



REX/321
EU-Turkey Joint
Consultative Committee

Brussels, 8 August 2011

29th meeting of the EU-Turkey Joint Consultative Committee
Istanbul, Turkey
15-16 September, 2010

REPORT

Towards low-carbon economies - The case of the energy sector

RAPPORTEUR

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1. The objective

Although the objective set by the United Nations Climate Change Conference in Cancun at the end of 2010 was non-binding, it was adopted in principle by the world community: limiting global warming to a maximum of 2°C above pre industrial temperatures. This decision is based on the research finding of the IPCC, that only in this way can far-reaching changes in the natural environment and thus in living conditions on Earth be kept within manageable limits.

The IPCC see also suggested measures that were needed in order to achieve this objective. As is well known, these include drastic measures to reduce emissions of the greenhouse gas carbon dioxide. This has given rise to the vision of a low-carbon global economy which is to be achieved at the latest by 2050. By this date it is intended that the world community should have cut its CO₂ emissions by half compared with 1990. Taking into account the contribution of the developing and emerging countries, this means that the industrialised nations will have to cut their greenhouse gas emissions by between 80 and 95% by 2050 compared with the 1990 level. However, the states were not able to agree to a binding roadmap for national targets in Cancun.

And the trend is continuing - in the wrong direction. In 2010 global greenhouse gas emissions were up by around a third compared with 1990. And the emerging country China has replaced the USA as the largest CO₂ emitter. This fact was also reflected in the discussions in Cancun: cutting greenhouse gas emissions is not mainly the task and responsibility of the industrialised countries, i.e. the USA, the EU/Europe, Japan, Australia and Canada; the emerging countries too need to submit plans for clear cuts in emissions.

And here account needs to be taken of physical laws. Greenhouse gases accumulate in the atmosphere in the long term so that, ultimately, the total amount of climate gases emitted up to 2050 needs to be limited. With every year that passes in which the world community fails to agree and implement binding national reduction targets the task becomes greater. If the target of limiting global warming to a maximum of 2°C and thus preventing damaging consequences for the world economy and population is to be achieved, there can be no further increase in emissions.

2. Climate protection at minimum cost - when is it cheapest to act?

The British economist Nicholas Stern has calculated the investment needed in order to achieve the global climate protection objective at less than 2% of annual global economic output. The priorities here are additional investment in renewable energies and increased energy efficiency. But Stern also pointed out that this percentage will grow, the longer the world community delays in adopting effective measures, because the necessary investment will then be concentrated on an ever shorter period of time, with a corresponding increase in the annual burden on the global economy.

The European Commission's Communication *A Roadmap for moving to a competitive low carbon economy in 2050* of 8 March 2011¹ (hereafter "Roadmap 2050") spells out the problem facing the EU. It advocates early additional efforts aimed at achieving an 80% reduction in greenhouse gas emissions by 2050 as cheaply as possible.

The underlying assumption of the Commission's analysis is that without additional efforts, i.e. by continuing with the current measures to promote renewable energies and energy efficiency, a reduction of less than 40% at best can be expected by 2050. In other words the target would clearly be missed. Further efforts are therefore needed; the question is when can they be deployed most cheaply in terms of the total costs arising between now and 2050? In other words: is it better to wait in order to achieve quick results towards the end of the period with tried and tested and cheap technologies or, as Nicholas Stern demonstrated in global terms, is rapid action needed in the EU now?

The EU has in principle decided in favour of early action. By adopting a climate protection package in December 2008 as part of the Europe 2020 strategy for smart, sustainable and inclusive growth the EU Member States committed themselves to an intermediate target for 2020 under the catchy slogan 20-20-20. In accordance with this target, by 2020 20% of final energy is to be derived from renewable energy sources, greenhouse gas emissions are to be reduced by 20% compared with 1990 and energy efficiency is to be increased by 20%. The Commission urgently recommends that these targets be met. "The analysis also shows that a less ambitious pathway could lock in carbon intensive investments, resulting in higher carbon prices later on and significantly higher overall costs over the entire period" (Roadmap 2050, p. 6). The European Commission also adopts Stern's approach and attempts to translate this analysis into political action. In its Communication *Energy 2020 A strategy for competitive, sustainable and secure energy* of 10 November 2010² (hereafter "Energy 2020") the Commission estimated the necessary energy investment for a strategy of cost minimisation for the period to 2020 at around EUR 1 trillion "both to diversify existing resources and replace equipment and to cater for challenging and changing energy requirements" ("Energy 2020", p. 3).

