Ambitious emission reductions will be cost-neutral for the EU

Greenhouse gas emissions in the EU27 can be reduced to 30% below 1990 levels by 2020 and to 45% lower by 2030. The key to realising this potential is to replace all energy-related equipment in the EU at the end of its economic life with energy-efficient and low-carbon technologies. The resulting lower energy bills are expected to repay the costs of such a transition.

The SERPEC-CC project (Sectoral Emission Reduction Potentials and Economic Costs for Climate Change) has mapped out the potential represented by 650 relevant technologies for reducing the emissions of greenhouse gases in the European Union across ten major sectors. It also investigated the associated costs to society.

The potential of low-carbon technologies

SERPEC assumes that low-carbon technologies are applied in each cycle of renewal or renovation of industrial plants, power production plants, buildings, cars, trucks and electric appliances. Renewal rates –at the end of an installation's technical lifetime– range from 10–15 years, for e.g. refrigerators and cars, up to 50 years for industrial plants. At the same time, the rate of improvement of existing installations (retrofitting industrial plants or renovating houses) is assumed to double to 2–3% per year.

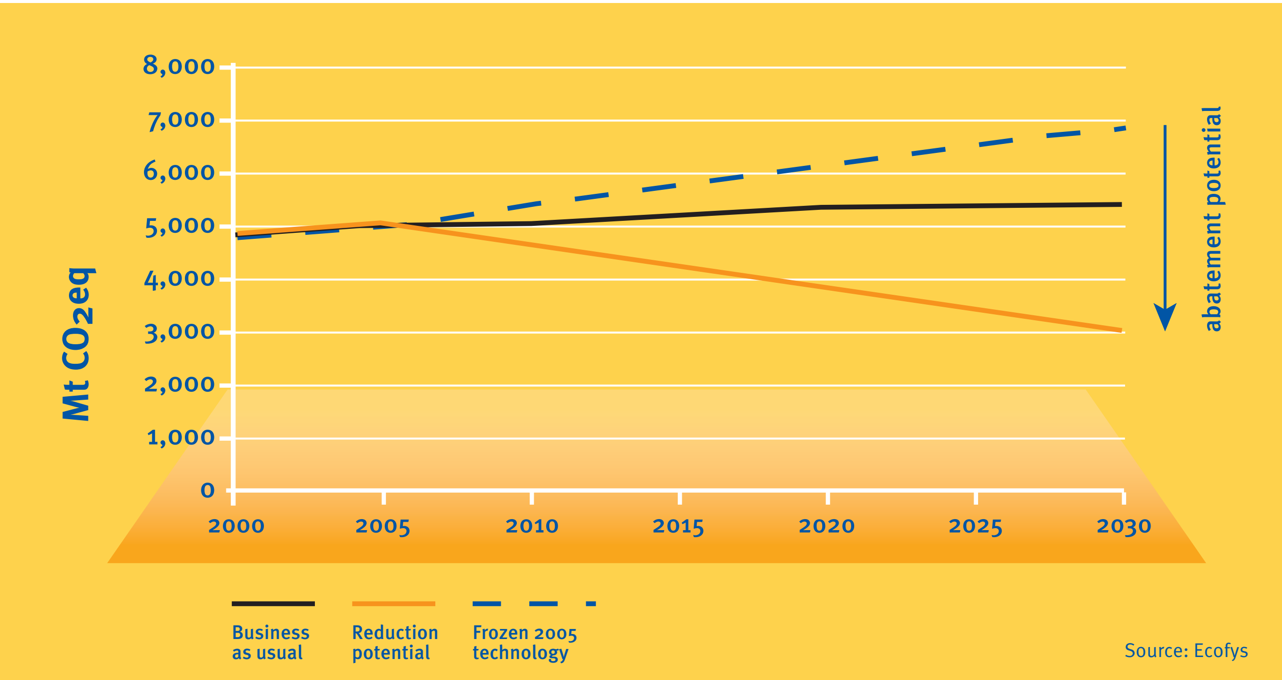

Figure 1 Emission curves for the EU27.

Some limitations are also assumed, for instance there is a practical maximum to the market growth rates of new technologies because new factories for producing wind turbines or solar panels cannot be built straightaway.

Based on these assumptions, SERPEC concludes that the abatement potential for greenhouse gas emissions in the EU27 is 30% below the 1990 level by 2020 and 45% by 2030. Compared to the 2005 level, the potential reduction in 2020 is -25% and -40% in 2030 (Figure 1).

The SERPEC figures for feasible reduction potential by 2030 are largely supported by several other (model) studies. The SERPEC study identified the technological potential for emission reductions. Even greater reductions could be achieved with structural changes in the economy (increasing material efficiency or modal changes in transport) and behavioural changes such as people eating less meat.

