

# Warmer homes and lower bills – the impact of the Renovation Wave

22 October 2021

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*Soaring gas prices are highlighting the vulnerability of countries and households to market instability. One way to help insulate the most vulnerable from such instability is to reduce their demand for gas by improving the quality of their homes. An initiative such as the European Commission's Renovation Wave, which aims to renovate 35 million homes by 2030, has the potential to reduce gas demand across the EU by about 43,000 GWh annually. In doing so, dependence on gas imports could be reduced by €3.3bn per year, and household gas bills could be lowered by around €400 per year (a reduction in gas heating costs of around 50%). To achieve such benefits, policies should be designed in such a way that retrofitting schemes operate smoothly, and drive renovation at pace and at scale, in order to deliver homes that are fit for the future.*

Recent months have been characterised by great instability in international energy markets. In the weeks between 4 September 2021 and 16 October 2021, wholesale gas prices increased by 43%.<sup>1</sup> Analysts are attributing this instability to both demand and supply side effects. The easing of COVID-19 restrictions and the associated reopening of the economy, along with the approach of winter, have contributed to an increase in demand for gas and other energy sources. Meanwhile the supply of fuels has been constrained by supply-chain frictions, difficulties in ramping-up production, and geopolitical factors.

Such energy price instability, as the northern hemisphere moves into winter, can have significant and far-reaching consequences for markets, firms, consumers, the climate, and households. Soaring gas prices have prompted [government bonds sell-offs](#), while also threatening [energy firms which failed to hedge effectively](#). Businesses warn of the knock-on effects of energy prices increases on the [prices that consumers will pay for goods](#). The climate may suffer also, as increases in gas prices prompt a [switch back to coal](#). The most vulnerable in society may bear the brunt of gas price increases, with an estimated 80 million Europeans [struggling to stay warm](#) this winter. This last point is supported by Eurostat statistics that find that 96.5 million people across the EU are at risk of poverty or social exclusion.<sup>2</sup>

In this context, initiatives aimed at reducing dependence on gas are particularly impactful. One such initiative is the European Commission's Renovation Wave for Europe, which focusses on improving the energy efficiency of buildings. Buildings are a prime target for decarbonisation because they consume 40% of the EU's energy and emit 36% of the EU's

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<sup>1</sup> TTF gas price (2021) [Spot market data | Powernext](#)

<sup>2</sup> Eurostat (2021) - [Living conditions in Europe - poverty and social exclusion](#)

energy-related GHG emissions. Making homes more energy efficient will reduce gas consumption while lowering energy costs for consumers, improving quality of life, and enabling a just transition. The Renovation Wave's goal is to support the deep renovation of 35 million homes by 2030 such that the current energy renovation rate is at least doubled over that period.<sup>3</sup> With 75% of the EU's heating generated through the burning of fossil fuels, increases in the heat retention ability of European homes will decrease demand for gas, all else being equal.

The next section describes the objectives of the study and how it is aligned to the Renovation Wave goal. The modelling methodology is then discussed, with the findings and policy conclusions reported in the final two sections respectively.

## Objectives

This note explores the relationship between home renovations and gas demand. Specifically, it quantifies the reductions in gas demand for home heating that could be achieved by the energy efficiencies achieved through the Renovation Wave. The results are expressed in terms of:

- At EU27 level, and for Germany
  - The fall in gas demand
  - The effect on gas imports
  - The value of the reduction in imports
  - The GHG emissions reduction
- Household level
  - Gas bill savings
  - Percentage reduction in spending on gas heating

