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POLICY brief

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How to Refurbish All Buildings by 2050[1]

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Highlights

- The objective of the 7th THINK report is to provide policy recommendations for the European Commission (DG Energy) on how to refurbish all buildings by 2050. The report is summarized in this policy brief.
- Buildings account for 40% of the total energy consumption of the EU and they are one of the most significant sources of greenhouse gas emissions (36% of the EU total). In order to achieve the 2050 EU building sector target, the energy performance of existing buildings will need to be improved substantially (excluding those planned for demolition). This can be done either by integrating the use of renewable energy sources into existing buildings, by replacing building components and systems in order to reduce energy consumption, or to use electricity which will be decarbonised by 2050.
- It is essential to improve price incentives and to further develop the building refurbishment market to minimise the associated costs. However this in itself will not be enough to meet the target. The expected investments in existing building stock that are considered beneficial for society are not economical at today's prices for individual decision makers. Therefore, regulatory instruments will be needed to encourage owners and users to refurbish, and also to ensure that refurbishment leads to improved energy performance.
- EU institutions should allow member states enough freedom to tailor their building refurbishment policies to their own needs. However, the institutions nevertheless have an important role to play. In order of importance, our recommendations are:

  1. To abolish to end-user regulated prices for electricity and gas
  2. To internalize the cost of carbon in building refurbishment decisions
  3. To establish national building refurbishment targets or to at least mandate the development of national building refurbishment action plans
  4. To create an EU energy performance certificate scheme
  5. To facilitate the design of a building refurbishment market framework
  6. To continue to widen and strengthen technology standards and the labelling of building refurbishment technology, products and materials
  7. To develop an EU building refurbishment technology roadmap
  8. To use EU funding to support the implementation of the previous recommendations

The Florence School of Regulation (FSR) was founded in 2004 as a partnership between the Council of the European Energy Regulators (CEER) and the European University Institute (EUI), and it works closely with the European Commission. The Florence School of Regulation, dealing with the main network industries, has developed a strong core of general regulatory topics and concepts as well as inter-sectoral discussion of regulatory practices and policies.

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1. Topic 7 of the EU's FP7 funded project THINK. The project report is available at: http://think.eui.eu

Introduction

The roadmaps presented by the European Commission in 2011 show that the greenhouse gas emissions in the building sector will need to be reduced by 88 - 91% by 2050 in comparison to levels in 1990 in order to achieve the EU strategic objectives.

The path towards the 2050 building sector target includes three challenging trade-offs. First, the renewal of buildings can be accelerated or there can be greater investment in refurbishing buildings. Second, investing more in building refurbishment can be either to refurbish them more frequently or else to be more ambitious when refurbishing them. Third, regarding the timing and type of investments, we can follow a linear path, or we can make greater efforts at a later stage when technology will be more advanced. Thermal insulation can be used to reduce the energy consumption of buildings and the behaviour of users can be modified. The energy consumption of buildings can be further reduced by replacing energy consuming systems and components in buildings. Alternatively, buildings can move to using electricity or can integrate renewable energy generation as the objective is to reduce their greenhouse gas emissions.

Only a few studies have considered these trade-offs for the EU or at member state level, however three key observations can be made. Each study shows the need not only to increase the current rate of refurbishment, but also to increase the greenhouse gas emission savings that are achieved by refurbishing a building. The studies also emphasise that there will continue to be a 'deepness mix' with some buildings becoming net zero energy buildings while others will only undergo moderate, minor or even no refurbishment. For instance, a holiday house that is only used for short periods of the year should not necessarily be refurbished and there are protected historical buildings which have to adhere to strict guidelines regarding their refurbishment. The studies also show that there are significant differences between different member states concerning the nature of their building stock and the usage of these buildings.

Why should expected investments be regulated?

