

Important choices for the 21st century:

The situation and prospects of energy research in the European community

A quarter of a century after the initial oil shock, the question of the cost and security of our energy supplies becomes ever more compelling under the force of current events. But, even though the question is raised with the same seriousness, it is part of an industrial, technological and scientific background which has changed considerably. Since that period, the emerging needs for energy savings have increased steadily. In most regions of the world, household consumption absorbs an increasingly large volume of resources, both directly and indirectly. One must also take the exceptional American growth of these past ten years into account, as well as the increase in business activity seen in Europe over the past three years or so. To all of this is added the unprecedented saturation of international traffic flows due to the globalisation of trade.

Current tensions in the energy markets might thus seem to be a simple repetition of previous energy crises, whose main and essential difference is a substantial change in scale. But, since 1975, we have learned a good deal, forcing us to reason differently. At that time, environmental sciences were still in their infancy. Consequently, public opinion, business leaders and governments had not yet realized the extent and seriousness of the climatic phenomena threatening us. It was not until 1992, at the United Nations Earth Summit Conference in Rio de Janeiro, that the United Nations Convention on the climatic change programme was signed, followed, in 1997, by the Kyoto protocol committing 38 countries to increasingly precise objectives regarding the reduction in the emissions of six greenhouse gases for the years 2008-2012.

From that moment on, the equation which decision-makers and European citizens were henceforth faced with became more complex. It brings technology, economics, energy and the environment into a relationship which is closer than ever. Involving its access to the more traditional basic energy resources, two realities continue to hold Europe back. On the one hand, the fact that its oil and gas reserves are limited. On the other, the extraction of coal in its subsoil is generally difficult, making it relatively uncompetitive in

relation to coal from regions with cheap labour. Over the past several months, we have been sharply reminded of this weakness.

Progress on all fronts

With respect to possible ways out of this situation, with its changing and endlessly renewed difficulties, a long-lasting solution will not come from simple mechanisms designed to adjust the volume of import costs using the conventional means available to the States in question. It is more than likely that this would only palliate matters for a while and that the potential of such a solution would soon run dry. Relaxing the constraints which we are suffering at the present presupposes that we are capable of acting by adopting a strategy which implements a wide range of means. But at the current time, Europe already has a certain amount of scientific knowledge and technological know-how which should enable it to significantly reorient its energy policy. The advantage of this knowledge and know-how is two-fold since it means that we can take into account requirements dictated by the economy but also those dictated by the objectives which we set ourselves in our efforts to preserve the environment. At the present, our competitiveness and improvement in and quality of our way of life imply a substantial and continuous development of new energy technologies.

Concrete, significant results have already been obtained over the past ten years through the combined efforts of the European Union and its member States. These results affect most major fields currently being explored. For example, with respect to wind energy, the target set in European Commission's White paper on renewables reaches 40 000 megawatts in Europe alone by 2010. To develop biomass use, we went from 37 million tons oil equivalent in 1990 to 54 in 1998. The goal for year 2010 is 135 million. The use of solar energy has also made substantial progress, both in the thermal and photovoltaic approaches. For "thermal" solar

energy, there were 3.5 million square meters installed in Europe in 1990, and then 8.5 million square meters in 1998. The aim is to reach 100 million square meters by the year 2010. As regards photovoltaic energy, we rose from 7.6 installed megawatts in 1990 to 110 in 1998, and anticipate 3 000 megawatts by the year 2010.

Energy in the 5th framework program

Both the analysis of our weaknesses and the realistic assessment of the ways we can remedy them constituted the backbone of the European Union's 5th framework program on technological research and development in energy matters. It then became clear that, if Europe wished to reduce its dependence in relation to fossil energy sources, it was necessary for it to increase its research efforts in the field of renewable energies. It is important to note that according to forecasts most commonly accepted by the scientific community, fossil energies should account for almost 90% of our international primary energy needs by the year 2030. At the same time, this proportion should progress from 80% in 1995 to 85% for the European Union. This implies a considerable upsurge in our energy imports at that time – from 47.5% in 1995 to more than 70% in 2030 – and thus a radically increased dependency.

