STATUS OF FAST REACTOR DEVELOPMENT IN GERMANY

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Abstract

The paper gives a short survey of future fast reactor activities in Germany. The fast reactor activities of KfK are part of the Nuclear Safety Research Project. The R&D program of this project is being restructured in accordance with the demands of the Federal Government. The key issues and tasks of the programme concerned safety and transmutation of minor actinides and fission products.

1. Political Background and Funding

The total nuclear power plant capacity of Germany amounts to about 23 gigawatts electric power, covering roughly 34 per cent of the public electricity demand.

However, the situation of fast reactor activities in Germany in 1992/1993 is strongly influenced by the general political situation in the Federal Republic, in particular by

(i) substantial cutbacks in R&D funding due to the costs of German unification,

(ii) serious problems of public acceptance of nuclear energy, which have prompted utilities not to order any new nuclear plants for the next years to come,

(iii) changes in the priorities awarded to research projects by the Federal Government.

In recent years, this situation has resulted in quite a number of decisions affecting the nuclear developments in Germany:

- Construction of the Wackersdorf fuel reprocessing plant was stopped by the German utilities in 1989, subsequently German reprocessing R&D including research on fast reactor reprocessing was discontinued at Karlsruhe. The Federal Governmant is preparing a new version of the Atomic Law, which would also change the principles for the "Entsorgung": forthwith the direct HAW final storage is to obtain a legal status equivalent to the present concept of final storage after reprocessing (with recycling of uranium and plutonium).
- Local state governments are hampering work on final storage exploration and MOX fabrication.
- It has already been reported at the 25th Annual IWGFR Meeting, that the state government of North Rhine-Westphalia did not issue a nuclear operating license for the German-Belgian-Netherlands SNR 300 project at Kalkar. Therefore the Federal Ministry of Research and Technology (BMFT) decided in 1991 to discontinue the non-nuclear commissioning of the plant. The SNR-300 is now being dismantled. (The High Temperature Reactor THTR, whose site is also in North-Rhine-Westphalia, has met a similar fate). The BMFT also decided not to continue funding of industrial R&D work on fast reactors beyond 1992. In March 1993, the Siemens company decided to dissolve the site of its Interatom subsidiary at Bergisch Gladbach in 1994.
- In 1992, the Karlsruhe KfK stopped operation of the KNK II fast reactor experimental power station. In November 1992, the supervisory board of KfK, whose funding is based mainly on the Federal Government, decided to stop the breeder R&D of KfK by the end of 1993. However, work on innovative systems is to be intensified. This includes, in particular, R&D activities on the issue of actinide burning in fast reactor systems with sodium cooling.

2. Dismantling of SNR 300

SNR 300 on-site dismantling activities performed by the staff of the SBK utility were focused on provision of an access to the reactor vessel to allow for the removal of the residual sodium left in the vessel after sodium drainage. For that purpose the small rotating plug was lifted with the fuel handling hall crane, loaded to the transfer lorry and moved with the aid of other auxiliary equipment to a sodium working pit external to the reactor building. Visually the inflatable seal was in surprisingly good condition.

The plug side exposed to the cover gas atmosphere was also found in good condition. The thermal insulation plates have been clear and only very small amounts

of sodium were identified during the water cleaning process. A next step in dismantling is the removal of the second rotating plug (total weight approx. 135 t). It will be kept at the fuel handling floor level of the reactor building until being cut by hydrogen-lance technique.

The SBK statt is also involved in cutting the primary and secondary piping.

3. R&D Work Planning at KfK

The fast reactor activities at KfK are part of the Nuclear Safety Research Project. The R&D program of this project is being restructured in accordance with the demands of the Federal Government. The key issues and tasks of the program concerning fast reactors can be summarized as follows.

- Assessment of new sysems ("inherently safe "LMRs)
- Passive decay heat removal
- Passive shutdown systems
- Structural integrity
- Safety analyses of proposed concepts
- Fuel and fuel rod behavior of innovative systems
- Containment studies of innovative systems
- Transmutation of minor actinides and fission products (special studies in neutronics etc. as part of a more comprehensive international program).

This program is still subject to changes, depending on the future German energy policy.

It is a main objective of the program to preserve competence and know-how in fast reactor technology, and to continue the European and worldwide cooperation in this field.

A REVIEW OF THE INDIAN FAST REACTOR PROGRAMME
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Abstract

The Indian nuclear power programme now is based upon PHWRs in the first phase in which Pu will be produced. In the second phase, this Pu would be used in the FBR to enhance fissile materials, i.e. Pu, and also generate ^{233}U by irradiating thorium. The paper presents the main results of Fast Breeder Test Reactor (FBTR) operation in 1992, R&D and design on prototype Fast Breeder Reactor (PFBR) and studies on FR technology.

1.0 BACKGROUND

India is currently going through a significant phase of economic transformation. The structural reforms initiated in 1991 have been designed to encourage foreign and local investments in all industrial sectors resulting in rapid economic growth.

The energy scenerio in the country has been changing significantly with the need for commercial energy growing rapidly. The installed electrical energy capacity is 72.3 GWe currently and it is expected to reach a level of 100 GWe by the end of eigth plan period (1992-97). However, only about 50% of the total energy consumption is in commercial form while the rest comes from wood, agricultural wastes and animal dung. About 46% of the commercial energy is used by the industries, 25% by the transport sector, 16% by household and 9% by agricultural sector. The commercial energy consumption during 1991-92 had been - 245 million tonne of coal plus lignite, 30 million tonne of oil, 18 billion cubic meter of natural gas, 73 TWh of hydro electricity and 6 TWh nuclear electricity. Electricity generated in thermal power plants which is accounted in the above through coal was 209 TWh in the above period. The total electricity generation during 92-93 was 301 TWh which gives a per capita energy consumption of 350 KWh. The per capita income is Rs.11,200.

Investments in energy sector during the plan period (92-97) would be about 1140 billion rupees constituting about 30% of the total outlay of the budget. Of this investment on energy, about 800 billion rupees would be spent on generation of electrical energy capacity, 240 billion rupees on petroleum and natural gas and the rest on coal sector.

The present electricity generation capacity is made up of about 50 GWe of thermal power, 20 GWe of hydel power and 2 GWe of nuclear power. The nuclear energy contribution has not been significant mainly due to delays in construction during the development period (seventies and eighties) and at present the growth is hampered by financial resource crunch. Two boiling