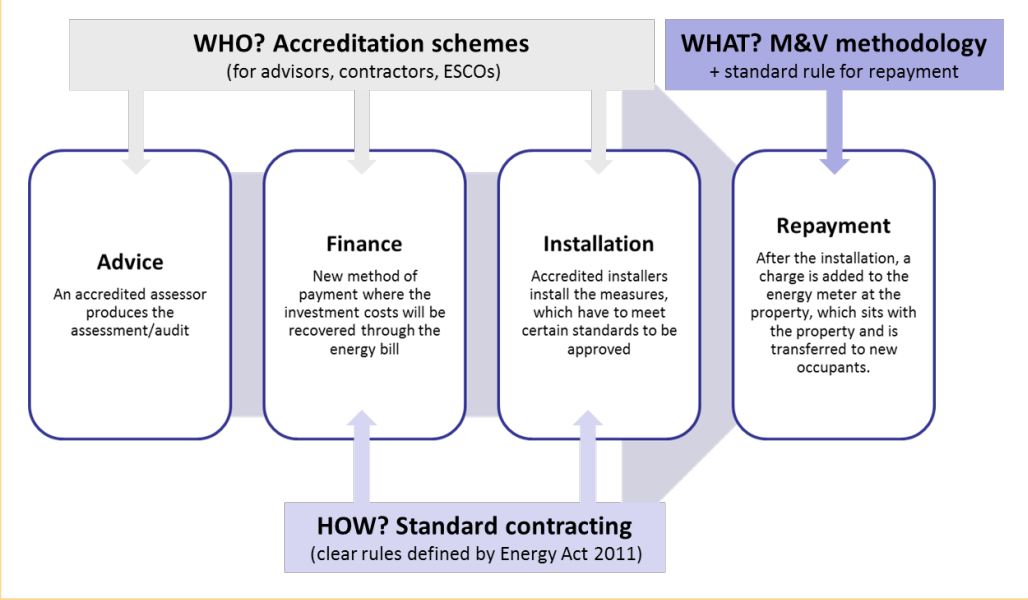
In order to achieve the 2050 building sector target, 600-1800 billion euros will have to be invested in the building sector. Most of this is expected to come from private building owners and users. With the exception of public buildings and infrastructure investments (e.g. district heating and cooling, and smart metering), the investment concerns the building itself, and its components and systems, and a large share of the buildings is privately owned and used.

Price incentives are important not only to give building owners and users correct economic signals to refurbish, but also to guide them towards the right choices when refurbishing and to provide them with incentives for the efficient use of energy in buildings. Currently, these signals are often distorted, for instance, because of end-user price regulations for electricity and natural gas, and because the cost of carbon has not yet been fully internalized into the building refurbishment decisions.

Moreover, there are market failures (i.e. information problems, high transaction costs, and externalities), and building owners and users are not always qualified to make complex refurbishment decisions. This is especially the case for households. This issue can be remedied by improving the awareness of market players, and by developing a market framework with accreditation, standard contracting and a measurement and verification protocol, as illustrated by the UK Green Deal (Box). However, simply developing the market for building refurbishment will not be enough to meet the target as the expected investments that are considered to be beneficial for our society, are not economical at today's prices for the individual decision makers. Increasing public support for building refurbishment could also be an option, but it can only address part of the problem considering the magnitude of the investment needs, and public budget constraints, especially in the current context in Europe. Therefore, regulation of building construction and refurbishment is needed.

Box: UK Green Deal, a framework to enable the development of the building refurbishment market

The Energy Act 2011 includes provisions for the Green Deal which has been established by the UK government to enable British households to undertake building refurbishment. It is an organised market framework that provides support to building owners and users along the building refurbishment decision process, as illustrated by the diagram below. It includes clear rules on who to contract with, how to contract them, and what is contracted, with accreditation of market players, contract standards, and measurement and verification (M&V) methodologies.



How to regulate expected investments

As illustrated in Figure 1 (below), regulatory instruments can be used to prompt the refurbishment of a building (i.e. regulation of actors), to then also prevent actors from making inappropriate decisions when refurbishing (i.e. regulation of input), and to ensure that the refurbishment leads to improved energy performance (i.e. regulation of output). For each of these regulatory instruments, this report illustrates the rationale, limitations, and possible role for the EU in facilitating the implementation of these instruments.

