bigEE

Your guide to energy efficiency in buildings.

It's really worth it: the potential for energy savings in buildings

Energy efficiency in buildings is crucial for sustainable development, mitigating climate change and limiting resource use, and a low-risk worldwide energy system. Approximately 40% of global final energy demand and one third of energy-related CO2 emissions are related to buildings (IEA 2008). Early and comprehensive use of energy efficiency design and technology can substantially reduce both energy and emissions. Further energy savings can be made in appliances used in buildings, see the text on Appliances – Potential for Policy.

New ultra-low energy buildings (read more in the **bigEE Buildings Guide**) needing 60 to 90% less final energy for heating and cooling than conventional new buildings can be constructed cost-effectively in most parts of the world. Retrofitting existing buildings can bring similar improvements. Extensive energy-efficient renovation measures ("deep renovation") can achieve final energy savings of 50 to 90%. These can be profitable investments, too, if done as part of typical refurbishment cycles and if the energy cost savings during the life cycle are considered (Global Energy Assessment [GEA] 2012). However, integrated policy packages are needed to guarantee that developers, designers, builders, investors, and users get the right incentives and achieve these high energy savings through energy efficiency. Appropriate policies include minimum energy performance standards and financial incentives such as support programmes for energy efficiency measures. Find more in the **bigEE Policy Guide**.

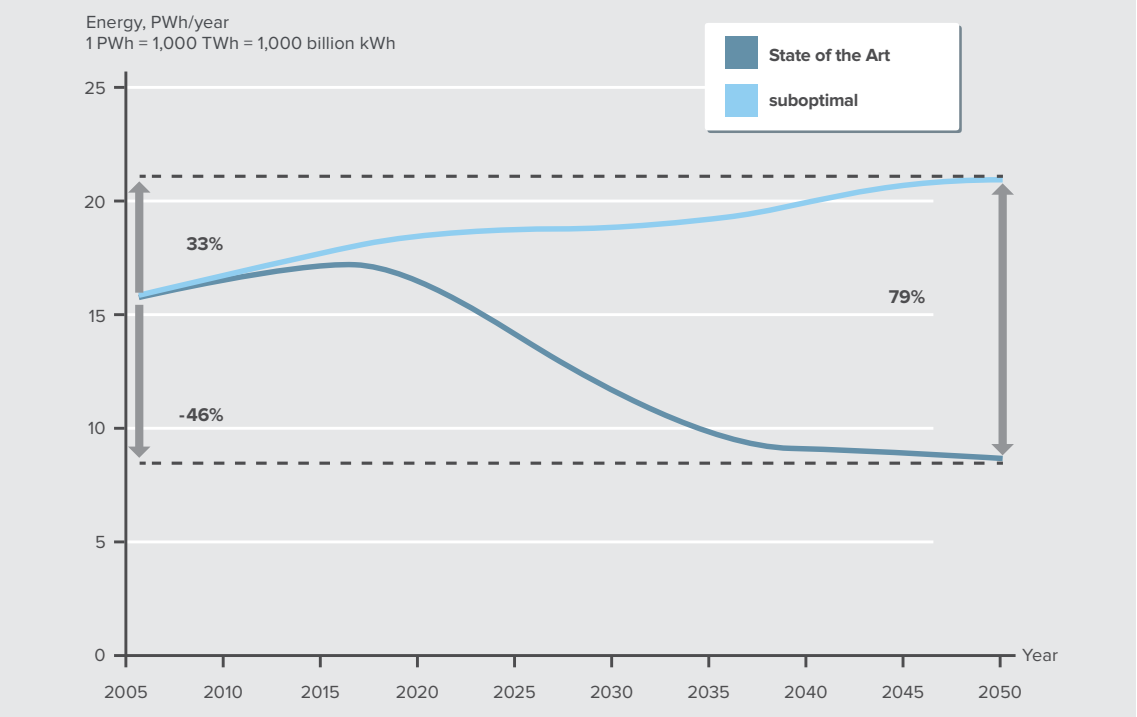

Figure 1: World Space Heating and Cooling final energy use, 2005 – 2050, suboptimal and state-of-the-art energy efficiency scenarios (GEA 2012).

