



Comprehensive study of building energy renovation activities and the uptake of nearly zero-energy buildings in the EU

Executive Summary – Key messages

Objective

The objective of this study is to deliver a comprehensive analysis of the **renovation activities and nearly zero-energy buildings (NZEB) uptake in the EU from 2012 to 2016**, applying indicators in line with the **Building Stock Observatory (BSO)**. The following main results are available for the EU and for each of the 28 Member States:

- Precise **definitions** in the context of energy renovation of buildings
- EU28 building stock **inventory** and new construction data
- **Renovation rates and investment costs**; split into energy renovation, non-energy renovation, residential and non-residential buildings, and renovation depths
- Related **primary energy savings**; split into residential and non-residential buildings, and different renovation depths
- **Avoided greenhouse gas emissions** through energy renovation; split into residential and non-residential buildings
- **Impact on employment** rate of overall building renovation
- Rates for the **uptake of NZEB**; split into new construction and renovation
- Information on **triggers, drivers, barriers and incentives**.

Methodology

Secondary data was obtained through extensive **desk research** and purchase of **market data** on some renovation measures. In order to obtain primary data on energy renovation activities and NZEB uptake in the EU28 Member States, three surveys were conducted, taking into account the perspectives of multiple stakeholders.

- The large-scale **online consumer survey** (30,118 respondents in the EU28, 18,302 energy renovators) targeted consumers that have performed (energy) renovations. The sample is composed of three main groups; owners, tenants and landlords. It provides information on residential buildings and respondents' drivers and barriers to perform energy renovation.
- The **online architect survey** (1,581 respondents in the EU28) focused on both residential and non-residential buildings. The data is also used to explore architects' and their clients' drivers and barriers to conduct energy renovation.
- The **main contractor and installer telephone survey** (2,009 respondents in the EU28) was tailored towards the supply side. This survey focused on residential and non-residential renovation projects and NZEB. It provides insight into the drivers and barriers for energy renovation of main contractors, installers and their clients.

Energy savings, renovation rates, and investment costs were derived based on a **detailed simulation** using inputs from secondary and primary data collection.

Results and conclusions

Renovation

The determination of renovation rates and depths requires a clear common understanding of what renovation "rate" and "depth" mean. To reduce uncertainty about definitions, this study proposes and applies **clear definitions for different renovation depths**, relating them to non-renewable primary energy savings achieved in a specific calendar year:

- **Below threshold** ($x < 3\%$ savings)
- **Light** renovations ($3\% \leq x \leq 30\%$ savings)
- **Medium** renovations ($30\% < x \leq 60\%$ savings)
- **Deep** renovations ($x > 60\%$ savings)

"One-off" deep renovation gets significant attention in discussions about a decarbonised building stock. Yet, with an estimated rate of only around 0.2% - 0.3% in terms of affected floor area, deep renovations **only occur sporadically in the EU28**.

In practice, **step-by-step renovations with little primary energy savings per step dominate the market**. "Below threshold", "light" and "medium" renovations are more prevalent than "deep" renovation (the lower the depth the higher the rate). This typically means that only a few measures are implemented.

The speed at which the building stock improves its energy performance can be expressed as **annual reduction of the total building stock's primary energy consumption**. This weighted energy renovation rate is calculated to be **about 1%**.¹

¹ This is in line with other estimations of the European Commission (0.4-1.2% depending on the Member State).

If this rate persists, the building sector will clearly and significantly fail to deliver its share of the overall need for primary energy reduction and consequently a reduction in greenhouse gas emissions. Significant acceleration is needed.

Energy renovations and non-energy renovation highly coincide. At the same time repairs, regular maintenance and inspections are major triggers for energy renovation. Furthermore, do-it-yourself activities have a significant share in building renovation. This underlines the necessity to interpret **deep renovations as a journey with several milestones** that needs to be planned ahead and coordinated.

Another concern is the economic law of diminishing marginal utility. Naturally “low-hanging fruit renovations” (typically light renovations) with most favourable cost-benefit ratios will be realised first. Hence, **future renovations will have a tendency to feature less attractive cost-benefit ratios. This might potentially further slow-down the renovation process.** Within an unchanged market and policy environment, it will get increasingly hard to even keep the current too slow speed.

In the EU28, **residential sector current investments in energy renovations² are about 200 billion Euros per year and another 300 billion Euros for non-energy renovations** in the residential sector. Another **200 billion appears to be invested in non-residential buildings.** Further significant growth would occur if renovation activities moved towards a level that ensures a decarbonised building stock by 2050. Then energy renovation investments would probably exceed those in non-energy renovation.

