Analysis of options to move beyond 20% greenhouse gas emission reductions

Policy Brief
addressing the EC Communication on more ambitious greenhouse gas reductions

February 2011

The discussions invited by the Communication

The Communication **Analysis of options to move beyond 20% greenhouse gas emission reductions and assessing the risk of carbon leakage** (COM(2010) 265) invites discussions about a redesign of the energy and climate policy of the EU by addressing the following issues:

- Options for a more ambitious reduction target for 2020
- Economic evaluations of these options
- Implications for economic innovation and employment

Our key findings

Responding to the discussions opened by this Communication, our analysis reveals the following key findings:

- A more ambitious reduction target for 2020 needs to be embedded into a long-term strategy for GHG reductions up to 2050.
- The new challenges for international climate policy have shifted from controversies about targets to a competition of technologies.
- In this competition for technological innovations the EU is facing a widening technology gap towards the United States and China.
- Any future emission reduction policies, therefore, should be closely tied to an ambitious technology initiative.
- The estimated costs in the Communication of 0.54% of GDP for achieving a 30% target need a detailed explanation.
- According to our analysis a supporting technology initiative requires investments beyond 2% of GDP and new finance mechanisms.

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Perspectives for a more ambitious emission reduction target

The need for a long-term roadmap

The need for a roadmap up to 2050

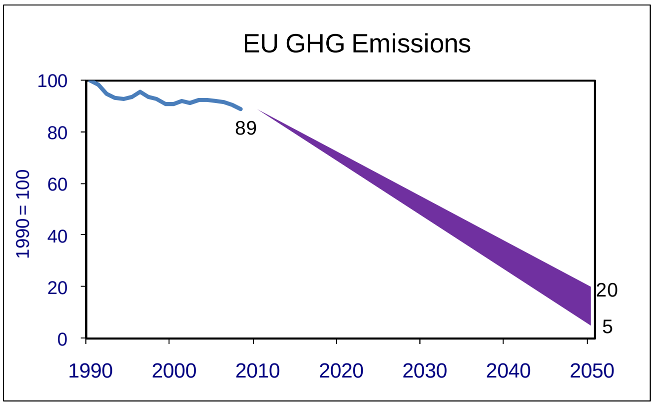
Discussions about a more ambitious EU emission reduction target for 2020 need to be embedded into a long-term roadmap that outlines reduction paths up to 2050.

This is necessary because of the impact of current investment decisions on energy demand over many decades.

Perspectives for radical reductions

There is an emerging agreement that limiting global temperature increase to 2°C would require in the industrialized countries by 2050 radical reductions of GHG emissions in the range of 80% to 95% compared to 1990.

Figure 1: EU GHG emission paths up to 2050



Source: Own graph

Searching for feasible reduction paths

Assuming a linear reduction path, the compatible targets for 2020 would be 28% or 32%, respectively, as indicated in Figure 1.

It would be premature, however, to draw conclusions about 2020 targets, since there is not sufficient information available about the dynamics of feasible long-run reduction paths which will depend on

- the diffusion rate of new technologies, e.g. the introduction of electric cars,
- the limits of physical and financial resources, e.g. the availability of renewables and long-term financing, or
- past decisions, like the thermal quality of the building stock.

From the controversies about targets to a competition of technologies

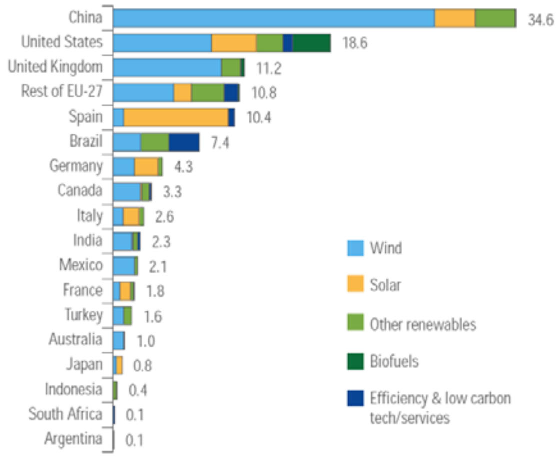
The new architecture of climate policy after Copenhagen

From the Kyoto Protocol to the Copenhagen Accord and the Cancun Agreements

In many ways the Copenhagen Accord of December 2009 marked a departure from the architecture of multilateral climate cooperation, which is above all the branding of the Kyoto Protocol.