## Methodology

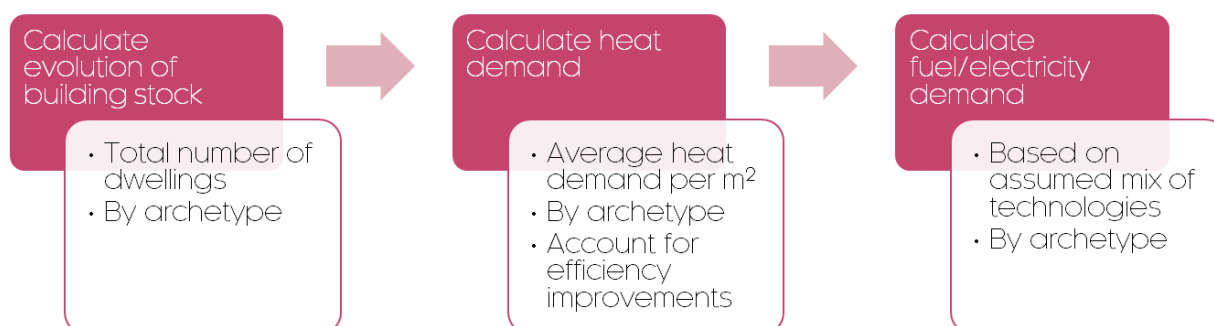
This analysis uses Cambridge Econometrics' building stock model to estimate the impact of home renovations on the gas demand for heating. The building stock is broken down into 21 different archetypes. These are different property types, with different levels of heat demand resulting from different sizes of property and energy efficiency.<sup>4</sup> The model consists of a three-stage process, as shown in Figure 1. First, it captures how the characteristics of the building stock evolve over time (i.e., terms of number of dwellings for each archetype). Second, the model estimates the heat demand for the given building stock, accounting for the efficiency improvements brought about by home renovations. Third, the model calculates the fuel demand for heating based on assumptions on the mix of heating technologies.

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<sup>3</sup> European Commission (2020) - [A Renovation Wave for Europe - greening our buildings, creating jobs, improving lives](#)

<sup>4</sup> The model is constructed using data from the Danish Energy Agency, PRIMES, and the H2020 Hotmaps Project.

Figure 1 Building stock model three-stage process



The model was applied to a baseline and two different scenarios:

- *Baseline*, which foresees the continuation of historical trends in renovation and accounts for a shift towards less carbon intensive heating sources, with the share of home-heating through electricity growing to 40% by 2030 – in line with the EU Strategy for Energy System Integration.
- *Medium renovations*, which foresees the renovation of 35 million buildings in Europe to reduce heat demand in each by 30%. Our analysis shows that this fails to achieve the Renovation Wave goal of doubling the weighted energy renovation rate in Europe.
- *Deep renovations*, which foresees the renovation of 35 million buildings in Europe to reduce heat demand in each by 60%. This is in line with the level of renovation required to meet the target of the Renovation Wave.

In both ‘treatment scenarios’ renovations are allocated across Member States based on population. Within each country, most renovations tend to occur to the oldest homes in most need of renovation, although some renovations occur across the entire age distribution.

Based on the results from the model, a further calculation is carried out to estimate the impacts of reduced heat demand on EU gas imports, CO<sub>2</sub> emissions and energy bill savings in each of the scenarios. To do this, three alternative sets of gas prices are considered, to account for the uncertainty that prevails around gas prices out to 2030:

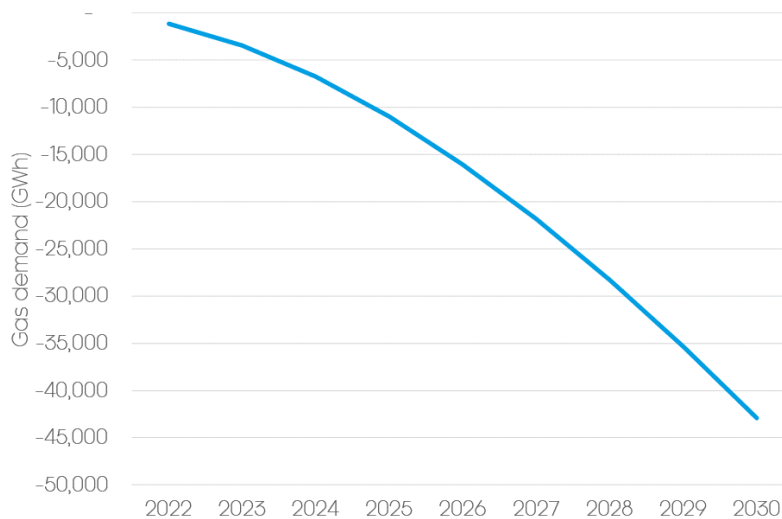
- 1) Gas prices from 2019 are assumed to continue through to 2030. For this purpose, gas prices were sourced from the [European Commission’s dashboard on energy prices](#).
- 2) Gas prices are assumed to follow the [International Energy Agency projections for the Stated Policy scenario](#).
- 3) Late 2021 gas prices are assumed to continue through to 2030. For this purpose, gas prices were sourced from the [European Energy Exchange](#).

