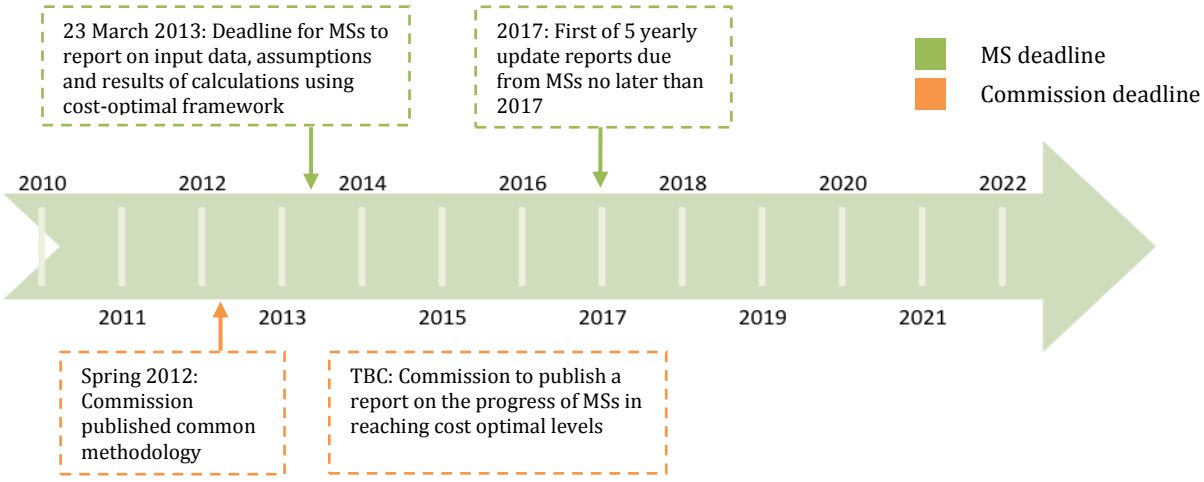
Factsheet on Cost-Optimality

Other factsheets in toolkit: *Nearly Zero-Energy Buildings, Finance, Energy Performance Certificates, Training*

Why use cost-optimal as a criterion?

There are two objectives to setting "cost-optimum" as a minimum level of performance requirement. First, to ensure coherent, well-planned and ambitious minimum refurbishment standards that avoid the undesirable effects of sub-optimal refurbishments, such as the lock-in effect where future energy performance improvements are made more difficult or more expensive following partial refurbishment. Secondly, to enable the most effective use of financial resources and thus avoid over-investment where the benefits no longer outweigh the costs. The cost-optimal level of minimum performance is intended to point to the economic optimum, achieving these two aims. As an economically based calculation, the cost optimal methodology is also technology neutral.

Description



When first introduced in 2002 the Energy Performance of Buildings Directive (EPBD) contained a requirement for Member States to apply a methodology for the calculation of the energy performance of buildings. It also required minimum energy performance requirements to be established for new buildings and existing buildings that undergo major renovation. What it did not do was provide an indication of the level at which these performance requirements should be set. The recast of the EPBD, approved in 2010, provides this indication with the introduction of the 'cost-optimal' level.

Article 4 of the recast EPBD contains the requirement for Member States to ensure that minimum energy performance standards for buildings and building elements are set "with a view to achieving cost-optimal levels". It does not require a harmonisation of the different Member State performance requirements (i.e. EU-wide performance requirements). However it works to streamline the levels of ambition through benchmarking existing performance requirements against a common approach to standard setting.

The cost-optimal level is defined as "the energy performance level which leads to the lowest cost during the estimated economic lifecycle". This is similar to a cost benefit analysis, and requires consideration of the total energy-related costs including installation, operation and maintenance of the building set against the total benefits over the lifecycle of the building or building element. The definition in the recast EPBD states that this level shall lie within the range of performance levels where the cost benefit analysis calculated over the estimated lifecycle is positive.

Comparative framework methodology

On 16th January 2012 (delayed from 30th June 2011), the Commission published a common methodology in the form of a 'cost optimal comparative framework methodology'. This was accompanied by a supporting guidance document outlining how to apply this framework at Member State level. The framework allows for variables such as building category, building use patterns, climate conditions, investment costs, maintenance and operating costs (and savings) and earnings from energy produced. It also differentiates between new and existing buildings.

The comparative framework methodology and the accompanying guidelines are both available at:
http://ec.europa.eu/energy/efficiency/buildings/buildings_en.htm

Application by Member States

Following publication of the methodology by the Commission, the Member States were required to undertake calculations in line with it and report on the results to the Commission. The results are to be used to establish whether existing performance requirements are in line with the cost optimal level. It is important to note that the Member States are allowed to apply requirements which are more demanding than the cost optimal level. The inputs into the calculations and the results were due to be reported to the commission by 23rd March 2013 and subsequently every five years (potentially in the NEEAP[1]). The four main steps for Member States were:

1. To define a set of reference buildings (number as yet unknown) that cover residential and non-residential, new and existing buildings (each reference building will then be sub-categorised by size and age);
2. To define a number of different packages of energy efficiency measures to be assessed for each reference building. These could be for individual building elements, for buildings as a whole or a combination of both;
3. To assess final and primary energy need for each of the reference buildings, both before and after the energy efficiency measures have been applied; and
4. To calculate the costs and benefits, i.e. the net present value, of the energy efficiency measures, over their lifetime for each reference building.

This calculation must also be carried out for building elements, starting with the minimum standards that are applied on replacement or upgrade and are to be specific to a reference building.

If the results of this process show that existing national performance requirements (for buildings or building elements) differ from the cost optimal range by more than 15%, a justification must be provided to the Commission and if the gap is not justified an outline of appropriate steps to close the

[1] National Energy Efficiency Action Plan required under the Energy Services Directive 2006 to be produced by each MS.

gap must be set out. The Commission has committed to report on the progress of Member States in meeting cost optimal levels of minimum standards but has not specified a date.

