

RENOVATION STRATEGIES OF SELECTED EU COUNTRIES

A STATUS REPORT ON COMPLIANCE WITH ARTICLE 4
OF THE ENERGY EFFICIENCY DIRECTIVE



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EXECUTIVE SUMMARY

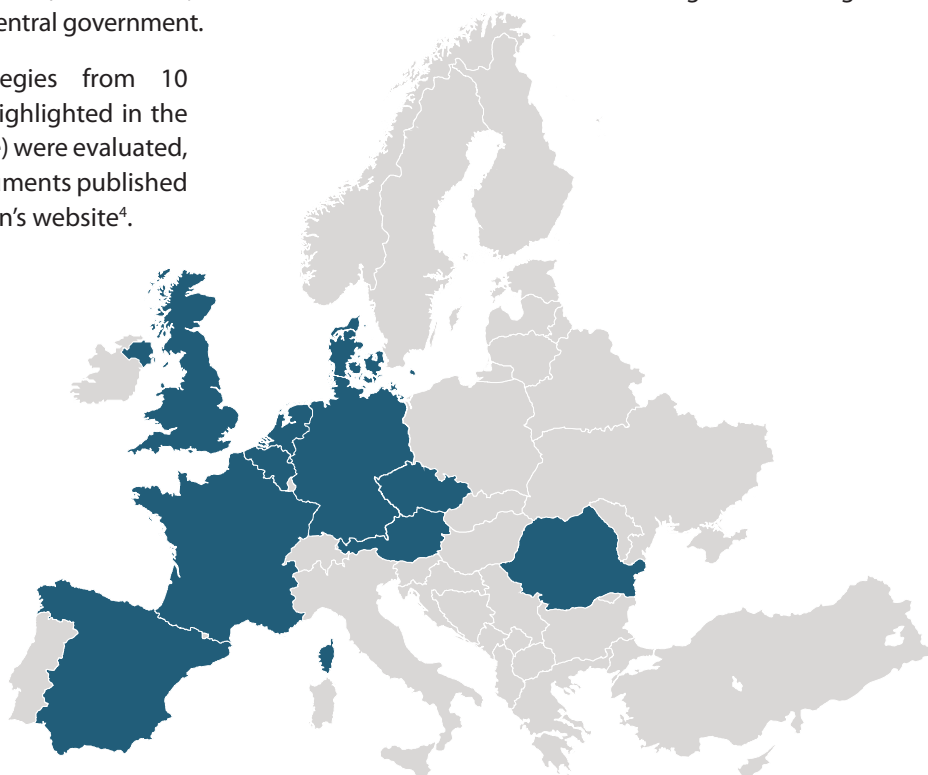
This report examines a cross section of building renovation strategies from 10 Member States throughout the EU. The importance of energy renovation of buildings is exemplified by the fact that existing buildings are responsible for as much as 40% of the EU's energy requirements, and over one third of greenhouse gas emissions. Furthermore, Europeans spending 90 % of their time indoors, it is therefore important that energy renovation supports healthy indoor climate of buildings.

New buildings are increasingly constructed to demanding energy performance levels, and the path has already been laid within EU legislation¹ for all new buildings to have nearly zero energy requirements within a matter of years. Yet the vast majority of existing buildings were constructed prior to any formal energy performance requirements, as a result of which the energy performance of the stock is considerably below the best that can be achieved today. However, at current rates of renovation, the full potential for cost-effective improvement will not be achieved before the end of the century.

It is timely, therefore, that Article 4 of the Energy Efficiency Directive (EED)² requires Member States to establish long-term strategies for mobilising investment in the renovation of national buildings stocks. First versions of these strategies were to have been published by 30th April 2014 yet, nearly six months after this deadline, six Member States had still not met this requirement³.

Article 4 complements other requirements within EU legislation concerning the renovation of buildings. In line with Article 9 of the Energy Performance of Buildings Directive (EPBD), Member States must develop policies and measures to stimulate the transformation of buildings that are refurbished into nearly zero-energy buildings (nZEB). Meanwhile, Article 5 EED sets a 3% annual renovation target for buildings owned and occupied by central government.

Renovation strategies from 10 Member States (highlighted in the map below in blue) were evaluated, based on the documents published on the Commission's website⁴.



¹ "EPBD" - Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings

² Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency

³ The following six Member States had not published renovation strategies as of October 15, 2014: Greece, Hungary, Luxembourg, Poland, Portugal, Slovenia

⁴ http://ec.europa.eu/energy/efficiency/eed/article4_building_strategies_en.htm

COMPLIANCE

Each strategy was examined for compliance against the five requirements of Article 4, namely:

- a) An overview of the national building stock;
- b) Identification of cost-effective approaches to renovations;
- c) Policies and measures to stimulate cost-effective deep renovations of buildings;
- d) A forward-looking perspective to guide investment decisions;
- e) An evidence-based estimate of expected energy savings and wider benefits.

In addition to compliance aspects, the level of ambition contained within the strategies was considered. And, given the fact that we spend so much time inside buildings, issues related to indoor climate were also explored.

Austria - The Austrian renovation strategy is the least detailed of the ten strategies evaluated. There is no mention of policies at a national level to promote renovation, no forward perspective to guide investment decisions, and no assessment of benefits. As such, it is clearly non-compliant and should be rejected by the European Commission.

Brussels Capital Region, Belgium⁵ - The description of the building stock and the section on cost-optimality were among the best out of the strategies reviewed. The analysis of cost-effective opportunities at the level of individual buildings, and the description of measures that comprise individual renovations, were particularly detailed. The strategy includes some useful policies which can be expected to help grow the market for building renovation. However, it was quite weak in the forward perspective and quantification of benefits. These deficiencies mean the strategy is not fully compliant with the Article 4 requirements.

Czech Republic - The strategy covers all aspects of Article 4 adequately, and can therefore be considered compliant. The particular strengths of this strategy lie in the technical analysis of energy saving opportunities, modelling of renovation scenarios, as well as the holistic approach to identifying policies and measures to stimulate the market.

Denmark - The Danish building renovation strategy is short on technical details concerning the building stock, yet is among the most ambitious strategies in terms of what the Government plans to do. A package of 21 initiatives addresses all building sectors, recognising the importance of skills and R&D. A comprehensive stakeholder engagement process was used to inform these policies. The Danish strategy in particular also recognises the importance of providing a healthy indoor environment for building inhabitants. However, the absence largely of basic information within the strategy itself, namely the identification of cost-effective approaches to renovations, a forward-looking perspective to guide investment and quantification of benefits, means that the Danish strategy is not compliant with the Article 4 requirements.

France - One of the key strengths of this strategy is the Presidential-level commitment to some ambitious goals in the building sector, such as the deep renovation of 500,000 dwellings a year and the desire to introduce a mandatory renovation requirement for the non-residential sector. The three-pronged approach of supporting households, facilitating finance and increasing professionalism, points to a co-ordinated effort, supported by a significant number of initiatives. What is lacking in the French renovation strategy is a clear enunciation of how the 38% energy saving goal by 2020 will be achieved. Also two elements specified in Article 4, namely the forward-looking perspective and quantification of energy savings and wider benefits, are dealt with only superficially, such that the French strategy is considered to be not fully compliant.

⁵ Due to the federal structure of Belgium, each of the three regions published its own renovation strategy. Brussels Capital Region was selected for this study in order to consider building renovation from the perspective of the city level.

Germany - The German renovation strategy provided the most details out of all those examined into the research agenda. This is clearly an important consideration if we are to develop more effective ways of achieving deep cuts in the energy consumption of buildings. However, the German Government has yet to specify all elements of its strategy for renovating the national building stock. This is expected by the end of 2014. Other shortcomings were the description of cost-effective approaches to renovation and the forward perspective. Accordingly, this strategy is not considered fully compliant with the requirements of the Energy Efficiency Directive.

The Netherlands - The Dutch strategy is based around three key principles: informing and raising awareness; facilitating; and financial incentives. The aim is to help residents and businesses to help themselves and realise the benefits that energy renovation can bring, not only in cutting energy bills but also in terms of improved living conditions and increased property values. To stimulate this improvement in the quality of life for its citizens, the Government has identified a number of approaches that are quite innovative and with the potential to stimulate significant improvements in building energy performance. The fact that a wider Energy Agreement has been secured with a number of stakeholder bodies is encouraging. From the perspective of the Article 4 requirements, it must, however, be noted that the Dutch strategy fundamentally does not cover two of the five requirements – cost-effective appraisal of renovation opportunities, and forward-looking perspective to guide investment decisions – and cannot therefore be considered compliant.

Romania - A unique feature of the Romanian strategy is that it has sought to quantify the wider benefits of building renovation. Another positive aspect is the comprehensive appraisal of policy options that need to work together to address the underlying barriers. The strategy recognises that the benefits of renovation are felt across a number of different Ministries, including for example Health, since poor quality housing has a cost to the nation in terms of lost working days and impact on health services. The policies section of the strategy recognises the importance of engaging across the political spectrum in support of the strategy for deep renovation of the building stock, including for example establishing an objective to eradicate fuel poverty through enhancing energy performance of the housing stock. Overall, the strategy complies with the requirements of Article 4.

Spain – The Spanish strategy includes a good technical appraisal of the building stock and energy saving opportunities. It notes the strategic importance of building renovation and identifies the need to provide information and advice, adequate finance, and a suitably trained workforce. Specific actions that reduce bureaucratic hurdles, and help the financing of renovation measures, have been identified. Building renovation is seen as a key component of improving the economic conditions in Spain, reviving the construction sector and revitalising urban areas. Multiple benefits are identified, including the improved quality of life that flows from reduced expenditure on energy and improved indoor comfort conditions for occupants. Overall, the strategy meets the basic requirements of Article 4.

United Kingdom – The UK renovation strategy includes a very detailed description of the building stock, and presents a useful insight into the cost-effective renovation packages that might typically be adopted in different building types. The existing policy framework is clearly set out, while the forward plan is placed in the context of the 5-yearly carbon budgets which have been specified through to 2027. Energy saving potentials and existing funding sources are identified. While the UK has met the basic requirements for compliance with Article 4, it is of concern that no new policies have been introduced⁶, despite the fact that a large and cost-effective savings potential has been identified in the strategy and that existing measures are not resulting in cost-optimal deep renovations.

⁶ Other than the Energy Savings Opportunity Scheme (ESOS) for larger companies, in response to the energy auditing requirements of EED Article 8.

OVERVIEW

In order to appraise the strategies on a common basis, each one was scored against the five component sections of Article 4 on a scale of 0-5, where:

- 0 = MISSING – the item is not covered at all, or only described in another source
- 1 = UNSATISFACTORY – only the most cursory coverage of the item
- 2 = INADEQUATE – item addressed poorly, with insufficient detail, or with important aspects missing
- 3 = ADEQUATE – meets the basic minimum requirements
- 4 = GOOD – topic is described in some detail
- 5 = EXCELLENT – exemplary coverage of the topic

These scores are then aggregated by section and by Member State to derive overall averages.

The strongest section of most strategies was the characterisation of the building stock, and indeed this scored the highest average rating of 3.6. The only other sector scoring an average of over 3 (considered within the context of this study to be the minimum acceptable rating) was the policy description. Note, however, that the score largely reflects compliance with the requirements of Article 4, rather than a statement of ambition level. Only a few strategies included the comprehensive policy mix that needs to be put in place to transform the market for building renovation.

Generally, Member States struggled most with the forward-looking perspective, which scored an average of just 2.2 out of 5. Given that these strategies are meant to provide confidence to building owners to invest in building renovation, and to the market to invest in the supply chain, this is a major criticism of the approach taken in the 10 strategies that have been appraised in this study. While the forward perspective should cover more than simply the financing of measures, Member States may find the Commission's technical guidance on financing the energy renovation of buildings⁷, published earlier in 2014, a useful source of inspiration to inform this part of the strategy.

Table 1 presents the assessment of each renovation strategy against each of the items, together with an overall score based on the percentage of total possible points.

Table 1 - Compliance with EED Article 4 requirements

COMPLIANCE WITH EED ARTICLE 4 REQUIREMENTS						
COUNTRY	Overview of building stock	Identification of cost-effective approaches to renovation	Policies to stimulate cost-effective renovation	Forward-looking perspective to guide investment decisions	Estimate of expected energy savings and wider benefits	OVERALL level of compliance with Article 4
Austria	3	2	1	0	1	28%
Brussels Capital Region	5	5	3	2	2	68%
Czech Republic	3	3	4	4	4	72%
Denmark	2	1	4	0	1	32%
France	4	4	4	2	2	64%
Germany	4	2	3	2	3	56%
The Netherlands	3	0	3	1	3	40%
Romania	3	3	4	4	4	72%
Spain	4	4	3	4	3	72%
The UK	5	4	3	3	3	72%
AVERAGE	3.6	2.8	3.2	2.2	2.6	58%

⁷ http://ec.europa.eu/energy/efficiency/studies/doc/2014_guidance_energy_renovation_buildings.pdf

The colour coding reflects the overall assessment, as follows:

RED = non-compliant strategy. The strategy scored less than 50%, and is seriously deficient in two or more sections. Austria, Denmark and The Netherlands fell into this category. The Commission should REJECT these strategies and request revised ones be presented within six months.

ORANGE = partially-compliant strategy. The strategy scored between 50% and 69%, and had weakness in one or more sections (i.e. individual score of less than 3). Brussels Capital Region, France and Germany were ranked as partially compliant. The Commission should request that the deficient sections be rectified as part of a resubmission.

YELLOW = compliant strategy. (Score 70-79%, where no individual section scored less than 3). Czech Republic, Romania, Spain and UK produced strategies which are considered compliant.

GREEN = best practice. Any strategy scoring 80% or more would be considered best practice. Unfortunately, none of the 10 strategies met this benchmark.

AMBITION

Alongside compliance aspects, this review considered whether the policies and forward plans proposed by Member States were consistent with achieving the required transformation of existing buildings into highly energy performing ones. Below are the key policy highlights from selected strategies:

- **Germany** expects the majority of savings to 2020 to be achieved through the Energy Saving Ordinance, with most of the rest from the various KfW financial support schemes.
- **Romania, Czech Republic and Denmark** have all presented a holistic approach with 15 or more individual measures.
- The **French** strategy is noteworthy by virtue of the Presidential-level commitment to deeply renovate 500,000 dwellings a year, and to introduce a renovation obligation for the non-residential sector.
- **Brussels Capital Region** has, within its regional Plan Air-Climate-Energy (PACE), focused on regulatory measures.
- The **Netherlands** aims to catalyse action by addressing barriers and fostering innovative approaches. One example of an agreement between construction companies and housing associations to deliver 100,000 net zero energy dwellings by 2020, at no extra-cost to the residents or the housing associations.
- The **UK** relies on policies already in place, such as the Green Deal and Energy Company Obligation.

No Member State set out a roadmap of how the renovation market is expected to evolve in the coming years, while only a few included any appraisal of scenarios. Potential investors, seeking to make their business plans on the basis of these strategies, will be disappointed by the lack of detail provided in this vital area.

In summary, the strategies **do not set a clear, strategic path** for the renovation of national building stocks. There was a **lack of bold, determined action** on the part of Member States that could be expected to lead to a significant upturn in renovation activity. Whilst a number of Member States mentioned their long-term goals such as greenhouse gas reduction or switching to renewable energy supplies, their strategies **did not set out how the building sector would contribute** to that goal. Indeed, **none of the strategies looked at policy or market requirements in the medium to long-term**. Rather, the focus was very much on near term actions.

RECOMMENDATIONS

If we are to achieve the true potential for transforming Europe's built environment into a highly energy performing one, with all the co-benefits this brings, Member States need to take the renovation agenda much more seriously than hitherto. Based on the analysis undertaken in this report, national building renovation strategies need to include the following dimensions:

- 1) **Stakeholder involvement** – Getting all actors and stakeholders to have the opportunity to input into strategy development will not only improve its quality, but also facilitate its delivery and implementation.
- 2) **Building stock** – A detailed breakdown by building type, age, energy carrier, climatic zone, and energy performance is a fundamental knowledge requirement to underpin subsequent steps in the strategy. Ideally, this should be made freely available online.
- 3) **Cost-effective approaches to renovation** – A summary of the cost-optimality analysis, undertaken in accordance with the Commission's guidelines, should be presented, identifying energy performance levels to be attained in different building types.
- 4) **Policies** – these need to be geared towards achieving deep renovations (including staged deep renovations) and be holistic in their coverage.
- 5) **Forward-looking perspective** – Policies must be designed to provide appropriate long-term signals to the market, and communicated in a way that consumers and all actors in the supply chain understand the overall objective and plan their investment strategies with confidence. A roadmap with key dates, targets, milestones etc. for the introduction of legislation and support mechanisms should be considered an essential requirement of future renovation strategies.
- 6) **Recognition of building market dynamics** – Policies and support measures can only achieve their objectives if they are geared towards the needs, desires and motivations of building owners. The inherent drive towards home improvement and better work places needs to be captured as an important trigger point for improving the energy performance of buildings. Other trigger points and actions that work with the dynamic of the market need to be exploited, such as at change of occupancy or when building components are being replaced.
- 7) **Quantification of benefits** – In addition to the energy, carbon and cost savings, Member States should factor in the quantifiable wider benefits in terms of economic impact, societal benefits, and environmental improvements.
- 8) **Healthy buildings** – It is important to include requirements and guidance on how to ensure that building renovation not only results in significant energy savings, but also in a healthier building stock with natural daylight, adequate ventilation and a good quality indoor climate to improve the quality of life and well-being of the people living and working in them.
- 9) **Monitoring implementation and enforcement** – Having developed strategies that are worthy of the description, the vital next step is to ensure they are implemented so that the identified benefits can be realised. Enforcement, both within Member States and at EU level, needs to be in place to ensure that the desired outcomes are achieved in practice.
- 10) **Ongoing review and revision** – Renovation strategies need to be living documents, which change and evolve over time as experience grows and the market adapts to developments in technological solutions, installation practice, costs, financing mechanisms and consumer demand. Article 4 requires Member States to update and resubmit their strategies every three years.

CONTEXT AND POLICY LANDSCAPE

WHY BUILDING RENOVATION MATTERS

Buildings are the lifeblood of society – a place to work, rest, bring up future generations and undertake the myriad other actions that define our existence in the post-industrial society in which we live. Europeans spend on average 90% of their time in buildings, and for most households, the cost of owning or renting their dwelling is the largest item of investment and/or expenditure. With most of us now living in cities, the functioning of the urban environment, with buildings at its core, has a major bearing on our quality of life.

The cost, in terms of resource use, energy consumption, and expenditure, of this array of buildings is immense. While individual buildings may not have a significant impact, the collective energy consumption of over 200 M buildings across the EU is as much as 40% of total EU requirements, responsible for over one third of our greenhouse gas emissions.

There are many good reasons why we need to make our buildings safe, efficient and healthy places. Studies show that the learning abilities of children can be improved by up to 15% when the indoor climate is improved⁸, while those students with the most daylighting in their classrooms progressed 20% faster on maths tests and 26% on reading tests⁹. Likewise, the productivity of adults can be improved by up to 15%¹⁰⁻¹¹.

Much needs to be done to address the worst building stock. The World Health Organisation (WHO) has estimated that 10-50% of the indoor environments where people live, work and play in Europe are damp¹², and humid buildings are known to cause health problems such as allergies and asthma¹³. Conversely, new or retrofitted buildings that are too airtight can overheat which also has implications on health and well-being¹⁴.

So, when defining renovation strategies, the objective should be to reduce the energy consumption of our buildings without compromising the health and well-being of people inside them, and doing so in a way that optimises costs. Recent history shows us that focusing on energy consumption without due consideration for the latter can have adverse consequences, as for example in Denmark and Sweden, when in response to the oil crises in the 1970s, dwellings were constructed to be airtight with inadequate ventilation, as well as having small windows and insufficient daylight, leading to a poor quality indoor environment. Rather, renovation should be viewed as an opportunity to improve the indoor air quality and, more generally, the comfort and quality of life for occupants.

Accordingly, the appraisal of renovation strategies, presented in section 3, includes a specific focus on what they say on indoor climate, even though this is not a stated requirement of the legislation (see next section).

⁸ Wargocki, P., and Wyon, D.P. (2013) *Providing better thermal and air quality conditions in school classrooms would be cost-effective*, Building and Environment

⁹ 1999 by George Loisos for The California Board for Energy Efficiency Program. Submitted by HESCHONG MAHONE GROUP. Test score results for over 21,000 students in 2000 classrooms from districts, located in Orange County, California, Seattle, Washington, and Fort Collins, Colorado.

¹⁰ *A Literature Review of the Effects of Natural Light on Building Occupants*, L. Edwards and P. Torcellini, Nati. Renewable Energy Laboratory, U.S. Dep. of Energy, 2002

¹¹ <http://www.worldgbc.org/activities/health-well-being-productivity-offices/>

¹² WHO, 2009: "Damp and Mould. Health risks, prevention and remedial actions"

¹³ See e.g. J. Sundell, W. Bischof, et al., *Dampness in Buildings and Health (NORDDAMP)*, Indoor Air, vol. 11, no. 2, pp. 72-86, 2001

¹⁴ *Investigation into overheating in homes* for the UK Department of Communities and Local Government by AECOM (2012)

Our building stock is in a constant state of flux. While individual building structures may last hundreds of years, their usage, occupancy and amenity levels will change several times over the building's lifetime. Technological development and changing requirements over the years leads to new materials and construction techniques, leading to a heterogeneous mixture of buildings. The vast majority of EU buildings were constructed prior to any formal energy performance requirements, as a result of which the energy efficiency of the stock is considerably below the best that can be achieved today.

