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Nuclear Energy in the 21st Century

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As the distinguished and highly skilled speakers before me have already demonstrated - and I cannot plead the case any better - nuclear energy will be a major ingredient in the energy mix of the new century.

There are three reasons for this, already presented by those who spoke before me:

- The world is in desperate need of energy.

At present, a quarter of the world's population consumes more than three-quarters of the world's energy. Is that acceptable? Is it sustainable?

In addition, the percentage of the population currently consuming very little energy is going to grow. Whether tomorrow's world has a population of 9, 10 or 12 billion, the order of magnitude is the same: over the first half of this century, annual energy consumption will have doubled.

According to the usual forecasts, the new century will consume three times more energy than the world has consumed since it began, and fossil fuel reserves will run out. Today, the new oil fields discovered no longer make up for the depletion of known deposits.

The consequences are easy to predict: price rises, of course, but worse still, military conflicts to gain control of resources. I am thinking here of the Middle East and the geopolitics of the Caspian Sea. Against a backdrop of oil wars, nuclear energy will ease the pressure on hydrocarbons and come to be seen as contributing to peace.

- By releasing waste from fossil energy production into the atmosphere, we pollute the environment and we pass on to our children a little more each day. Is that acceptable? Is it sustainable?

No matter how surprising - though doubtless temporary - the conclusions of the Bonn Conference were in excluding nuclear energy from the clean development mechanisms, we are still left with the predictions of scientists: average global warming of at least 1.4 C and perhaps even 5.8°C. Even in the best-case scenario, we must be prepared for regional climatic cataclysms.

- Setting aside these economic, strategic, and environmental arguments, mankind has - since its beginnings - proved itself capable, apart from a few setbacks in the history of some civilizations, of controlling technical progress to ensure its own well being and the smooth development of the planet.

Nuclear energy lies at the heart of the most elementary processes in the creation of the universe. The world has been steeped in natural radioactivity since the Big Bang. This source of radioactivity is far higher than that generated by industrial sources, and living creatures have gradually adapted to it.

Why then should nuclear energy be the only form of progress to be deliberately rejected by human society?

Why should this be the only area where human society follows a few ideologists advocating a return to the Stone Age?

Despite the weight of these arguments, the nuclear industry is still marking time as we enter the 21st century. Of course, top ranking politicians in different countries are now showing us some signs of encouragement, for example with the Green Paper on the security of energy supply and the bold position adopted by the European Commission Vice-President Loyola de Palacio in Europe, the Cheney report and President Bush's energy policy in the United States, and even here in the UK, where the government has initiated a broad debate on energy policy, explicitly including nuclear power.

Though these developments will help considerably in persuading public opinion to accept nuclear energy, they are not persuasive enough to convince investors to launch new projects.

A very lengthy presentation would be needed to cover all the conditions required to secure significant growth in nuclear investments. Two prerequisites, however, are the perfect operation of existing reactors and transparency by operators in their business activities. It is not for us to sing our own praises, but on these two issues, the progress made in our sector is considerable and we compare most favorably with other industries, especially the gas and oil (not to mention coal) industries. That is why I would like to make just a few comments concerning the only other decisive factor: reinforcing the competitive edge of our industry in the context of increasing globalization. We must demonstrate that we are extremely competitive, possibly without taking into account the CO₂ credit.

At least two conditions must be met to achieve this:

- The nuclear industry must be powerful and capable of acting on a global scale. Our industry has done the right thing by concentrating the leading suppliers of reactors – I am in a good position to tell you that Framatome ANP is doing very well indeed! - and by initiating mergers between reactor vendors and fuel cycle suppliers. Anne Lauvergeon will talk about AREVA, the latest of these mergers.
- Reactors must be standardized: if the complexity of a reactor model is one of the deciding factors in its cost, standardized design allowing series production is another key factor. However, this requires international standardization of safety

rules. Of course, we know that these rules are determined by the sovereign powers of each country in which nuclear plants are located. Nevertheless, the safety authorities will have to agree some day to common policies and mutual recognition of the licences they grant, just as the aerospace industry did more than fifty years ago. The industry can help by asking for the licence of the same reactor model to be validated at the same time in different countries. New design concepts currently being studied - both "evolutionary" and "revolutionary" - provide the opportunity to do this.

Further, the range of reactors is being reviewed with a view to making them quicker to build and easier to operate. In this area, too, new concepts abound, just as in the good old pioneering days of nuclear power. We owe much respect to those like Corbin McNeil who are leading this renaissance: it is excellent news for the industry, provided it keeps a cool head.

The nuclear industry would be making a mistake, however, if it inferred that new, competitive, safe products were already available when, in fact, they are only on the drawing board. I am referring here specifically to high-temperature reactors. Although their potential is well known (intrinsic safety, efficiency, etc.), we still have to analyze their safety in terms of the intangible principle of defense in depth: for example, what containment is needed to ensure safety from internal accidents or external hazards? We must also remember that high temperature reactors consume more uranium and separative work units (SWU) than light-water reactors, and require enrichment levels that current plants are not licensed to handle. We cannot compare the competitiveness of these reactors with that of water reactors until the principles controlling their safety and the industrial framework for their fuel cycle have been defined.

Lastly, universally accepted solutions must be implemented for end-of-cycle and waste disposal issues. Processing and recycling spent fuel definitely makes these issues easier. Certainly, we know that solutions exist, as France, Finland, Sweden and, maybe tomorrow, the United States are gradually showing the way. Paradoxically, at a time when internationalized safety analysis appears to be one of the prerequisites for the revival of nuclear energy, it seems more essential than ever for each country to hold on to and assume its responsibilities for radioactive waste. Of course, the lifetime of such waste is long and the only certainty is that national borders will have shifted by the end of an actinide half-life, but this cannot justify exporting waste at present to countries with very few financial resources. On the contrary, such exports are not only open to question from an ethical viewpoint, but they also add fuel to our opponents' arguments, who would claim that the nuclear industry is irresponsible and incapable of solving the problems it has itself created.

Since the World Nuclear Association exists, I should say a few words about its role and its goals. One may ask whether public relations are feasible on a world scale, and whether a single approach is not bound to be defeated by the wide diversity of public opinion, and by the cultural, political and institutional frameworks encountered from one region of the world to another. On the other hand, tomorrow's nuclear energy must seek its strength in a global industrial approach, with cross-border industrial groups operating within uniform safety contexts and with countries responsible for the management of all types of waste. I wish the WNA every success if it can help to build this essential environment for a revived nuclear industry.