There is a strong link between investments in (energy) renovation and the work force being active to execute these works. The **average total number of fulltime employees in the construction sector involved in renovation of residential buildings** is estimated to be **about 4.6 million** per year for the period 2012-2016 and **1.9 million for renovation of non-residential buildings.** This illustrates the significant **additional work force needed if the intensity of energy renovations (speed and depths) should increase** significantly in the next few years. Additional spill-over effects would be generated amongst manufacturers, i.e. more capacity and personnel would also be needed there. This poses the question whether the European labour market is ready for this challenge.

The new energy policy framework that has been created with the “Clean Energy for all Europeans” package provides several opportunities to properly address the aforementioned issues. Instruments like the long-term renovation strategies or the Smart Finance for Smart Buildings initiative can provide the proper context for the transformation ahead.

Uptake of nearly zero-energy buildings

Nearly zero-energy targets – depending on their ambition level - **could represent the way towards a decarbonised building stock,** both in renovation and new construction. However, this study revealed significant differences in approaches to achieve NZEB levels in new constructions compared to renovations. Furthermore, some of today’s published national performance targets for NZEB clearly exceed the performance benchmarks provided in the European Commission’s recommendation on nearly zero-energy buildings³.

² Calculated as full cost, not as incremental cost on top of renovations that would take place anyway.

³ European Commission (EC) (2016): Commission Recommendation (EU) 2016/1318 of 29 July 2016. on guidelines for the promotion of nearly zero-energy buildings and best practices to ensure that, by 2020, all new buildings are nearly zero-energy buildings.

Based on market perceptions (and not on actual NZEB definitions), this study found a **slight upward trend of NZEB for the period 2012-2016 in new construction across the EU28.**⁴

It is important to point out that these results are based on perceptions of important market players and multipliers such as architects. Therefore, this does not need to be in line with already mandatory requirements in some countries that all new buildings already need to be NZEB (e.g. France or Luxembourg), but it reflects the reality on the market.

Determinants of energy renovation

This study also looked at **triggers, drivers, barriers and incentives** on the demand side (consumers split into tenants, owner-occupiers and landlords) and supply side (architects, main contractors and installers).

The **most common triggers** for all types of consumers turned out to be necessary **maintenance, replacement** of a defective component, **budget becoming available** to carry out the renovation or the will to counteract shortcomings that lead to **health issues**. Recent studies showed a clear **relationship between the quality of dwelling, energy poverty and health**. Therefore, the most relevant aspects of energy renovation for consumers are not the energy savings, but the cost savings and making their home more comfortable and healthier.

Results show that different **instruments such as EPCs** (recommendations and rating), information on the energy bill and energy labels for energy using components have different levels of importance throughout the "renovation journey". While most of these instruments have **limited function as triggers, their influence is much higher once the renovation decision has been taken**. Then they help to justify the decision, to select or recommend the right solutions from different options, or to increase the ambition level.

This asks for **more promotion of EPCs especially amongst intermediaries**.

Intermediaries - architects, main contractors and installers – appear to be a group whose **influence** on energy renovation decision making is **largely underestimated**. These intermediaries are not only the ones being assigned the most prominent role in quality assurance of energy renovation measures by investors. They are also the persons consumers listen to when deciding about the extent or depth of energy efficiency measures.

Consumers but also commercial investors report **uncertainty about what to expect from installers**, which probably partly explains the **high share of laymen (tenants, home owners) taking responsibility for quality** controls. Half of all installers across Europe already dealing with energy renovations report energy efficiency measures being too complicated to install. This certainly also hampers quality and signals a high need for capacity building.

Even many architects find it hard to select the most suitable measures. This is time consuming, which continues on the construction site, where many architects feel quality controls of energy efficiency measures take too long. **Education is needed here, too**.

Only if intermediaries fully support energy efficiency measures, they will effectively catalyse renovation activities – speed and depth - in the market.

⁴ The period covered by the study (2012-2016) did not allow to comprehensively examine the NZEB uptake according to the NZEB definitions which are supposed to be mandatory only after 2020 (or 2018 for public buildings).

Last but not least, consumers, architects and contractors/installers across the board view **financial and administrative barriers** as being the **main roadblocks** for consumers carrying out energy renovation works or for those on the supply side to recommend such renovations. For commercial clients financing and savings are even stronger drivers. In this context, it is striking, that a vast majority of **consumers use their own capital** to finance renovation works, suggesting that consumers don't undertake energy renovations unless they have sufficient own capital.

Results show that energy renovation and uptake of NZEB are not a 'simple' story, but the result of their complex determinants like drivers, barriers and incentives.

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