Constructing new buildings to ever-higher energy performance standards (and ultimately to generate more energy than they consume) can halt the increase in energy demand, yet the existing stock of buildings already constructed today will be responsible for the majority of building energy use for the remainder of this century and possibly beyond. Efforts to reduce the energy use and environmental impact of the building sector must therefore put significant emphasis on the renovation of existing buildings to achieve higher energy performance levels and better, healthier living environments.

LEGISLATIVE CONTEXT FOR SUSTAINABLE BUILDING RENOVATION

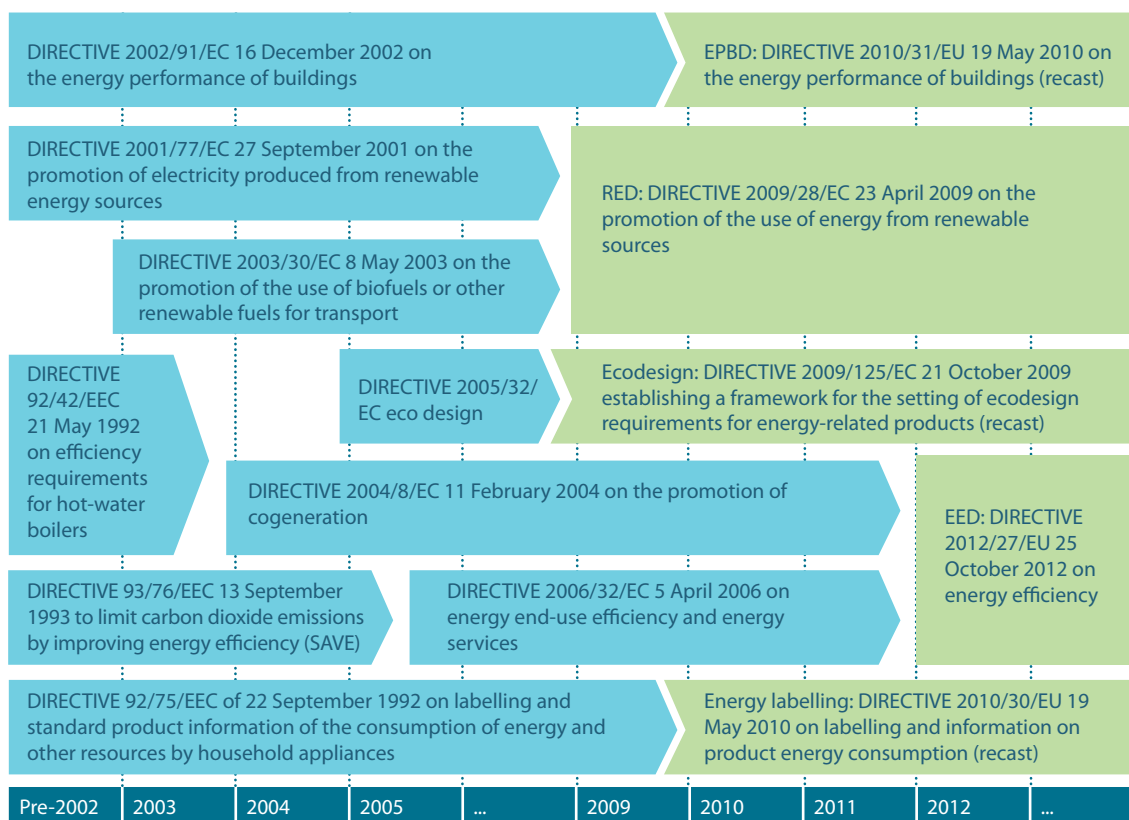
Across Europe and other developed regions, buildings represent the largest potential for cost-effective carbon emission reduction and with it, improvement in energy security, as well as a myriad of other benefits - fuel poverty alleviation, improved indoor and outdoor air quality, increased comfort, increased property values, energy system benefits, as well as energy bill savings. Yet historically, "deep", or comprehensive energy renovation of buildings to significantly reduce energy consumption¹⁵ has not been a priority, either for policy-makers or building owners and investors.

Progressive waves of EU legislation over a period of 20 years have sought to address different aspects of energy use in buildings, starting with hot water boilers and household appliances, until, in the early 2002, the first comprehensive policy addressing building energy performance was enacted (Figure 1). The Energy Performance of Buildings Directive (EPBD, 2002) required EU Member States to implement a number of measures, including the introduction of Energy Performance Certificates and inspection of heating, ventilation and air conditioning (HVAC) systems. Another fundamental aspect of the EPBD was the need for Member States to set energy performance requirements for new as well as existing buildings, and for these to be revised on a regular basis.

Many of these requirements were strengthened in the 2010 recast of the Directive (EPBD 2010), which most notably introduced the requirement for all new construction to be nearly zero-energy buildings from 2021 (2019 for buildings owned and occupied by public authorities). In the 2010 recast it is furthermore highlighted that, when setting minimum energy performance requirements, the general indoor climate conditions shall be taken into account in order to "avoid possible negative effects" (EPBD, Article 4).

¹⁵ The definition of "deep" renovation was explored in a 2013 report by the Global Buildings Performance Network (GBPN), *What is a Deep Renovation Definition?* (<http://www.gbpn.org/reports/what-deep-renovation-definition>). In Europe, expert opinion suggests this equates to a reduction in energy consumption for heating, cooling, ventilation and hot water of 75% or more.

Figure 1 - Timeline of key EU legislation affecting energy use in buildings



KEY – LIGHT BLUE = SUPERCEDED DIRECTIVE; GREEN = CURRENT DIRECTIVE

However, despite more than 20 years of legislation, the provisions for existing buildings have remained weak, relative to the requirements on new buildings. To a large degree, this is understandable, since a new building must secure approval from the relevant authorities before being constructed, and this is therefore easier to impose obligations. This is also easier to design for low energy requirements in a new construction.

That said, the EPBD does require certain energy performance requirements to be met when a building is undergoing a major renovation¹⁶, though this leaves the vast majority of existing buildings not subject to any obligation to renovate, as they are below the EPBD threshold. In a similar fashion, the Renewable Energy Directive requires the use of minimum levels of energy from renewable sources in existing buildings that are subject to major renovation.

The latest addition to the EU legislative framework in 2012 is the Energy Efficiency Directive (EED), replacing the previous Energy End Use Efficiency and Energy Service Directive and the Cogeneration Directive. Among its many provisions is a new requirement for Member States to develop national building renovation strategies or roadmaps, described in Article 4 of the EED:

¹⁶ A "major renovation" is defined in the EPBD as one where EITHER the total cost is higher than 25 % of the value of the building, OR where more than 25 % of the surface of the building envelope undergoes renovation

Member States shall establish a long-term strategy for mobilising investment in the renovation of the national stock of residential and commercial buildings, both public and private. This strategy shall encompass:

- a) An **overview of the national building stock** based, as appropriate, on statistical sampling;
- b) Identification of **cost-effective approaches** to renovations relevant to the building type and climatic zone;
- c) **Policies and measures to stimulate cost-effective deep renovations** of buildings, including staged deep renovations;
- d) **A forward-looking perspective** to guide investment decisions of individuals, the construction industry and financial institutions;
- e) An evidence-based **estimate of expected energy savings and wider benefits**.

A first version of the strategy shall be published by 30 April 2014 and updated every three years thereafter and submitted to the Commission as part of the National Energy Efficiency Action Plans.

Whilst the five individual sub-clauses of Article 4 may seem self-evident, the analysis presented in this report shows that Member States have interpreted some of these requirements in various ways. The forward-looking perspective proved most troublesome. One might have expected Member States to set out a number of scenarios of different renovation options, and a roadmap setting out key implementation dates and milestones, yet these were largely absent from the ten strategies that were examined in preparing this report.

In addition to Article 4, which pertains to all buildings, Article 5 sets out the requirements for Member States to play an exemplary role in connection with buildings owned and occupied by central Government. As from 1 January 2014, 3% of the total floor area of such buildings shall be renovated each year to meet at least the minimum energy performance requirements set out in the EPBD. These energy performance requirements should be derived according to the Commission's cost-optimality methodology¹⁷. Member States may opt for an alternative approach that achieves at least an equivalent amount of energy saving. Most have chosen the alternative route. For a summary of the approach taken by each Member State, please refer to the BPIE Factsheet on Article 5¹⁸.

Furthermore, the EPBD requires Member States to develop policies and measures to stimulate the transformation of buildings that are refurbished into nearly zero-energy buildings (nZEB). The opportunity to link renovation strategies, both for central government buildings (Article 5) and the wider building stock (Article 4), with these nZEB action plans clearly exists.

GUIDANCE FOR MEMBER STATES ON DEVELOPING NATIONAL RENOVATION STRATEGIES

A number of documents have been published to support Member States in their development of renovation strategies. We briefly examine four from the following organisations:

- BPIE
- The Policy Partners
- The Joint Concerted Action Working Group
- The European Commission

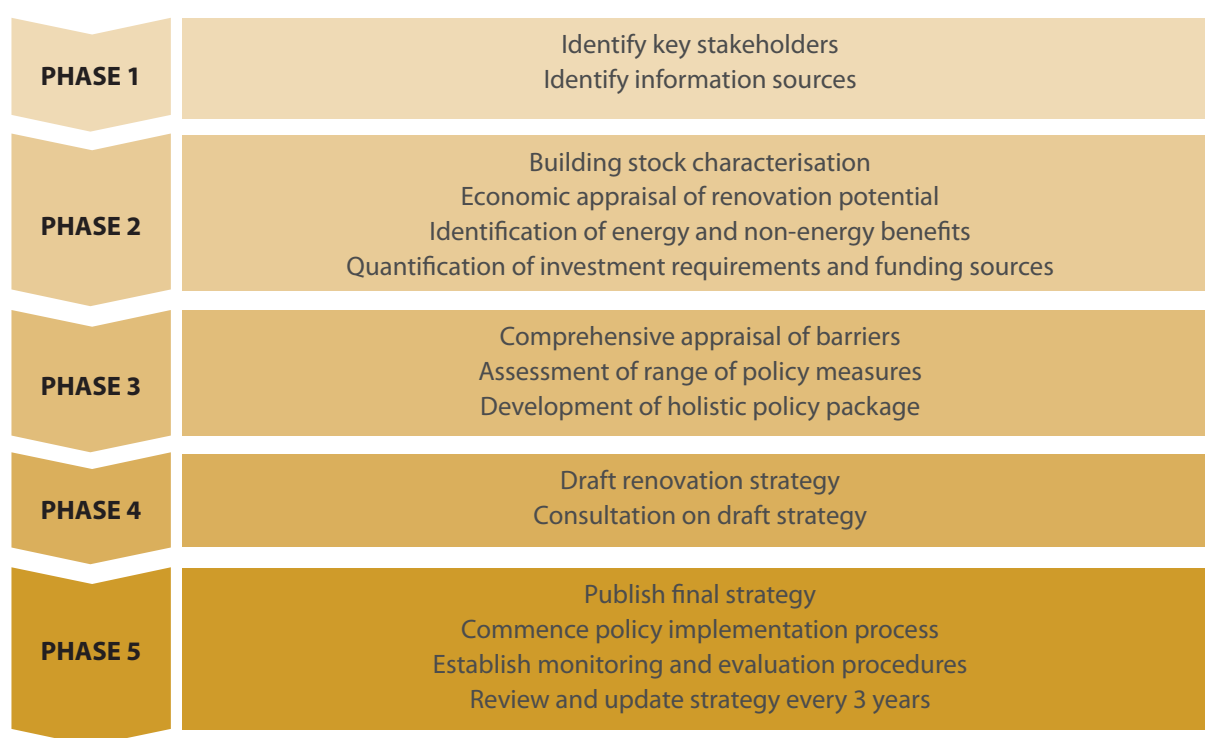
¹⁷ <http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32012R0244>

¹⁸ http://bpie.eu/factsheet_article5.html#.VEZxR_mvWgY

1. BPIE'S *GUIDE TO DEVELOPING STRATEGIES FOR BUILDING ENERGY RENOVATION*¹⁹

In order to assist Member States in developing their national renovation strategies, BPIE developed a guide, published in February 2013, setting out the key steps in the process of strategy development, including a checklist of policy initiatives for Member States to consider. The five phases, and component steps, are presented in figure 2.

Figure 2 – BPIE's 5-phase approach to renovation strategy development



The document includes information sources that quantify some of the co-benefits of renovation, in order to encourage Member States to include the value of these co-benefits in their economic appraisals. In addition, a checklist of policies and measures that Member States could consider including in their forward plans is provided (see Appendix).

¹⁹ http://bpie.eu/documents/BPIE/Developing_Building_Renovation_Strategies.pdf

2. THE POLICY PARTNERS' RENOVATION ROADMAPS FOR BUILDINGS²⁰

Renovation Roadmaps for Buildings was published in January 2013 by The Policy Partners for Eurima, the European Insulation Manufacturers Association. It highlights eight key elements of a building renovation roadmap, which are summarised below:

1. **A high-level of ambition** with a long-term perspective and high-level political ownership to provide key actors with enough lead-in time and certainty to plan and prepare for changes as well as a sufficient planning horizon for sustainable change to become visible and materialise. For the EU's building stock, a 2050-horizon is identified as the best option.
2. **Clear and ambitious targets**, including intermediate milestones. Research has demonstrated that, by 2050, the EU building stock can reduce its final energy consumption for heating and cooling by 80%, with a reasonable annual rate of renovation.
3. **Support and collaborative involvement from all levels of Government, market actors and stakeholder parties.** Good roadmaps are supported by all parties involved, including in their ambitions as well as their short-term plans. All parties also have a role in their implementation and are responsible for fulfilling that role. All parties need to be consulted early on in the development process, and sufficient attention given to parties' concerns.
4. **Flexible but focused iterative development.** Roadmap development is iterative, focusing on goals and directions. It also involves accepting that strategies and action plans may need to be adjusted after some years of implementation. Although roadmaps focus on long-term goals, actions need to reflect the possibilities and limitations of the market at any given moment. Tailoring of actions is required throughout the implementation of a roadmap.
5. Take a **holistic approach, addressing the whole building stock**, the whole sector and all relevant issues including technologies, construction, skills, financing, removal of legal and regulatory barriers and engaging building owners.
6. **Integrate energy performance with broader societal goals** and build on the strength of market parties. This includes focusing on employment impacts and taking into account changes in society, demographics and housing needs.
7. Include **flexible, creative thinking, beyond what has been tried before.** Good roadmaps encourage innovation in technologies and markets, but also collaboration between parties, so that there is on-going cost and efficiency improvement of building renovations.
8. **Inclusion of financial support, consumer education, and organisational support.** These "market enablers" are essential to bring building owners to a level of understanding of the benefits that building renovation can provide, to ensure the supply chain can deliver, and to make it easy to finance the investment.

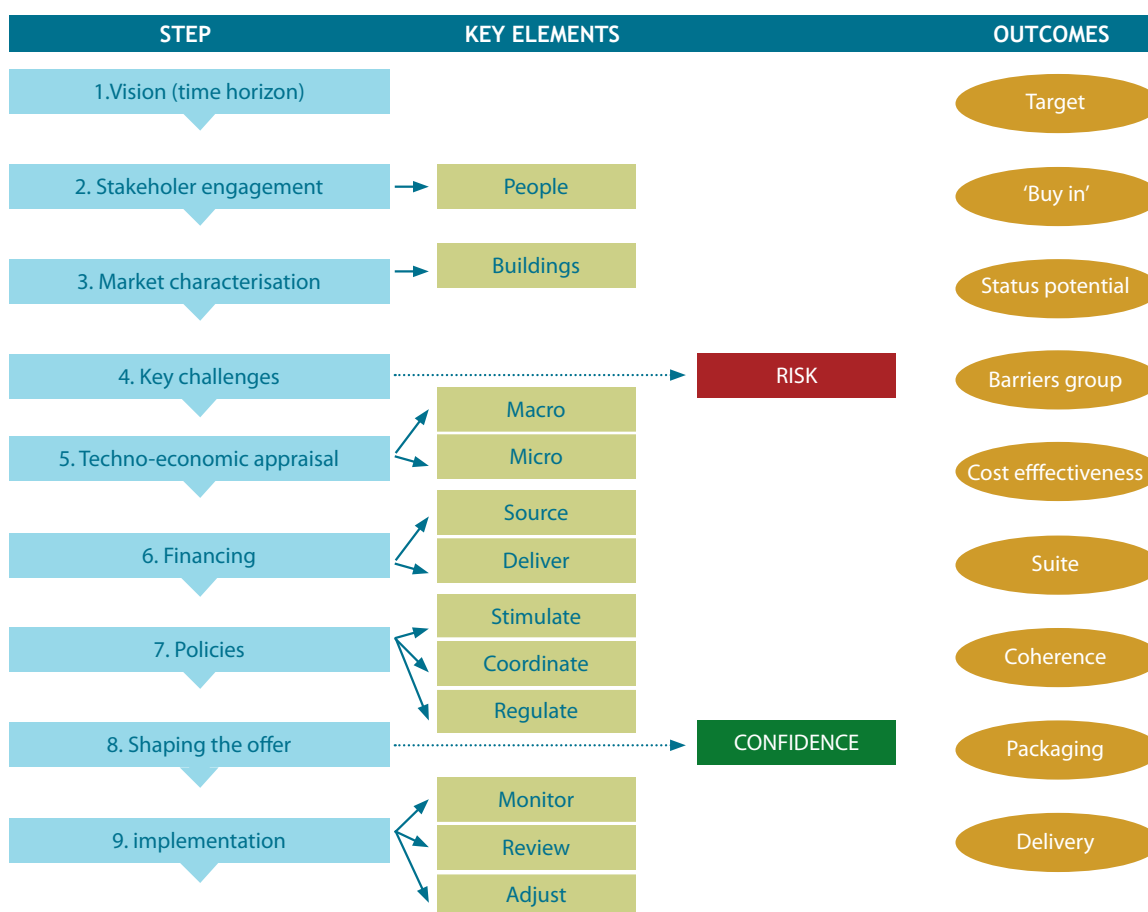
²⁰ http://www.eurima.org/uploads/ModuleXtender/Publications/96/Renovation_Roadmaps_for_Buildings_PP_FINAL_Report_20_02_2013.pdf

3. CONCERTED ACTION ASSISTANCE DOCUMENTS²¹

A set of Assistance Documents has been developed by a Joint Working Group drawn from three EU 'Concerted Action' projects (EPBD, EED and RES, corresponding to the three EU Directives) under the Intelligent Energy Europe programme. Published in November 2013, it has been prepared as a resource to encourage and assist Member State authorities in the development of their renovation strategies, with active hyperlinks to additional sources of information. The authors stress that it has a voluntary status and any views expressed therein are not to be attributed to the EU Commission or to any national or EU institutional party.

At its core is a nine step approach to strategy development, presented in figure 3, and fully described throughout the 100-page document, which includes plenty of case studies and links to useful sources of information.

Figure 3 – Concerted Action 9-steps towards a renovation strategy



²¹ <http://www.epbd-ca.org/Medias/Pdf/EED-Article4-composite-document-final.pdf>

4. THE COMMISSION'S GUIDANCE FOR NATIONAL ENERGY EFFICIENCY ACTION PLANS²²

The fourth and final example of guidance is from the Commission itself, and comes as part of the guidance to Member States on development of National Energy Efficiency Action Plans (NEEAPs), as required by the Energy Efficiency Directive and the previous Energy End-Use Efficiency and Energy Services Directive (ESD). Annex B of the guidance sets out in more detail the areas that Member States are requested to address under each of the five sub-paragraphs in Article 4. These are reproduced here.

The Directive requires that the Member State includes a building renovation roadmap in the NEEAP, which includes a long-term. Please include here the long-term strategy of the Member State for mobilising investment in the renovation of the national stock of residential and commercial buildings, both public and private. As part of the long-term strategy, the following items should be addressed.

1. Provide an overview of the national building stock based, as appropriate, on statistical sampling (EED Article 4(a));

GUIDANCE 57:

a) What main building categories have been identified as part of the overview?

- i) Single-family houses
- ii) Apartments/multi-residential dwellings
- iii) Offices
- iv) Educational buildings
- v) Hospitals/health establishments
- vi) Hotels
- vii) Sports facilities
- viii) Warehouses/data centres, etc
- ix) Retail premises (including restaurants)
- x) Other types of energy-consuming buildings

b) What age bands having a material bearing on building energy performance have been identified?

- i) Traditional construction types, including historic/heritage buildings (typically pre-1900)
- ii) Buildings constructed prior to regulations on energy performance (e.g.1901-1960)
- iii) Early phase building regulations (1961-1990)
- iv) Mid-phase building regulations (1981-2000)
- v) New (2001-2012)

c) What main climatic zones which have a material bearing on building energy performance have been identified?

²² http://ec.europa.eu/energy/efficiency/eed/doc/neeap/20131106_swd_guidance_neeaps.pdf

d) How many combination of building type, age and climatic zone have been identified?

On an illustrative basis of 10 building types, 5 age bands and 3 climatic zones, this results in a matrix of up to 150 combinations. However, in practice it is unlikely that a breakdown by age band will be possible or necessary for each non-residential building type, so the number of combinations will be far smaller.

e) What ownership and tenure have been identified in terms of the two elements specified below?

