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THE EUROPEAN NUCLEAR FUTURE

F. Noon

Consultant, Energy Industries
Treetops, Stodmarsh Road, Canterbury Kent CT3 4AR U.K.

SUMMARY

The Nuclear Industry, both reactor manufacturers and generating companies, have a responsibility to make the case for Nuclear Energy in very positive terms if Western Europe is to avoid the economic trap of serious power deficits in the early part of the next century. Significant progress will not be made without public consent, and the public must be made aware of the real needs for the future : A COMMITMENT TO SAFE NUCLEAR ENERGY UTILISING ECONOMICAL DESIGNS BASED UPON PROVEN TECHNOLOGY. However some re-thinking of accepted energy philosophy is also called for, and the speculation here as to what could happen in Europe over the next thirty years, is one possible scenario.

INTRODUCTION

In Western Europe, with the exception of France and Great Britain, construction of Nuclear Power Plants has come to a virtual standstill. There are contradictory influences which form a background to this hiatus:- Public concern for safety, rapidly escalating costs for new Nuclear Plants, and a lack of political will on one hand. Then on the other hand;- accelerating depletion of natural resources, environmental pollution due to CO2 emissions from fossil fuels (Greenhouse Effect) and the need to replace existing older generating stations as they are retired from service. Earlier promising alternatives such as Solar, Wind and Tidal Power electricity generation are not proving viable for sustained industrial and economic stability.

Efforts by various Governments to introduce energy conservation, barely keep pace with increasing demand, and the unit cost of electricity will increase in real terms as the generating industry prepares for an uncertain future. Some of the more interesting aspects in specific countries are considered here.

CURRENT STATUS WESTERN EUROPE

SWEDEN.

In 1980 Sweden held a Public Referendum which concluded that Nuclear Power would be phased out by the year 2010. The country has twelve Nuclear Plants with a total capacity of 9.7 GWe net, which contributes about 45% of the countrys electricity generation. In June 1988, following the Chernobyl tragedy, the Swedish Government proposed to accelerate the programme by taking two reactors out of service in 1995 and 1996. This decision is still hotly debated by both sides of the argument and the Danes have voiced their concerns about Barsebeck and Ringhals sites situated across the Kattegat Strait between Sweden and Jutland.

It is becoming clear however that public opinion is shifting away from the declared intentions, where successive polls have shown an increasing number in favour of keeping Nuclear Plants in operation beyond 2010. In considering alternative sources of energy, Swedens' Hydro capacity is (in the opinion of environmentalists) already exceeded, and Combined Cycle Gas Turbine Plants are producers of CO2, adding to the detrimental effects of increased global warming. The government prohibited any increase in 1985 levels of CO2, thus effectively limiting that option.

In November 1990, a report "Control Station 90" will be presented to Parliament to comprehensively document the pros and cons of the Nuclear debate. Opinion is that the report may not be formally debated until the Spring of 1991, but much of the content will be in the public domain beforehand.

The uncertainty of future energy supplies is causing many Swedish companies to seek solutions independently of the Governments' slow progress in formulating a satisfactory energy policy

BELGIUM.

There are seven nuclear power plants in operation, having a capacity of 5.5 GWe net, contributing about 65% of electricity generation, making Belgium second only to France in the proportion of nuclear utilisation. BR3, the first in Belgium, used principally as a fuel test reactor, is no longer in service and is presently in the process de-commissioning under a European Community and industry "Green Fields" programme. The nuclear debate is not as emotionally charged as in some countries, however plans to build an additional plant at Doel have been cancelled, and it is expected that increased energy demands will be met by the construction of new fossil units.

Belgium's long history in the nuclear field, with extensive research facilities at Eurochimique in Mol, has created the need for a national nuclear waste management plan and the official agency ONDRAF is presently developing comprehensive strategies.

YUGOSLAVIA.