The costs of low-carbon technologies

Besides the technical potential, SERPEC also investigated the cost of low-carbon technologies to society. The bottom-up methodology used identified (per sector, technology and country) all of the costs of capital investments and operation & maintenance (O&M), over and above the reference technology, assuming a discount rate of 4%. These costs fall over time, as new technologies become mainstream. The financial benefits of energy savings are accounted for, but taxes and subsidies are excluded. This cost calculation method, which is also referred to as the 'societal cost method', allows for comparison of the 'bare' costs of technologies across measures, sectors and countries.

Some technologies have a negative cost, in other words they imply a net welfare gain from a societal point of view. A positive cost indicates a net welfare loss. SERPEC arranged the abatement options in order of increasing costs per ton of abated CO_2 emissions. This results in the 'marginal abatement cost curve' (MACC) shown in Figure 2. A large proportion of all technology clusters clearly benefit society. In these cases, fossil fuel savings over the lifetime of technologies exceed investment and O&M costs.

The overall benefits from these negative-cost technologies are at least comparable, or even larger, than the overall societal costs from the other, more expensive technologies on the right-hand side of the graph, which represent a net cost. Accumulating the costs and benefits of all technologies leads to the conclusion that the EU can

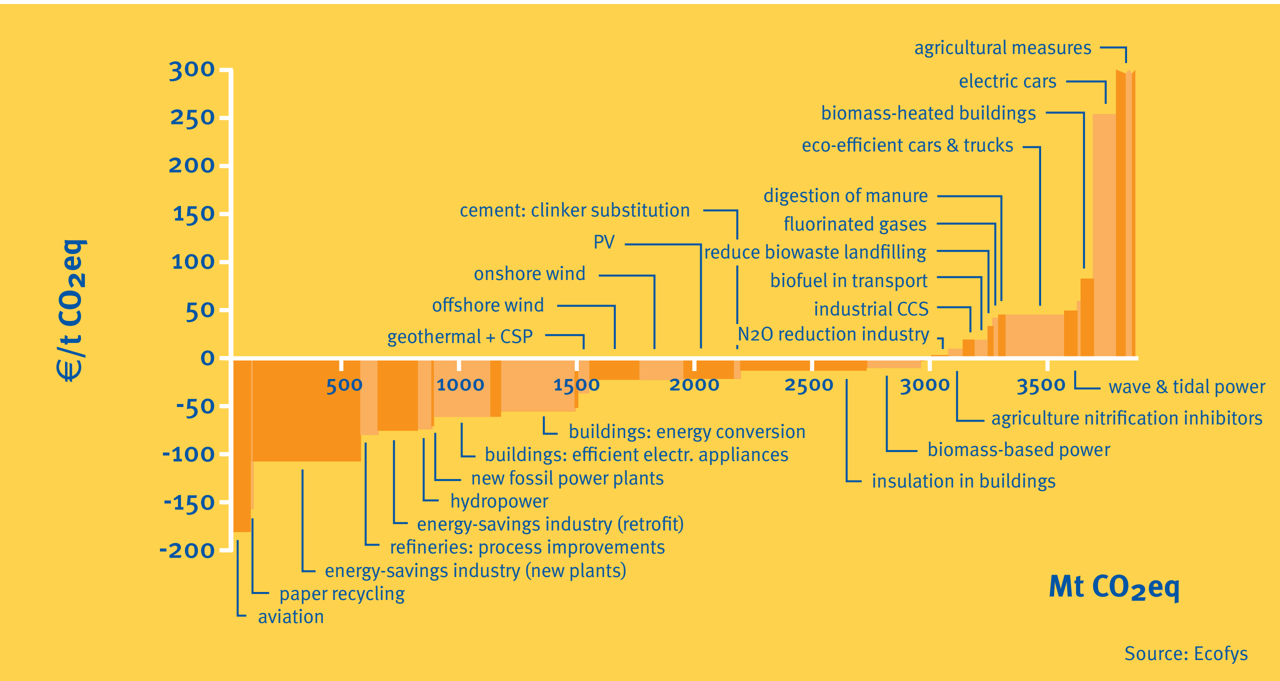

Figure 2 Abatement cost curve for 650 technologies in the EU27 in 2030, aggregated into clusters. The abatement potential (X-axis) is relative to a Frozen 2005 technology pathway (see Figure 1). Y-axis shows specific societal costs of abatement.

undertake a cost-neutral transition to a low-carbon EU economy.

It must be noted that these scenario results largely depend on input assumptions such as future fossil energy prices, learning curves for new technologies and discount rates. The assumptions used in SERPEC are considered realistic.

The relationship between emission reductions and costs (the cost curve) is non-linear, with sharply increasing costs at the tail end of the curve. The curve shows that more than 75% of the emission reductions can be obtained at a profit. However, the more expensive technologies are also required to create new markets and prepare for further emission reductions after 2030.

Another important observation is the difference between societal costs and the costs that investors face. In practice, investors apply payback times that are much shorter than the lifetime of technologies. Nevertheless, the societal cost calculations in SERPEC justify ambitious policies. Such policies must, however, take all foreseen impediments into account.

