9 Technology Scenarios to 2030: Baseline and Alternative Technology Scenarios[39]

Technological development is a complex phenomenon that has drawn the interest of many scholars. Understanding the nature of the forces behind the process of scientific discovery, technological innovation and know-how dissemination is a challenge for which many theories have been formulated and are still under discussion. It is customary to distinguish between basic research, often supported by public funding, and applied research, whose outcome is protected by intellectual property rights under some legal scheme. It is probably impossible to forecast completely the nature and stage of development of the technologies that will be relevant for power generation in 2030. Indeed, at least for the time being, there are no large scale energy models, which even try to model technology progress endogenously.[40]

The difficulties of forecasting over such a long period are based not only on the nature of technological discoveries and breakthroughs, which are almost by definition unexpected, but also on the dependence of the technology of 2030 on the actions taken by economic agents between now and then. Future power generation technologies will also be determined, by the market structures, which are currently changing extremely rapidly.

Consequently, the methodology adopted in this chapter is to construct a number of possible technology scenarios for the power generation system over the next 30 years. It is hoped that this approach will stimulate debate on the likely benefits of these alternative technology futures and on the likely priorities for public funding.

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[39] The principal author of this chapter was Antonio Soria of IPTS. The application of the technology scenarios were carried out by Patrick Criqui of IEPE and Niko Kouvaritakis of ECOSIM, at the world level, and by Pantelis Capros and Leonidas Mantzos of NTUA.

[40] A number of efforts to address this weakness are currently under way, including the one by the EU funded TEEM project.

P. Capros et al., *Climate Technology Strategies 1*

These scenarios were based on a number of *feasible* and *plausible energy technology trajectories* that have been constructed around a limited number of technology clusters, which were discussed in the previous chapter. One of the reasons for this approach was the necessity of identifying the benefits of a breakthrough « other things being equal », as well as the possible synergies within each cluster. Indeed, some of the key technologies within each cluster could experience significant progress, and therefore induce important cost reductions in the related technology families which, in turn, could lead to much higher penetration of these technologies.

Another key defining characteristic of the scenarios presented below is the degree of market concentration. As it has already been mentioned, some technologies, because of their capital requirements, size of optimal plant etc., are more likely to be associated with decentralised market structures.

9.1.1 Energy Technology Baseline Projection

In order to analyse the impact of likely future energy technology trends, a reference technology deployment trajectory has been explored within this research. It corresponds to a BAU (Business As Usual) scenario, for whose numbers a consensus has been achieved after an in-depth look in the literature survey.

The electricity generating costs for some selected technologies as they are characterised in the technology database and corresponding to years 1990 and 2030 are reported in the following graphs. For these cases it was assumed that, during the period considered, the price of coal would increase by 5% in real terms, lignite price would remain stable, whereas oil and natural gas prices would experience substantial increase, by 50% and 80%, respectively. These assumptions are in conformity with the results of the POLES model on international energy prices.