Krsko, jointly owned by Slovenian and Croatian Utilities is the only nuclear power plant in Yugoslavia, rated at 632 Mwe net it contributes about 5% of national electricity generation. The Federal Government prohibited further nuclear plants, however recent political pluralism will re-open the issue because inter-republic energy and fuel tariffs have become of great economic importance. The legality of the Federal ban on nuclear development is also open to question.

The Technical Institutes and the Utilities have an excellent reputation and are constantly participating in international programmes in the nuclear field. It can be expected that together with heavy industry in the north, they will exert influence in the decision making process of the new governing bodies in individual Republics. However there are contradictions; Croatia initiated the development of a Nuclear Plant Bid Specification in 1987, and made good progress. While the Green lobby in Slovenia where Krsko is located, has achieved political credibility by opposing more Nuclear Power.

The background of Hyper-inflation experienced over the past two Years, and the confused decline of the Communist Party will continue to create difficulties for Croatia in its efforts to build a Nuclear Plant within its boundaries.

ITALY.

Latina and Garigliano are in decommissioning, and the only two plants capable of producing power, Caorso and Trino (combined 1120 Mwe net) are in cold shutdown. In fact since Trino shut down for refueling in March 1987. no electricity from nuclear power has been generated in Italy.

The 1988 National Energy Plan ratified a November 1987 referendum which imposed a five year moratorium on Nuclear Power. That effectively killed the Progetto Nucleare Unificato (the PUN Programme) for four to eight 900 Mwe units, for which orders for the first two PWR units at Trino-Piemonte had been placed by ENEL (the National Utility, in March 1986, just one month before Chernobyl). The second casualty, in February 1988 was Montalto di Castro, two 1000 Mwe units under construction near Rome which were eighty percent complete. Montaldo di Castro alone represented an investment of about five billion dollars.

After the five year moratorium, in November 1992, a review will be made and the future for Italian Nuclear Generation will be decided. However there exists a growing body of opinion, concerned with untenably high imported electrical supply, which is attempting to bring the debate before Parliament during 1990, this at least may permit Trino and Caorso to resume operation.

In the meantime both ENEL and associated Industrial Companies have seconded scientists and engineers to selected overseas reactor manufacturers to facilitate the potential introduction of "advanced designs".

SPAIN.

Thirty six percent of electricity generation 7.5 Gwe net, comes from Spains ten Nuclear Units. No new plants are committed, and as elsewhere in Europe the dominating feature is political sensitivity. Growth in electrical demand has been one of the highest in Europe over the past few years, and if the same growth in industrial output is to be maintained, Spain too will soon have to decide which of the available options to take ; - Imported Power, more fossil plants (but fuel must be imported), or resume the Nuclear programme

SWITZERLAND

As in Spain, thirty six percent of electricity generation is from Nuclear Plants. The five in operation have a total capacity of 2.9 Gwe net. The Kaiseraugst Project, a 920 Mwe BWR was terminated by the Government due to public opposition and the contractors were partially compensated. A Government body of experts is expected to report on various possibilities, with and without Nuclear Power, and a public referendum will be held within the next year or so. The results will be of considerable interest to the international industrial community.

OVERVIEW.

The foregoing summary reflects the overall trend in most European countries, with the notable exception of France and the United Kingdom. As these two countries are the subjects of specific papers, it will serve the purpose of this overview to remark that with over seventy five percent of electricity generation from Nuclear Plants, the French public must have confidence in their Nuclear Industry. Also the export of electricity has become an important contributor to foreign earnings. While in the UK, the ongoing "Privatisation" of the electricity supply and distribution industry, together with projected decommissioning costs of the Magnox Reactors, (reported to be twenty billion pounds sterling) have forced the city institutions who will underwrite the share issues, to bring pressure on the Government to keep Nuclear Plants in the public sector.

It should be noted that although only a few countries are referenced here, they are characteristic of the spectrum across Europe. Approximately 35 percent of electricity generated in Western Europe is from Nuclear Plants, which are 22 percent of installed capacity. Base load operation and good availability are self evident in these figures.