The Cancun Agreements of December 2010 basically transfer the Copenhagen architecture, which shows the handwriting of the United States and China, into the UN negotiating environment.

Figure 2: Investments in clean energy in 2009 (billions of US$)



Source: PEW Center (2010)

Climate policy shifts from targets to technologies

The architecture of pledges and technology transfer

In a nutshell this new architecture for international climate policy rests on two pillars:

- Individual pledges of countries concerning their emission efforts replace joint reduction targets in a legally binding framework.
- The transfer of technologies with accompanying financial facilities emerges as a new agenda item, although it still needs a long way before becoming operational and effective.

Modest pledges but strong investments in clean energy technologies

There is increasing evidence that this re-design of the climate policy agenda has already started. There is a striking contrast, however, between the rather modest unilateral emission reduction pledges of some countries and their efforts for investing in clean energy technologies.

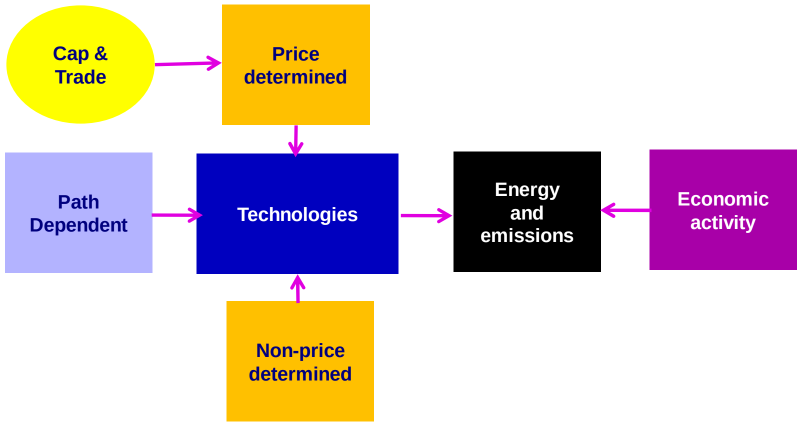
The new geography of clean energy investments

China has become the biggest investor in clean energy

The new agenda in climate policy is remarkably reflected in China, which has been rather hesitant as to commitments for reduction targets but highly ambitious as to innovative energy technologies. This becomes evident in the new geography of clean energy investments as indicated in Figure 2 which was produced by PEW Center (2010). China, accordingly, has become the single state with the biggest investments in this sector.

Although the EU in total still surpassed China in 2009, this has probably changed already in 2010 when China expanded its investments by about 30% as reported by Bloomberg New Energy Finance. China represents now about one fifth of total world demand of clean energy investments.

Figure 3: Drivers for the state and change of technologies



Source: Own graph

Understanding the drivers of technological change

Technologies are not only price-determined

Since climate policy is discovering the key role of technologies, we need to obtain a better understanding about their current state and their drivers for change.

As demonstrated in Figure 3, technologies are only to some extent determined by prices, e.g. energy prices. Non-price determined motives, as e.g. strategic behaviour, might be more important. In addition we need to realise that current technologies reflect decisions of the past.

The limits of cap-and-trade for inducing technological change

A cap-and-trade based climate policy mainly relies on price incentives for technological change. The impact of these price-induced incentives may face limits in particular if radical technological changes are aimed for. For reasons of international competitiveness the emission cap and the related carbon price signals are restricted and thus may not be sufficient to trigger the switch to a technological change as envisioned in a perspective up to 2050.

Responding to the agenda of the Communication

Developing a shared energy vision for 2050

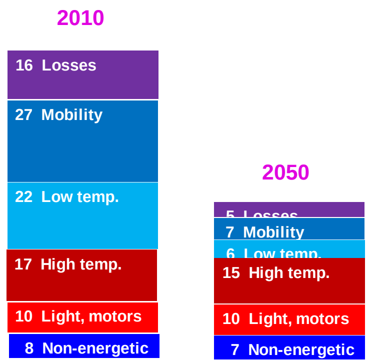
A radical transformation of the energy system by 2050

New reduction targets for 2020 need to be checked for consistency with long-term reduction paths. If the EU is committed to GHG emission reductions between 80% and 95% by 2050 this requires a radical transformation of our energy system.

