                    | 20%        |
| <b>Latvia</b>      | 0.12  | 0.29       | 1                        | 2          | 1                           | 1          | 1%  | 4%        | 10%                      | 19%        | 8%                     | 13%        |
| <b>Cyprus</b>      | 0.07  | 0.16       | 0                        | 1          | 0                           | 1          | 4%  | 10%       | 28%                      | 52%        | 22%                    | 36%        |
| <b>Malta</b>       | 0.01  | 0.02       | 0                        | 0          | 0                           | 0          | 4%  | 10%       | 27%                      | 51%        | 22%                    | 35%        |
| <b>Total</b>       | <b>60</b>   | <b>141</b> | <b>397</b>               | <b>750</b> | <b>319</b>                  | <b>515</b> | <b>3%</b>   | <b>8%</b> | <b>22%</b>               | <b>42%</b> | <b>18%</b>             | <b>29%</b> |

<sup>5</sup> Excluding renovations that save less than 20% final energy consumption per building.

## POLICY RECOMMENDATIONS

Since the beginning of the war in Ukraine, the EU's attempts to show leadership in addressing climate change and guide the clean energy transition have been increasingly challenged. Torn between the need to meet the short-term challenges brought by the energy crisis and to continue the transition towards climate neutrality, the EU and its Member States are called to make bold choices to secure a prosperous future. This study shows that buildings are critical to reducing energy dependence from fossil fuels and must be treated as vital infrastructure enabling higher energy security and climate neutrality.

The challenge is two-fold: reduce the EU's dependence on fossil fuels in the short-term, and boost renovation activities to deliver the Renovation Wave. The EU must deliver a 60% reduction of GHG emissions in the buildings sector by 2030, thereby contributing to its 2030 climate target of reducing overall GHG emissions by 55%, putting the EU on the path to achieve climate neutrality by 2050.

This research shows that increasing the energy performance of the building envelope in residential buildings contributes to both objectives and that there are some clear choices that must be made now to achieve energy and climate security.

To tap into the full energy savings and fossil fuel savings potential, renovation activity in the residential sector must accelerate and increase in the next decade:

- If the current average annual renovation rate of 1% is doubled by 2030 as stated in the Renovation Wave strategy, and the rate is stagnating at 2% until 2050, the full potential energy savings outlined in this study will not be tapped by 2050. In this scenario, 30% of buildings will be left unrenovated by mid-century and 235 TWh of potential final energy savings will be wasted. This waste is more than the savings potential for Germany alone, or the potential for Italy and France combined.
- To fully benefit from the savings potential (777 TWh) the entire building stock must be renovated by 2050, the renovation rate must be at least doubled by 2030, and further increases must occur to reach 3% by 2035 and almost 4% by 2040.

### What does this mean for the EU and its renovation strategy?

**EU building policies must align short-term actions with long-term needs and ambitions. Building renovation must be delivered at a high pace to reduce the energy consumption in the long-term and to enable a quick and successful phaseout of fossil fuels in residential buildings.**

The study shows that an approach aiming at doubling the renovation rate by 2030 would only result in the renovation of 18% of the residential building stock by 2030. Without an acceleration in renovation now, more than one third of the building stock will remain unrenovated in 2050. A bolder approach in the next ten years, one attempting to match the increasing rate and depth of renovation, with a push towards serial renovations, would better address the need to get rid of fossil fuel imports and rapidly reduce energy demand in buildings.

The recast of the Energy Performance of Buildings Directive (EPBD) could not be more timely. It is now imperative to set rules and incentives to drive the changes needed to achieve a highly efficient and decarbonised building sector by 2050.



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# Recommendations

for the recast and implementation of the EPBD



The EPBD should introduce a definition of “deep renovation” and require that financial programmes and advisory services prioritise projects achieving deep renovation.

Minimum Energy Performance Standards (MEPS) should be effective and fair, in line with the following key principles:

**A differentiated design based on the ownership structure is preferable to a general approach.**

- MEPS should be designed with clear milestones and a long-term vision up to 2050. This will give clarity to building owners and will help the construction and renovation supply chain to organise itself and plan their resources accordingly, thereby boosting innovation and workforce training.
- They should be in line with the deep renovation ambition and the EU’s 2030 and 2050 climate neutrality targets. This means that even in a step-by-step approach, the “first step” should pull the building out of the category of the worst-performing, preferably in one-go.
- They should be easily communicable to citizens and foresee an effective compliance and penalty system to ensure credibility and delivery of results<sup>6</sup>.

- MEPS design should focus on individual buildings and meet the owners’ ability to invest. They should be embedded in a well-designed ecosystem of financial support and advisory services, where a strong and coherent enabling financial framework is in place to support citizens undertaking deep renovations.
- Funds currently used for emergency relief measures against high energy prices should be progressively phased out and redirected to support building renovation programmes, specifically targeting worst-performing buildings owned by low-income households.
- National financial support to building renovation should prioritise multi-annual, stable and predictable programmes. It should ensure proportionality between the amount of subsidy and the level of energy performance achieved, and further support renovations where a substantial amount of energy is saved either in one-go or in the first step of a staged deep renovation.
- Subsidy schemes for the installation of fossil fuel boilers should be stopped and funding should be redirected to support the rollout of renewable heating alternatives.

**MEPS should first focus on the worst performing buildings<sup>6</sup> across all segments in order to deliver high amounts of energy savings and show quick positive results contributing to energy security and the alleviation of energy poverty.**

<sup>6</sup> For more info see [EPBD recast: new provisions need sharpening to hit climate targets \(BPIE, 2022\)](#)

<sup>7</sup> The European Commission defines worst performing buildings as those in Energy Performance Certificate (EPC) classes G, where the G rating corresponds to the 15% worst performing buildings in each country (EPBD recast, art.16). The EPBD Rapporteur Ciaran Cuffe in its report considers worst performing buildings “buildings corresponding to energy performance classes E, F and G (AM51, Art 2§1 new)”, which covers a larger share of buildings in each country.



**Member States should not wait for a ban of fossil fuel boilers to be introduced by the EPBD and should stop fossil fuel subsidies immediately.**

**Support in the form of advisory services is also key:**



- Member States should use the EU Year of Skills in 2023 as an opportunity to launch initiatives in upskilling and training in the construction and renovation sector to boost deep and serial renovations before 2030 and help deliver the Renovation Wave.
- Member States should boost industrialised / serial-type renovations, targeting especially multi-apartment buildings and social housing<sup>8</sup>.
- Member States should put in place a network of public and private one-stop-shops to ensure reliable energy renovation advice is available throughout their territories, and roll out the deployment of Renovation Passports, in line with the upcoming EU scheme, to guide citizens in their renovation journey, outlining the right sequence of renovation measures to implement.

<sup>8</sup> More specific recommendations available here: [https://www.bpie.eu/wp-content/uploads/2022/07/BE\\_WLC\\_PolicyRecs\\_Final.pdf](https://www.bpie.eu/wp-content/uploads/2022/07/BE_WLC_PolicyRecs_Final.pdf)



**This analysis confirms that investing in better insulation can drastically reduce the use of fossil fuels for heating across all Member States and substantially contribute to securing the EU's energy needs and climate targets. Sustained energy savings will increase the EU's independence from fossil fuels.**

**To tap into the full energy and fossil fuel savings potential, renovation activity in the residential sector must accelerate and increase in this decade and continue until full renovation of the building stock is achieved by 2050.**



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