Foreword


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The new energy deal which is emerging at the dawn of the 21st century is the result of a variety of economic, socio-political, scientific and technological factors.

The economic context is profoundly influenced by deregulation, competition, the convergence of different forms of energy (of which the cogeneration of electrical power and steam is just one example), and the combined energy product offer put forward by an industry undergoing extensive restructuring. At the same time, there is a growing trend for small energy generation in more flexible and decentralized stations requiring minimal capital expenditure.

In the sociopolitical field, the need to ensure the transition from fossil fuels (which are by definition exhaustible) to more durable or renewable sources of energy is increasingly seen as a key issue. Another growing concern is the impact of energy sources on climate change. The European Union and all of its members must comply with agreements to reduce greenhouse gas emissions signed at the Kyoto conference and strive to find responsible solutions to the commitments made. France, in particular, is ahead in the challenge to meet these commitments: 40.9% of the average French person's total primary energy consumption is supplied by nuclear-produced electricity and other sources of energy that do not produce greenhouse gases. Therefore, the average French consumer emits 1.8 times less carbon dioxide than a German and 2.9 times less than an American. Still, the French can further improve their record through new production modes and rationalizing energy use.

In the scientific and technological fields, new options are emerging with respect to collecting, converting, storing and using energy. Perspectives for renewable resources, that until now have been unattractive from an economical standpoint, are ever widening. In the short term, it is obviously not realistic to assume that these new resources will fill an important role in global supplies of energy or to imagine that they will make a significant contribution to large-scale production of electricity at base level. Nevertheless, there is a genuine desire to develop renewable resources in areas where their advantages have proven consequential.

Transportation, representing one fourth of all energy consumed, 95% of which is provided by oil, is of course a key issue. One aspect that must be examined in particular is the economic competitiveness of using hydrogen as an energy vector concurrently with electricity. Doing so will require producing hydrogen from different energy sources, being able to easily transport it, store it and convert it using different forms of energy (mechanical, electrical, chemical, thermal, etc.). Hydrogen, especially as used in fuel cells, is set to play a major role in the twenty-first century.

Aware of the stakes involved, the CEA is more than ready to contribute to finding new solutions to energy problems both in the French and European context. A considerable amount of technological research is needed for these solutions to become economically viable. The CEA will be stepping up its work on hydrogen and its applications, especially through the fuel cell research and innovation network that it co-directs with the Ademe (Agency for the environment and energy control). The "New Energy Technologies" project launched by the CEA will also base its research work on photovoltaic systems (reducing infrastructure costs and optimizing the management of a complete energy system), and rationalized energy use. Overall, the CEA will more than double its investment in the project as part of the four-year contract (2001-2004) it signed with the government last January 25.

One mission of the CEA is to serve the nation by making the very best energy options available. Nuclear energy is obviously an essential component. Although it is not discussed in this issue of *Clefs CEA* dedicated to *New Energy Technologies*, nuclear energy could be linked to the development of the hydrogen vector and used to produce it. Large scale production of hydrogen through the electrolysis of water can only be acceptable in terms of the environment if it is done using sources of electricity that do not produce greenhouse gases. Nuclear energy can also produce hydrogen using the heat from high-temperature reactors to feed thermochemical reactions of water cracking. Besides, as part of its more upstream research, the CEA is working on biological production of hydrogen by microorganisms or by enzymes such as hydrogenases.

Encouraged by the public authorities, the CEA is therefore determined to fully employ its specific skills to developing new technologies that will contribute to the necessary diversification of energy sources. In certain areas, it will be able to play a central role in helping to unlock scientific and technological bolts. In still other areas, it will be able to provide industry with the know-how it has acquired through its many nuclear energy-based activities.

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