

COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF REGIONS

Energy Roadmap 2050 - ABSTRACT

1. Background:

The Commission is preparing an **Energy Roadmap to 2050** to be adopted **by the end of 2011**. This Energy Roadmap will follow "**Roadmap for moving to a competitive low-carbon economy in 2050**".¹ and focus on decarbonisation in the energy sector. The background to the need to develop a decarbonisation strategy is the EU commitment to an **80-95% reduction in greenhouse gas emissions** below 1990 levels **by 2050** in the context of necessary reductions by developed countries as a group. The Energy Roadmap will present policy challenges for the decarbonisation of the energy sector while preserving the competitiveness of industry and strengthening energy security.

This EC staff working paper is accompanied by an Impact assessment paper and the Results of the public consultation on the "Energy Roadmap 2050".

In this **Energy Roadmap 2050** the Commission explores the challenges posed by delivering the EU's decarbonisation objective while at the same time ensuring **security of energy supply** and **competitiveness**. It responds to a request from the European Council².

A roadmap involves making a number of **assumptions**. This **uncertainty is a major barrier to investment**, technological and behavioural change. However, an analysis of scenarios, both by the EU and other organisations, gives a better understanding of the risks and requirements which investors need to deal with. Based on this analysis, this Energy Roadmap draws a number of **conclusions on the direction of the future policy framework**, identifying areas for action which are most likely to deliver desired results and confirming some key conclusions on "no regrets" options in the European energy system. Due to these uncertainties, the **scenario analysis undertaken is of an illustrative nature**, examining the impacts and risks of possible ways of modernizing the energy system.

2. Overview of scenarios analysed for the Energy Roadmap 2050

Current trend scenarios: Reference scenario, Current Policy Initiatives (CPI),

Decarbonisation scenarios: High Energy Efficiency, Diversified supply technologies, High Renewable energy sources (RES), Delayed CCS, Low nuclear.

3. Ten structural changes for energy system transformation

- (1) *Electricity plays an increasing role*
- (2) *Decentralisation and centralised large-scale systems depend on each other*
- (3) *Energy savings throughout the system are crucial in all scenarios*
- (4) *Renewables rise substantially in all scenarios*
- (5) *Carbon capture and storage has to play a pivotal role in system transformation*
- (6) *Nuclear energy provides an important contribution*
- (7) *Higher capital expenditure and lower fuel costs will occur*
- (8) *Electricity prices rise until 2030 and then decline*
- (9) *Household expenditure will increase*
- (10) *Decarbonisation is possible – and can be less costly than current policies in the long-run*

4. Moving from 2020 to 2050 – Challenges and Opportunities

This chapter addresses the following topics: Transforming the energy system towards decarbonisation, Rethinking the energy market, Mobilising investors under a unified and effective approach to energy sector incentives.

¹ COM(2011)112, 8 March.

² Extraordinary European Council, 4 February 2011

Integrating local generation and long-distance networks

In a long term perspective, with electricity trade growing in all scenarios, the need for adequate infrastructure grows in importance. Under almost any scenario up to 2050, **more interconnected networks are needed**, with the highest need coming in the case of strong penetration of renewables, both within Member States as well as cross-border. Existing plans for **increased transmission capacity** need to be realised as a matter of urgency. Expansion of **interconnection capacity** is happening too slowly. The European Council recognized this issue already in 2002 and implemented targets for import capacity.³ The targets have not been achieved yet in all Member States. By 2020 interconnection capacity needs to expand at least in line with current development plans. An increase of interconnection capacity by 40% up to 2020 will be needed, with further integration after this point.

In a European context, **planning of infrastructure needs** well in advance is ongoing (ACER, ENTSOs) and should have a positive impact on investment risks. In addition, new policy options could play a role in the future: a common asset base for infrastructures of European importance, the **evolution towards regional Transmission System Operators (TSO)**, the general harmonisation of network charges and the extension of current planning methods to a fully integrated network planning for transmission, distribution and storage in a potentially longer timeframe. Furthermore, CO2 infrastructure, that does not currently exist, will be required and should start to develop soon. **New, flexible infrastructure development is a "no regrets" option** and would allow for accommodating various power generation pathways.⁴

5. The key role of ENTSO-E's work for a modular development plan of a Pan-European Electricity Highways System up to 2050

To exploit renewable electricity from the North Sea, the Mediterranean and from North Africa, significant additional infrastructure, notably subsea, will be needed (for the Mediterranean area, an example is the concept "Medgrid"). In the framework of the North Seas Countries' Offshore Grid Initiative, **ENTSO-E is already conducting grid studies for North Western Europe with a 2030 horizon**. This should feed into ENTSO-E's work for a modular development plan of a Pan-European Electricity Highways System up to 2050. Building such highways requires closer cooperation of TSOs across Europe and will induce changes to market structures.

To accommodate renewable production locally, the **distribution grid** also needs to become much smarter to deal with variable generation from many distributed sources. With more decentralised generation, smart grids, new network users (e.g. electric vehicles) and demand side management, there is also a greater need for a **more integrated view on transmission, distribution and storage**.

6. The Way Forward

The **EU Energy 2020 strategy, the existing rules and the energy targets have to be fully implemented** and full market integration by 2014 has to be achieved. The policy proposals currently in discussion should be **adopted and complied with** swiftly to ensure that the progress can be made in time as a necessary step in the process towards 2050. Member States and investors need **more certainty** on the policy framework in 2030. Therefore, the EC should develop a number of new initiatives and **"no-regret"** options.

On the basis of this Roadmap, the Commission will continue discussions with other EU institutions, Member States and stakeholders on the actions which need to be developed to deliver the 2050 goal to transform the energy system. These actions must enable the EU to make the necessary changes in the most efficient, economically sound and socially acceptable way. This Energy Roadmap 2050 focuses on the present moment, but **needs to be updated and reassessed regularly over time**. Member States need to prepare and adapt their strategies. This will result in an iterative process between Member States and the EU to shape a common view on how to achieve an energy system transformation which delivers decarbonisation, greater security of supply and increased competitiveness.

³ European Council, March 2002, Barcelona.

⁴ For improved regulation and targeted support see the proposed new infrastructure fund to 2020 ("Connecting Europe Facility") and the Commission's proposal published on 19.10.2011 "Regulation concerning guidelines for the implementation of European energy infrastructure priorities" (COM(2011) XXX).