- i) The split by owner – public, private or mixed
- ii) The split by tenure – owner occupied, rented, (mixed?)

f) If appropriate, provide a split by location as follows:

- i) Urban
- ii) Suburban
- iii) Rural

g) What energy use and performance characteristics of each building combination have been identified?

- i) Construction type and U-value of main building elements:
 - (1) Floor
 - (2) Walls
 - (3) Windows and External Doors
 - (4) Roof
- ii) Air infiltration rate
- iii) Energy systems (In all cases, please identify typical replacement lifecycles):
 - (1) HVAC system type/performance level/controls
 - (2) Hot water provision
 - (3) Lighting systems/controls
- iv) Maintenance regimes (e.g. mandatory annual safety checks/servicing)
- v) Energy use for:
 - (1) Heating
 - (2) Cooling
 - (3) Hot water
 - (4) Lighting
 - (5) Appliances
- vi) Energy carriers:
 - (1) Gas (natural gas or LPG)
 - (2) Liquid fuels (oil, etc.)
 - (3) Solid fuels (coal, etc.)
 - (4) Renewable fuels:
 - (a) Solar hot water
 - (b) Solar PV
 - (c) Wind
 - (d) Heat pump (type and Coefficient of Performance)
 - (e) Biomass
 - (f) Biogas
 - (g) Other (specify)
 - (5) District heating (identify energy carriers)

2. Identify cost-effective approaches to renovations relevant to the building type and climatic zone (EED Article 4(b)).

a) What technical opportunities for retrofit of energy efficiency measures for each building category have been identified?

- i) Fabric measures
- ii) Windows
- iii) HVAC plant - heating/cooling/hot water
- iv) Air infiltration
- v) Lighting
- vi) Appliances

b) What technical opportunities for retrofit of renewable energy measures have been identified?

- i) Solar hot water
- ii) Solar PV
- iii) Passive solar
- iv) Shading
- v) Wind
- vi) Heat pumps
- vii) Biomass
- viii) Biogas

c) Has the opportunity to connect to a district heating system been considered?

d) What packages of measures that can achieve at significant energy saving, at least up to the prevailing energy performance requirements for new buildings of the same category, have been identified?

e) Has it been determined whether deep renovations should be undertaken as a single package, or staged over a period of time?

f) Has the cost effectiveness of the different packages of measures been determined using cost optimality methodology?

- i) Costs – the total installed cost of renovation measures, less any avoided cost due to end-of-life replacement or by undertaking renovation alongside other building maintenance, new construction or modernisation measures
- ii) Consider the transaction costs, including costs of temporary relocation of occupants
- iii) Have the following benefits (and identify the beneficiary – building owner, building occupier, society at large) been quantified?
 - (1) Energy cost savings
 - (2) Reduction in Fuel Poverty
 - (3) Health benefits
 - (4) Increased property value (rental and/or sale value)
 - (5) Reduced energy imports/increased energy security
 - (6) Employment impact
 - (7) Environmental impact (externality value of carbon saving)
 - (8) Air quality improvement
 - (9) Other social, economic or environmental benefits

g) From the above cost appraisal, have you determined a prioritised set of renovation packages for each building category, and a timeline for implementation?

- i) Have you considered the exemplary role of the public sector (at all tiers of government, as well as public services such as public housing, defence, health and education) in leading the drive towards deep renovation, and in exerting influence of citizens and businesses?
- ii) Have you considered the appropriateness of targeting the least energy efficient building stock as a priority?
- iii) Have you considered different scenarios as to the rate of change of key parameters?

3. Provide information on policies and measures to stimulate cost-effective deep renovations of buildings, including staged deep renovations (EED Article 4(c)).

a) Give an appraisal of existing measures/policies in the Member State:

- i) Regulatory (EU, national, regional and local)
- ii) Fiscal (tax incentives, grants, subsidies, loans, etc.)
- iii) Information campaigns
- iv) Labelling (EPCs, etc)
- v) Voluntary agreements
- vi) Other

b) Provide an analysis of barriers.

c) Give an appraisal of relevance of policies used in other territories.

d) Provide a design of new policy landscape that addresses barriers and enables the delivery of the required ramp up in deep renovation activity, with a particular focus on those measures which need to be introduced within the next 3 years.

4. Demonstrate a forward-looking perspective to guide investment decisions of individuals, the construction industry and financial institutions (EED Article 4(d)).

a) Quantify total annual investment requirements, mapped out over the period to 2050, in order to deliver the identified renovation opportunities.

b) Identify existing sources of funding for building energy renovation:

- i) Owners' private equity
- ii) Public purse (including EU Structural and Innovation Funds)
- iii) Banks and other sources of private investment (e.g. pension funds)

c) Analyse barriers to investment.

d) Identify possible funding sources and mechanisms to meet the identified investment profile.

5. Provide an evidence-based estimate of expected energy savings and wider benefits (EED Article 4(e)).

a) Has the attractiveness to building owners of their direct benefits been identified?

b) Have the societal benefits arising from deep renovation been identified?

c) Have ways in which externalities (e.g. societal benefits from reduced CO₂ emissions, increased energy security, etc.) can be internalised for the benefit of the investor been identified?

CRITIQUE OF SELECTED NATIONAL RENOVATION STRATEGIES – COMPLIANCE ASPECTS

CURRENT STATUS

Only half a dozen or so Member States met the official 30th April 2014 deadline for submission of renovation strategies. As of 31st July, i.e. 3 months after the deadline, this list had grown to 20. Subsequently, on 7th August, two further strategies were published, from Bulgaria and Romania.

As of 20th October, nearly 6 months after the official deadline, the following six Member States had still not published their strategies: Greece, Hungary, Luxembourg, Poland, Portugal and Slovenia.

THE COMMISSION SHOULD IMMEDIATELY COMMENCE PROCEEDINGS AGAINST THESE SIX MEMBER STATES. FURTHERMORE, ADVANCE NOTICE SHOULD BE GIVEN THAT ANY DELAY IN SUBSEQUENT 3-YEARLY UPDATES IS NOT ACCEPTABLE, AND WILL INVOKE IMMEDIATE PENALTIES.

DETAILED APPRAISAL OF 10 MEMBER STATES STRATEGIES

Member States have approached the task of developing their national renovation strategies in a number of different ways. The most common approach has been to follow the five sub-paragraphs in Article 4, starting with a description of the building stock and energy saving opportunities, followed by a discussion of policies, measures and initiatives – both existing ones and proposed new ones. Accordingly, this evaluation will use the same five headings specified in Article 4, namely:

- a. Overview of National Building Stock
- b. Cost-effective Approaches to Renovation
- c. Policies and Measures to Stimulate Deep Renovation
- d. Forward-looking Perspective to Guide Investment Decisions
- e. Energy Savings and Wider Benefits

For each of the above sections, each strategy is given a ranking on the scale 0-5, where:

- 0 = MISSING - the item is not covered at all, or only described in another source
- 1 = UNSATISFACTORY – only the most cursory coverage of the item
- 2 = INADEQUATE – item addressed poorly, with insufficient detail, or with important aspects missing
- 3 = ADEQUATE – meets the basic minimum requirements
- 4 = GOOD – topic is described in some detail
- 5 = EXCELLENT – exemplary coverage of the topic

The overall score for a country is then derived as the sum of the individual scores as a percentage of the total maximum score of 25.

The following 10 strategies have been selected for detailed assessment:

1. Austria
2. Brussels Capital Region, Belgium
3. Czech Republic
4. Denmark
5. France
6. Germany
7. The Netherlands
8. Romania
9. Spain
10. The UK

The following sections describe and appraise each strategy in turn.

AUSTRIA

Introduction

The Austrian renovation strategy²³ has been published as a simple, stand-alone document, as well as an annex to the NEEAP.



a. Overview of National Building Stock

Residential buildings were divided into the following categories:

- 6 building age classes (pre-1919, 1919-60, 1961-80, 1981-90, 1991-2000, 2001-13)
- Three building types (single-family houses, small apartment buildings with 3-10 units, and large apartment buildings with more than 10 units)
- 7 heating systems (wood- including wood chips & pellets-, coal, oil, natural gas, electricity, district heating and heat pump)

Non-residential buildings were divided into the following categories:

- 3 building age classes (up to 1980, 1981-90, from 1991)
- 5 types of buildings (office, hotel, retail, school/cultural and other)
- 7 heating systems (as above)

The overall results of the calculation are presented as screenshots from an Excel spreadsheet.

b. Cost-effective Approaches to Renovation

The reader is referred to the cost-optimality report, as published in Austria's response²⁴ to the Commission's guidelines, pursuant to the EPBD Article 4 (2) 2010/31/EU. The report asserts that national requirements are compatible with the cost-optimality methodology.

No further details are provided as to the implications of the cost-optimality calculations for the renovation strategy.

²³ http://ec.europa.eu/energy/efficiency/eed/doc/article4/2014_article4_de_austria.pdf (in German)

²⁴ http://ec.europa.eu/energy/efficiency/buildings/doc/at_costoptimal_2013_en.zip

c. Policies & Measures to Stimulate Deep Renovation

There are no details of any initiatives at the national (federal) level. The description of policies within the nine regions focuses mainly on housing. For the most part, these are simply a summary of the existing support measures such as subsidies, as well as a statement of relevant regulations already in place. None of the regions provide any information on their future plans for policy development and evolution.

d. Forward-looking Perspective to Guide Investment Decisions

No forward perspective has been provided.

e. Energy Savings and Wider Benefits

Annual energy savings to 2020 are contained in the Excel screenshots, where the evolution of energy consumption for both residential and non-residential buildings from 2013 to 2020 is provided. In both cases, the reduction in energy use in 2020 amounts to around 3% compared with 2013, though the basis whereby these savings arise is not clear. Wider benefits are not identified.

Summary

The Austrian renovation strategy is the least detailed of the ten strategies evaluated. Nearly half the document is devoted to describing housing subsidies and other support measures in the nine regions (Austria is a federal nation, and much energy policy is devolved to the regions). Most of the rest of the document describes the process for calculating energy use in the building stock.

In summary, the Austrian renovation strategy leaves a lot to be desired. There is no mention of policies at a national level to promote renovation, no forward-perspective to guide investment decisions, and no assessment of benefits. As such, it is **clearly non-compliant and must be rejected as such by the Commission**. This is regrettable, as individual regions have some ambitious policies regarding building renovation. An example is the demanding target in the Lower Austria region for renovated public buildings, which is as low as 30 kWh/m²/a. One would expect a national strategy to at least compare and contrast the different regional approaches, and identify common areas for interaction between the regions.

There is no mention of indoor climate requirements to take into account when renovating a building.

Table 2 summarises the assessment of Austria's renovation strategy against each of the 5 components of Article 4. The overall rating for Austria is just 28%, reflecting the inherent weaknesses in all but one of the required subject areas.

Table 2 – Assessment of Austria's renovation strategy

The strategy is non-compliant and should be rejected by the Commission.

Overview of building stock	3
Cost-effective approaches to renovation	1
Policies to stimulate renovation	2
Forward-looking perspective to guide investment decisions	0
Estimate of expected energy savings and wider benefits	1
OVERALL level of compliance with Article 4	28%

BRUSSELS CAPITAL REGION, BELGIUM

Introduction

In Belgium, most legislative responsibility is devolved to the three federal regions – Wallonia, Flanders and the Brussels Capital Region (BCR). Accordingly, each region has its own National Energy Efficiency Action Plan (NEEAP), incorporating individual Building Renovation Strategies. The three separate NEEAPs have been published together in a single 400-page document, including an overview of relevant legislation applicable at the Federal level.²⁵



The strategy of the Brussels Capital Region has been selected for analysis as it provides an opportunity to explore the scope for renovation in a highly urbanised “city state” region with a dense, mature building stock, much of which is of historical value.

a. Overview of National Building Stock

Brussels is described as having an area of 162km², comprising 550,000 residential units (just over half of which are in apartment blocks), located in a single climate zone. The space per capita is higher than average, when compared with other European capitals. An important part of the building stock, including in the central districts, consists of old houses of several floors, relatively narrow and deep and arranged in a closed “islet” or island configuration, frequently found since the sixteenth century in all Belgian cities and in the north-west of France. Many of these townhouses and old mansions that have not been replaced by office buildings are now divided into apartments. On average, each year since 1990, some 2,190 new dwellings were started, nearly 1,650 transformed and 40 demolished.

Of the non-residential building stock, over 80% is accounted for by office buildings, the vast majority of which are in the private sector.

The strategy includes a detailed and comprehensive analysis of buildings by age, type, floor area and energy performance characteristics (e.g. insulation levels), as well as energy consumption by carriers and end use.

b. Cost-effective Approaches to Renovation

Following a detailed cost-optimality analysis, in accordance with the Commission’s guidelines, the strategy makes some general conclusions about the applicability of certain renovation measures, split according to architectural/structural measures, and technical installations. For example, insulation of walls and roof, replacement of single-glazed windows with double glazing, strengthening air-tightness and installation of condensing gas boilers are considered generally cost-effective. For multi-family units with 20 or more apartments, production of heat in a central boiler plant is considered most efficient.

For offices, comfort ventilation with heat recovery is a viable retrofit measure provided a double-flow type network ventilation already exists. Variable speed circulators for both hot and cold are recommended, as are lighting installations comprising T5 luminaires, electronic ballast, presence detectors and daylight dimming. PV is also considered cost-effective.

Table 3 summarises the typical investment costs (in €/m²) and resulting impact in terms of primary energy consumption for different building types.

²⁵ http://ec.europa.eu/energy/efficiency/eed/doc/neeap/2014_neeap_belgium_en.pdf (in French). See page 24 onwards (section 3.2) of the Brussels NEEAP

Table 3 – Typical investment costs and primary energy consumptions

	Investment (€/m ²)	Primary energy consumption BEFORE (kWh/m ² /a)	Primary energy consumption AFTER (kWh/m ² /a)
Smaller single family houses	115	201	100
Larger single family houses	136	413	131
Average single family houses	126	-	-
Small multi-family building (3-4 apartments)	57	290	241
Large multi-family building (20 apartments)	338	463	184
Average multi-family buildings	197	-	-
Office building (5 storeys)	143	237	74
Office building (11 storeys)	224	301	111
Average office buildings	183	-	-

c) Policies & Measures to Stimulate Deep Renovation

The regional environmental plan “Plan Air-Climate-Energy (PACE)” provides a range of measures to stimulate the Brussels market for sustainable construction and renovation of buildings to a high energy and environmental performance level. Strands of activity include strengthening the exemplary role of public authorities, implementation of incentive measures (such as the label “Green Building”), alternative financing systems, and development of a competent and qualified workforce.

A repository of buildings that have had their energy and environmental performance assessed will be implemented. This framework will form the basis for certification and application of a new “sustainable building” label. While initially voluntary, certification may be made mandatory for certain types of buildings or for those occupied or intended to be occupied by a public authority, as well as buildings that are the subject of work in which a public authority is the owner. The label, which still needs to be developed, could in time be extended to buildings in the private sector.

PACE also provides for removal of barriers to improve the energy performance of buildings, for example by setting guidelines to broaden the consideration of environmental, climate and energy requirements in the overall assessment of projects. For example, external wall insulation will be allowed, even if it results in a slight overshoot of the site boundary.

Improving the energy performance of rental properties will be encouraged by allowing rent to increase to cover renovation investment costs, as long as the overall cost of tenure does not increase.

The requirements for simple renovations (e.g. single measures) will be strengthened such that they do not preclude eventually achieving a highly efficient energy standard for the whole building. In other words, they allow for deep renovation to be achieved in stages.

There are also various financing support schemes, including:

- An “energy performance credit” of up to €25,000 at zero interest;
- Extending the supply of pre-financing to all households;
- Creation of a regional bank guarantee, the “green express warranty” (capped at €250,000);
- Plans to change the system of property taxation to include consideration of the energy performance of residential units;
- Action to encourage mobilisation of funds currently available in residents’ savings accounts to improve the energy performance of their homes, as this can yield a higher return than the savings account.

d) Forward-looking Perspective to Guide Investment Decisions

Based on the cost-optimal calculations identified earlier, the investment potential in building renovation between 2014 and 2030 is estimated to be in the range €179-211 M, which represents a total investment of €3 billion by 2030.

This indication of investment requirements is useful, but does not provide any information as to timing and sources of funding, nor the steps by which market scale-up will be achieved.

e) Energy Savings and Wider Benefits

Energy saving potentials are identified only at the level of individual buildings, and then only for residential buildings.

In terms of wider impacts, only the employment benefit is mentioned, though there is no attempt to quantify the impact. However, significant emphasis is placed on the wider environmental sustainability considerations associated with building renovation, such as use of ecological materials, reuse and recycling, water efficiency etc.

Summary

Two aspects of the Brussels Capital Region strategy can be considered among the best examples from the selected strategies, namely the description of the building stock and the section on cost-optimality. The analysis of cost-effective opportunities at the level of individual buildings, and the description of measures that comprise individual renovations, is excellent. However, scaling up to the whole Brussels Region is only done in terms of costs, and not in terms of energy saving.

The Plan Air-Climate-Energy (PACE) has some useful elements which can be expected to help grow the market for building renovation, yet the absence of a forward plan limits its usefulness as a tool for stakeholders to work with the regional Government to deliver the identified investment potential.

Issues pertaining to internal air quality and comfort have been factored into the cost optimality calculation by specifying fresh air requirements.

Table 4 summarises the assessment of the Brussels Capital Region renovation strategy against each of the 5 components of Article 4. Top scores were awarded for the building stock overview and cost-effectiveness appraisal, though the remaining three topics were not covered in as much detail.

Table 4 – Assessment of Brussels Capital Region’s renovation strategy

Overview of building stock	5
Cost-effective approaches to renovation	5
Policies to stimulate renovation	3
Forward-looking perspective to guide investment decisions	2
Estimate of expected energy savings and wider benefits	2
OVERALL level of compliance with Article 4	68%

The Commission should request that the two weakest areas (each scoring less than 3) be revised and an updated strategy submitted.

CZECH REPUBLIC

Introduction

The Czech renovation strategy has been published as Annex 6 of the NEEAP²⁶.



a) Overview of National Building Stock

The residential building stock is described in detail in terms of number, type and age of building. It is estimated that 25% of single family houses and 40% of apartment blocks have already been renovated, typically consisting of external wall insulation, together with window replacement in many cases. Such renovations are unlikely to have achieved a cost-optimal level, but subsequent renovation to improve fabric insulation may no longer be cost-effective, thus creating an example of “locked out savings”. Previously renovated buildings have nevertheless been included in the modelling, described later, from 2035 onwards.

Non-residential building stock is described in much less detail due to lack of statistical data.

b) Cost-effective Approaches to Renovation

A detailed array of 72 building categories has been devised, based on the assessment of the building stock undertaken earlier, and using the results of the Intelligent Energy Europe TABULA project²⁷ for the residential sector. Costs and savings for achieving both a “moderate” saving and a more ambitious one that approximates to the Passive House standard are presented in detail, by measure. From this, the following total investment requirements are identified. See table 5.

Table 5 – Costs and savings achieved by measure

Category	Recommended standard	Passive standard
Single family houses – envelope	23.5 € bn	28.0 € bn
Single family houses – technologies	6.4 € bn	13.9 € bn
Apartment blocks – envelope	9.4 € bn	10.9 € bn
Apartment blocks – technologies	1.5 € bn	7.4 € bn
Total – residential buildings	40.8 € bn	60.2 € bn
Ensuring adequate ventilation (not included in total below)	7.2 € bn	5.7 € bn
Energy savings in residential buildings	92 PJ	155 PJ
Services and agriculture incl. public and commercial buildings		14.4 € bn
Energy savings in the services and agriculture sectors		55 PJ
Buildings in the industrial sector		statistical data not available
Total	approx. 55 € bn	approx. 75 € bn

Modelling, described under section d), shows that these investments are cost-effective.

²⁶ http://ec.europa.eu/energy/efficiency/eed/doc/neeap/2014_neeap_czech-republic_cs.pdf (in Czech). See Annex 6

²⁷ <http://episcopes.eu/iee-project/tabula/>

c) Policies & Measures to Stimulate Deep Renovation

17 policy initiatives are identified and described, under the following categories:

Strategic

- 1. Inclusion of renovation into national energy policy.** The State Energy Policy is the top level strategic document in the field of energy, and should include one of the identified renovation scenarios within it.
- 2. Incorporating renovation into other aspects of State policy.** Renovation of buildings affects many sectors of the economy and society. For the State to adopt a consistent approach in all areas, relevant points of this strategy need to be incorporated into sectoral policies, and for there to be good inter-departmental co-ordination.