## Findings

This section first considers the effect of home renovations on gas demand, gas imports, and GHG emissions at the country level. The household results are then reported, in terms of energy bills. All results reported within this section are based on the *deep renovations* scenario, as described above. Results for the *medium renovations* scenario are reported in the appendix.

Gas demand for heating is reduced by almost 43,000 GWh across the EU27 2030, as shown in Figure 2. The size of the reduction increases over time, as more and more homes are renovated. Over the entire period, the cumulative reduction in gas demand is almost 167,000 GWh.

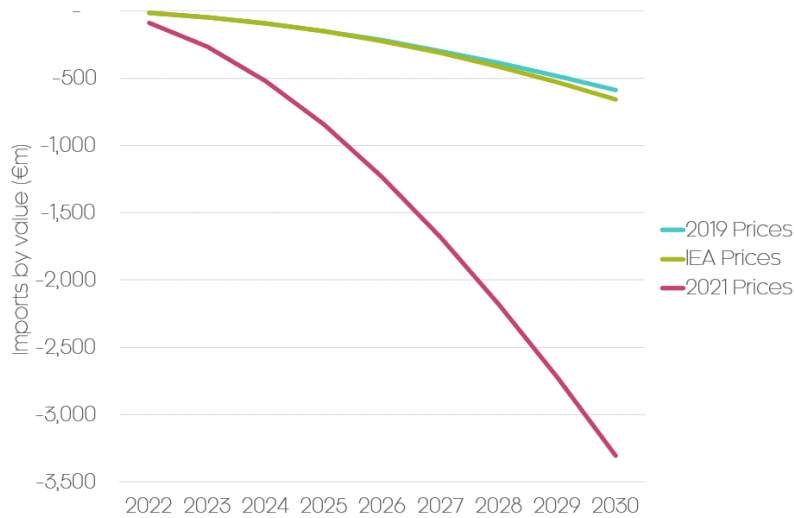
**Figure 2 Reduction in demand for gas for heating (EU27 total)**



With almost 90% of the EU's gas imported, this represents a significant reduction in the value of gas imports.<sup>5</sup> Using the three price trajectories described above, Figure 3 shows that savings on gas imports will greatly depend on the evolution of gas prices over the decade. Should 2021 gas prices persist, gas imports could be reduced by €3.3bn across the EU27 in 2030. Cumulatively, this represents a saving of €12.8bn on gas imports over the next nine years. Savings could be higher if countries move faster to scale up programmes for the deep renovations of their oldest and least efficient housing stock.

<sup>5</sup> Eurostat (2021) - [Energy import dependency by products](#)

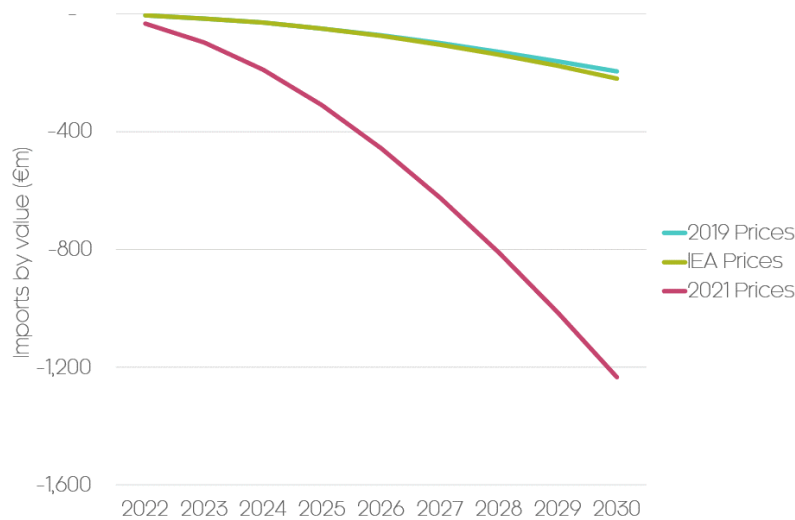
**Figure 3 Reduction in the value of EU27 gas imports under different price trajectories**



Similar results are observed across the Member States, but results vary depending on the underlying characteristics of the housing stock of each country. For example, countries where the oldest housing is dominated by gas-fired heating systems, and where lower average temperatures increase demand for heating, will experience greater savings. Germany has long, cold winters and the primary source of home heating is gas. The result is that Germany could save around €1.2bn on gas imports per year by 2030 (see Figure 4).