Most recent scenarios (GEA 2012, see the figure above) show that state-of-the-art energy-efficient renovation and new construction could result in worldwide overall energy savings of 46% in 2050 compared to 2005 or 60% of the energy consumption expected in 2050 for the suboptimal scenario, expressed in final energy demand for heating and cooling. Despite growth in the building stock, this translates into an absolute decrease in energy consumption from 15.7 PWh (15,700 TWh) in 2005 down to 8.5 PWh (8,500 TWh) in 2050. GEA (2012) estimated that the US$57 trillion (approximately) of cumulative energy cost savings by 2050 in avoided heating and cooling energy costs alone - substantially exceed the estimated US$15 trillion investments that are needed to realize this pathway. Such a transition will only be achieved with early, comprehensive and systematic implementation of state-of-the art energy efficiency measures in design, construction and technology in both new and existing buildings.

These measures are urgently needed because policy that only encourages low-standard improvements, e.g. energy savings of only 35%, will lead to considerable “lock-in” effects. Once renovated or built, it will not be cost-effective to further upgrade the energy efficiency of these buildings for several decades. In other words, inadequate action now means losing cost-effective opportunities for long-term investments, energy and carbon emission reductions. This scenario could lead to energy consumption for heating and cooling of 20.8 PWh in 2050 (i.e., an increase of 33%). Some “Business-as-usual” scenarios cited below predict even a doubling of worldwide greenhouse gas emissions from buildings by 2050.

Both paths are visualized in Figure 1 above, the state-of-the art scenario in dark blue (with “deep renovation” in existing buildings and ultra-low energy new buildings) vs. the suboptimal development path in light blue. The overall difference in 2050 adds up to an implementation gap of 93%.

To tap this enormous potential, appropriate and integrated packages of policies and measures are necessary, supporting state-of-the art renovation and new construction. This will avoid the “lock-in” effect of insufficient policies and measures encouraging sub-optimal energy efficiency.

In both technologies and policies, comprehensive packages are much more effective than single actions or measures. On the policy side, measures must be tailored to the regional characteristics (e.g. climate zones) and combined to address all relevant actors and barriers to energy efficiency. On the technology side, it is also important to apply packages of energy efficiency improvements because a sequence of measures is less cost effective than a package implemented all at once. This is because fixed costs occur each time technologies are implemented or retrofitted.

Regional differences

Looking at new build vs. renovation, the priorities in terms of energy efficiency differ between world regions. In Western Europe, North America and Pacific OECD, the focus should be the renovation of the large existing building stock. New buildings are clearly the main challenge in Centrally Planned Asia, South Asia, Latin America, Middle East, Africa and Non-OECD Pacific Asia. These regions are characterised by high new construction rates and increasing energy demand for cooling. Only in Eastern Europe and the former Soviet Union is there similar potential for new and existing buildings (GEA 2012).

Building energy efficiency and climate change mitigation

Expressed in carbon emissions, the building sector, including electricity use, caused emissions of 8.6 gigatons (Gt) of CO2 in 2004 (IPCC 2007). Different projections calculate between 11.1 Gt and 14.3 Gt of carbon emissions in 2030. A survey of studies (IPCC 2007) shows that on a global scale, approximately 29% of the projected baseline carbon emissions can be reduced cost-effectively by 2020. In the long run, the IEA "Blue Map" Scenario shows that out of the needed overall carbon emission reductions of 48 gigatons in 2050 for all sectors, 38% are attributed to the building sector (IEA 2008).