Economic and Financial

- 3. New Green Savings Programme.** This programme, funded from the proceeds of auctioning emission allowances in the EU ETS, is focused on single-family houses and certain other types of buildings that cannot be covered by the European Structural and Investment Funds.
- 4. European structural and investment funds.** The Czech Republic may receive up to €20.5 billion over the period 2014–2020. Part of these funds can be used to finance energy renovation of buildings.
- 5. Energy Performance Contracting.** Proper alignment of state aid and European funding is required to ensure that building envelope renovation is included within EPC contracts, which normally focus on equipment replacement (e.g. lighting).
- 6. Other financial instruments.** The market failures that are hampering investment in building renovation, which has an attractive rate of return when compared with other investments, need to be addressed to release the commercial potential for financing energy saving measures.
- 7. Public buildings.** Some 500-600 buildings fall within the scope of EED Article 5. During 2014, the Government will decide on how they will be selected for renovation and how these renovations will be financed.
- 8. Energy Efficiency Obligations.** The form of a possible obligation on energy suppliers/distributors, pursuant to EED Article 7, is being considered. It might be feasible to introduce the scheme in a voluntary phase from 2016, and for it to become mandatory from 2018.
- 9. Energy-efficient social housing.** The conditions for State support for accommodation for underprivileged or elderly citizens must necessarily include progressive energy criteria if long-term operating costs are to be minimised.

Legislative and Administrative

- 10. Minimum energy standards.** For the purpose of support programmes financed from public funds, the criteria should be established at a cost-optimal level.
- 11. Energy Performance Certificates (EPCs).** The role of the State Energy Inspectorate (the supervisory authority) will be further strengthened so that EPCs maintain their credibility as an instrument with certified quality. The Ministry of Industry and Trade has supported the establishment of an information portal at www.prkaznadum.cz which contains all important facts about EPCs.
- 12. Reduce administrative burden of financial support schemes.** An amendment of the Act on Energy Management (No. 406/2000 Coll.) has been proposed, enabling the providers of financial support to define the requirements concerning the way applicants should demonstrate anticipated energy savings. Furthermore, in cooperation with other ministries (Ministry of Regional Development,

Ministry of the Environment) the parties will strive to unify and reduce the administrative burden when providing grants from EU funds.

13. Coherent requirements in construction legislation. Better alignment and standardisation between construction legislation and energy management legislation is required to ensure construction companies are fully aware of the requirements for building renovation, including the provision of a good quality internal environment.

14. Introduction of a reporting and evaluation system. Data energy audits, energy performance certificates and direct reporting by public institutions should be centralised and the system for reporting achieved energy savings strengthened to increase the knowledge based on the actual performance of energy saving measures.

Educational and Professional Skills

15. Strengthen the role of the state-guaranteed consultancy. The Energy Consulting and Information Centres should have an enhanced role to increase knowledge about appropriate specific measures to enhance the energy performance of buildings. For common building types it is also important to prepare sample projects quantifying the investment costs and the savings achieved.

16. Education at all levels. To ensure the required quality of the preparation and execution of construction work, the current state of education in energy-efficient construction will be assessed and measures to strengthen certain areas may be proposed. The analysis will cover training and lifelong learning of engineers and technicians active in the field of construction, architects, energy experts, as well as apprentice education and secondary vocational education, as well as universities and research institutes. Trade unions and professional chambers play an important part in fulfilling this task.

17. Science and research. Development of new materials, technologies and processes can significantly reduce the costs of implementing energy saving measures. Opportunities will therefore be sought for targeted support of science and research to achieve this objective.

These policies, if implemented, represent a comprehensive action plan that could generate sufficient momentum to transform the Czech building stock into a highly energy performing one.

d. Forward-looking Perspective to Guide Investment Decisions

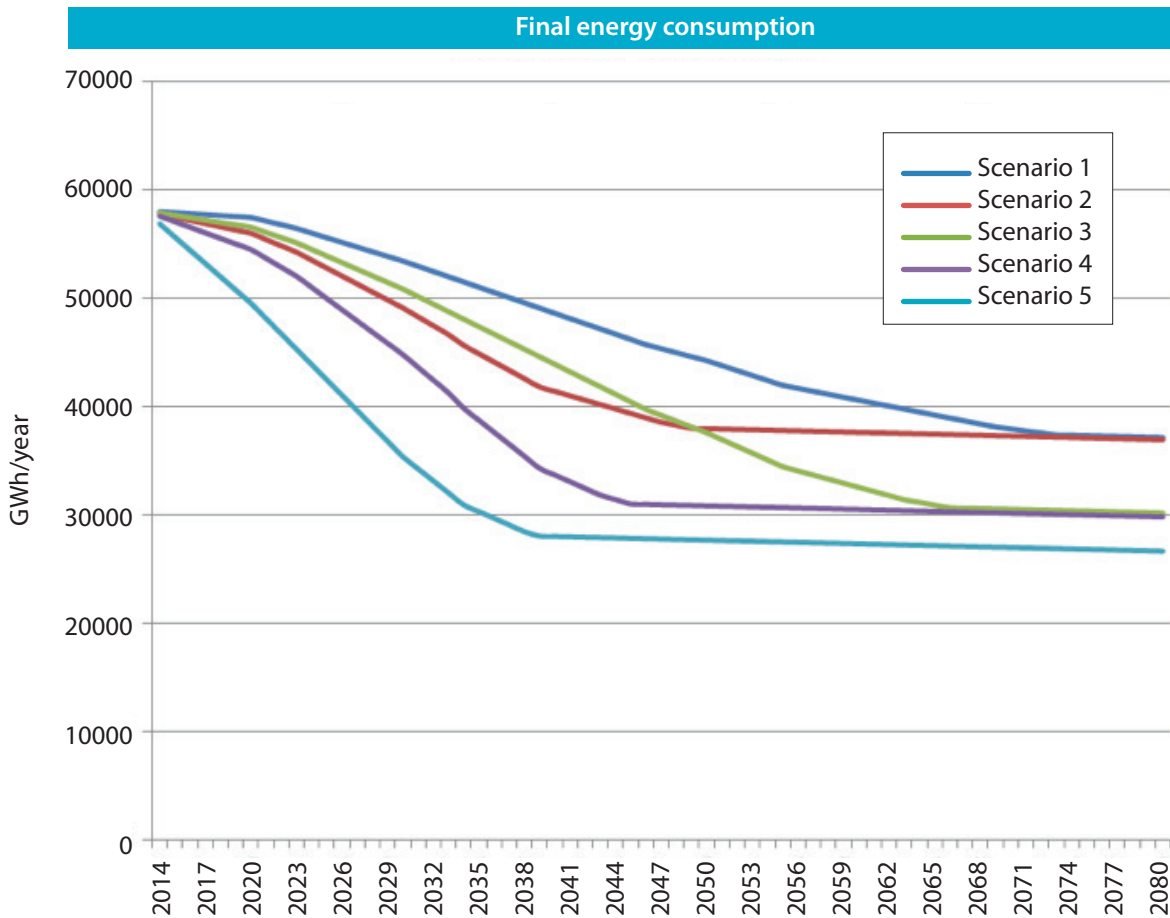
Detailed modelling, undertaken with BPIE, considered 5 scenarios for the evolution of renovation activity in the Czech Republic. These range from a “business as usual” case up to a hypothetical “technical” potential if deep renovation of 3% p.a. of the building stock were to commence with immediate effect. The three intermediate scenarios, which are considered plausible, are:

- Scenario 2. Quick, but shallow – 2-3% p.a. renovation rate, but only moderate renovation depth
- Scenario 3. Slow, but thorough – 1-1.5% p.a. renovation rate, with mainly deep renovation
- Scenario 4. Quick and thorough – 2-3% p.a. renovation rate, with mainly deep renovation

The results are presented in detail in the strategy. The evolution of delivered energy requirements in the residential sector under the 5 scenarios is reproduced in figure 4. It can be seen that the theoretical scenario 5 enables energy consumption to be more than halved, and that the thorough renovation scenarios (3 and 4) eventually achieve most of the potential savings.

A conclusion of the strategy is that the ambition described in scenario 4 is the best balance of achieving energy saving with a positive return on investment. Note that the scenarios are expressed only in terms of delivered energy and thus do not take into account the potential for renewable technologies. The full potential for primary energy saving is therefore not evaluated.

Figure 4 – Energy consumption profile of the Czech building sector under 5 renovation scenarios



e. Energy Savings and Wider Benefits

The potential savings of energy for heating in residential buildings is calculated as 77 PJ, based on a moderate energy savings approach. This represents a 45% reduction compared to current consumption. Further savings of 12 PJ in hot water use and 3.4 PJ in lighting bring the total savings to 92 PJ. The technical potential has also been calculated, assuming the renovation of the entire building stock to a Passive House standard. This would achieve a saving of 140 PJ (a reduction of 81%) on heating energy use, and of 155 PJ including hot water and lighting.

For the non-residential sector (services and agriculture), the energy saving potential on heating has been estimated, based on energy audits, at 50%, and for other types of consumption at 10-15%, giving a total energy saving of 55 PJ.

Investment requirements to achieve the above savings were presented in section b).

In addition to the quantified energy, carbon and financial impacts of the different scenarios, the strategy considers wider benefits. According to the studies prepared for the Ministry of the Environment and the Chance for Buildings Alliance, a state investment of CZK 1 bn (€36M) into support programmes can bring CZK 1-1.2 bn (€36-44M) back into public budgets in the form of company and employee taxes, and avoided unemployment benefit payments. At the same time, it will foster GDP growth of CZK 2.1- 3.6 bn (€76-130M). On the basis of a total investment in building renovation reaching CZK 35-40 bn (€125-145M) per year as a result of implementing the renovation strategy, 35 000 new jobs will be created and GDP increased by 1%.

Summary

The Czech renovation strategy covers all aspects of Article 4, and can therefore be considered a compliant strategy. The ambition can also be seen in the opening paragraph of the strategy, which describes the wider benefits – *“Energy efficient building renovation represents an opportunity for the Czech construction and energy sectors. Implementation of this strategy will create new jobs [...] across the country. It will increase the living comfort and improve the use of buildings. Households, institutions and businesses will have more funds available for the purchase of non-energy services and goods. An energy efficient construction sector has a strong multiplier effect on the Czech economy and it can thus significantly contribute to its growth. It will also allow saving energy and thus decrease the need to use fossil fuels, which will in turn reduce local pollution and greenhouse gas emissions and increase energy security.”*

The particular strengths of the Czech renovation strategy lie in the technical analysis of energy saving opportunities, coupled with the modelling of renovation scenarios, as well as the holistic approach to identifying policies and measures to stimulate the market.

On indoor air quality, the strategy makes the following comments: *There is one specific need related to energy savings in buildings (especially to the installation of new windows), i.e. to ensure adequate ventilation. In this respect, the requirements of [The Construction Act] are not sufficient and it will be appropriate to refine them on the basis of an expert debate so that the standards concerning the hygiene and the quality of the indoor environment will always be respected.*

Table 6 summarises the assessment of the Czech renovation strategy against each of the 5 components of Article 4, together with the overall rating of 72%. The overall performance places the strategy in the “acceptable” category.

Table 6 – Assessment of the Czech renovation strategy

Overview of building stock	3
Cost-effective approaches to renovation	3
Policies to stimulate renovation	4
Forward-looking perspective to guide investment decisions	4
Estimate of expected energy savings and wider benefits	4
OVERALL level of compliance with Article 4	72%

Whilst scoring quite highly compared with other strategies, the Czech strategy’s weakest point is the lack of clear commitment that the preferred scenario will be followed and the identified policy measures adopted.

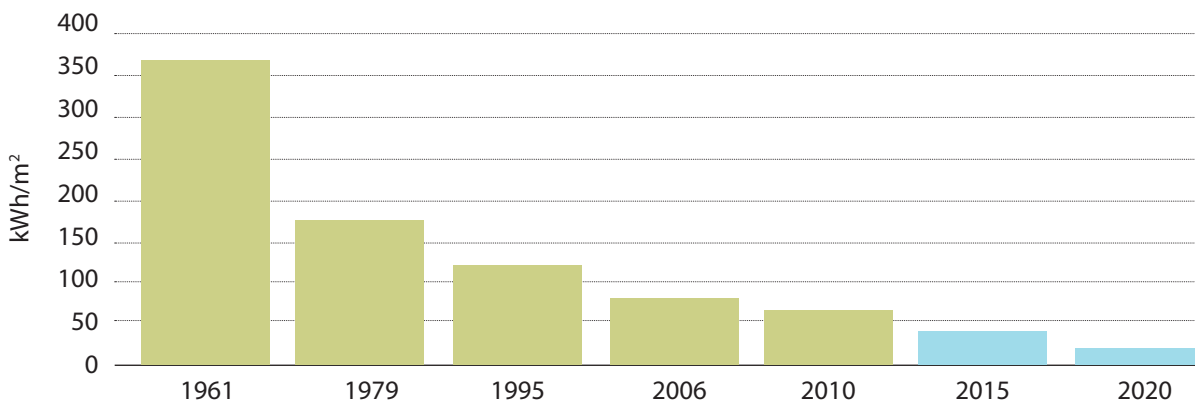
Introduction

The Danish Government's "Strategi for energirenovering af bygninger" or strategy for energy renovation of buildings, was published in May 2014 by the Ministry of Climate, Energy and Building as a stand-alone full colour report²⁸. Extensive use of photographs, an attractive layout and the absence of detailed technical information suggest the publication is aimed at a wider audience than just policy-makers and buildings professionals.

The renovation strategy is portrayed as very much part of the Government's efforts to move towards a fossil-free future, with the aim of using only renewable sources of energy by 2050. Denmark embarked on its vigorous efforts to save energy as a result of the 1970s oil crises, and it has maintained that effort ever since, such that the country now has among the most progressive and ambitious energy and climate change policies in the world. The Energy Agreement of 2012 secured cross-party support for the Government's ambitions for large investments up to 2020 in energy efficiency, renewable energy and the energy system. As evidence for the effectiveness of policies, figure 5 shows the energy performance requirements for new dwellings since 1961, including the projected requirements in 2015 and 2020.



Figure 5 – Evolution of energy consumption profile of new dwellings 1961-2020



Building regulations, together with measures such as high levels of energy taxation, various subsidy schemes, energy performance requirements for building components, advice/information and an energy efficiency obligation on energy companies, have resulted in energy consumption per square metre for heating homes being reduced by almost 45% since 1975.

As further evidence of the importance the Danish Government ascribes to the topic, during the preparation of the strategy a wide network of stakeholders consisting of more than 40 organisations and up to 200 people was established, covering a period of over a year before the strategy was published. The network identified a comprehensive catalogue of suggestions to improve and promote energy renovation, which provided key input into the development of the strategy itself. The stakeholder process is described more fully in the World Green Building Council's *Collaborative Policy Making* case study.²⁹

²⁸ http://ec.europa.eu/energy/efficiency/eed/doc/article4/2014_article4_en_denmark.pdf (in Danish)

²⁹ http://www.worldgbc.org/files/1813/9254/0062/Policy_Case_Study_-_Denmark.pdf

a. Overview of National Building Stock

The building stock is described only at the aggregate level, in terms of, for example, the proportion of buildings constructed in different time periods, and the corresponding average energy consumption. There is no detailed breakdown, as required in the Commission's NEEAP guidance, by building type, climatic zone, use, etc. However, reference is made to a report by SBI³⁰, the Danish Building Research Institute, which includes the detailed analysis.

b. Cost-effective Approaches to Renovation

The main approach outlined in the strategy relates to the renovation of existing buildings as components or building elements wear out. Undertaking renovation upgrades at this time is considered most cost-effective.

In fact, the strategy highlights the fact that reducing energy consumption is not usually the main driver for renovation. In addition to times when replacement of worn components or building elements is necessary, renovation occurs when buildings are being adapted for different needs as a result of changing family or business circumstances, or to improve the indoor climate. Every time a replacement or a modification of a building occurs, there is a possibility to implement energy renovations in a cost-effective manner at the same time, the strategy emphasises. For example, it is possible to install new, energy efficient windows that reduce energy consumption in the building and also provide better comfort when existing windows need to be replaced. Given that energy renovation can be done most cheaply and effectively in conjunction with alteration, extension, ongoing renovation or maintenance of buildings, the strategy argues that it is essential to conduct energy renovation each and every time such works are carried out.

Every renovation "trigger point" should include measures which achieve the highest energy performance, consistent with achieving a deep renovation. Sub-optimal component replacement or fabric measures will limit the long-term potential for energy saving. Furthermore, every opportunity to switch to renewable energy sources should be taken.

The strategy does not identify any cost estimates, either at the individual building level or globally. Instead, the reader is referred to the SBI report mentioned earlier.

c. Policies & Measures to Stimulate Deep Renovation

Within the strategy, the Government commits to organising the concerted effort required in order to realise the energy saving potential in buildings. Furthermore, the strategy complements and supports the national Smart Grid strategy and Climate Plan. In particular, realisation of the Smart Grid strategy is seen as strengthening the integration of renewable energy in buildings and buildings' interaction with the energy system, which can contribute to more efficient operation of the electricity system at the same time as lower energy consumption in buildings.

In more detail, the strategy outlines 21 initiatives, across 4 sectors:

1. Initiatives aimed at all construction segments

- 1.1 Upgrade the energy requirements of the building envelope
- 1.2 Upgrade the energy requirements for windows in line with the 2015 and 2020 already agreed energy classes and based on energy balance
- 1.3 Upgrade the energy requirements of building technical installations
- 1.4 Ensure increased compliance with the building code rules

³⁰ http://www.worldgbc.org/files/1813/9254/0062/Policy_Case_Study_-_Denmark.pdf

- 1.5 Introduce voluntary energy classes for existing buildings and a possibility to comply with energy calculations of the entire building instead of component requirement when renovating
- 1.6 Upgrade the energy requirements for new buildings
- 1.7 Strengthen information and communication efforts on renovation and energy efficiency in buildings and develop information tools that take a broader perspective on energy renovation e.g. that includes daylight, health, indoor climate etc.
- 1.8 Target energy companies' energy saving initiatives
- 1.9 Ensure an effective and targeted energy labelling scheme for buildings
- 1.10 Ensure better data and tools to assist decisions on energy renovation
- 1.11 Promote a good framework for financing energy renovation
- 1.12 Present a political strategy to formulate the Government's overall approach to the construction sector and address industry challenges

2. Initiatives targeted at single family dwellings

- 2.1 Promoting energy retrofit houses through the Better Housing Scheme (BedreBolig-ordningen) - a single point of information (one-stop-shop) for homeowners
- 2.2 Promote the uptake of renewable energy alternatives to oil and gas boilers

3. Initiatives targeting multi-family buildings, commercial buildings and public buildings

- 3.1 Promoting energy renovation of major buildings by public procurement offering guaranteed services for energy savings in residential buildings, office buildings, etc.
- 3.2 Promoting energy renovation of social housing through the development of a flexible digital energy renovation platform
- 3.3 Promoting energy renovation of private rental homes, condominiums and owner associations
- 3.4 Put forward a Bill to amend the commercial rent law to make it easier for landlords to enter into agreements with tenants on energy renovation of buildings
- 3.5 Promoting energy efficient public buildings

4. Initiatives targeted at strengthening the skills and innovation to promote energy renovation

- 4.1 Strengthen training and skills development in energy renovation
- 4.2 Strengthen research, innovation and demonstration in the area of energy renovation

d. Forward-looking Perspective to Guide Investment Decisions

Whilst the forward landscape in terms of policy initiatives has been set out in some detail, this has not been translated into investment amounts or activity levels at future points in time. Perhaps in the context of the ongoing stakeholder engagement process in Denmark, it is less important to have these figures, which of course can only be projections rather than absolute commitments. Nevertheless, for organisations and individuals not involved in the process (including those not directly connected with the Danish market), a profile of the future evolution of the market along the lines specified in the NEEAP guidance would be required.

e. Energy Savings and Wider Benefits

Overall, the Government's expectation is that the strategy will lead to at least 35% reduction in net energy consumption for heating and hot water in the building stock by 2050 compared to 2011. However, in order to achieve this, the following criteria need to be met, according to the strategy:

- Barriers must be removed to make it easier to renovate to improve energy performance;
- Energy renovations should be properly implemented so that the expected performance is achieved in practice;
- A high-level of knowledge and awareness of energy for building owners/users needs to be achieved and maintained through information and advice initiatives;
- Energy requirements for buildings and building components should be tightened, and compliance with these requirements ensured;
- Buildings must be maintained as components wear out, with highly energy performing replacements installed;
- There must be development of future energy-efficient solutions and processes, leading to reduction of costs.

In addition to the energy and climate benefits, the strategy identifies the following attributes of energy renovation:

- Increasing the utility value and quality of buildings, through better thermal and daylight conditions, providing a healthier and better place to live and work in;
- The potential for enhancing the buildings' architectural value;
- The opportunity to incorporate wider environmental objectives in renovation, such as recycling and sustainability in construction;
- Increasing the value of the building stock;
- Enhancing the already strong skill set of Danish companies in the building renovation market, providing a platform for export of goods and services.

Summary

In summary, the Danish building renovation strategy is short on technical detail concerning the building stock, yet is among the most ambitious strategies in terms of what the Government plans to do. The package of 21 initiatives addresses all building sectors, as well as recognising the importance of skills and R&D to ensure quality of installation and development of better and cheaper ways of reducing energy consumption in buildings. Whilst the comprehensive range of policy initiatives is to be highly commended, the absence of basic information within the strategy itself, namely the identification of cost-effective approaches to renovation, a forward-looking perspective to guide investment and quantification of benefits, means that the Danish strategy is not compliant with the Article 4 requirements.

The strategy takes a practical approach on how to trigger renovation and the importance of not compromising the indoor climate and health of the people working, living and learning in the buildings. Throughout the strategy, the importance of energy efficiency and improvement of the indoor climate is emphasised by the Danish Government. It also introduces new instruments, e.g. a possibility to use energy calculations of the entire building instead of specific component requirements when renovating, introduction of a "one stop shop" to raise awareness, new information tools that include aspects such as indoor climate, health, comfort in addition to energy considerations.

