IEA EBC Annex 56
Cost-Effective Energy and Carbon Emission Optimisation in Building Renovation

2011-2015
Today’s standards are mainly targeted to new buildings, providing less guidance on the renovation of existing buildings.

Today’s standards do not respond effectively to the numerous technical, functional and economic constraints of this kind of buildings.

Today’s standards are mainly targeted to energy efficiency measures that very often result in expensive processes and complex procedures, seldom accepted by users, owners or promoters.
Within the EU, each Member State must prepare renovation plans for existing buildings, with the nearly-zero energy goal which means:

- Goals must be set for energy consumption and carbon emissions for the existing building stock
- Cost effective renovation packages must be found
In existing buildings, the most cost-effective renovation solution is often a combination of energy efficiency measures and carbon emissions reduction measures.

So, it is relevant to investigate where is the balance point between these two types of measures in a cost/benefit perspective.

Question?
How to achieve the best performance with minimal effort?
IEA EBC Annex 56 Objectives

Develop a new methodology for a cost optimal building renovation towards both the nearly zero energy and nearly zero emissions objective

Identify the optimal balance between the “minimization of demand” and “generation of renewable energy” measures in a cost/benefit perspective

Questions?

How far is it possible to go with energy conservation and efficiency measures (initially often less expensive measures) ?

From which point the carbon emissions reduction measures become more economical ?
IEA EBC Annex 56 Main Objectives

- Define a methodology for the establishment of cost optimized targets for energy and carbon emissions in building renovation.
- Clarify the relationship between the emission and the energy targets and their eventual hierarchy.
- Determine cost effective combinations of energy efficiency measures and carbon emissions reduction measures.

However, in this project we intend to have a broader approach, going beyond the cost effective reduction of carbon emissions and energy consumption and take into account, as much as possible, the overall added value achieved in a renovation process.
Overall Added Value means identifying:

- Global quality improvement
- Economic impact of the intervention
- Operating costs reduction
- Resulting co-benefits (as much as possible)

It is also an objective, although in a voluntary basis, to take into account embodied energy and related emissions for building renovation materials and equipments since the better the performance of buildings the more relevant embodied energy use becomes.
**IEA EBC Annex 56 Scope**

- **Residential buildings**
  Single-family houses and multiple-family buildings

- **Non-Residential buildings without complex HVAC systems**
  If relevant and useful information can be extracted from them used to prove the applicability of the developed methodology and tools to other buildings’ categories besides residential buildings)

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IEA EBC Annex 56 Target Groups

Decision makers (owners, investors, promoters)
To make better decisions and choose the best options that apply to their needs

Multipliers (architects, planners, consultants and professionals of construction and building renovation industry)
Technical guidance

Policy makers
To define the most appropriate policies, measures and incentives to put into practice for an effective renovation strategy
Methodology

- Will allow taking into account country specific situations (like climate, electricity mix, conversion factors, national energy targets, etc.)

- Will allow prioritizing either nearly-zero emissions renovation (NZEmB) or nearly-zero energy renovation (NZEB), each with an additional energy or emission goal that has to be achieved at the same time

- In any situation there is a strong requirement to make sure that substantial energy reductions must be achieved whatever the priority chosen

The challenge will be to explore the tradeoffs between emissions reduction and energy reduction at the nearly zero border taking into account costs, energy use, emissions and, as far as possible, co-benefits
Co-Benefits

• Integrate co-benefits in the methodology is one of the aims and one of the major challenges of this project

• Co-benefits – All benefits besides energy and energy cost savings and carbon emission reductions like comfort improvement (thermal, natural lighting, indoor air quality, acoustics, etc.), fewer problems related to building physics, fewer negative external effects of the building (air pollution) and increased value of the building

• Co-benefits can be as important as energy cost savings and, in certain circumstances can be the drivers for the renovation

Question

How to find feasible methods to monetize, or at least partly quantify, co-benefits in order to take them into account in cost-benefit analysis?
Co-Benefits

Health effects

- Improved thermal comfort
- Increased energy efficiency
- Less exterior noise
- Less problems with building physics
- Operational comfort
- Aesthetics
- Risk exposure to energy price increases

Moderating energy prices

Direct benefits

- Less carbon emissions
- Less life cycle costs

Health effects

Productivity and learning capacity

- Increased building value

Better indoor air quality

2nd level Side effects

- Co-Benefits

Medical

Increased building value
To develop and support the methodology:

- **Generic buildings** in each country are being selected – prevailing typologies and constructive solutions must be found.

- Parametric studies are being performed on them.
**Methodology**

**Market Approach**
Cost based, cost effective measures: range for measures between cost optimal and cost neutral, ranking/trade-off between energy or emissions reduction measures to be determined

**Private cost perspective**
- Initial renovation cost
  - Initial investment cost
  - Replacement costs
- Utilization costs building
  - Energy costs
  - Maintenance costs
  - Operational costs
- Co-benefits

**Social cost perspective**
- Initial investment cost
- Replacement costs
- Energy costs
- Maintenance costs
- Operational costs
- External costs or benefits

**Normative Approach**
Normatively (politically or environmentally) preset targets (primary energy or carbon emissions reduction), least cost measures to meet the targets

**Preset energy targets**
Preset with respect to
- Resource or environmental target
- Politically preset (depending on costs from market approach)

**Preset emission targets**
Preset with respect to
- Resource or environmental targets
- Politically preset (depending on costs from market approach)

Relevant for owners, investors, users

Relevant for policy makers
Information about the project and documents for download are available in:

www.iea-annex56.org

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