In its Resolution of 4 February 2009 *The Future Begins Today* (A6-0495/2008), which was adopted by an overwhelming majority, the European Parliament even advocates "a medium-term target of a 25%-40% reduction in greenhouse gases by 2020, as well as a long-term reduction target of at least 80% by 2050".

With the Directive on the *Promotion of the use of energy from renewable sources* (2009/28/EC) the EU translated the 20% target into binding national plans with a view to achieving the targets.

The EESC endorsed this approach in an opinion. The situation with regard to energy efficiency is different, however. Here there are no binding national implementation plans. In its analysis the Commission concludes that additional regulatory measures may be needed here in order to achieve the 20% target set for 2020. Using the existing voluntary measures, without binding national

¹ COM(2011) 112 final

² COM (2010) 639 final

efficiency plans, efficiency would in all likelihood increase at most by 10%. The Commission's approach is to decide in 2014 whether binding national implementation plans should be introduced. On 22 June 2011 the Commission submitted a proposal for an energy efficiency Directive³. In its opinion⁴ on the Commission Communication on the *Energy Efficiency Plan 2011*⁵ the Committee endorses voluntary, or if necessary binding, regulatory measures.

As the Commission suggests in the "Roadmap 2050", achieving the 20% target for renewable energy sources and energy efficiency could even mean that by 2020 total EU CO₂ emissions could be cut by a quarter compared with 1990. As an emission trading system is in place in the EU, overachieving the 20% target for greenhouse gas emissions would mean a fall in the price of certificates, thus easing the burden on CO₂-intensive industry. "Various forms of low carbon energy sources, their supporting systems and infrastructure, including smart grids, passive housing, carbon capture and storage, advanced industrial processes and electrification of transport (including energy storage technologies) are key components which are starting to form the backbone of low carbon energy and transport systems after 2020" ("Roadmap 2050", p. 11). Assuming that this initial impetus is given, the 2050 targets would then also realistically appear achievable.

The Commission makes one thing absolutely clear: even the proposed cost-minimising strategy for a low-carbon economy in 2050 will require a significant rise in capital investment. Over the coming 40 years this would entail an average rise in annual public and private-sector investment of around EUR 270 billion. This is equivalent to additional investment of about 1.5% of GDP. "In this context", the Commission points out, "it is interesting to note the much larger shares of GDP allocated to investments in China (48%), India (35%), and Korea (26%) in 2009, showing emerging economies' need to build up infrastructure but also the potential in leapfrogging towards a competitive, low carbon economy" ("Roadmap 2050", p. 11/12).

And what about jobs ? The Commission also makes it clear that it expects that early investment in a low-carbon economy "can create in net terms new jobs both in the short- and the medium-term" (Roadmap 2050, p. 13). "In just 5 years, the renewable industry increased its work force from 230 000 to 550 000. Also for the construction sector low carbon investment offers large short-term job opportunities."

3. A low-carbon economy as the key to climate protection

The electricity generation sector, industry, transport and housing (above all heating) each contribute around 20% to global greenhouse gas emissions, mainly carbon dioxide. (The remaining 20% consists of other greenhouse gases, above all methane from agriculture.)

³ COM (2011) 370 final

⁴ TEN/450 - *Energy efficiency plan 2011* (Sirkeinen, EESC 1180-2011, July 2011)

⁵ COM (2011) 109 final

3.1 *The electricity sector*

A key aspect of the necessary change is an end to the use of fossil fuels, above all coal which has the highest specific CO₂ emission rates, for energy. Coal is, however, the main fuel used for electricity production; in the main emitter countries, China, the USA and the EU/Europe, well over half total electricity generation uses coal.

Between 1990 and 2005 greenhouse gas emissions in the electricity sector in the EU fell by 7%, despite a significant increase in production. This is mainly due to the increased efficiency of new power plants and an increase in the share of renewable energies. This trend is likely to intensify. The EU expects that by 2050 virtually no CO₂ will be emitted by the electricity generation sector, particularly as a result of the development target for renewable energy sources. If renewables are to play the main role assigned to them in the European energy mix, however, extensive investment will be needed in storage and networks, as fluctuating energy sources like the wind and the sun are not always available when needed. Power plants with rapidly adjustable output will be required in order to be able to react to fluctuations in the supply of renewables. Natural gas, and increasingly biogas, plants are particularly suitable, particularly as part of highly efficient combined heat and power schemes. Investment in smart grids is a key enabler, "notably facilitating demand-side efficiency, larger shares of renewables and distributed generation and enabling electrification of transport" ("Roadmap 2050", p. 8). The early introduction of innovative technologies, the Commission argues, is of paramount importance to ensure their cost-effective and large-scale penetration later on. In this connection the Commission pinpoints various forms of low-carbon energy source, carbon capture and storage, smart grids and hybrid or electric vehicles.