Table 7 summarises the assessment of the Danish renovation strategy against each of the 5 components of

Article 4, together with an overall rating. Except for the policy section, the scores are below the acceptable threshold of 3, reflecting the fact that the discussion is missing altogether, discussed in the most basic terms or covered in other documents.

Table 7 – Assessment of the Danish renovation strategy

Whilst the required information as set out in the Article 4 legislation may be available elsewhere, the strategy

Overview of building stock	2
Cost-effective approaches to renovation	1
Policies to stimulate renovation	4
Forward-looking perspective to guide investment decisions	0
Estimate of expected energy savings and wider benefits	1
OVERALL level of compliance with Article 4	32%

should include sufficient detail for it to be a comprehensive stand-alone document, as required by the EED. The absence of this information, or its cursory treatment, means the Danish strategy is non-compliant and should be rejected by the Commission.

Introduction

France has set out an ambitious long-term goal to cut greenhouse gas emissions by 75% by 2050, compared with 1990. Within that objective, a target of 38% energy reduction in the building sector by 2020 has been identified as a key contributor to the longer term goal. As part of the process of engagement with stakeholders, the Government commenced in 2012 a cycle of what was to become a programme of annual environmental conferences, at which stakeholders can engage in the process of developing and defining sustainable development objectives across the economy, including in the building sector.



a. Overview of National Building Stock

The French renovation strategy identifies dwellings constructed in the period 1949-1975, comprising 28% of the total dwelling stock in France, as the most energy inefficient. Buildings constructed prior to this period (33% of the total) were frequently constructed with bioclimatic considerations which minimised energy requirements, while newer ones post-1975 (comprising nearly 40% of all dwellings) were built after the introduction of thermal regulations.

As with other EU Member States, France has introduced an Energy Label for buildings (“Diagnostic de Performance Énergétique - DPE”), which in the case of France takes the form of the familiar A-G rating system. Half of all dwellings are in the D and E categories (25% each), while one third (33%) are in the worst energy performance categories F and G. What is interesting is that the French authorities acknowledge there is a difference between the theoretical energy performance and actual performance, particularly for less efficient properties where occupiers are unlikely to heat buildings to the design level. The phenomenon is described as the “wallet effect”.

As regards the non-residential stock, the strategy analyses the main building categories, for example by size or age of buildings. The majority of offices and retail premises have been constructed since 1974. However, except in the case of retail sector, there is no appraisal of the energy performance (in kWh/m²/a) of non-residential buildings. The faster growth rate of the non-residential stock is noted, with annual increases in floor area of 2-3%, compared with around 1% for residential buildings.

b. Cost-effective Approaches to Renovation

France has committed to reducing energy use in existing buildings by 38% by 2020. To examine the potential in further detail, three example building types are illustrated:

- Single-family house constructed between 1950 and 1975 (i.e. prior to energy performance requirements in the building codes);
- Multi-family building constructed between 1975 and 1990;
- Office building constructed between 1985 and 2000.

In each case, three scenarios are considered:

1. Replacement of energy systems (heating, lighting etc) at the end of their lifetime;
2. Intermediate level renovation, improving both energy systems and envelope (including window replacement);
3. Deep renovation, achieving a high level of energy performance.

³¹ http://ec.europa.eu/energy/efficiency/eed/doc/article4/2014_article4_fr_france.pdf (in French)

A cost-benefit analysis, utilising the European Commission's cost-optimality methodology, is presented. The results indicate that, in all three cases, when evaluated over a 30-year period, deep renovation proved to be the least costly option, even though the investment (in the case of the two residential building types) was more than 10 times greater than for the equipment-replacement option.

Despite these results, which indicate that deep renovation is the preferred option with the best long-term financial return, the strategy argues it is not possible to generalise a solution applicable to the entire building stock. Furthermore, there is great uncertainty over the future evolution of energy prices, while the costs of renovation can vary considerably according to the specific building and measures to be installed. Also, the way in which occupants use the building has a significant bearing on the actual savings achieved. Nonetheless, the following conclusions are drawn:

- In the case of individual uninsulated housing (corresponding roughly to the period of construction from 1948 to 1975), deep renovations appear to be most profitable.
- In the case of multi-family housing or housing that has already been insulated or already having relatively efficient equipment, the results are not clear cut, so it is recommended that specific assessment be undertaken.
- In the case of office buildings, complete renovation of both energy systems and the building fabric appear profitable. However, the level of renovation to aim for is highly dependent on the initial state of the building and terms of occupancy.
- For other non-residential buildings for other uses, the heterogeneous nature of the market requires specific audits to be undertaken to evaluate the specific cost-optimal solution.

One further conclusion is that the cost-optimal renovation is one that requires significant investment, which may be beyond the means or willingness to pay of the building owner. This illustrates the importance of having suitable financing mechanisms in place to overcome the initial investment cost hurdle.

c. Policies & Measures to Stimulate Deep Renovation

The French Government has, since 2012, organised an annual environmental conference at which sustainable development objectives are discussed. It is an opportunity for stakeholders to engage with the agenda, and has also been used to inform the renovation strategy.

At the inaugural conference, the President of the Republic, Francois Hollande, announced the goal of deep renovation of 500,000 dwellings annually, in order to meet the 38% energy saving target. This was followed in March 2013 by the Energy Renovation Plan for Housing³² which, in addition to saving energy, seeks to tackle fuel poverty. The plan is built around three pillars:

- Support for households to facilitate and engage in decision-making towards renovation;
- Improving the financing arrangements for energy renovation, the aim being to make available to every household some form of assistance adapted to their needs and means;
- Professionalisation of the renovation sector to improve quality and cost-control.

Household support includes a free "one-stop-shop" service, offered through a network of 450 Renovation Information Service Points. The scheme is branded (see image) and promoted widely, including a single access national telephone number.



The objective of the **package of financial support** is to ensure that every household has support tailored to their income:

- For private housing, there is the zero-interest eco-loan (eco-PTZ) and a sustainable development tax-credit. To encourage deeper renovation, the tax-credit operates at two rates:
 - 25% for packages of work comprising at least two measures;
 - 15% for low-income households carrying out a single action.

³² Plan de Renovation Energétique de l'Habitat -PREH. See <http://www.renovation-info-service.gouv.fr/>

- In order to tackle fuel poverty, the Better Living Programme of the National Housing Agency (Anah) has been expanded in terms of funding available, and extended to include private landlords.
- Value Added Tax (VAT) on energy renovations that comply with the tax credit requirements has been reduced to 5.5%.
- Pilot third-party funding schemes are being tested in eight French regions.
- For social housing, the rate of the eco-loan, distributed by the Caisse des Dépôts et Consignations (CDC) since 2009, was reduced in August 2013 to finance the renovation of the most energy inefficient housing. The goal is 120,000 social housing units renovated each year by 2017.

In March 2013, the Government announced the establishment of a guarantee fund, managed by CDC, designed specifically to boost banking services and encourage banks to distribute a new line of “energy retrofit” credit to individuals. In this context, a specific guarantee fund allowing banks to cover part of their initial losses is currently being studied.

On **professionalisation** of the energy renovation sector, the main actions include mass training of employees for companies and building trades, development of a trusted quality mark to demonstrate expertise and competence of firms in this area of work, and developing the supply chain.

By contrast with the extensive description of actions for the residential sector, the tertiary or non-residential sector is covered in much less detail. Nevertheless, some potentially interesting policies are identified.

- At the 2013 environment conference, President Hollande announced his intention to introduce a renovation obligation during 2014;
- In preparation for the renovation obligation, on 31st October 2013 a voluntary charter was signed with large French companies. Focused on buildings over 1000 m², the charter seeks to mobilise action to renovate profitably existing public and private buildings and set performance targets to be achieved.

Mandatory renovation is also being considered for other cases. For example, if a roof needs repair or replacement, adding insulation or replacing windows at the same time will be a small extra cost. Addition of roof insulation could therefore become a mandatory measure in cases where roof structures need to be replaced, and where the existing insulation is below a certain threshold.

To support renovation in the public sector, the State has allocated a national budget of € 20 billion over the period 2013-2017, open to all local authorities, at the rate of € 4-5 billion/year. Renovation of public buildings is one of 10 approved spend areas.

Finally, in the area of research, support is given to scaling-up mass renovation of the housing stock.

Subsequent to publication of the strategy, the French Government approved its Energy Bill on 30th July, clearing the way for it to go before Parliament this autumn. Among its measures, the bill proposes a series of new tax breaks and zero-interest loans to help drive investment in clean energy and energy efficiency measures. State-backed lender CDC has been instructed to set aside €5bn to support the new bill, while zero interest loans are also expected to be made available to support a domestic insulation programme. Environment Minister Ségolène Royal argues that the new package would mobilise around €10 bn of investment and create thousands of jobs, adding that it was the “most ambitious” clean energy transition “in all of the EU”. She described the measures as providing the “financial engineering” to support the transition to a greener economy.

d. Forward-looking Perspective to Guide Investment Decisions

The strategy includes a chapter on forward-looking perspectives, subdivided according to building owners, the supply chain (industry and professionals) and the finance community. In reality, this section largely consists of an amplification of the policy measures identified earlier, together with details of additional policies and initiatives. It is more a statement of the status quo than a forward-looking perspective that can guide investment decisions.

e. Energy Savings and Wider Benefits

For a discussion on energy savings, the reader is referred to the French NEEAP. No details are provided in the strategy itself. There is no indication of whether or how the 38% energy saving goal for the building sector will be achieved.

The benefits of building renovation are identified as:

- Job creation (direct and indirect), particularly in the SME sector, contributing to increased economic activity and a reduction in social security costs. An estimated 75,000 jobs will be created by the renovation action plan
- Reduction in energy consumption, contributing to the French goal of energy independence and increased energy security
- Increase in property values
- Increase in comfort and improved indoor environment, particularly for occupants with health problems or at risk of fuel poverty – affecting some 3.4 million homes, of which 87% are in the private sector
- Improved productivity
- Increased purchasing power, by virtue of lower energy bills
- Environmental benefits

For the most part, these benefits are not quantified.

Summary

France has made a commitment at the highest level to some ambitious goals in the building sector. The three-pronged approach of supporting households, facilitating finance and increasing professionalism points to a co-ordinated effort, supported by a significant number of initiatives. It will be particularly interesting to see how the proposed mandatory renovation requirements will be formulated, and how they will be received by the market.

What is lacking in the French renovation strategy is a clear enunciation of how the 38% energy saving goal by 2020 will be achieved. Also largely absent are two elements specified in Article 4, namely the forward-looking perspective, and quantification of energy savings and wider benefits.

One of the many benefits of renovation is identified as being an increase in comfort, particularly for occupants with health problems or at risk of fuel poverty, where not only temperatures, but also humidity levels may be contributing to an unhealthy indoor environment.

Table 8 summarises the assessment of the French renovation strategy against each of the 5 components of Article 4. The overall rating for France is 64%.

Table 8 – Assessment of the French renovation strategy

Overview of building stock	4
Cost-effective approaches to renovation	4
Policies to stimulate renovation	4
Forward-looking perspective to guide investment decisions	2
Estimate of expected energy savings and wider benefits	2
OVERALL level of compliance with Article 4	64%

The Commission should request that the two weakest areas (each scoring less than 3) be revised and an updated strategy submitted.

Introduction

The central goal of the Federal Government is, in the long-term, to reduce the heating requirements of the building stock in order to achieve a nearly carbon-neutral building stock by 2050. By then, buildings will have only very low energy requirements, with the remaining energy demand met mainly by renewable energies.

The Government acknowledges that existing instruments alone are not sufficient to achieve this ambitious national goal. An adequate, reliable, legal framework is required, as well as significant investments. In addition to funding tools, the Government will continue to develop the energy saving legislation in the context of economic viability. However, the apparent enthusiasm for radical measures is tempered by the argument that building owners and tenants “must not be overwhelmed by the implementation of the European guidelines. Housing must remain affordable and built environment values are to be preserved.”



a. Overview of National Building Stock

The German renovation strategy includes a comprehensive description of the building stock and its energy performance. Of the 41 million homes located in 18.2 million buildings, 68% were built before 1979. The largest proportion of dwellings, 43% of the total, was constructed between 1950 and 1979. From an energy performance perspective, these are the least-efficient buildings, erected before the first Thermal Insulation Ordinance came into force. Over half of all residential units are rented. These buildings are primarily located in multi-family buildings.

It is estimated that there are about 1.7 million non-residential buildings, but this figure is subject to uncertainty. Office and administration buildings comprise the largest share of the total, at 22%, followed by retail and agricultural (both 14%) and hotels, cafés and restaurants (13%). Public buildings of the federal, state and local Government comprise about 20% of all non-residential buildings by floor area.

Previous efforts to reduce energy consumption in buildings over the last decade or so have borne fruit, as illustrated by the decline in space heating consumption (weather-adjusted) from 205 kWh/m²/a in 2000, down to 147 kWh/m²/a in 2012.

According to a study by IWU³⁴, the following annual renovation rates in the period 2000-2009 for the residential sector were noted:

- Nearly 1% p.a. of residential buildings built up to 1978 received exterior wall insulation
- Thermal insulation of top floor ceilings is between 1% and 2% p.a.
- Basement ceiling insulation is well below 1% p.a.
- Renewal rate of the main heat source is just under 3% p.a.

The study concludes that, on average, the renovation rate in Germany is around 1% p.a. By contrast, some 3% p.a. of the building stock is subject to some form of non-energy renovation, so there are missed opportunities to improve energy performance at the time of works being carried out in 2 out of every 3 buildings.

³³ http://ec.europa.eu/energy/efficiency/eed/doc/article4/2014_article4_de_germany.pdf (in German)

³⁴ Datenbasis Gebäudebestand, Institut für Wohnen und Umwelt, Darmstadt 2010

b. Cost-effective Approaches to Renovation

Cost-effective energy saving opportunities are not identified. Instead, there is merely a statement that all buildings are different and that a toolkit of measures is required.

c. Policies & Measures to Stimulate Deep Renovation

One existing measure of note is the requirement to insulate previously uninsulated, accessible roof space and heating distribution pipes. It is one of very few examples across Europe where a mandatory renovation requirement exists that is not directly linked to other works being undertaken in a building. Individual regions (Länder) are free to introduce their own mandatory requirements.

An existing tenancy law allows landlords to increase rents by up to 11% per year to cover the cost of energy renovation.

Perhaps the largest and best-known support regime for sustainable buildings in Europe, the KfW programme has, since 2006, funded energy-efficient renovation or construction of nearly 3.5 million homes with a total investment of around €159 bn. For every €1 of public funds, €12 of private investment has been leveraged. The KfW CO₂ Building Rehabilitation Programme will continue to operate, under the following principles:

- Higher levels of saving (i.e. deeper renovation) needs to be rewarded with greater support levels (i.e. higher grant amounts or more favourable loan conditions);
- Support thresholds need to be adjusted periodically in response to technological development, changes in the energy legislation, and as a result of evidence gained from monitoring;
- Funding flexibility should remain, to take account of different starting positions.

€1.8bn has been made available for 2014, and the intention is to increase this in the future. Another KfW programme “Energetic Urban Renewal” focuses on districts and neighbourhoods. Such projects can be complex, relying on many players, and often seeking to achieve multiple objectives such as better social as well as environmental conditions for inhabitants. Accordingly, a special Rehabilitation Manager is appointed to oversee such initiatives.

€518M annually till 2019 is allocated by the Federal Government to the Regions to support modernisation of social housing. A further €438M is available in 2014 under the incentive programme for renewable energies in the heat market, mainly focused on measures in existing buildings. Part of the funding is used for forward-looking infrastructure, such as heat networks and heat storage. There are also tax breaks, worth up to €1200 p.a., for owner-occupiers making energy-saving investments without recourse to public funds.

Recognising that finance is often not the main barrier, support is provided in the form of advice, information and consultancy for residential owner-occupiers and private landlords. For example, the “housing transformation” campaign, supported by Government and industry bodies from across the supply chain, aims to raise awareness of renovation opportunities and to signpost building owners to suitably qualified experts.

d. Forward-looking Perspective to Guide Investment Decisions

Renovation is placed in the context of the German “Energiewende”, or transition towards an energy system based almost entirely on renewable energy sources by 2050. It recognises that existing instruments are not sufficient, yet does not spell out what measures are required for the building sector to play its part in the transition. Rather puzzlingly, the strategy states that the federal Government will “develop a national long-term rehabilitation schedule” for buildings, yet that was the requirement of Article 4, to be included in the present strategy.

Most of the forward perspective is devoted to a significant number of research initiatives, such as “Future Building”, which seeks to identify new, better and cheaper ways of deploying energy saving and renewable

technologies in new as well as existing buildings. The research agenda is clearly a vital component of a forward-looking renovation strategy. However, the discussion concerning policies and actions that will support deployment of existing technologies is largely missing, other than a continuation of the KfW support programmes.

e. Energy Savings and Wider Benefits

An estimate of energy savings to 2020, totalling 337 PJ/a compared to 2008, is provided, broken down by initiative. 215 PJ/a, or two-thirds of the total savings potential are expected to come from the Energy Saving Ordinance, with most of the rest from the various KfW schemes. No estimate or discussion of wider benefits is included.

Summary

One of the strengths of the German renovation strategy is the effort that is being put into the research agenda. Given the significant investment that has already been made in the building stock over many years through programmes such as KfW, it is important to identify even more effective ways in which building energy performance can be improved, particularly through the holistic integration of energy efficiency and renewable technologies to deliver buildings that do not require fossil fuels (the stated long-term ambition). It is, however, odd that in section 5.1 (p 26) of the submission, the German Government says that it “will develop a long-term rehabilitation schedule”, since that was the requirement that needed to have been delivered within the present report. It can therefore be expected that Germany will present a full renovation strategy in due course. The plan is for key documents to be presented to cabinet for approval by the end of 2014.

There is little or no mention of indoor air quality issues in the strategy, other than the fact that only 0.4% of buildings constructed before 1978 have a (retrofitted) mechanical ventilation. Of these, about three-quarters are simple ventilation systems without heat recovery. Even in new buildings from 2005, a ventilation system is installed in only about 9% of the cases, but then largely with heat recovery. The proportion of controlled ventilation systems with heat recovery has increased steadily in recent years.

Table 9 summarises the assessment of the German renovation strategy against each of the 5 components of Article 4. The Commission should request that the sections on forward perspective and cost effective approaches be revised and an updated strategy submitted.

Table 9 – Assessment of the German renovation strategy

Overview of building stock	4
Cost-effective approaches to renovation	2
Policies to stimulate renovation	3
Forward-looking perspective to guide investment decisions	2
Estimate of expected energy savings and wider benefits	3
OVERALL level of compliance with Article 4	56%

Introduction

The Dutch building renovation strategy is based on the Energy Agreement for Sustainable Growth³⁶, published in September 2013 and endorsed by some 40 stakeholders active in the field of energy efficiency and sustainable generation. With an aim to achieve 80-95% reduction in CO₂ emissions by 2050, and at least a 40% CO₂ reduction in 2030, it contains (according to the Government) strong ambitions, goals, intentions and commitments regarding energy savings in many areas in the Netherlands, for the short, medium and long-term.



Headline goals in the Energy Agreement for existing buildings are:

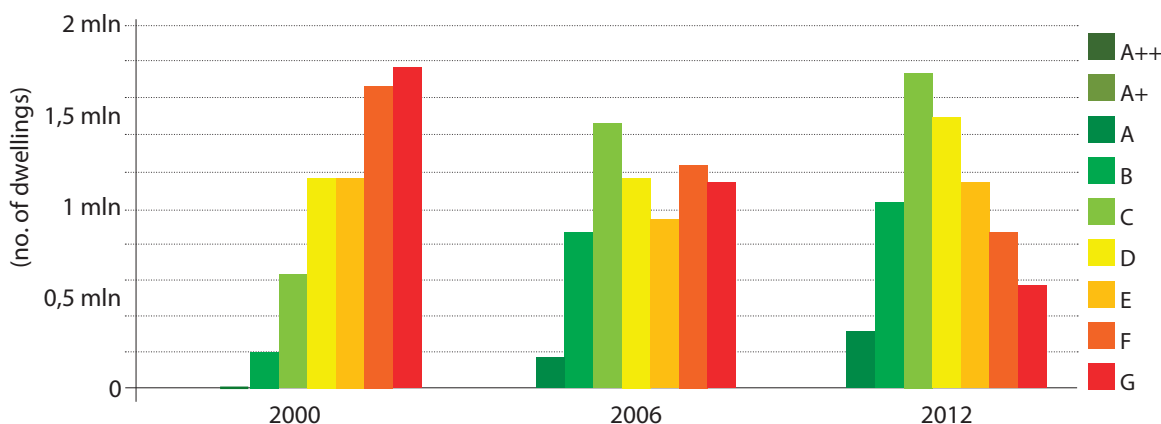
- 300,000 existing homes and other buildings a year to improve by at least two label steps³⁷;
- Average social rental property to achieve label B, while 80% of private rental to achieve minimum label C in 2020.

The Energy Agreement also aims to achieve at least an average energy label A for buildings in 2030.

a. Overview of National Building Stock

The Dutch housing stock comprises just over 7 million dwellings. As illustrated in figure 6, the energy performance of the housing stock is visibly improving. In 2000, 70% of residential buildings were rated E, F or G. By 2012, that figure had dropped to 36%.