There is no doubt that a large sector of the general public throughout Europe, who were tolerant if not enthusiastic about Nuclear Power, have been greatly influenced by the tragedy at Chernobyl. It is not surprising that various Governments have introduced a breathing space in the construction of more nuclear units.

In the recent and well publicised International Conference on The Environment (and the Greenhouse Effect), although a great deal of discussion centered upon the contribution of CO and CO2 emissions from burning fossil fuels, there was scant reference to Nuclear Plants, which are the "friendliest" of all so far as Global Warming is concerned. The omission is not surprising, because even the scientists and technologists involved in the prevailing forum of public opinion, could not promote a resumption of Nuclear Power construction.

The questions raised by these events and their collective impact upon the Nuclear Industry, must be effectively addressed if we are to regain the confidence of the general public.

First and foremost, there must NEVER be another "Chernobyl", and the existing plant investment must be protected. Secondly the available new technologies to deal with Radwaste must be implemented without delay. Until recently this latter and un-glamorous sector of the industry has not received the priority it really merits, partly due to the fact that it is a cost without profit to the plant owners. Recent legislation in the United States and within the EEC is now forcing a more quality based approach to dealing with all forms of Radioactive Waste. Thirdly as is well known, the major reactor manufacturers are all heavily engaged in the development of plant designs with enhanced safety features. If those designs are to succeed they must also be less vulnerable to operator error, require simple and clear administrative controls, and construction times must be reduced in order to return to sensible costs.

THE FUTURE

The Utilities protect their investment by practices such as : - Training and Re-qualification Programmes for operators and maintenance personnel ; Ensuring adequacy of replacement components and strategic sub-units (eg skid-mounted motor/pump assemblies etc). Dedicated engineers and scientists charged with ensuring that contemporary Safety Engineering is practiced at all levels, and that the potential for upgrading Safety Related Equipment is kept under constant review. Work and Operational Planning for both routine and emergency intervention being subject to a formal Review and Approval process. As is well known, it was the failure of a combination of these items which resulted in the Three Mile Island core damage in 1979.

Enhancement of plant performance can be achieved by several available techniques, such as UPRATING, RE-ANALYSIS AND OPTIMISATION OF FSAR LIMITATIONS, and PLANT LIFE EXTENSION.

In the absence of continued construction, American Utilities are engaged in those options at an increasing level, and that will continue to be a major source of work for the Reactor Manufacturers throughout the 1990s.

The major companies are developing advanced designs in anticipation of the changes which will come in due course. In the USA, several domestic and foreign Utilities and the Department of Energy are providing funds to support those efforts with a view to Licensability in the mid-nineties. We can expect that by the turn of the century, the economics of those designs will be such that they will represent the only way of containing the costs of electricity to industrial and domestic consumers. For their part, the plant owners must pay more attention to the management of Radwaste, and use the breathing space to generate public confidence by adopting improved technologies to deal with all categories of nuclear waste.

To speculate, Nuclear Plants of the future will be designed so that RE-COMMISSIONING BECOMES AN ACCEPTED NORM. There is no justification in the presumption that a nuclear site must be returned to a "Green Field" state. The costs are horrendous and avoidable. The civil structures will be arranged so that major components can be removed and replaced with new. Modular factory built sub-units will be used in new construction. Sophisticated and reliable robotic tools have been developed which can be adapted for cutting and sectioning large assemblies. On-site processing of Radwaste using mobile Chemical Decontamination, Liquid Solidification, High Force Compaction and Smelting Furnaces which will enable all contaminated limited life components to be removed and rendered safe for off-site shipment to Engineered Depositories. It would be interesting to subject these methods to a feasibility study at an existing plant nearing the end of its operational life. It may transpire that RECOMMISSIONING is a less expensive alternative than DECOMMISSIONING, and a sensible way to gain a "new" plant.