In a comprehensive opinion on the "Roadmap 2050" adopted on 17 February 2011⁶ (hereafter "TEN/425") the EESC endorsed this approach in principle. It considers a medium- and long-term EU strategy to be needed "that sets out a roadmap up to 2050 aimed at competitively and sustainably reducing the carbon content of energy produced, so as to provide a global response to the challenges of climate change and to satisfy EU societal and industrial needs" (TEN/425, p. 1, point 1.1). The EESC sets out the following priorities for a policy mix for electricity (TEN/425, p. 2, point 1.4):

- energy efficiency measures;
- safe CO₂ capture and storage (CCS) systems;
- robust mechanisms for emission exchange;
- competitive development of renewables;
- conversion of power plants to low carbon energy production;
- sustainable conversion of modes of transport;
- adequate international technical standardisation;
- measures to expand high-efficiency combined heat and power production (CHP).

⁶ TEN/425 – *Roadmap for a low carbon energy system by 2050* (Pezzini, CESE 359-2011, February 2011)

The 2010 Commission Communication "*Energy 2020*" and the Commission's 2011 *Energy Efficiency Action Plan* also treat combined heat and power as a key feature of a strategy to increase the share of renewables and at the same time increase the efficiency of energy production. CO₂ savings of up to 30% can be achieved by the simultaneous production of heat and power. "Energy efficiency, in the production as well as in the distribution, should become an essential criterion for the authorisation of generation capacities" (Energy 2020, p. 9).

The EU Member States have different approaches to nuclear energy. The Commission includes this among the zero-carbon forms of energy and expects that in 2050 nuclear energy will continue to be part of the zero-carbon mix. The EESC recommends "the development of nuclear fission in those Member States that wish to continue using this technology, moving from Generation III to IV, and of techniques for reusing most of the materials" (TEN/425, p. 3). Especially after the Fukushima Daiichi disaster, however, its importance in the EU can, rather, be expected to decline. All the political groups in the German *Bundestag* have agreed that Germany should give up the use of nuclear energy. There has, however, been some discussion of the speed of the transition. In June 2011, however, a deadline of 2022 was finally adopted by a 90% majority. Eight reactors have already been taken permanently offline in Germany. In a referendum the people of Italy rejected the planned introduction of nuclear power by a 90% majority. A number of other Member States, such as Austria and Portugal, have already renounced the use of this technology for the long term. The postponement of China's ambitious plan for the development of nuclear energy in the wake of the Japanese disaster and the announcement by the Japanese Prime Minister that Japan would be considering giving up nuclear energy suggest that nuclear energy will not increase further in importance in global terms. It follows that renewables will need to grow in importance faster than hitherto assumed.

3.2 *Transport sector*

The continuing rise in the contribution of the transport sector to greenhouse gas emissions - both in absolute terms and relative to other sectors - is a cause for concern. Transport emissions (including air transport) rose by an enormous 30% or so between 1990 and 2005, thus significantly counteracting emission reductions in other sectors. In its White Paper *Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system* of 28 March 2011⁷ (hereafter "Transport White Paper") the European Commission sets out an ambitious programme for cutting transport emissions by 60% compared with 1990 by 2050.

The Commission states unequivocally: "Still, the transport system is not sustainable. Looking 40 years ahead, it is clear that transport cannot develop along the same path. If we stick to the business as usual approach, the oil dependence of transport might still be little below 90%" (Transport White Paper, p. 5). CO₂ emissions from transport would remain one third higher than their 1990 level by 2050. Assuming that the demand for transport continues to grow, this would require a radical new direction in this area too - a move away from oil as by far the main energy source and the development of a radically different infrastructure. "Technological innovation can help the transition

⁷ COM (2011) 144 final

to a more efficient and sustainable European transport system by acting on three main factors: vehicle efficiency through new engines, materials and design; cleaner energy use through new fuels and propulsion systems; better use of networks and safer and more secure operation through information and communication systems" ("Roadmap 2050", p. 8).

The Commission assumes that up until 2025, "the main driver for reversing the trend of increasing greenhouse gas emissions in this sector is likely to remain improved fuel efficiency" (Roadmap 2050, p. 8). Electrification and alternative fuels like biofuels will then replace oil as the main fuel, thus achieving the forecast emission reduction targets, provided that, as expected, electricity is generated mainly from renewables. There will also have to be major changes in transport infrastructure, with a move from road to rail.