Figure 6 – Average energy label of Dutch dwellings, 2000-2012



The average electricity consumption of households has stabilised at just over 3,200 kWh a year, while gas consumption (the main heating fuel in The Netherlands) has been gradually reducing since 2004.

The stock of non-residential buildings in the Netherlands comprises about 600 million m² (Gross Floor Area), compared to around 1 000 million m² for residential buildings. The energy intensity differs widely for each type of non-residential building. Total gas consumption within the service sector is 181 PJ/a and the total electricity consumption is 128 PJ/a.

³⁵ http://ec.europa.eu/energy/efficiency/eed/doc/neeap/2014_neeap_netherlands_en.pdf (in English). See Annex II

³⁶ <https://www.ser.nl/en/publications/publications/2013/energy-agreement-sustainable-growth.aspx>

³⁷ note - the Dutch housing stock currently consists mainly of C and D label homes

b. Cost-effective Approaches to Renovation

Rather than covering cost-effectiveness in the renovation strategy, the reader is instead referred to another source³⁸.

c. Policies & Measures to Stimulate Deep Renovation

Within the strategy, it is argued that citizens and businesses need to take responsibility themselves for investments in energy saving measures. The role of the Government is to facilitate, support, encourage and address regulatory restrictions. Accordingly, the three key themes of the renovation strategy are:

1. Inform and increase awareness
2. Facilitation
3. Financial incentives

Increase awareness – Whilst acknowledging that it is property owners who invest in buildings, the strategy notes that they are not really aware of the opportunities for improving the energy performance of the home, nor the cost-savings and comfort improvements that ensue. In an attempt to address this, in early 2015 all homeowners will receive an indicative energy label. The aim is to increase awareness of the energy performance of dwellings and encourage the uptake of energy saving measures. Marketing campaigns are being developed to maximise the impact. The scheme has been introduced in order to comply with the EPBD, as the Netherlands has not to date fully implemented the requirements for Energy Performance Certificates.

The Netherlands has launched an interesting initiative to facilitate action to improve energy performance. “Acceleration” consists of an agreement between construction companies and housing associations to renovate 100,000 existing dwellings to net zero-energy levels by 2020. The essence of the concept, which is targeted at relatively poor tenants of homes with high energy bills, is that the savings on energy bills will be used to finance the building renovation³⁹.

Block-by-Block is another initiative which aims to launch a movement to save energy on a large scale in existing buildings. Market participants are municipal authorities, corporations and provincial authorities, who carry out a joint plan to make significant improvements to the efficiency of at least 1,500-2,000 residential buildings in one municipality. At least three market participants must work together in a consortium. They share their knowledge and experience to achieve a possible national introduction to this way of working. This initiative is viewed as the start of a movement to achieve energy neutrality in buildings.

Another interesting initiative is the so-called *Green Deals*, (not to be confused with the UK Green Deal) whereby the Government seeks to unblock specific barriers faced by businesses, civil society organisations and other public bodies in the realisation of sustainable energy projects. Such barriers may relate to legal or regulatory aspects, might concern finding suitable partners, or indeed the right sort of finance. In such situations, the Government offers a service to overcome these barriers and facilitate the deployment of sustainable energy solutions.

In terms of financing, one new scheme is the revolving fund, launched in January 2014. For owner-occupiers, the scheme is called the Foundation for National Energy Saving Fund (NEF)⁴⁰, offering low-interest loans to owner-occupants. 75% of the €300M fund is provided by two private banks, with Government providing 25%. A further €300M is provided for housing associations and private landlords of rental properties.

Under another scheme, €400M in grants is made available for social landlords for investments that improve the property’s energy label by three steps or more. In addition, Housing Corporations must achieve a minimum B label. For private landlords, the target is a minimum C label.

For non-residential premises consuming at least 50,000 kWh of electricity or 25,000 m³ of natural gas annually, the Environmental Protection Act Activities Decree obliges owners to implement all energy saving measures with a payback of 5 years or less.

³⁸ Verbetering referentiebeeld utiliteitssector (voorraadgegevens, energiegebruik, besparingspotentieel, investeringskosten, arbeidsinzet).

³⁹ <http://www.energypost.eu/zero-energy-zero-cost-industrialising-building-sector/>

⁴⁰ www.lkinvesteerslim.nl

Central Government aims to play an exemplary role, directly and through its influence on municipal authorities. The Association of Netherlands Municipalities has announced that it will take the initiative in establishing local and sustainable energy supplies.

d. Forward-looking Perspective to Guide Investment Decisions

While the policy initiatives discussed in the strategy provide some degree of a forward-looking perspective, there is no specific quantification of investment levels, nor the timing of different initiatives.

e. Energy Savings and Wider Benefits

In terms of energy saving potential, if all dwellings were to be improved to an A rating, primary savings of 197 PJ/a would be achieved, representing a 39% reduction.

For the non-residential sector, the technical saving potential for gas is 67 PJ/a, and for electricity is 29 PJ/a. To achieve these savings would require a total investment of €22 bn.

On wider benefits, the Energy Agreement, which covers all energy uses, identifies the job creation potential and hence economic impact of investing in energy saving. However, those pertaining specifically to the building sector are not specified.

For residents, the improvement in comfort and health from improved energy performance are noted.

Summary

The Dutch strategy is based around three key principles: informing and raising awareness; facilitating; and financial incentives. The aim is to help residents and businesses to help themselves by appreciating the benefits that energy renovation can bring, not only in cutting energy bills but also in terms of improved living conditions and increased property values. To stimulate this improvement in the quality of life for its citizens, the Government has identified or put in place a number of approaches that are quite innovative and with the potential to stimulate significant improvements in building energy performance. The fact that a wider Energy Agreement has been secured with a number of stakeholders bodies is encouraging. What is particularly interesting in the Dutch approach is that the emphasis is less about needing to provide financial support. Rather, it is about a different way of viewing the challenge, and about finding holistic solutions that address the barriers holding back the implementation of cost-effective opportunities.

From the perspective of the Article 4 requirements, it must however be noted that the Dutch strategy fundamentally does not cover two of the five requirements – (b) cost-effective appraisal of renovation opportunities, and (d) forward-looking perspective to guide investment decisions. While the former is seemingly covered in a separate document, one would expect at least the headline conclusions to be included within the strategy.

Table 10 summarises the assessment of the Dutch renovation strategy against each of the 5 components of Article 4. The overall rating, at 40%, is rather low, given the fact that two of the five required topics are not explicitly covered.

Table 10 – Assessment of the Dutch renovation strategy

Overview of building stock	3
Cost-effective approaches to renovation	0
Policies to stimulate renovation	3
Forward-looking perspective to guide investment decisions	1
Estimate of expected energy savings and wider benefits	3
OVERALL level of compliance with Article 4	40%

Based on this appraisal, the strategy is non-compliant and should be rejected by the Commission.

ROMANIA⁴¹

Introduction

The Romanian Government has published its official national renovation strategy based largely on the BPIE report “Renovating Romania”⁴². In developing the proposed strategy, an important part of the development process was a stakeholder engagement exercise, undertaken over a 6-month period (November 2013-April 2014) with over 50 key individuals and organisations, including representatives from the Ministry. Key organisations consulted on strategy development are listed in the document.



The strategy covers all the essential requirements of Article 4. It recognises the progressive, long-term nature of the renovation challenge, by setting out a 3-phase stepwise approach:

- Phase 1 - Establish conditions that major renovations can become a target within five years;
- Phase 2 - Developing technology for renovation of buildings that can provide the means to achieve a substantial reduction in energy consumption and nearly zero energy consumption in buildings, within about 15 years;
- Phase 3 - Deep renovation of all buildings as the norm thereafter.

a. Overview of National Building Stock

The building stock is described in some detail, giving a breakdown by type, age, energy performance, energy carrier and other characteristics. Residential buildings dominate the market, accounting for 86% of the built floor area. Another feature is the high level of private ownership of residential buildings, at 84%. Due to poor built quality in the latter half of the 20th century, and the low income of much of the population, a significant proportion of buildings in Romania would benefit from a wider renovation in the building stock in order to address building defects, to modernise amenities, to provide a healthier indoor environment and to contribute to regeneration of rundown areas. Whilst this point is sometimes alluded to in some of the other renovation strategies, it is certainly the case that building renovation should be part of urban regeneration efforts as a matter of course in Romania and elsewhere.

b. Cost-effective Approaches to Renovation

The approach to cost-effectiveness taken in this strategy is to consider packages of renovation activity which change over time. Regulated energy prices, amongst the lowest in Europe, are below market prices, which currently discourages the adoption of energy-saving measures. As the costs of renovation come down (through a combination of technological development and by the increased volumes stimulated by policies such as those identified in the strategy) and energy prices move towards the EU average, so the economic attractiveness of progressively deeper renovation becomes more attractive.

When assessed during the economic life of measures, all scenarios discussed in section d) are cost-effective, in that the overall savings in energy costs significantly exceed the investments. However, the difficulty lies in securing funding for initial investments in a context where building owners have modest means, coupled with low levels of motivation and awareness.

c. Policies & Measures to Stimulate Deep Renovation

A comprehensive review of policy options is undertaken, across 6 dimensions:

- Strategic
- Legislative/Regulatory
- Technical
- Fiscal/Financial

⁴¹ http://ec.europa.eu/energy/efficiency/eed/doc/article4/2014_article4_ro_romania.pdf

⁴² http://bpie.eu/uploads/lib/document/attachment/39/Renovating_Romania_EN_Final.pdf

- Communication/Capacity Building
- R&D

The applicability of different types of measure is assessed and prioritised. The following actions are identified as being of high importance.

Strategic

- Establish support across the political spectrum for deep renovation of the building stock
- Undertake systematic appraisal of barriers to renovation in each segment of the market and develop policy responses to address each barrier
- Establish objective to eradicate fuel poverty through enhancing energy performance of the housing stock

Legislative/Regulatory

- Identify trigger points and develop respective regulation that could be used to encourage, or require, building energy performance improvement
- Address restrictive practices concerning local deployment of low/zero carbon technologies to ensure that a positive environment for buildings integrated renewables is established
- Remove restrictive tenancy laws which disincentivise or otherwise inhibit energy performance improvement

Technical

- Analyse potential for district heating systems to provide efficient, low carbon energy

Fiscal/Financial

- Secure sources of finance, including those identified in EED Article 20 and EU/international funding sources, together with mechanisms that effectively leverage private capital
- Factor in monetary value of co-benefits (e.g. health, employment) in public funding decisions
- Develop funding vehicles, tailored to specific market segments, that provide a simple (“one-stop-shop”) and commercially attractive source of finance for deep renovation
- Develop mechanisms to encourage deep renovation via third party financing (TPF) e.g. ESCOs, EPCs

Communication/Capacity Building

- Gear-up skills and training programmes covering the key professions and disciplines
- Encourage development of the local supply chain industry for maximising macro-economic benefits and to minimise embedded CO₂ emissions
- Develop promotional and dissemination activities that sensitise building owners to opportunities for deep renovation and that provide stepwise support throughout the renovation process
- Communicate regularly and publicly on progress with the renovation strategy

On August 4th 2014, the Romanian Government introduced Law 121/2014, which includes the objective of decreasing energy consumption across the economy by 19% by 2020, and elaborated the legal general framework for implementing EED in the national legislation, including the strategy for building renovation.

d. Forward-looking Perspective to Guide Investment Decisions

Four scenarios are examined for the future evolution of the renovation market to 2050. These range from the baseline, where the currently low rates and depths of renovation continue, through to an ambitious scenario when they rise significantly. The results are discussed in the next section.

In order to finance the measures, maximising the utilisation of EU funds has been identified as a priority.

e. Energy Savings and Wider Benefits

The results of the scenario modelling are summarised in table 11.

Table 11 – Scenario modelling for energy savings and wider benefits

Scenario		baseline	modest	intermediate	ambitious
Energy Saving					
Energy saving in 2050	TWh/a	8.5	31.1	44.8	63.2
Energy saving in 2050 compared to 2010	%	8.3%	30.4%	43.8%	61.8%
Carbon Emissions*					
Annual CO ₂ saving in 2050	MtCO ₂ /a	3	22	24	25
2050 CO ₂ saved (% of 2010)	%	12%	79%	83%	89%
CO ₂ abatement cost	€/tCO ₂	-138	-40	-54	-70
<i>*decarbonisation rate for baseline is the average rate of decarbonisation in the EU since 1990. For other scenarios, it is the required rate to achieve the EU 2050 Low Carbon Roadmap objectives</i>					
Societal Benefits					
Employment generated	Ave. Jobs/a	4,403	15,854	24,888	39,736

Furthermore, the benefits of building renovation are spelt out in some detail. Indeed, the Romanian strategy is the only one to put a monetary value on a range of benefits arising from building renovation. Table 12 shows the value of certain benefits in relation to the quantified energy cost saving.

Table 12 – Value of selected benefits in relation to the quantified energy cost saving

Item	Multiplier
Energy Cost Saving	1.0
Economic Stimulus	1.5
Societal (health) Benefits	1.0
Environmental Benefits	0.1
Energy System Benefits	1.0
TOTAL	4.6

It can be seen that the total societal benefit could be approaching five times the value of the energy cost savings alone. For the most part, these benefits accrue to society at large, rather than the building owner/investor. This “benefits gap” is a major factor behind the current underinvestment in building renovation, further exacerbated in Romania, which has the lowest electricity price, and third lowest gas price, in the EU, reducing the incentive to invest in energy-saving measures for cost-saving reasons. Providing support measures (be they financial or otherwise) that encourage investment in building renovation is one way in which this benefits gap can be addressed.

Summary

A unique feature of the Romanian strategy is that it has sought to quantify the wider benefits from building renovation. Another positive aspect is the comprehensive appraisal of policy options that need to work together to address the underlying barriers. If the Romanian Government does in fact act on all, or at least most of, the identified initiatives, it will truly set the scene for an active and thriving building renovation market in Romania.

The strategy recognises that the benefits of renovation are felt across a number of different Ministries, and that causes a difficulty in securing the adequate level of support. It argues, for example, that health, while not an obvious policy area with a role to play in building renovation, is in fact highly relevant, since poor quality housing suffering problems such as under/overheating, condensation, mould growth and internal air pollution leads to significant health issues which has a cost to the nation in terms of lost working days and impact on health services. The policies section of the strategy recognises the importance of engaging across the political spectrum in support of the strategy for deep renovation of the building stock, including for example establishing an objective to eradicate fuel poverty through enhancing energy performance of the housing stock.

Table 13 summarises the assessment of the Romanian renovation strategy against each of the 5 components of Article 4. The overall performance places the Romanian strategy in the “acceptable” category.

Table 13 – Assessment of the Romanian renovation strategy

Overview of building stock	3
Cost-effective approaches to renovation	3
Policies to stimulate renovation	4
Forward-looking perspective to guide investment decisions	4
Estimate of expected energy savings and wider benefits	4
OVERALL level of compliance with Article 4	72%

Introduction

The Spanish strategy is a comprehensive 71-pages stand-alone document, which provides a good level of detail across all the required headings. Analysis undertaken by GTR⁴⁴, El Grupo de Trabajo de Rehabilitación, or Rehabilitation Working Group, is used extensively throughout the document. GTR, co-ordinated by the Green Building Council España and the CONAMA Foundation, is a stakeholder group that has been working on renovation strategies for a number of years, having now published three reports setting out renovation roadmaps for the building sector since 2011.



This extensive period of engagement with key stakeholders from industry, finance, academia and the national energy agency IDAE⁴⁵ has undoubtedly had a positive influence on the building renovation landscape in Spain, and also on the official national strategy published in June 2014. The strategy talks of the need to raise general awareness and to create a culture in favour of renovation.

One criticism must, however, be levelled at the Spanish renovation strategy, in that it is available only as a scanned document, and the quality of the scan is so poor as to render some parts, particularly tables and graphs, illegible. A good quality machine readable version needs to be uploaded as a matter of urgency.

a. Overview of National Building Stock

A comprehensive description of the building stock is provided, with breakdown by age, type, climatic zone, heating system, and energy use, as well as by location (urban/rural). A particularly interesting feature is the segmentation of the market into clusters of building types with similar characteristics, which provides the basis for prioritising the most common properties or the ones with the largest potential for energy saving.

b. Cost-effective Approaches to Renovation

For each of the clusters identified above, a description of the typical properties is provided, alongside relevant energy saving measures such as insulation, window replacement, ventilation, heating/cooling system. The costs and savings potential for a typical property in each cluster are provided. Depending on building type, and principal energy carrier (e.g. gas, electricity), savings of between 60% to over 90% are identified.

Typical renovation measures are identified: insulation of walls, roofs and floors, replacement windows, including solar protection, ventilation controlled by CO₂ sensors, HVAC plant and solar panels. In fact, the strategy identifies particular measures for ten residential clusters. For the non-residential sectors, menus of typical measures with typical saving are provided for four sectors: Offices, Health, Hotels, and Retail.

c. Policies & Measures to Stimulate Deep Renovation

A number of recent or pending laws are identified, notably the 2013 law on Urban Rehabilitation, Regeneration and Renovation (Law 8/2013). Its objective is to establish the basis for sustainable development of the urban space to ensure a good quality of life for citizens. The link between building renovation, rehabilitation and urban regeneration is made throughout the strategy. In terms of building energy performance, the law facilitates the installation of measures such as external insulation of buildings or solar collectors, and allows the enclosure of balconies and terraces, as long as energy savings of at least 30% are achieved and that the uniform character of the building is maintained. Furthermore, it favours financing mechanisms that allow scaling up of renovation activities, including public-private partnerships for public administrations.

⁴³ http://ec.europa.eu/energy/efficiency/eed/doc/article4/2014_article4_es_spain.pdf

⁴⁴ <http://www.gbce.es/en/pagina/gtr-2014>

⁴⁵ Instituto para la Diversificación y Ahorro de la Energía, <http://www.idae.es/>

Other regulatory measures include:

- a. Improving implementation of Law 8/2013. A model of regulation for renovation and energy efficiency should be realised for municipalities in order to provide standardised solutions
- b. Extending the scope of the Building Evaluation Document in order to evaluate the building stock of Spain and inform the owners about the possible improvements
- c. Improving programmes for energy certification of existing buildings, in order to allow the evaluation of different options for improving building energy performance
- d. Creating a "Building Book" for existing buildings, as a collection of all documents related to energy performance improvements, information, certificates, etc., to be updated on an ongoing basis

Furthermore, better coordination between the different public administrations (national, autonomous regions and municipalities) needs to be realised through administrative measures such as:

- a. Simplification, homogenisation and streamlining of administrative procedures through licences, authorisations and electronic platforms
- b. Improving local agencies or municipal services (dealing with building rehabilitation, urban regeneration and renovation) in order to inform and support stakeholders during the rehabilitation process, resolve conflict, elaborate intervention programmes, establish regulation for support measures and the criteria for obtaining subsidies
- c. Introduction of flexible criteria to be adopted for the authorisation processes related to the Building Code. One of the most significant improvement would be the possibility for single owners (and owners associations) to obtain adequate financing through access to credit at low interest (not higher than 5%) and for a long-term (20 years)

However some barriers have been identified which require additional measures to be undertaken:

- a. Channelling of resources from the National Energy Efficiency Fund to building rehabilitation
- b. Collaboration with the European Investment Bank on programmes for the financing of building rehabilitation, such as JESSICA-FIDAE managed by IDAE (regarding the financing of energy efficiency and renewable energy measures in urban environments)
- c. Allowing companies dealing with energy services, building or rehabilitation management to receive the support funding directly, assuming the explicit agreement of the client
- d. Improving the financing of the public bank ICO (Instituto de Crédito Oficial) for owner associations, in particular reducing the cost of obtaining money from the capital markets and obtaining soft financing from international financial institutes or other financial bodies such as KfW
- e. Supporting financial institutions in the design of specific products for financing rehabilitation

Other actions include establishing an Energy Efficiency Obligation scheme, and a National Energy Efficiency Fund, pursuant to articles 7 and 20 respectively of EED.

d. Forward-looking Perspective to Guide Investment Decisions

Five scenarios are described, three for the residential sector and two for the non-residential one:

- Residential HIGH – achieving 32% delivered energy saving by 2020 (compared with the average for 2010-2012)
- Residential MEDIUM – achieving 26% delivered energy saving by 2020
- Residential BASELINE – achieving 7% delivered energy saving by 2020 (this strategy essentially continues existing policies and funding sources)
- Non-Residential HIGH – achieving 20% delivered energy saving by 2020
- Non-Residential BASELINE – achieving 16% delivered energy saving by 2020

Each scenario includes a description of the assumptions and the results in terms of number of properties renovated, investment (including public subsidy level), energy saving, carbon emission reduction and jobs created. However, what is not specified is which trajectory the Government intends to adopt.

e. Energy Savings and Wider Benefits

Investing in building renovation is seen as a strategically important action, with employment benefits identified as particularly valuable, given the continuing impact in Spain of the economic crisis. 18 jobs are said to be created for every €1M invested. When taking into account the fact that public subsidies are around 25%, this equates to a job creation rate of some 55 for every €1M of public funding. Other benefits include improved public finances, reduced energy bills, revitalisation of the construction sector (an important part of the Spanish economy), increasing property values and increased energy security. Insulation is also seen as a benefit in reducing noise transmission between properties, contributing to an improvement in quality of life, given that noise transmission between properties is recognised as a particular issue in Spanish buildings.

