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Concluding Remarks

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Concluding remarks

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Over the past two days we have been taking stock of the overall position as regards the development of fast reactors in Europe, the U.S.S.R., the U.S.A. and Japan. I am sure we can agree that collectively we have made good technical progress with the development of this major source of electrical power for the next century. In Europe, we have two large prototypes operating, Phénix and PFR. We also have a 1200 MW_e demonstration reactor (Superphénix), which is now continuing with its commissioning programme after the interruption caused by the leak from the fuel storage vessel. The Soviet Union is pressing ahead with its programme; in the U.S.A. FFTF has given outstanding reliability and in Japan the construction of Monju is going well and is on schedule for criticality in 1992.

Of course there are a number of possible realizations of the sodium-cooled fast reactor concept. We have had in this conference some muted debates about the merits of pool versus loop, oxide versus metal fuel, large versus small modular and the possibilities of eliminating the secondary sodium circuit. But we can all probably agree that the pool mixed-oxide fuelled design is one realization which has now reached an advanced state of development, certainly the pre-commercial stage.

We are also all likely to agree on the basic economic and performance parameters of the fast reactor and its fuel cycle. In particular, after the first of a kind costs have been met, fast reactor and PWR generating costs are likely to be broadly similar, in the absence of large increases in uranium prices (Hall *et al.* 1989).

In Europe we have an enlightened group of electrical utilities who are sponsoring a common and improved design of reactor, the EFR. With the signature of the fast reactor agreements in Bonn recently we have cleared out of the way the obstacles to closer collaboration between the R&D and the design companies in our respective countries.

Yet despite all this I see some glum faces around the room. What haven't we got right? Why can't we look forward with increasing confidence? Well, for one thing our timing has been a bit out. The energy crises of the 1950s and 70s, which provided the strong imperative for the development of nuclear power and of the FBR, have been replaced by the fossil fuel surpluses of the 80s and oil prices have reached lows not seen in real-terms since before 1973.

Secondly, we find in our various countries problems facing the future development of nuclear power in general. Here in Britain we have the hiatus of the electricity industry privatization; that came at a time when the public utility, the CEGB, was accepting a progressively larger share of the financial responsibility for the fast reactor development programme in the U.K. However, the new soon-to-be privatized company takes the view that such a major commitment is inappropriate for an organization no longer statutorily responsible for keeping the lights on in the U.K. At the same time our Government has decided to reduce its spending on fast reactor R&D. Likewise in Germany the political climate does not favour nuclear power and least of all reprocessing and the breeder reactor. The problems of licensing SNR300 and of the future of the Wackersdorf reprocessing plant only amplify these difficulties. In Western Europe only in France does the political will, in contrast to the technical capability, remain strong.

But what are the important points we need to reflect on as we come to the end of this conference? There are I think a number of points we can all agree upon.

1. By 2030 the world population will have grown from five to eight thousand million and global usage of energy will have increased by a factor of between $1\frac{1}{2}$ and 2. At the same time the cost of energy, driven by the cost of oil, will have increased in real terms by a similar factor if not more. Of course this is not new, but there is growing awareness of the factors behind it: the population growth and pressure to increase living standards in the less developed countries. This growing awareness stems from the environmental debate and the understanding that it will simply not be possible to limit energy consumption to today's levels, let alone reduce consumption.

2. That environmental debate itself is the second point: there is growing appreciation by the public world-wide of the damage we are doing to our environment both on a national and on a global scale by burning fossil fuels. While the scientists cannot say conclusively yet whether the greenhouse effect is a major problem, the message is clearly that we cannot afford to wait around and find out. In short the concern is real. We can expect these increasing levels of public concern to force a political and economic response to harmonize energy policies on both a European and a global basis.

3. Therefore, although the immediate future for nuclear power may be uncertain because of the factors I have described, nuclear is the only economic electricity supply option capable of rapid large-scale deployment to meet the expanding needs without exacerbating the problems of the greenhouse gases. Therefore, in the mid-to-long-term both economic and environmental factors will move strongly in favour of nuclear power. Indeed, recent public opinion surveys in the U.K. and U.S.A. show that a substantial majority of people already believe that nuclear power will become more important as a source of energy in the future.

4. Expansion of nuclear power will, in turn, put renewed pressure on uranium reserves and prices. This will reinforce the fossil energy price rises that are bound to occur. Although almost certainly there are sufficient uranium reserves to allow for anything up to a doubling of the present capacity of thermal reactors for their entire lifetimes, it seems likely that concern will develop around 2020–30 about the lifetime supplies for reactors ordered around that time and expected to operate for the next 40–60 years. Against this backdrop of fuel supply limitations and higher prices the need for the fast reactor to ensure that fission power can continue to make a dominant rather than a modest contribution to world energy supplies will be clear.

5. This in turn identifies the time horizon of 2020–30 as the current expectation of when fast reactors must be capable of being deployed in significant numbers in the form of a standardized commercial design. This timing also corresponds with the date for replacement of much of the current European nuclear capacity. The first commercial AGRs in the U.K. and PWRs in France will retire from 2010 onwards and a major tranche of European nuclear stations will need to be replaced in the 2020–30 decade.

However, we cannot afford to sit on our hands while we wait for market forces to move in favour of the fast reactor; in that case our timing would definitely be out. We have to press on now if we are to have the feedback from operating experience with a standardized design, to ensure that deployment of fast reactors in sufficient numbers can take place when they are needed. We only have to look at the history of the development of thermal reactors over the past 30 years to realize the sorts of minor, but irritating but commercially damaging problems we are likely to encounter. There are, however, two highly encouraging factors that give me confidence that we can meet this timescale.

1. Firstly, current developments towards joint ventures and the merger of large European companies supplying the electricity industry gives me hope that the appropriate industrial structure will be in place to allow a single standardized European NSSS design to be pursued.

2. Secondly, it would appear that there is now, probably for the first time, a common international perception of the timescales on which we will need fast reactors and on the basis which industry and governments should participate in that development. In Japan following the completion of Monju there are plans for a demonstration FBR to be started in the late 1990s, on the same timescale as EFR, with the electrical power companies taking the lead in its design, construction and operation in an analogous manner to the European utilities group, EFRUG. Japan has decided that the R&D needed for the design, construction and operation of follow-on plants should be funded by the private sector with government reserving its role for fundamental R&D and safety and other activities where adequate resources could not be expected to come only from the private sector. I think this is a general point we have to learn. The thrust for the further development of the fast reactor has to come from the utilities and private industry; governments have done their bit in bringing the concept to its present state.

So Europe and Japan at least are working towards similar aims, on similar basis and with similar time horizons in view. It remains to be seen whether the present technical collaboration with Europe will move towards a closer industrial and commercial collaboration. This, in my view, would be an appropriate response by way of a reaction by the international nuclear industry to the growing global climatic and environmental problems.

This is not the first time that an address has been made closing a major fast reactor conference with the reassuring message that, despite the short-term problems, the longer-term position is clear and positive. What has changed is that the stakes are higher than ever before. This is in part due to the lack of willingness of governments to pay for development as opposed to research. At the same time there is an increasing concern about the environmental issues that the fast reactor can help to alleviate. My message, however, is based on the fact that we are starting to see a convergence of views from the industry side world-wide on need and costs but also, and most importantly, on timing. That is why I believe that fast reactors will, early in the next century, become today's technology rather than always being a prospect for the future.

Reference

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