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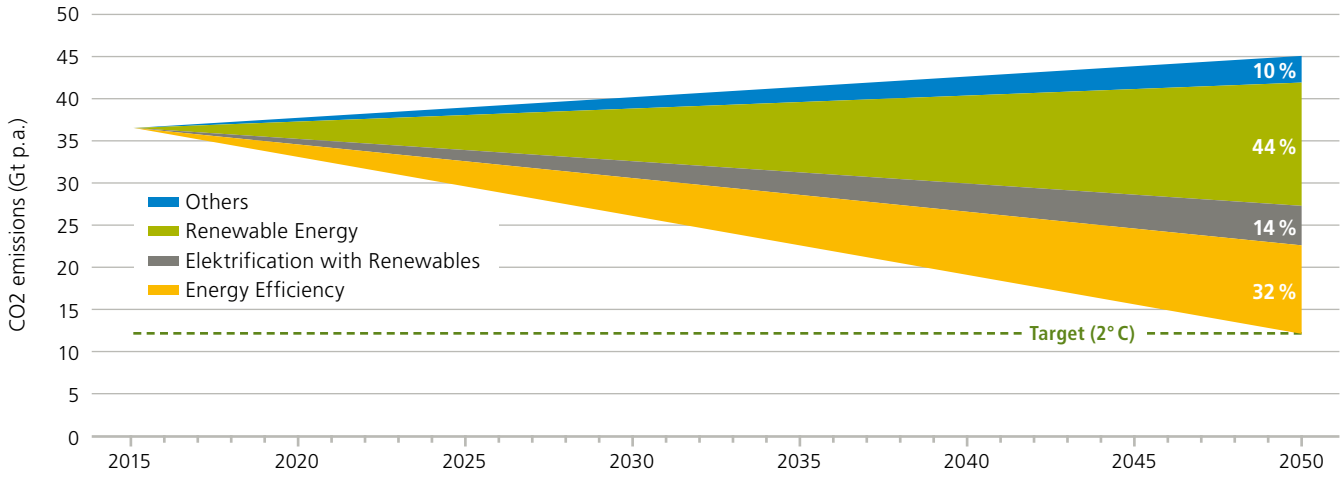
AT A GLANCE – ENERGY EFFICIENCY NR. 2

Synergy effects of Renewable Energies and Energy Efficiency, and what does this mean for Paris climate targets

In order to achieve the goal negotiated in the Paris Climate Convention – to limit global warming to below 2°C compared to the pre-industrial age – it is necessary to limit global annual emissions to a maximum of 12 gigatonnes (Gt) of CO2.[1] However, current trends are still far way from this objective. On the contrary: due to the long term trend of global growth and the resulting prosperity, increases in emissions are still being observed. Without concrete measures to prevent this development, it will continue over the next 30 years. With unforeseeable but drastic consequences for the climate.

Figure 2: Technology-based CO2 savings potential[2]



According to a study by IRENA[3], 90% of the required CO2 reductions could be achieved by the increased use of renewable energies and an expansion of energy efficiency. Figure 2 illustrates how emissions would rise to 45 Gt CO2 per year in the reference case – and how the Paris targets could still be achieved through decisive and controlled action.

The measures can even be achieved cost-effectively. While the relative costs of expanding or replacing conventional thermal power plants with renewable energies are already partly negative[4] in most regions, efficiency measures tend to undercut these costs. Depending on regional conditions – especially raw material and emission prices – renewable energies are highly competitive – which is why they have continued their triumphant advance in recent years.

Onshore solar and wind power plants are already the cheapest sources of energy generation in most regions. For this reason, the relative costs of expanding them can become negative (compared to the costs of adding conventional plants). The costs of energy efficiency measures especially in the cross-sectional technologies (nearly in all businesses broadly applicable established technologies, e.g. LED lighting), are still well below those for renewable energies, i.e. clearly in the negative range due to the achievable savings relative to conventional alternatives.[5]

[1] IRENA (2017), in accordance to IEA
[2] IRENA: Synergies between renewable energy and energy efficiency (2017)
[3] International Renewable Energy Agency
[4] Negative relative costs: if the costs of adding one unit of energy production compared to the costs of adding one additional unit of energy production based on conventional technology becomes cheaper the relative costs of the new production becomes negative.
[5] IRENA: Synergies between renewable energy and energy efficiency (2017)

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LED vs. light bulb:
The substitution of old lighting systems with LEDs illustrates the facts of relative negative investment costs. While the acquisition costs for LED lamps are many times higher compared to other alternatives, this difference is already put into perspective by the longer service life (service life: incandescent lamp ≈ 1,000 h/energy-saving lamp ≈ 10,000 h / LED ≈ 50,000 h). An approx. 70% to 90% lower power consumption of LED lights thus leads to significant cost savings in the long term. The highlight: this reduces the relative costs of replacing conventional light with LEDs into the negative cost range.

The negative externalities of conventional energy production (air pollution, climate change, ...) are not included in these calculations. Their influence would further improve the analysis considerably.

Ultimately, it's not about one or the other. Energy efficiency and renewable energies are not in competition with each other. The two factors complement each other and together they could achieve considerable synergy effects and thus reduce the costs of the entire energy system.

For example, efficiency measures and the resulting lower energy demand increase the share of renewable energies in a region's overall electricity mix. Meanwhile, the expansion of renewable energy reduces primary energy consumption, as there is no heat loss due to renewable energy production. The efficiency of wind and solar power plants is accordingly 100%, compared to an effectiveness of only 30 to 40% of coal-fired power plants. Therefore 2 to 3 times less PEC is used per unit power generation from renewables.

Example electric motor:
In terms of efficiency, electric motors are far superior to combustion engines, which require two to three times as much primary energy, assuming the electricity was generated by renewables. In addition, they can perform work in a completely climate-neutral manner by using renewable energy sources. Increased use of electric motors in combination with batteries could reform not only mobility but also many industrial processes and building equipment.

A coordinated expansion of energy efficiency and renewable energy – focusing on the synergy effects – provides the key to decarbonize the economies. Moreover, the transformation can be achieved cost-effectively. Given the advantages, the question arises: why is the momentum in implementation still restrained?

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