Summary

Overall, the Spanish strategy includes a good technical appraisal of the building stock and energy saving opportunities. It notes the strategic importance of building renovation, including the link to wider urban regeneration, and identifies the need to provide information and advice, adequate finance, and a suitably trained workforce, etc. Specific actions that reduce bureaucratic hurdles, and help the financing of renovation measures, have been identified.

Building renovation is seen as a key component of improving the economic conditions in Spain, reviving the construction sector and revitalising urban areas. Multiple benefits are identified (and some are quantified), including the improved quality of life that flows from reduced expenditure on energy and improved indoor comfort conditions for occupants.

Table 14 summarises the assessment of the Spanish renovation strategy against each of the 5 components of Article 4, together with an overall rating. The overall performance places the Spanish strategy in the “acceptable” category.

Table 14 – Assessment of the Spanish renovation strategy

Overview of building stock	4
Cost-effective approaches to renovation	4
Policies to stimulate renovation	3
Forward-looking perspective to guide investment decisions	4
Estimate of expected energy savings and wider benefits	3
OVERALL level of compliance with Article 4	72%

Whilst the Spanish strategy is compliant with EED Article 4 requirements, it should be resubmitted as a good quality, machine readable document.

Introduction

The UK building renovation strategy, published as part of the NEEAP, is an extensive and detailed document with a comprehensive presentation of the building stock, identification of cost-effective opportunities and policy appraisal. The structure follows the main section headings in Article 4.

The strategy argues that the UK has a rich tradition in retrofitting buildings, often being a leader in the area, for example with one of the first (if not the first) Energy Efficiency Obligations on energy suppliers in Europe. Improving the energy performance of the UK building stock is a priority for the Government, since such investments:

- Lead to lower energy bills and increased comfort for occupants
- Drive innovation and creates new business opportunities, including export potential; and
- Help deliver the UK's energy security and climate change goals.



a. Overview of National Building Stock

A very detailed overview of the UK building stock is provided, including an appendix running to 23 pages. This can be considered best practice in terms of providing the level of detail for stakeholders, researchers and other parties to gain a clear picture of the current status of the building stock.

b. Cost-effective Approaches to Renovation

Based on an Energy Efficiency Marginal Abatement Cost Curve, the remaining technical and economic potential for uptake of renovation measures is identified. Specific numbers of installations by measure type and the corresponding energy savings are listed. Typical measure packages for different property types are also described. As with the building stock analysis, the level of detail provided is commendable.

c. Policies & Measures to Stimulate Deep Renovation

Four key barriers holding back the full potential of the renovation market are identified:

- **Embryonic markets:** existing market is small relative to the size of the opportunity
- **Information:** difficulty of accessing relevant and trustworthy information means that individuals and businesses are unable to fully assess the benefits of the energy efficiency opportunity
- **Misaligned financial incentives:** those investing in energy efficiency measures are not always the ones receiving the direct benefit. This manifests itself as the usual "landlord/tenant" barrier, but also in the fact that the wider benefits of energy efficiency investment, such as improved security of supply and reduced carbon emissions, are not fully realised by those making the investment
- **Undervaluing energy efficiency:** the long-term financial and wider benefits of improved energy efficiency are often regarded as less certain, partly because of the lack of trusted information in the market. Consequently, energy efficiency has traditionally been undervalued relative to other investment options and not prioritised as it might otherwise be.

Building on many years' experience and activity in this field, the UK has a comprehensive range of policies addressing both the residential and non-residential markets, as illustrated by the schematics published in the strategy and reproduced in figure 7 and 8.

⁴⁶ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/307993/uk_national_energy_efficiency_action_plan.pdf

Figure 7 – UK residential sector refurbishment cycle and policy framework

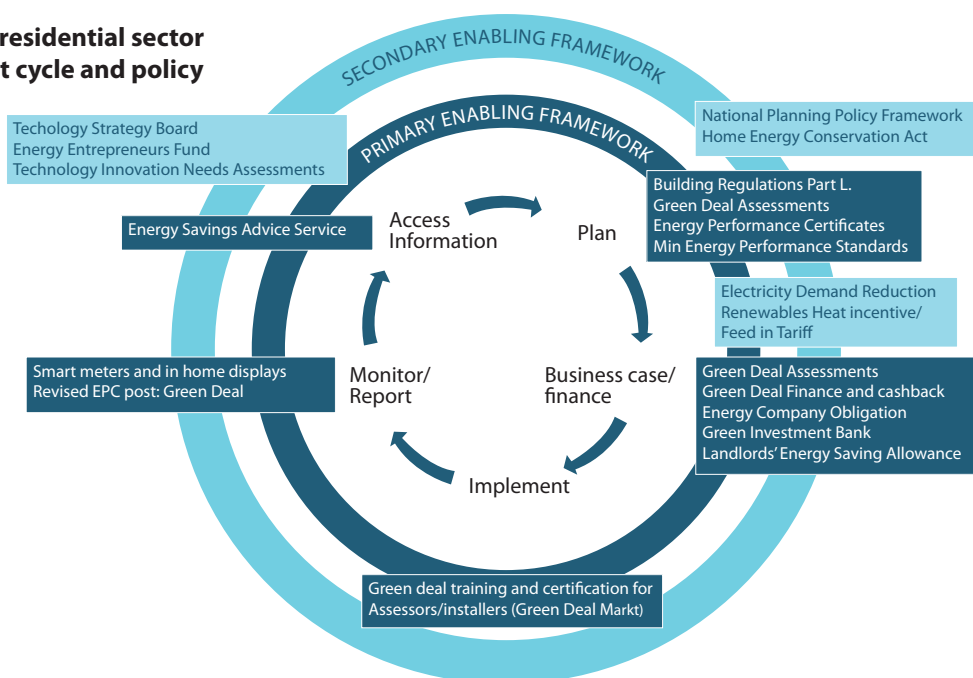
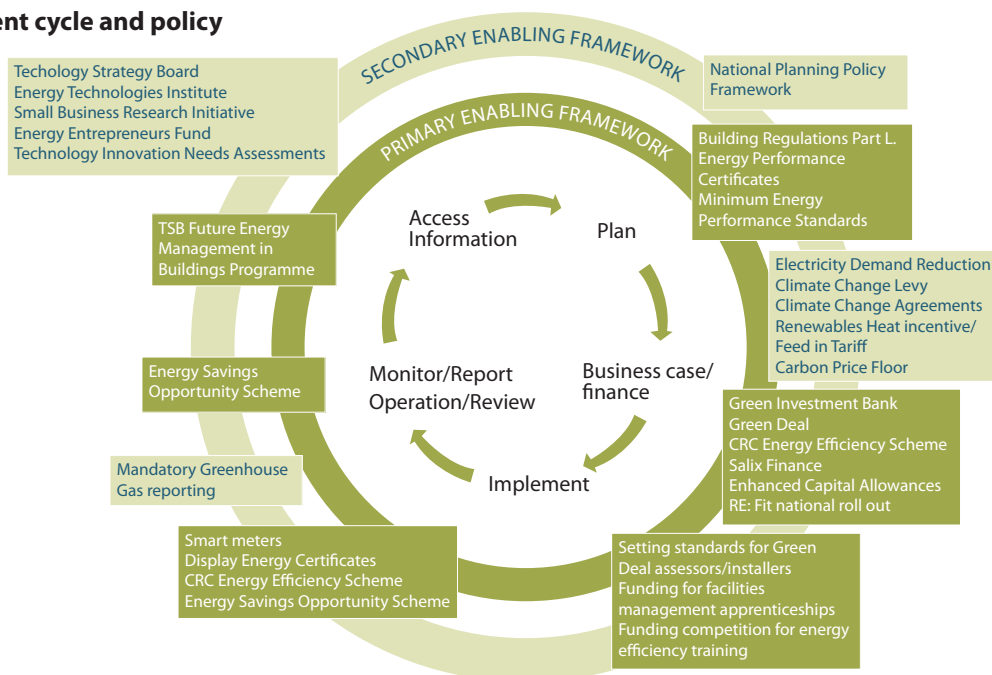


Figure 8 – UK non-residential sector refurbishment cycle and policy framework



More specifically, the UK Government sees the following policies will be key drivers of building renovation over the next decade:

- **Residential sector** - Green Deal, Smart Metering and the Energy Company Obligation
- **Non-Residential sector** - Climate Change Agreements, the CRC Energy Efficiency Scheme and the new Energy Savings Opportunity Scheme (ESOS) aimed at large business, introduced in June 2014 as a result of the energy auditing article 8 in the Energy Efficiency Directive.

According to the strategy, deployment of solid wall insulation will increase in the residential sector post-2020, while low carbon heat will start to be deployed widely in the both sectors. These technologies are subject to recent and ongoing research.

d. Forward-looking Perspective to Guide Investment Decisions

Available sources of finance and support are identified, and placed into the context of UK's 5-yearly carbon budgets. The strategy singles out the Green Deal as one of the key sources of finance for smaller consumers, while Energy Performance Contracting or ESCOs are expected to increase in importance for larger consumers. The Green Investment Bank, launched in 2012, is identified as a source of finance, as is Salix for the public sector, alongside EU sources such as the European Regional Development Fund (ERDF). However, no overall sums or timescales for expected investment levels are provided.

e. Energy Savings and Wider Benefits

An energy saving potential of 54 TWh has been identified for the residential sector, broken down by measure type. The majority of savings are expected to come from insulation (particularly solid wall insulation which to date has not featured significantly in the UK due to its higher cost) and heat pumps. For the non-residential sector, the potential, according to the Marginal Abatement Cost Curve, is some 27 TWh. Wider benefits have been identified as:

- Reduced energy costs for consumers;
- Reduced fuel poverty;
- Increased energy security;
- Expanding global markets for energy saving technologies;
- Developing skills and supply chains;
- Improved health.

Summary

The UK renovation strategy includes a very detailed description of the building stock, and presents a useful insight into the cost-effective renovation packages that might typically be adopted in different building types. The existing policy framework is clearly set out, while the forward plan is set in the context of the 5-yearly carbon budgets which have been specified through to 2027. Energy saving potentials and existing funding sources are identified.

While the UK has met the basic requirements for compliance with Article 4, it is of concern that no new policies have been introduced⁴⁷, despite the fact that a large and cost-effective savings potential has been identified in the strategy and that existing measures are not resulting in cost-optimal deep renovations. The Government appears to take the view that, while it stresses the importance of building renovation as a priority activity, its analysis is that the UK is on target to meet its Carbon Budget commitments under the Climate Change Act (a legally binding target to reduce GHG emissions by 80% by 2050). This remains a major weakness and criticism of the UK building renovation strategy.

Only a passing reference to indoor air quality benefits is made in the strategy, as part of a list of wider benefits. Energy efficient renovation is seen as providing health benefits, by improving the thermal comfort of properties and reducing cold related and respiratory illnesses.

Table 15 summarises the assessment of the UK renovation strategy against each of the 5 components of Article 4. Please note that the overall rating of 72% is considered "acceptable" on compliance aspects. However, there remains considerable scope for the UK to improve the strategy in terms of its ambition level.

Table 15 – Assessment of the UK renovation strategy

Overview of building stock	5
Cost-effective approaches to renovation	4
Policies to stimulate renovation	3
Forward-looking perspective to guide investment decisions	3
Estimate of expected energy savings and wider benefits	3
OVERALL level of compliance with Article 4	72%

⁴⁷ Other than the Energy Savings Opportunity Scheme (ESOS) for larger companies, in response to the energy auditing requirements of EED Article 8.

OVERALL STATE OF COMPLIANCE WITH ARTICLE 4

The table below scores the ten strategies reviewed earlier according to the five components of Article 4. Scoring is based on a scale of 0-5, where 0 = item not covered at all, and 5 = comprehensive coverage. A score of 3 is considered the minimum for a strategy section to be considered acceptable. Overall compliance is then determined, based on a percentage of the total potential score. Finally, strategies have been colour coded according to the overall scores:

SCORE	CATEGORY	CRITIQUE/ACTION REQUIRED	COLOUR
0-49%	NON-COMPLIANT	Strategy should be rejected by the Commission as not fulfilling the basic requirements of Article 4. The Member State should be given 6 months to resubmit a fully compliant strategy	RED
50-69%	CORRECTIVE ACTION REQUIRED	Individual sections with a score less than 3 should be revised and resubmitted	ORANGE
70-79%	ACCEPTABLE	Strategy meets the basic requirements of Article 4	YELLOW
80-100%	BEST PRACTICE	Strategy represents best practice example in terms of the Article 4 requirements	GREEN

The table below presents the scores and overall results from the evaluation process. It should be noted that the scores reflect primarily the compliance aspects of the renovation strategies, namely whether they meet the requirements set out in Article 4 of the Energy Efficiency Directive. A compliant strategy does not necessarily mean that it is an effective one that will deliver the required transformation towards deep renovation of the national building stock.

COMPLIANCE WITH EED ARTICLE 4 REQUIREMENTS						
COUNTRY	Overview of building stock	Identification of cost-effective approaches to renovation	Policies to stimulate cost-effective renovation	Forward-looking perspective to guide investment decisions	Estimate of expected energy savings and wider benefits	OVERALL level of compliance with Article 4
Austria	3	2	1	0	1	28%
Brussels Capital Region	5	5	3	2	2	68%
Czech Republic	3	3	4	4	4	72%
Denmark	2	1	4	0	1	32%
France	4	4	4	2	2	64%
Germany	4	2	3	2	3	56%
The Netherlands	3	0	3	1	3	40%
Romania	3	3	4	4	4	72%
Spain	4	4	3	4	3	72%
The UK	5	4	3	3	3	72%
AVERAGE	3.6	2.8	3.2	2.2	2.6	58%

The results are presented graphically below, compared to the maximum potential score of 25 (=100%).

Figure 9 – Comparison of scores of the 10 appraised renovation scenarios

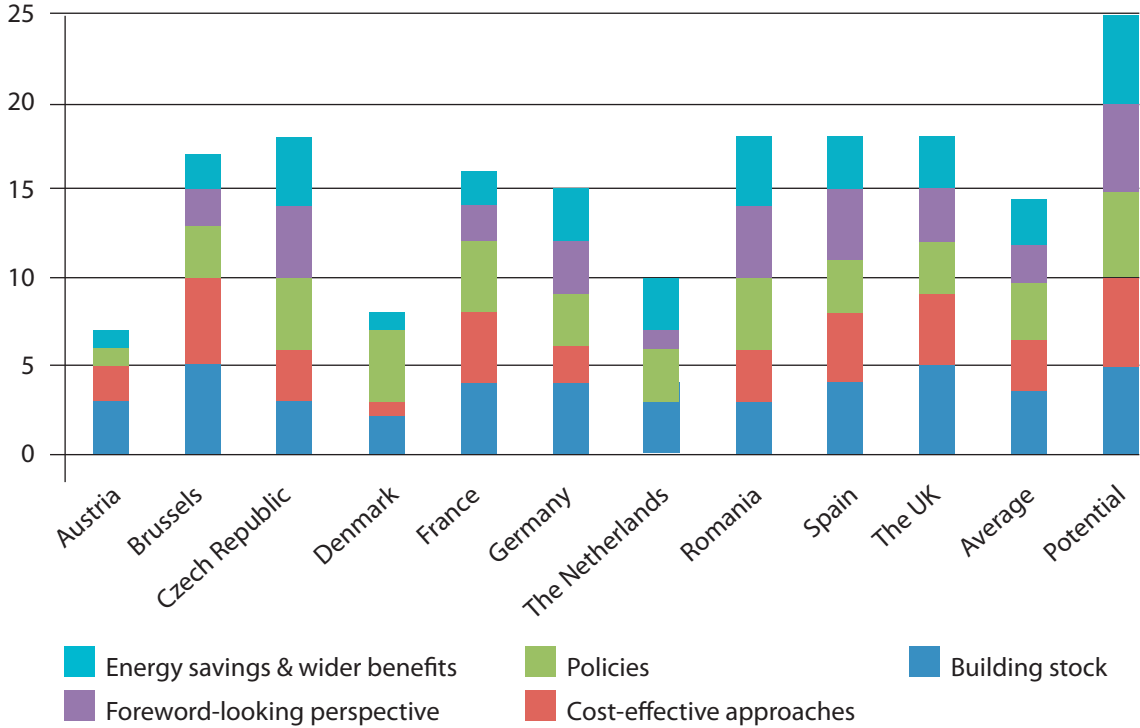
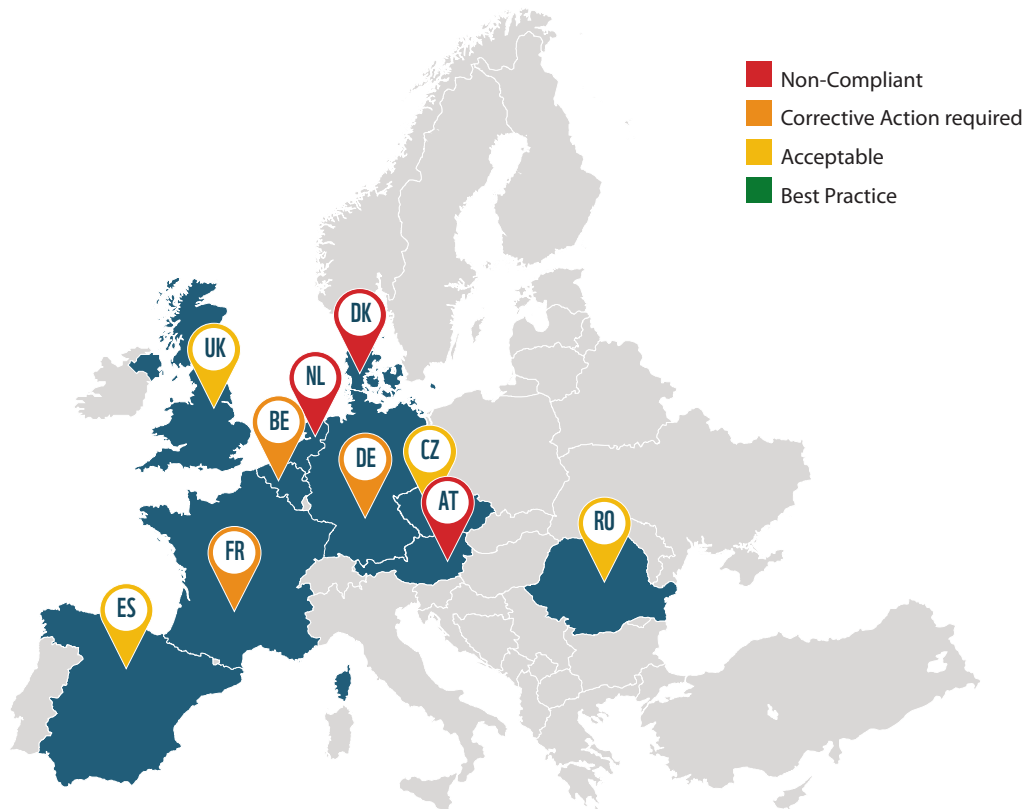


Figure 10 – Map illustrating ranking of appraised renovation strategies



The strongest section of most strategies was the characterisation of the building stock, and indeed this scored the highest average rating of 3.6. The existence of building registers at a national level means this component of the renovation strategy should be relatively easy to present, notwithstanding that data on the non-residential sector in Europe is generally not as accessible as for the residential sector (see for example the GBPN report on Building Performance Data⁴⁸).

The only other sector scoring an average of over 3 (considered within the context of this study to be the minimum acceptable rating) was the policy description. Note, however, that the score largely reflects compliance with the requirements of Article 4, rather than a statement of ambition level. Only a few strategies included the comprehensive policy mix that needs to be put in place to transform the market for building renovation.

Generally, Member States struggled most with the forward-looking perspective, which scored an average of just 2.2. Given that these strategies are meant to provide confidence to building owners to invest in building renovation, and to the market to invest in the supply chain, this is a major criticism of the approach taken so far in the 10 strategies that have been appraised in this study. Better, more effective guidance is needed from the Commission to support Member States in defining meaningful roadmaps that give the right market signals to potential investors. In this context, it should be noted that the Commission has published technical guidance on financing the energy renovation of buildings⁴⁹ can inform the financing aspects of the forward-looking perspective.

NON-COMPLIANT STRATEGIES

NON-COMPLIANT

The following strategies do not meet the basic requirements of Article 4 and should therefore be rejected by the Commission as non-compliant. Revised strategies should be presented within 6 months.

Austria

Austria's strategy received the lowest overall score. Only the review of building stock was covered adequately; remaining sections were either missing or only skirted over briefly. In addition to compliance considerations, the absence of any discussion on the effectiveness of existing policies, or the need for new policies, suggests Austria is complacent about the need to tackle the building renovation market.

Overall, this is a strategy that does not do justice to some of the excellent work that is happening in the country.

Denmark

The main shortcoming of the Danish strategy is that it simply does not address all the requirements of article 4. There is only a basic overview of the building stock, and just a global figure for energy saving potential, with no identification of cost-effective approaches to renovation. While these points could be addressed by reference to other documents (as the Dutch strategy has done), the absence of a forward-looking perspective to guide investment is a major gap that needs to be addressed, in order to give investors and others the framework within which to plan their actions. The only section that can be considered to have been completed adequately is the one on policies.