Emphasising the services of the energy system

The outlines of such a transformation emerge if we look at the current structures of European energy systems in an innovative way that links energy flows to their related energy services. This is done in Figure 4, which depicts as an example Austria. Current energy flows are normalised to add up to 100. Typically losses for transformation and distribution, the use of energy for mobility and low temperature services account for two thirds of energy consumption in Europe.

Figure 4: A feasible transformation of the European energy system



Source: EnergyTransition (2010)

Maintaining the required energy services with half of the current energy flows

Switching to high-efficiency cogeneration for heat and power, to heat-pumps, to low- and plus-energy buildings standards and to electric vehicles should result in an increase of energy productivity over the next four decades at least by a factor four.

Envisaging smaller productivity increases in the remaining energy consumption for high temperature processes in manufacturing, the use of electricity for lighting, electric motors and electronics, and the non-energetic use of energy, it is quite safe to suggest that Europe could be able to provide all required energy services in 2050 with just half of the energy flows of 2010.

Achieving a GHG reduction of at least 80 %

Achieving emission reductions of at least 80% appears all of a sudden to become feasible if the volume of renewables that has been agreed upon for 2020 is doubled in the following three decades up to 2050.

Thus, the transformation to high-efficiency structures for transforming and applying energy becomes a prerequisite for any radical emission reductions.

Engaging in an ambitious technology initiative

A technology initiative for high-efficiency and low carbon energy systems

The EU has many reasons for engaging in an ambitious technology initiative with a focus on high-efficiency and low carbon energy systems:

- The global competition for these technologies is currently led by China and the United States with the EU being threatened falling behind.
- Energy security for the EU requires a decisive shift to high-efficiency and low carbon technologies.
- Maintaining credibility in the international climate policy negotiations needs demonstrable progress in the development and implementation of innovative energy technologies.

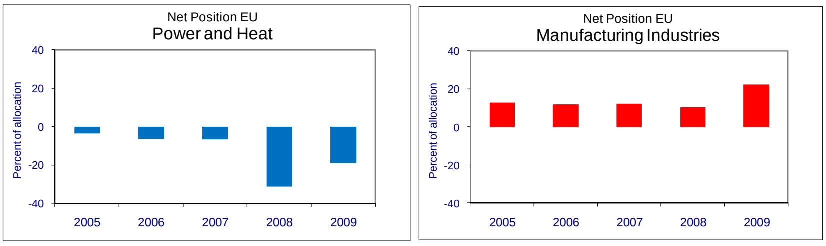
Although the EU has already a broad spectrum of technology programs, these seem to be fragmented and not at the top of the policy agenda.

Targets follow from technologies

A technology initiative for high-efficiency and low carbon energy systems

Having agreed upon a shared vision for the long-term energy paths and a supporting technology initiative, any agreements about more ambitious reduction targets for 2020 as well as 2030 should be rather a by-product of the preceding policy decisions.

Figure 5: Sectoral net positions of EU ETS from 2005 to 2009



Source: CITL, own calculations

Lessons learned from the EU ETS

This of course reverses past EU policy procedures about emission reductions which started with targets and hoped for induced technology changes. At least so far this has hardly materialised for the EU ETS, if we look at its first five years in Figure 5. During this period the emission cap was binding for the whole system only in 2008 and the manufacturing sector was always in surplus of emission allowances. Before drawing conclusions for a tighter cap at least two issues need to be addressed.

The first deals with the excess of allowances that result from the economic crisis and not from abatement efforts, the hot air phenomenon in the EU ETS. The second concerns the industrial base in Europe since extending the current set-up of the EU ETS to a 30% target, as suggested by the Communication, would require the elimination of every third emission unit by 2020.

New targets need a revised effort sharing

The distribution of the emission reduction needs between ETS and non-ETS sectors and the distribution of the efforts in non-ETS sectors among Member States is essential for the effort sharing.

Both distribution parameters need to be revised in a more ambitious target.