The 'non-trading' sectors have the potential to reduce emissions by 28% by 2020

The bottom-up methodology used in SERPEC shows how national and sector potentials can be assessed in more detail. This type of assessment will be needed if the Copenhagen Climate Summit in December 2009 concludes with an agreement between countries or sectors on how they will contribute to a single global target. As an example of this approach, the SERPEC study assessed the abatement potentials and costs of four key sectors: agriculture, road transport, buildings and waste. These sectors do not currently participate in the EU Emissions Trading Scheme (ETS), but they are covered by the 'Effort Sharing Decision' on emission reductions.

These sectors have an even greater emission reduction potential than the overall figures (Figure 3). The potential for reducing emissions, compared to 2005 levels, is 28% by 2020 and 41% by 2030. This compares to a current EU average target of 10% below 2005 levels by 2020.

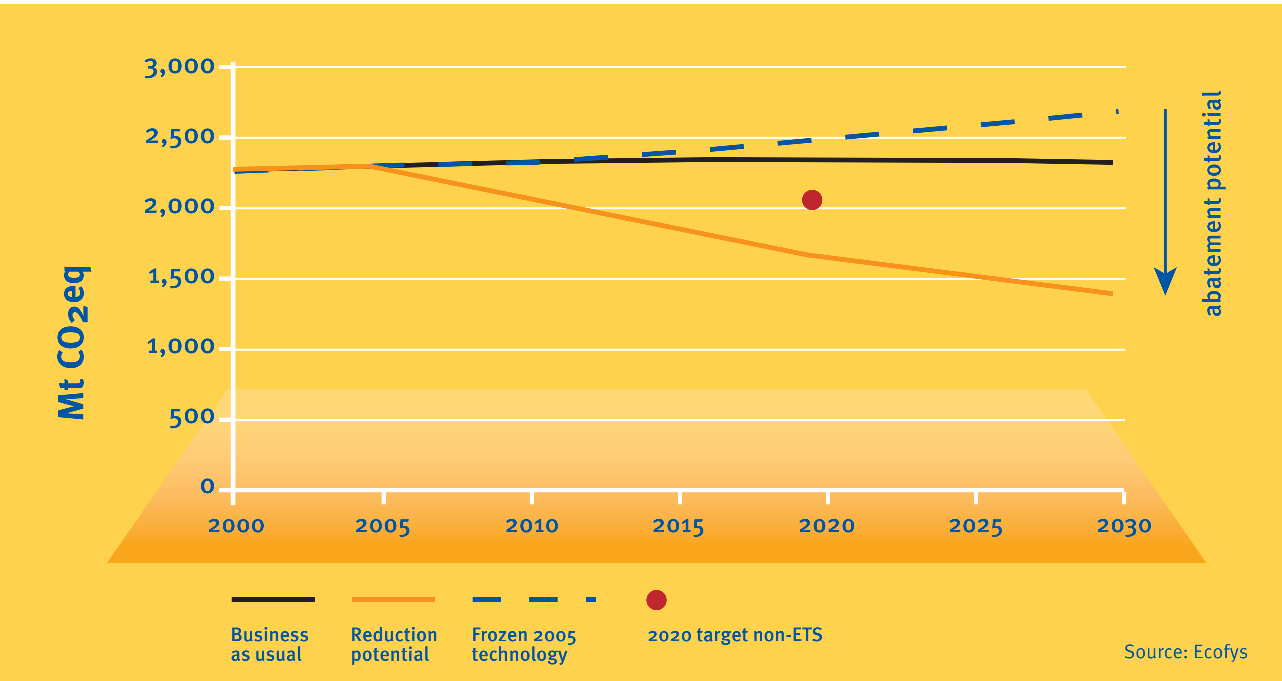

Figure 3 Emissions from agriculture, road transport, buildings and waste sectors in the EU27 (excluding emissions related to electricity use).

SERPEC-CC

ECOFYS

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Consortium partners in this project:

ECOFYS · ipts Institute for Prospective Technological Studies · CE Delft · AEA · ICCS E3M-lab

Ecofys has extensive experience in developing energy and emission scenarios. Because of our broad range of activities, we can bring together insights in the fields of energy supply and demand, as well as greenhouse gas emissions. This provides an excellent basis for identifying implementation potentials and their costs. Furthermore, our understanding of policies and practical barriers helps us create realistic scenarios.

Selected references:
- Economic Evaluation of Sectoral Objectives for Climate Change – European Commission
- Greenhouse gas mitigation scenarios and costs for Hungary up to 2025 – Hungarian Ministry of environment and water.
- Global energy demand reduction potentials on a regional level in 2050 – Contribution to Energy[R]evolution scenarios for Greenpeace and EREC
- Developing renewable energy policy scenarios in the EU in light of its renewable energy targets for 2010 and 2020 – European Commission

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