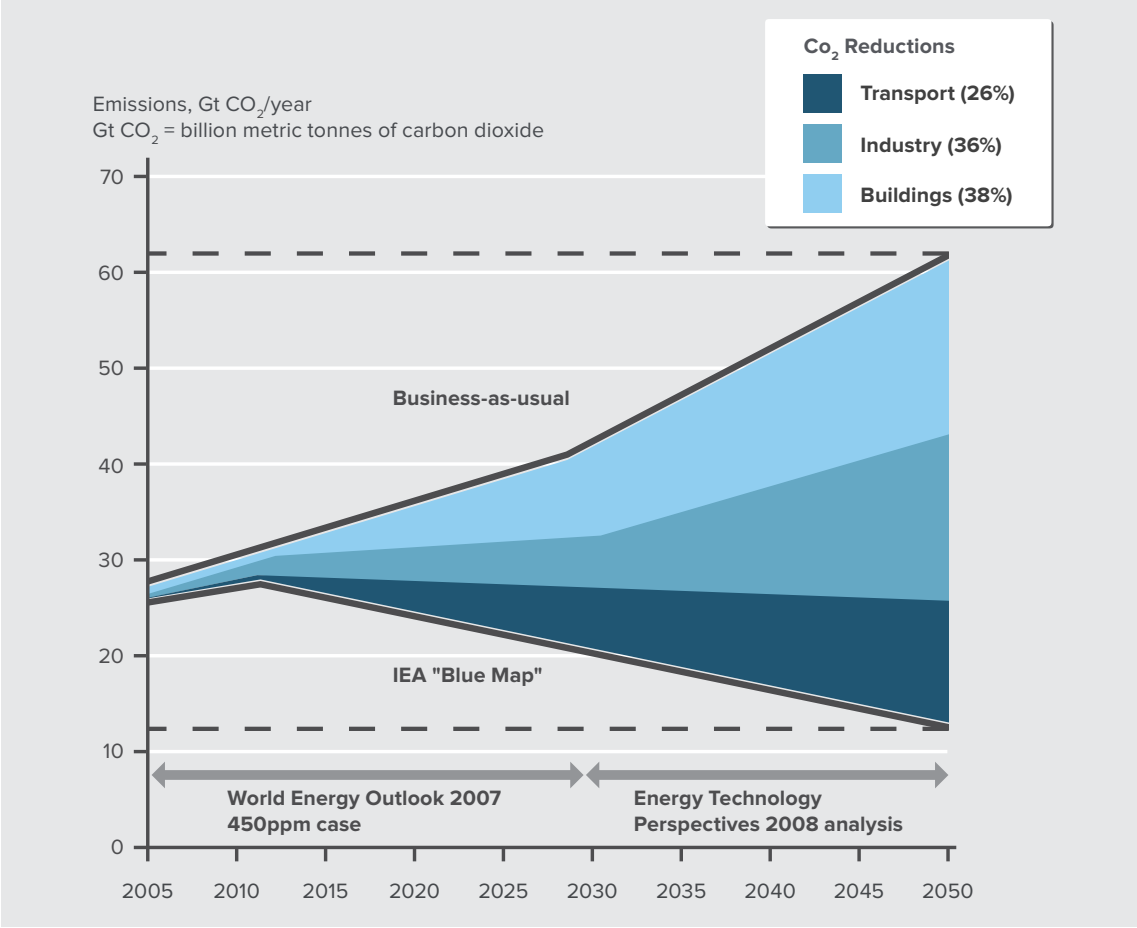

Figure 2: Carbon Emissions in the IEA Blue Map Scenario, IEA (2010).

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bigEE is an international initiative of research institutes for technical and policy advice and public agencies in the field of energy and climate, co-ordinated by the Wuppertal Institute (Germany). Its aim is to develop the international web-based knowledge platform bigee.net for energy efficiency in buildings, building-related technologies, and appliances in the world's main climatic zones.

The bigee.net platform informs users about energy efficiency options and savings potentials, net benefits and how policy can support achieving those savings. Targeted information is paired with recommendations and examples of good practice.

Co-ordinated by

Wuppertal Institute for Climate, Environment and Energy

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Financial support

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

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