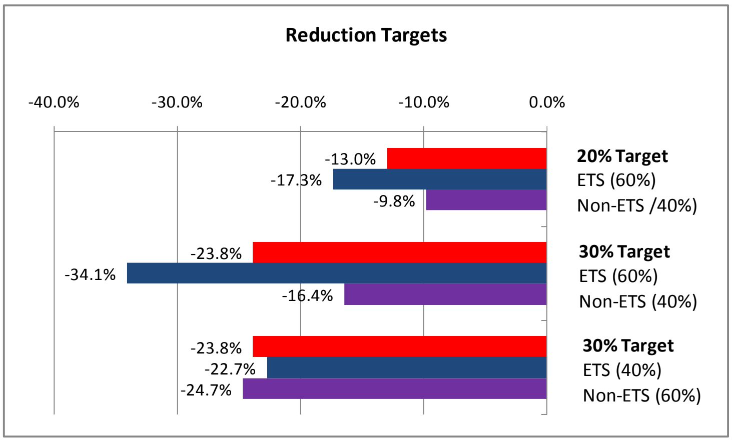
Distributing the reductions between ETS and non-ETS sectors

A comparison of different reduction scenarios for 2020 yields the following conclusions which are summarized in Figure 6.

- Compared to a 20% reduction target for 2020 over 1990, the total reduction requirements increase from 13% to 24% over 2005 when moving to a 30% target.
- The distribution of the reduction requirements between ETS and non-ETS sectors is essential as to the relative reductions efforts.
- Extending the current 60 : 40 distribution between ETS and non-ETS sectors requires a 34% reduction effort for the ETS sectors compared to 16% for the non-ETS sectors.

Since there is not sufficient evidence for justifying this asymmetry in effort sharing, reversing this distribution yields a 23% reduction for the ETS sectors and a 25% reduction for the non-ETS sectors, and thus comes closer to equal relative reduction efforts.

Figure 6: Distributing the reductions between ETS and non-ETS sectors



Sorce: Own calculations based on EC documents

Distributing the reductions of non-ETS sectors among Member States

Similarly an extension of the current modulation of non-ETS sector reductions would require at least a stabilisation of emissions even in states as Bulgaria and Romania, which under the current agreements are allowed to expand their emissions up to 20%. Meeting such a stringent cap would only be feasible with a massive inflow of technologies and financing.

A thorough economic evaluation

The additional costs suggested in the Communication for a 30 % target

The Communication proposes that the costs of stepping up the reduction target from 20% to 30% will be close to the cost reductions caused by the economic crisis. Thus, in 2020 the costs of a 30% reduction target are estimated 0.54% of GDP or 0.2% up for a 20% target. These costs are supposed to include also the actions needed for the 20% renewables target.

Why the economic impacts need to be re-evaluated

There are a number of reasons to call for a thorough re-evaluation of the economic impacts both of a 20% and a 30% target, mainly based on two grounds:

- There is a need to differentiate between investments and user costs for energy services. Only the latter are relevant for cost comparisons. This analysis is still missing.
- The investments needed for meeting both a 20% and a 30% target should be described in more detail, e.g. broken down for buildings, mobility, and restructuring energy supply.

Estimating investments and user costs of energy services

Based on data collected in the research project EnergyTransition which is led by the Austrian Institute for Economic Research we make two propositions:

- We estimate that achieving a target beyond 20% requires additional investments amounting to at least 2% of GDP up to 2020 if economic activity returns to pre-crisis growth rates.
- We emphasize, however, that many investments will have a useful life span beyond 2020, therefore the corresponding user costs of energy services will not necessarily be higher, depending on assumptions about investment cost reductions, depreciation rates, capital cost and energy prices.

Mobilising new finance

New financial instruments and their distribution between old and new Member States

The transition to high-efficient and low carbon energy systems requires investments that seem to have been so far rather underestimated. We support, however, all arguments that call for an ambitious technology initiative by the EU for engaging in this emerging competition for innovative technologies. Such a commitment poses at least two challenges as to the financial resources:

- First, there is a need for new finance instruments that deal in particular with long-lasting infrastructure, as buildings and energy transformation units.
- Second, given the inequalities between economic welfare and investment opportunities between old and new Member States, the issue of an adequate distribution of financial resources will gain new importance.

Thus, the credibility of any emission reduction commitments will crucially hinge on a supporting technology initiative and an accompanying mobilisation of financial resources.

This Policy Brief is based on the research project

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