The 5th framework program is now at its half-way mark: it will come to an end in 2002. Overall, the part of this program dedicated to energy research is 2 021 billion Euro, i.e. 13.5%. This can be broken down into 979 million for nuclear energy (788 million for fusion and 142 million for fission), and 1 042 million for non-nuclear energy. Research in new and renewable energies, continuously increasing, henceforth represents around 60% of the non-nuclear part of this program, i.e., around 30% of the total. Two of its key actions, entitled *Cleaner energy, including renewable energy sources* and *An economic, efficient energy for a competitive Europe*, with, for the forthcoming period of 2001-2002, a total budget of 480

million Euro. This budget will be used mainly to co-finance large research and technological development projects and demonstrations on the one hand and, on the other, "thematic networks" taking part in the construction of an authentic European Space for research as described in January 2000 by Philippe Busquin, European Commissioner.

After discussions with the Committee representing the member States, and based on opinions issued by the panels of experts who took part – the "External Consultative Group" in particular – the Commission drew general conclusions based on econometric models developed in the framework program including the results of socio-economic research applied to the field of energy.

For Europe, energy independence, industrial competitiveness and the fight against climatic change go hand in hand

These observations note first of all that the fight against climatic change has become a priority in environment, energy and research policies. The new energy technologies, which are cleaner and more efficient, provide a significant contribution to lowering the cost of reducing greenhouse gas emissions.

It emphasises the importance of research & development efforts aiming to reduce greenhouse gas emissions by 8% between 2008 and 2012 in relation to 1990, but at the same time, notes that they will produce the desired effects only if they are accompanied by the active use of other national and European Community policy instruments, especially as regards regulatory and fiscal matters.

Additionally, it underlined that the assessment of external costs has clearly shown that the use of fossil energies – especially coal – has seriously harmed human health and has played a major role in global warming. In the absence of their internalisation, these external costs should at least be taken into account in the choice of energy technologies to be promoted by public authorities.

It notes that the prospects for the next ten years include growth in energy demands and a reduction in the European oil, gas and coal supply. As the security of supplies and the diversification of energy sources have to be ensured, renewable energies will have a significant role to play. The plan is therefore to double their share so that they account for 12% of the gross domestic consumption of energy, i.e. 22% of electricity requirements by the year 2010.

Lastly, given that transport and, to a lesser

degree, construction are, if unchanged, sectors which will generate the greatest increase in CO₂ emissions in the future, it is absolutely essential to extend the advantages of renewed technologies to these two sectors.

This is the background to the decision to substantially modify the European Union's ENERGY program for the next two years. Emphasis is henceforth placed on priorities of European strategic interest and the focus of efforts on "targeted actions" in the short (less than 5 years) and middle-to-long term (more than 5 years).

Priorities for the short and long term

Five priorities are of strategic interest for the European Union: management of greenhouse gas emissions and climatic change, development of new information and communication technology potential, including the question of "e-science", socio-economic research relative to energy technologies and their impact, cooperation and partnership networks in the broad sense of the term (with the member States and at international level), and, finally, research into the possibility of drawing up European standards.

The short-term targeted actions involve fuel cells (stationary and mobile applications), bioelectricity (biomass and waste), "lasting communities" (integration of renewable energy sources, particularly in peripheral regions), clean urban transportation (alternative to cars), rational use of energy in buildings, and generation of electricity from gas (advanced turbine).

Long-term actions involve fuel cells and hydrogen technologies (stationary and mobile applications), bio-energy (biomass for generating electricity and heat), integration of renewable energy sources and decentralized production, cleaner fuels for transport, energy storage and photovoltaic energy.

In all cases, special emphasis is placed on cost reduction with respect to these new technologies and on their capacity to penetrate the market. The objective is to make European energy systems "long-lasting".

Receptive markets

The results which have been achieved are already significant. European research workers have in fact acquired an advanced position in very important fields such as photovoltaic systems. At the same time, our industries are among the leaders in numerous key markets – especially those of large wind turbines, advanced systems for gene-

rating current through the combustion of coal, or technologies involving oil and gas exploration and production.

The challenge facing us at this time has extended well beyond national borders. Behind this challenge are at least three major questions: how should national and European Community efforts be shared and structured, which energy sources should be given priority and, finally, what means can be implemented to encourage rapid access to the new energy technology market? With respect to all of these questions, the whole of Europe must be seen to make clear choices, able to mobilize its citizens and be properly interpreted by the various parties influencing the markets. Under these conditions, achieving fast and substantial progress for the development and distribution of new and renewable energies is a genuine concern for the European Union and its member States.



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