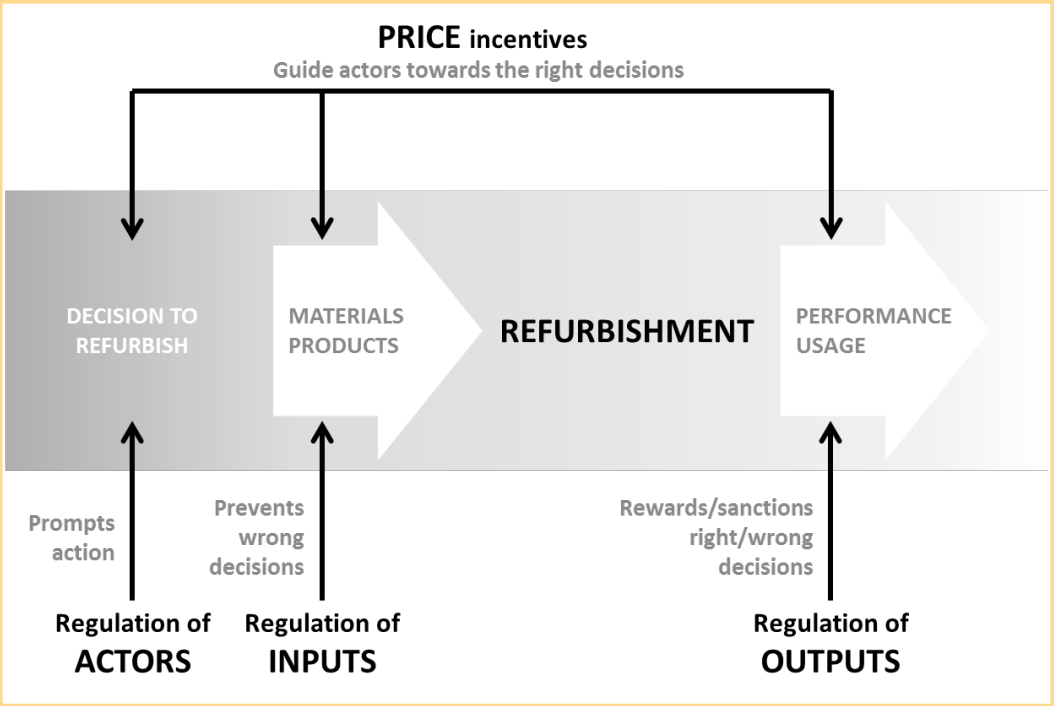
Regulation of actors

For the regulation of actors, we can distinguish between requirements that are made of building owners or users, and requirements that are made of third parties, such as energy suppliers and distribution system operators.

- **Rationale**: It can be necessary to induce actors to act because the expected investments are not always economical from the point of view of the individual decision maker. There are many different practices that imply such requirements and the experience is that it is difficult to generalise what works best, as this can be context-specific.

- **Limitations**: these depend on who the requirement is made of. Energy suppliers and distribution grid operators, for instance, have privileged information to identify promising investments, and they already have contractual relationships with building owners and users. However, their core business is to deliver energy so it is against their interests to save energy. Alternatively, requirements can be made of building owners and users to conduct individual building inspections to monitor compliance. These may already exist to monitor other aspects of build-

Figure 1 – Analytical framework for regulatory instruments



ings, such as for damp in Sweden and safety in Denmark, but they do not yet exist to monitor energy performance.

- **EU involvement**: the Energy Performance of Buildings Directive requires buildings that undergo a major renovation to comply with minimum requirements defined at the member state level. There is a rationale for obligations, but it is not clear on which actor they should be put, and what works best can be context specific. Therefore, it may be better to leave that choice of actor up to member states.

Regulation of input

For the regulation of input we can distinguish between technology standards (i.e. minimum energy efficiency requirements) and labelling for building products and materials (i.e. providing energy efficiency information).

- **Rationale**: because we have unqualified decision makers and market failures, it can be necessary to avoid (with standards) or reduce the risk (with labelling) that actors make inappropriate decisions in selecting material and products when refurbishing.

- **Limitations**: energy performance is not only about choosing the right products and materials during refurbishing, it is also determined by their installation and the behaviour of building users and owners following the installation. The performance of certain building systems and components depends on the entire building and how it interacts with other systems and components. For instance, the installation of a very efficient boiler will not guarantee a high level of energy performance for the building as a whole, as the building may not be sufficiently insulated.

- **EU involvement**: some examples are the EU Energy Star programme (2001), the Energy Labelling Directive (2010), the Ecodesign Directive (2009), and some provisions of the Energy Performance of Buildings Directive (2010). It would be good to continue this ongoing

process to avoid that decisions are biased towards products and materials that are not yet classified at EU level.

Regulation of output

For the regulation of output we can distinguish between: performance regulation and usage regulation. Performance regulation imposes energy performance requirements, such as the establishment of minimum energy performance level for refurbished buildings. Usage regulation imposes minimum requirements on how energy is used, such as behavioural constraints like the establishment of minimum and maximum indoor air temperatures.

- **Rationale**: to address the lack of skills of the actors and market failures, it can be necessary to regulate the energy performance of buildings, and their systems and components, and to incentivise actors to use energy in a manner that is efficient, and compatible with the greenhouse gas emission reduction targets. Output regulation can reward or sanction both good and inappropriate decisions.