On the positive side, policy aspects are addressed very well, with clear commitments by identified Ministries (mainly the Climate, Energy and Building Ministry) covering 21 action areas. A roadmap of dates and milestones here would be particularly helpful to stakeholders, so they could monitor progress and prepare for impending legislation etc. What is also inspiring from the Danish strategy is the holistic approach – that improving the health & well-being of occupants should go hand in hand with improving energy performance.

⁴⁸ <http://www.gbpn.org/laboratory/building-performance-data>

⁴⁹ http://ec.europa.eu/energy/efficiency/studies/doc/2014_guidance_energy_renovation_buildings.pdf

The Netherlands

Whilst possessing some interesting and innovative policy initiatives, the Dutch renovation strategy is let down by the absence of two sections. For the cost-effectiveness discussion, the reader is referred to another document, which is not considered acceptable practice. Meanwhile, the forward-perspective to guide investment decisions is completely missing from the strategy itself, even though this may be covered in other reports. These sections need to be addressed and included in a revised submission.

PARTIALLY COMPLIANT STRATEGIES – CORRECTIVE ACTION REQUIRED

CORRECTIVE ACTION REQUIRED

Brussels Capital Region, France and Germany all produced strategies with individual strengths, and with some interesting approaches to tackle the renovation agenda, but were let down by insufficient coverage of one or more of the Article 4 requirements. In the case of Brussels Capital Region and France, the forward-looking perspective and estimates of savings and wider benefits were inadequate. In the case of Germany, the identification of cost-effective approaches to renovation and the forward-looking perspective need to be improved.

These Member States should be requested to resubmit their strategies with the sub-standard sections improved.

ACCEPTABLE STRATEGIES

ACCEPTABLE

Of the ten strategies reviewed, four met the basic requirements of Article 4: **Czech Republic, Romania, Spain and UK**. All sections were addressed in sufficient detail to give the reader a good overview of the state of play in the country. That said, there is scope for improvement in all four of these strategies.

BEST PRACTICE

BEST PRACTICE

None of the 10 strategies reviewed represent “best practice”, though individual elements of certain strategies may be considered as such:

- a. The description of the building stock provided by **Brussels Capital Region** and **UK** was excellent. Overall, this section scored highest, which is not surprising, since it should be relatively easy to reproduce existing information on building stocks.
- b. **Brussels Capital Region** gave a very good insight into the area of cost-effectiveness, based on their cost-optimality report to the Commission. Since all Member States are required to submit similar reports, it should be straightforward to include a relevant summary in the renovation strategy.
- c. **Czech Republic, Romania and Denmark** undertook a comprehensive overview of policy options and presented a packaged approach, each with 15 or more discrete measures. Denmark’s approach is the most persuasive, with clear commitments to action for each of the 21 identified action areas identified.
- d. Overall, the weakest section was the forward perspective to guide investment decisions. One would have expected the strategies to include a clear roadmap, setting out significant actions to be taken by certain dates, and the expected impact on the market. **Czech Republic, Romania and Spain** were the only three strategies which included a presentation of scenarios of different forward trajectories of the market for

building renovation, which provided the basis for quantification of the investment requirements, energy savings and other benefits. Of the three, the **Spanish** strategy can be considered as the best example, since it includes a detailed exposition of the investment requirements for each building type.

- e. Assessment of energy saving potential was variable. Some (**Czech Republic, Romania and Spain**) presented the results of their scenario modelling, providing a clear basis on which to derive the savings potential. Others (e.g. France, Germany) simply re-stated the previous policy goal, but with no indication of how that saving would be achieved.
- f. Assessment of wider benefits was generally very poor. Most Member States identified the usual economic, environmental, societal and energy security benefits, though only **Romania** monetised these in a way that recognised the value to society, citizen and business. Now that the IEA has published its assessment of multiple benefits⁵⁰, it should become the norm for Member States to factor the quantifiable benefits into the economic appraisal of different renovation scenarios. Furthermore, the health & well-being dimension was mentioned in some of the strategies, but in general it is not elaborated.

AN “AMALGAMATED EUROPEAN” BEST PRACTICE STRATEGY

Looking at the coverage of the individual Article 4 requirements witnessed in the selected strategies, BPIE has chosen the following five strategies as comprising the best examples of each section from the perspective of compliance with Article 4 requirements.

Section	Best Practice example
Overview of national building stock	United Kingdom
Cost-effective approaches to renovations	Brussels Capital Region
Policies to stimulate deep renovation	Denmark
Forward-looking investment perspective	Spain
Energy savings and wider benefits	Romania

⁵⁰ http://www.iea.org/W/bookshop/475-Capturing_the_Multiple_Benefits_of_Energy_Efficiency

LONGER TERM STRATEGIC PERSPECTIVE

It is disappointing to note that Member States have not taken a strategic and integrated approach in developing their renovation strategies. For example, none link the building renovation requirement in Article 4 EED to the requirement in Article 9 EPBD for Member States to develop policies and measures to stimulate the transformation of buildings that are refurbished into nearly zero-energy buildings. Likewise, there was no strategic integration between the national renovation strategies and the Article 5 EED requirement for the renovation each year of 3% of buildings owned and occupied by central government.

While a number of Member States put their strategies into the context of longer term plans (Denmark, France, Germany, Netherlands and UK with their 2050 carbon reduction ambitions), only three explicitly go beyond 2020 in terms of their renovation strategies. Both Romania and Czech Republic undertake modelling of scenarios through to 2050, while the UK mentions the important role of solid wall insulation post-2020.

Considering the aggregate scores of all strategies, the forward-looking perspective to guide investment received the lowest average rating. The Commission should provide further guidance and support, for example through the Concerted Action initiative or other dedicated platform so that Member States put much more emphasis into setting out the vision for the sector. This vision should include a long term roadmap of the expected evolution of the renovation market, by relating the expected market interventions such as the timetable of policy implementation and financing mechanisms to the expected level of investment and volume of activity by market sector.

When considering the longer term perspective, the role of research is clearly important, yet it was mentioned in only a few strategies. In this area, the German strategy presented the most comprehensive picture of research initiatives, such as “Future Building”, which seek to identify new, better and cheaper ways of deploying energy saving and renewable technologies in new as well as existing buildings. Elsewhere, the UK Energy Technologies Institute’s £100 million, 5 year Smart Systems and Heat Programme aims to investigate what drives heat demand (the main energy end use sector in buildings) and the potential for technical innovations to meet this demand more efficiently.

POLICY CONSIDERATIONS OF SELECTED NATIONAL RENOVATION STRATEGIES

Having considered the compliance aspects of the renovation strategies in Section 2, this section now looks at the policies proposed or in place by each Member State.

The different emphasis placed on the policy mix is interesting to note, as indeed is the level of Government commitment.

Germany expects the majority of savings to 2020 to be achieved through the Energy Saving Ordinance, with most of the rest from the various KfW schemes.

Romania, Czech Republic and **Denmark** have all presented a holistic approach with 15 or more individual measures. Denmark’s approach is the most persuasive, with clear commitments to action for each of the 21 identified action areas.

The **French** strategy is noteworthy by virtue of the Presidential level commitment in two areas. For the residential sector, François Hollande announced the target to renovate 500,000 dwellings a year, while for the non-residential sector, he committed to introducing a renovation obligation for the non-residential sector.

Brussels Capital Region has, within its regional Plan Air-Climate-Energy (PACE), focused on regulatory measures. Improving the energy performance of rental properties will be encouraged by allowing rent to increase to cover renovation investment costs, while requirements for single-measure renovations will be strengthened in order to facilitate long-term staged deep renovations.

The Netherlands aims to catalyse action by addressing barriers and fostering innovative approaches. One such approach consists of an agreement between construction companies and housing associations to deliver 100,000 net zero energy dwellings by 2020. By combining energy bills with rents, overall costs can be maintained or reduced in these highly efficient renovations when done at scale and in a strategic manner. The other noteworthy initiative is the so-called *Green Deals*, whereby the Government offers a type of brokering/consultancy service to unblock specific legal, regulatory or financial barriers to renovation initiatives.

The UK relies on policies already in place, such as the Green Deal and Energy Company Obligation. The only new policy is the Energy Savings Opportunity Scheme (ESOS) aimed at large business, introduced to meet the energy auditing requirements in EED.

COVERAGE OF INDOOR CLIMATE CONSIDERATIONS

For the most part, renovation strategies do not discuss indoor comfort/air quality issues to any degree, other than as one of a number of wider benefits that building renovation can bring. Only a small number of strategies mention the need for adequate ventilation, but this is not a generic theme picked up as a core component of the renovation agenda.

In the shift towards deeper renovation, the issue of indoor air quality becomes increasingly important. Unintended consequences like overheating and inadequate ventilation may also occur. Ensuring access to fresh air is therefore important to ensure good indoor air quality in renovated buildings. Reducing air infiltration is a key component of improving the energy performance of buildings, and reducing draughts and cold spots as well as replacing existing poor quality windows with highly energy efficient ones makes an important contribution to improving comfort as well as health considerations. However, cutting unwanted air infiltration must not be done to the detriment of the air quality inside the building. To ensure that buildings maintain good indoor climate conditions while cutting unwanted air infiltration, proper ventilation is needed (natural or mechanical), ideally controlled with carbon dioxide sensors. Simple and efficient measures also have to be considered in order to avoid overheating. The most important are access to fresh air (cross ventilation) and use of solar shading. Ideally, prevention of overheating should be sensor-based. Ensuring access to daylight is also important, and the daylight conditions should not be deteriorated when renovating – indeed, renovation provides an opportunity to improve natural daylighting. By carefully selecting window products and installation techniques, an increased glazed area may be achievable without reducing energy performance.

These considerations on securing daylight and fresh air must be borne in mind when setting energy performance standards, and more importantly whenever buildings are renovated.

CONCLUSIONS & RECOMMENDATIONS

The Energy Efficiency Directive introduced, in 2012, an important new dimension to the energy saving in buildings legislative landscape. Article 4 requires Member States, for the first time, to set out national strategies for the renovation of their building stocks, thereby filling a major gap in policy concerning the existing building stock, with which the vast majority of energy use and resultant carbon emissions will be associated for the foreseeable future.

Article 4 stops short of requiring Member States to implement specific measures or policies, but the requirement to develop renovation strategies has stimulated Member States to think more strategically about the long-term energy saving and carbon reduction opportunities in this sector.

Inevitably, the first strategies are a learning process in themselves, and so the experience gained here must be translated into a more mature and sophisticated response when the strategies are revised in 2017, and every three years thereafter. In the meantime, the priority for Member States is to implement the commitments made in their own strategies, but also to learn from other Member States' strategies. Furthermore, given the increasingly international nature of the renovation supply chain (from research, through manufacture, to delivery and installation), Member States are encouraged to work together to effect an EU-wide transformation of existing buildings to highly energy performing ones.

Between them, the renovation strategies that have been considered within this report present an interesting spectrum of approaches and activities. They are the start of the process towards a strategic approach to transforming Europe's buildings into highly energy performing, healthy and comfortable spaces for citizens and employees.

Based on the strategies reviewed within this report, there is still considerable progress that needs to be made in ALL Member States before the European Union can be said to be on the required transformation path for its existing building stock. The required **level of ambition, sense of urgency and strategic importance** is still lacking.

RECOMMENDATIONS

If we are to achieve the true potential for transforming Europe's built environment into a highly energy performing one, with all the co-benefits this brings, Member States need to take the renovation agenda much more seriously than hitherto. Based on the analysis undertaken in this report, national building renovation strategies need to include the following dimensions:

1. **Stakeholder involvement** – Getting all actors and stakeholders to have the opportunity to input into strategy development will not only improve its quality, but also facilitate its delivery and implementation. See the references below for example case studies in Denmark, France and the Nordic countries⁵¹.
2. **Building stock** – A detailed breakdown by building type, age, energy carrier, climatic zone, energy performance, made available in a downloadable form, for example through the European Commission's proposed Buildings Observatory, identified within Horizon 2020, the EU framework programme for research and innovation⁵². This is a fundamental knowledge requirement to underpin subsequent steps in the strategy. Good examples of building stock appraisal can be seen in the Brussels Capital Region and UK strategies.

⁵¹ http://www.worldgbc.org/files/1813/9254/0062/Policy_Case_Study_-_Denmark.pdf, <http://www.worldgbc.org/infocenter/key-principles/case-studies/france>, http://www.worldgbc.org/files/6413/9271/3744/Policy_Case_Study_-_Nordic_Countries.pdf

⁵² <http://ec.europa.eu/programmes/horizon2020/>

3. **Cost-effective approaches to renovation** – Presentation of the results of cost-optimality analysis in accordance with the Commission’s guidelines, identifying energy performance levels to be attained in different building types (see for example Brussels Capital Region and France). Note that costs and savings will change over time, as technologies develop, as experience leads to price reductions, and as energy prices change, so cost optimality calculations need to be revisited every 3-5 years. Cost-optimal renovations must quickly become the norm, and all policies and investment decisions must be geared towards achieving the full economic potential in all building renovation activity going forward. Furthermore, costs can be brought down by scaling up activity levels, both at a local level through targeted initiatives generating larger volumes of renovation activity, and nationally through the policies and support measures that the renovation strategies should put in place.
4. **Policies** – These need to be geared towards achieving deep renovations (including staged deep renovations) that meet the cost optimal levels identified in 2) above. Policies need to be comprehensive, addressing all six of the following dimensions (see Appendix for checklist of measures under each heading):
 - a. **Strategic** – the right top-level steer needs to be signalled to stakeholders regarding the importance Governments ascribe to the renovation agenda
 - b. **Legislative/Regulatory** – existing barriers at all tiers of Government to the achievement of cost optimal renovation must be swiftly removed. A positive legislative and regulatory framework needs to be put in place which supports stakeholders in their investment decision-making by providing long-term signals and long-term certainty
 - c. **Technical** – packaged solutions that deliver multiple measures, including the incorporation of applicable renewable technologies, need to be developed
 - d. **Fiscal/Financial** - support measures must be geared towards the cost-optimal goal
 - e. **Communication/Capacity Building** – information, including “one stop shops”, as well as training and upskilling in the design, management and delivery of renovation projects (whether individual buildings or within the scope of wider programmes) are essential components of the policy landscape, to ensure building owners have access to the right information and source of support, while the supply side is able to deliver the goods
 - f. **R&D** – better, cheaper and more effective ways of improving building energy performance need to be developed and quickly brought to market.

Czech Republic, Denmark and Romania are examples of strategies where a wide ranging policy appraisal has been undertaken.
5. **Forward-looking perspective** - Policies must be designed to provide appropriate long-term signals to the market, and communicated in a way that consumers and all actors in the supply chain understand the overall objective and plan their investment strategies with confidence. “Stop-go” policies must be avoided.

A roadmap with key dates, targets, milestones etc. for the introduction of legislation and support mechanisms should be considered an essential requirement of future renovation strategies. The roadmap should take a long-term perspective, to 2030 at least, though ideally to 2050, and with sufficient detail over the next 10 years for stakeholders to plan their business and investment strategies. The forward looking perspective should quantify the total expected investment in building renovation on an annual basis, including an indicative breakdown by expected source (EU funds, national/regional funds, Energy Efficiency Obligations, private investment funds, building owners). To support the forward perspective, modelling of different uptake scenarios should be undertaken. None of the strategies addressed this item adequately.

6. **Recognition of building market dynamics** - Policies and support measures can only achieve their objectives if they are geared towards the needs, desires and motivations of building owners. The inherent drive towards home improvement and better work places needs to be captured as an important trigger point for improving the energy performance of buildings. Other trigger points and actions that work with the dynamic of the market need to be exploited, such as at change of occupancy or when building components are being replaced. The possibility of installing inefficient or sub-optimal products, from an energy use perspective, needs to be limited and ultimately removed. At the same time, the significant inertia among some building owners, and the long replacement cycles of certain components, need to be recognised and tackled through effective policy design and engagement with building owners. The Danish strategy seeks to capitalise on trigger points.
7. **Quantification of benefits** – In addition to the energy, carbon and cost savings, Member States should factor in the quantifiable wider benefits in terms of economic impact (e.g. GDP growth, increased property values), societal impacts (e.g. improved health), and environmental benefits (e.g. a valuation of the reduction in greenhouse gas emissions and other air pollutants). Where national data sources are available, these should be used. Otherwise, international sources, such as the IEA's September 2014 publication *"Capturing the Multiple Benefits of Energy Efficiency: A Handbook for Policy Makers and Evaluators"*⁵³ or other respected research institutes or economic consultancies can be utilised. Romania's is the only strategy to quantify co-benefits.
8. **Healthy buildings** – It is important to include requirements and guidance on how to ensure that building renovation not only results in significant energy savings, but also in a healthier building stock with natural daylight, adequate ventilation and a good quality indoor climate to improve the quality of life and well-being of the people living and working in them. Denmark's strategy had the best example of addressing the healthy building and indoor climate agenda.
9. **Monitoring implementation and enforcement** – Having developed strategies that are worthy of the description, the vital next step is to ensure they are implemented so that the identified benefits can be realised. Enforcement, both within Member States and at EU level, needs to be in place to ensure that the desired outcomes are achieved in practice. Monitoring and enforcement also apply at the level of individual buildings, to ensure that the expected savings are achieved in practice. The Netherlands has set up an Assurance Commission that will monitor and evaluate progress with the Energy Agreement, including those aspects relating to the renovation strategy.
10. **Ongoing review and revision** – Renovation strategies need to be living documents, which change and evolve over time as experience grows and the market adapts to developments in technological solutions, installation practice, costs, financing mechanisms and consumer demand. These changes do not occur overnight, so policies need to be progressive in nature, with a view to providing the right forward signals that are relevant to the prevailing market conditions.

It is therefore right and appropriate that Article 4 requires Member States to update their strategies every three years. Member States should be strongly encouraged to learn from each other and to co-ordinate effort in areas such as R&D, financing mechanisms, communication, and engagement with the supply chain, so that the required long-term transformation of the existing building stock can be achieved as swiftly, efficiently and cost-effectively as possible.

⁵³ <http://www.iea.org/topics/energyefficiency/multiplebenefitsofenergyefficiency/>

APPENDIX – POLICY MEASURE CHECKLIST⁵⁴

STRATEGIC	Establish support across the political spectrum for deep renovation of the building stock
	Establish an independent committee to monitor and report progress on the strategy on an ongoing basis, including making recommendations for improvements and periodic updates
	Undertake systematic appraisal of barriers to renovation in each segment of the market and develop policy responses to address each barrier
	Establish objective to eradicate fuel poverty through energy performance improvements to the housing stock
	Develop holistic cross-policy targets that integrate with and deliver on goals in related fields, e.g. sustainable urbanisation, resource efficiency, sustainable construction etc.
	Establish a wide stakeholder group as a forum for consultation, policy formulation and feedback on practical issues and barriers to renovation
	Demonstrate leadership through accelerated deep renovation of public buildings, thereby developing supply chain capacity and providing a knowledge base for private/commercial renovation activity
LEGISLATIVE & REGULATORY	Identify trigger points and develop respective regulation that could be used to encourage, or require, building energy performance improvement
	Design Energy Efficiency Obligations that encourage the delivery of deep renovation
	Facilitate the upgrade of all social housing to high energy performance levels
	Address restrictive practices concerning local deployment of low/zero carbon technologies to ensure that a positive environment for buildings integrated renewables is established
	Remove or implement measures to overcome restrictive tenancy laws which disincentivise or otherwise inhibit energy performance improvement
	Mandate improvement of least efficient stock to higher energy performance level, e.g. through restrictions on sale or rental of buildings in lowest energy performance categories
TECHNICAL	Develop renovation standards that are progressively and regularly strengthened in response to experience and new technological solutions
	Analyse potential for district heating systems to provide efficient, low carbon energy
	Ensure proper monitoring and enforcement of compliance with building codes
	Develop packaged solutions that can be readily replicated in similar building types
	Introduce quality standards/certification systems for installers & products (including packaged solutions)
FISCAL/FINANCIAL	Secure sources of finance, including those identified in EED Article 20 and EU/international funding sources, and develop mechanisms that effectively leverage private capital
	Factor in monetary value of co-benefits (e.g. health, employment) in public funding decisions
	Develop funding vehicles, tailored to specific market segments, that provide a simple (“one-stop-shop”) and commercially attractive source of finance for deep renovation
	Develop mechanisms to encourage deep renovation via third party financing, e.g. ESCOs, EPCs
	Strengthen energy/carbon pricing mechanisms to provide the right economic signals
	Remove fossil fuel subsidies to eliminate perverse incentives that discourage investment
Consider “bonus-malus” mechanisms, e.g. property taxation systems (which reward high energy performing buildings while penalizing poorly performing ones) and energy pricing	
COMMUNICATION / CAPACITY BUILDING	Establish publicly accessible databases demonstrating energy performance of renovated buildings and information on how to undertake deep renovation
	Gear up skills and training programmes covering the key professions and disciplines
	Establish knowledge and experience-sharing networks across regions/Member States
	Encourage development of local supply chain industry for maximising macro-economic benefits and to minimise embedded CO ₂ emissions
	Develop promotional and dissemination activities that sensitise building owners to opportunities for deep renovation and that provide stepwise support throughout the renovation process
	Communicate regularly and publicly on progress with the renovation strategy
R&D	Support research, development and demonstration projects into new & improved technologies and techniques to deliver deep renovation, including how to scale up best practice to multiple buildings

⁵⁴ BPIE http://www.bpie.eu/renovation_strategy.html



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