

Assessment of energy-efficient building retrofit strategies leading to cost-optimality and nearly zero energy building (nZEB)



Data of Your Paper



Topic

- Resilience
- Lifestyle
- Building
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- Tourism
- Energy

Title of the Paper

Assessment of energy-efficient building retrofit strategies leading to cost-optimality and nearly zero energy building (nZEB)

Form of Presentation

- Poster
- Presentation

Short Description (maximum 2500 characters)

Current energy policy and climate mitigation goals require distinct reductions of the primary energy demand and greenhouse gas emissions (GHG) in the building sector. The existing building stock poses a special challenge since clear-cut technically and economically optimized retrofit strategies for different types of existing buildings are not established yet.

The goal of the study is to identify such retrofit strategies to achieve cost optimal retrofit levels and concepts and to assess costs and benefits of nearly zero energy buildings (nZEB). The adopted methodology about the cost optimal draft regulation of the methodology framework of the EPBD recast. Firstly reference building types are defined, covering single-family houses, multi-family houses, office buildings, and school buildings. Secondly, a large set of generic energy efficiency and GHG mitigation measures are described, covering seven strategic fields, namely building envelope measures, heating and hot water supply technologies and fuel choice, ventilation and lighting systems, electricity and district heat mixes. Thirdly, energy performance is calculated based on technical and physical characteristics and using a building energy balance software. Based on useful energy requirements, delivered energy for space heating, cooling, ventilation, domestic hot water and lighting systems and primary energy use and GHG emissions are calculated, depending on the energy supply mix. Fourth, investment costs and life cycle costs are established based on unitary costs of building elements and building technologies. Generic cost data stem from extended surveys performed by the authors. Cost-effectiveness is determined based on the net present value method which is compared to the annuity method for a couple of cases.

Robustness of measures is identified by performing sensitivity analysis regarding critical parameters such as energy prices, interest rates, electricity mix and other uncertainties. The database of intermediate results obtained this way allows for

identifying trade-offs and synergies between measures of different strategic fields. This allows for selecting two kinds combinations of measures (packages): (i) robust cost-optimal retrofit strategies, and (ii) cost-effective approaches to achieve nZEB and Plusenergyhouses in the case of existing buildings. A special focus is given on boundary conditions such as the availability of local potentials of renewable energies.

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