- **Limitations**: the main limitations of output regulation are related to their administration and enforcement. For instance, energy performance regulation relies on energy performance certificates. The Energy Performance of Buildings Directive has already made such a scheme mandatory in each EU member state, but it does not yet apply to all buildings. Also, some member states have not yet properly implemented this scheme. Enforcing compliance with behavioural constraints is even more challenging.

- **EU involvement**: the EU already requires member states to introduce an energy performance certification scheme. This could be used to introduce energy performance regulations for buildings at the national level. There are however problems with the national implementation of this scheme, as the scheme should be a reliable tool to ensure its compliance with existing, and future, output regulations.

Recommendations for the European Commission

EU institutions should allow member states enough freedom to tailor their building refurbishment policies to their own needs. However, the institutions nevertheless have an important role to play, particularly in ensuring that there is a commitment at national level to addressing the building refurbishment problem and to facilitate the implementation of solutions to this problem.

Prerequisites for refurbishing all buildings by 2050 are to provide correct economic signals:

1. Abolish end-user regulated prices for electricity and gas. There are already on-going infringement procedures against practices that are not in line with the EU liberalisation legislation, however additional action could be taken in order to speed up their abolishment. The EU could avoid inconsistencies such as providing subsidies for energy savings' investments to member states which are keeping energy prices artificially low. protocol.
2. Internalize the cost of carbon into the building refurbishment decisions. Currently, the cost of carbon is only partly internalized so that the decisions are biased towards fossil fuels, which is inconsistent with the EU climate and energy objectives. The recent EU Energy Tax Directive proposal was a first step in this direction, but more is needed.

Primary recommendations for refurbishing all buildings by 2050 are to ensure that the EU 2050 building sector target is reached:

3. Establish national building refurbishment targets or, at the least, mandate the development of national building refurbishment action plans. This is essential to ensure that there is commitment at national levels to addressing the problem. The establishment of targets has already proven to provide commitment in other energy

policy areas. However, if targets are politically unfeasible, member states should at least be required to submit a plan so that the European Commission can monitor their progress. These plans will also be instrumental for the development of national building refurbishment policies.

4. Create an EU energy performance certificate scheme. As mentioned previously, regulation will be needed in order to get the expected investments in building refurbishment. This will be context-specific, but it will typically include obliging actors to refurbish, and ensuring that this refurbishment also leads to improved energy performance. Energy performance certificates are key to the implementation of these regulations as they can be used to administer and enforce them. The EU's main role, therefore, as facilitator of national solutions to the building refurbishment problem is to make sure that there are adequate energy performance certificate schemes for buildings.

The proposed Energy Efficiency Directive already introduces stricter requirements which provide the opportunity for the establishment of an EU scheme to which member states could voluntarily subscribe. In any case, member states will have to change their national energy performance certificate schemes to adhere to the new requirements.

Such certificates could also provide the information required for the development of national building refurbishment action plans, especially if they apply to more buildings than currently is the case. Increasing standardization of energy performance certificates would also make it easier to compare different national plans.

Secondary recommendations for refurbishing all buildings by 2050 are about minimizing the costs of achieving the EU 2050 building sector target:

5. Facilitate the design of building refurbishment market frameworks. As member states have only just begun to experiment with organised markets for building refurbishment (e.g. the UK Green Deal), it would be difficult to agree on an EU design. However, any national market framework should include accreditation, standardised contracting and measurement and verification protocols for building refurbishment. EU institutions are already involved in these three areas, however more could be done such as the establishment of a quality label for energy service providers, the development of contract templates and a standard measurement and verification protocol.

6. Continue to widen and strengthen technology standards and labelling of building refurbishment technology, products and materials. This is an ongoing process that needs to be finalised to avoid decision bias. Note that the rationale to do this at least partly at EU level is that national regulations for building materials and products can create barriers for the internal market.

7. Develop a building refurbishment technology roadmap. The development of a roadmap is essential to map and coordinate building refurbishment research, development and demonstration activities. It would also be used to track the progress of technology that is of strategic importance in achieving the objectives of the building sector. Several roadmaps have been developed as part of the SET-Plan, but these do not yet consider building refurbishment technology.

8. Use EU funding to support the implementation of the previous recommendations. EU funding should be allocated on the basis of national building refurbishment action plans, which should therefore be a condition to receive funding. The allocation of funding should be performance-based, which would require the use of energy performance certificate schemes for buildings in member states. Public funding should also be leveraged with financial mechanisms.