Key issues

There are two main stages to the adoption of the cost-optimal level for a minimum energy performance requirement. The first stage is at the Commission level and the second at Member State level, and there are key issues at each stage.

Comparative framework methodology

Possible issues with the framework methodology were clear even before it was published. Will improvements need to be cost-optimal to the investor or to society as a whole? Closely linked to this question is whether or not non-financial costs and non-energy benefits should be included in the methodology: including them would move the methodology towards a more societal perspective. More technical considerations include how the Commission will account for future fuel price assumptions and lifetime or lifecycle assumptions for different buildings or building elements. Finally, how cost-optimality links to the definition of nearly zero-energy buildings will be very important in determining how the refurbishment benchmark contributes to the ambition for an increasing proportion of the stock to be nearly zero energy.

Exhibit A – German energy conservation regulations

Since 1978 Germany has been basing its energy conservation regulations on cost-efficient recommendations. Germany uses a relatively comprehensive catalogue of reference buildings (4 residential and 15 non-residential). The calculation of cost-efficiency is based on costs (investment, maintenance, etc), savings, lifetime, actual energy price and future price rise. However the calculation does not consider social benefits like the carbon price or benefit of reduced emissions. Also, it does not consider benefits like improved comfort and disposal cost.

Application by Member States

Issues for Member States include the fair representation of local factors such as climate, resource availability, local energy prices and local costs. A large number of these considerations can be accounted for in the calculation of costs and benefits. However, the design of the reference building is also expected to account for not only standard energy performance and typical use for the building type but also typical cost structure in the country, indoor and outdoor climatic conditions and geographic locations.

Exhibit B – UK 'zero carbon standard and building regulations

The work that the Zero Carbon Hub (www.zerocarbonhub.org) in the UK has undertaken on the technical and commercial viability of the 'zero carbon' standard, coupled with the UK practice of regulatory impact assessments for new regulations[1] is likely to be presented by the UK administration as meeting the requirement in respect to housing.

The Impact Assessment for new building codes can be found at www.communities.gov.uk/corporate/publications/consultations

In the final regulation it is stated that reference buildings (two existing and one new build) will be required for each of at least four building categories - single family, apartment blocks or multi-family, office and other non-residential buildings - but does not state a limit to the number of reference buildings that can be used. A key challenge will be to create a manageable set of reference buildings that is representative of the national stock in terms of functionality, location, indoor and outdoor conditions etc. Central issues linked to Member State preparedness include: have Member States already defined reference buildings (or do they have the models in which to create them) and are they defined in all of the necessary variables including for example, orientation and shading and use patterns? The answers to these questions rely on the level and detail of existing knowledge of

the national building stock. Relevant data from a wide range of sources will be valuable and can be used to steer the debate towards more ambitious standards.

Finally, enormous potential is present as part of this process to push for, and to establish, refurbishment standards in Member States that move towards and are consistent with the nearly zero energy buildings definition outlined in Article 4 of the Directive. In this Article the Directive outlines that "*Member States shall…develop policies and take measures such as the setting of targets in order to stimulate the transformation of buildings that are refurbished into nearly zero-energy buildings*". The required revisiting of existing standards and, for many Member States, the revision of these standards is a point at which an ambitious trajectory can be set for the existing stock.

Resources

Commission Documents - meetings of the Expert Workshop on the comparative framework methodology on Cost-Optimality

1. **Commission** (2012) *Regulation on Cost Optimal Methodology:* http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32012R0244:EN:NOT
2. **Commission** (2012) *Guideline document accompanying the Regulation:* http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52012XC0419(02):EN:NOT
3. **Commission** (2013): Country reports on Cost-Optimality: http://ec.europa.eu/energy/efficiency/buildings/implementation_en.htm

Guides to cost optimality

4. **Buildings Performance Institute Europe** (2013) *Implementing the Cost-Optimal Methodology in the Member States*: http://www.bpie.eu/cost_optimal_methodology.html
5. **Buildings Performance Institute Europe** (2010) *Cost optimality in building renovations;* www.bpie.eu/cost_optimality.html
6. **Commission**; ec.europa.eu/energy/efficiency/buildings/buildings_en.htm
7. **ECEEE** (2011) *Cost Optimality webpage*; www.eceee.org/buildings/cost_optimality
8. **ECEEE** (2011) *Cost optimal building performance requirements;* www.eceee.org/buildings/cost_optimality/cost_optimality-eceeereport.pdf
9. **EPBD Concerted Action:** *Building Energy Performance under the EPBD – Taking Stock and Looking Forward* http://www.epbd-ca.eu/archives/610
10. **EPBD Concerted Action** (2011) *Cost optimal levels for energy performance requirements*; http://www.epbd-ca.org/Medias/Pdf/Cost_optimal_summary_document_final.pdf
11. **Institute for Building Efficiency** (2011) *European Union: Cost Effective Energy Efficiency in Buildings: issue brief*; http://www.institutebe.com/InstituteBE/media/Library/Resources/Existing%20Building%20Retrofits/Issue-Brief---Cost-Optimality-in-EU,-ENG.pdf

Basic guides to the EPBD recast

Accessible, short and direct guides to the new EPBD and some of the key questions around the recast:

- **ECEEE** (2010) *Steering through the Maze 1 Your guide to the EPBD recast;* www.eceee.org/buildings/Mazeguide1_EPBDrecastRev090310.pdf
- **ECEEE** (2010) *Steering through the Maze 3 Your guide to FAQs on the EPBD recast;* www.eceee.org/buildings/Mazeguide3-FAQ-EPBD.pdf