**Table 1 Gas demand and imports by volume and value in 2030**

Geography	Gas volume reduction (GWh)		Import value reduction (€m)		
	<i>Gas demand</i>	<i>of which imports</i>	<i>2019 price</i>	<i>IEA price</i>	<i>2021 price</i>
EU27	42,899	38,465	586	656	3,303
DE	14,359	14,359	196	219	1,233

**Figure 4 Reduction in the value of German gas imports under different price trajectories**

As discussed in the introduction, an important driver of the Renovation Wave initiative is to protect the vulnerable from energy poverty and increase their quality of life. Households with high demand for gas heating, such as in Germany, could save over €400 (see Table 2).<sup>6</sup>

**Table 2 Household energy bills and savings**

Geography	Average household energy bill (2019, €)	Average household spending on gas (2021 price, €) <sup>(1)</sup>	Gas bill reduction (€m)			Reduction in spending on gas for heating (%) <sup>(1)</sup>
			2019 price	IEA price	2021 price	
EU27	1,547	430	97	109	218	51
DE	1,715	889	163	182	412	46

Note(s): (1) Relates to the reduction in the portion of energy bills that typical gas-heated households spend on gas for heating only. Households may have other energy costs, as reflected in the average household energy bill information provided.

These results show that reducing heat demand by 60% across 35 million homes, in line with the Renovation Wave, and as per the deep renovations scenario, will bring about significant benefits across society and the economy. These benefits include:

- Reducing gas consumption from homes by up to 43,000 GWh across Europe annually. This is the equivalent to 25 of the world's largest LNG gas carriers saved each year.

<sup>6</sup> These numbers are conservative. The model assumes that only a share of the 35 million renovated buildings are heated with gas, yet the gas cost savings are shared out among *all* 35 million buildings.

The savings per household would be higher if the modelling factors in the cost savings from oil, coal or electric heating, or assumes that policymakers focus the 35 million renovations on gas-heated buildings.

- Reducing imports of gas into the EU by up to €3.3bn per year by 2030. This amounts to a reduction in imports equivalent to around €12.8bn cumulatively over the period to 2030. This figure would be higher if governments move faster to scale up their renovation programmes.
- Reducing household bills by around €400 per year in 2030 in renovated homes that are heated by gas (a reduction in gas heating costs of around 50%).<sup>7</sup> This represents a significant saving as the average household energy bill across the EU27 was estimated to be around €1,500 in 2019.<sup>8</sup>
- Significantly improved living standards for the approximately 80 million people living in the 35 million renovated buildings.<sup>9</sup>

To maximise the benefits that can be realised from retrofitting schemes such as the Renovation Wave, policies should be designed in such a way that renovation is driven at pace and at scale, delivering homes that are fit for the future.

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<sup>7</sup> This reduction does not account for the fixed components of gas bills.

<sup>8</sup> Author calculations based on Eurostat data on household energy consumption and number of households

<sup>9</sup> Author calculations based on [Eurostat data on household size](#) (average number of persons in per household across the EU27 is 2.3)

## Appendix

**Table 3 Gas demand and imports by volume and value in 2030 (medium renovations scenario)**

Geography	Gas volume reduction (GWh)		Import value reduction (€m)		
	<i>Gas demand</i>	<i>of which imports</i>	<i>2019 price</i>	<i>IEA price</i>	<i>2021 price</i>
EU27	21,823	19,567	298	334	1,680
DE	7,302	7,302	100	112	627

**Table 4 House energy bills and savings (medium renovations scenario)**

Geography	Average household energy bill (2019, €)	Gas bill reduction (€m)			Reduction in spending on gas for heating (%)
		<i>2019 price</i>	<i>IEA price</i>	<i>2021 price</i>	
EU27	1,547	50	56	111	26
DE	1,715	83	93	210	24