The "Transport White Paper" (p. 10/11) set ten key goals for the reorientation of the European transport sector:

1. Halve the use of 'conventionally-fuelled' cars in urban transport by 2030; phase them out in cities by 2050; achieve essentially CO₂-free city logistics in major urban centres by 2030.
2. Low-carbon sustainable fuels in aviation to reach 40% by 2050; also by 2050 reduce EU CO₂ emissions from maritime bunker fuels by 40% (if feasible 50%).
3. 30% of road freight over 300 km should shift to other modes such as rail or waterborne transport by 2030, and more than 50% by 2050.
4. By 2050, complete a European high-speed rail network. By 2050 the majority of medium-distance passenger transport should go by rail.
5. A fully functional and EU-wide multimodal TEN-T 'core network' by 2030.
6. By 2050, connect all core network airports to the rail network.
7. Deployment of the modernised air traffic management infrastructure (SESAR) in Europe by 2020 and completion of the European Common Aviation Area.
8. By 2020, establish the framework for a European multimodal transport information, management and payment system.
9. By 2050, move close to zero fatalities in road transport.
10. Move towards full application of "user pays" and "polluter pays" principles and private sector engagement to eliminate distortions, including harmful subsidies.

In its above mentioned opinion on the "Roadmap 2050" the EESC already called for the "sustainable conversion of modes of transport". The EESC is now working on a detailed opinion on the "Transport White Paper".

3.3 *The built environment*

Improvement of the energy performance of buildings provides "low-cost and short-term opportunities to reduce emissions", so that the Commission believes, "emissions in this area could be reduced by around 90% by 2050" ("Roadmap 2050", p. 9). In the Directive on *the Energy performance of*

*buildings*⁸ the EU requires that all new buildings built from 2021 onwards will have to be nearly zero-energy buildings. The technologies exist for this; they simply have to be applied across the board. With regard to the existing building stock, the Commission estimates that investment in energy-saving building components and equipment will need to rise by up to EUR 200 billion over the next ten years if the reduction target is to be achieved. It notes that several Member States have already implemented smart financing schemes, such as preferential interest rates for leveraging private sector investments in the most efficient building solutions. In Germany for example low-interest loans for improvements to buildings totalling EUR 1.5 billion will be available annually for the next few years through the state-owned Reconstruction Credit Institute. The money will come from the proceeds of the auction of emission trading certificates. It is not enough, however. The German Trade Union Federation and the German environmental associations have calculated that, for Germany alone, at least EUR 5 billion will be needed annually if the emission targets are to be achieved. This sum is in line with the Commission's estimates for the EU as a whole. It also has to be ensured that the costs and benefits of the necessary investment and of the economies made through energy savings are fairly distributed. This means that appropriate support will be needed for the socially disadvantaged sections of the population.

3.4 *Industrial sectors*

More advanced resource and energy efficient industrial processes and equipment, increased recycling, as well as abatement technologies for non-CO₂ emissions (e.g. nitrous oxide and methane), could make a major contribution to reducing industrial emissions of greenhouse gases in the EU by more than 80% by 2050, as planned. The solutions are sector-specific and must therefore be drawn up individually with individual industries. For the period after 2035 the Commission attaches particular importance to carbon capture and storage in industrial processes, especially in the cement and steel sectors, as, in contrast to power plants for example, emission-reducing changes to processes do not appear possible, or at least not without unacceptable costs (Road Map 2050, p. 9/10).

Conclusion and EESC's position

In its opinion on the "Roadmap 2050" (TEN/425, p. 11) the EESC stresses the following aspects which would seem critical to the achievement of the goal of reducing greenhouse gas emissions in the EU by at least 80% by 2050:

- costs and return on investment: moving from an annual average of some EUR 130 billion over the last three years to an average of EUR 600 billion;
- finding funds for investment: providing a stable framework for investors, adequate investment return schemes, financial support and low-tax incentives;
- decarbonising the electricity sector: radical energy policy change and significant investment are needed to break the current dependence on fossil fuels;

⁸ Directive 2010/31/EU of 19 May 2010

- design, operation and deployment of electricity grids, ensuring the flexibility of smart grids and power transformation plant, for better management of peak loads and a rational feed-in and redistribution of the various forms of energy (feeding in renewable energy sources and using smart meters can change the electricity transmission system);
- energy efficiency programmes, especially to improve carbon emissions levels from industry (22% of total emissions);
- reducing direct and indirect global emissions from the buildings sector (40% of total emissions), focusing on all structural aspects;
- in the transport sector less use of traditional fuels, an increase in the share of ethanol and biodiesel and technological breakthroughs (the EESC will be devoting a separate opinion to this subject) ;

and, last but not least:

- international coordination: the main emitters among the industrialised and emerging countries should set common 2030-2050 targets, with due respect for the specific nature of each area, for levels of economic development and endowments of natural resources.
-