

Some Remarks on the Introduction of Fast Breeder Reactors

V. Knapp

Zavod za fiziku,

Elektrotehnički fakultet, Zagreb

By means of uranium 238 conversion into plutonium 239, fast breeder reactors (FBR) in principle offer 50 - 60 times better utilisation of natural uranium than present commercial thermal reactors. In the past it was more or less generally assumed that for a long term utilisation of fission energy FBR are anecessity. Present situation is different in many respects:

- I) a rate of increase of nuclear power is lower, which gives time for development and introduction of thermal breeders,
- II) alternative methods for U-238 - Pu-239 conversion, such as fusion-fission hybrids appear promissin.

At present one must therefore conclude that FBR should be judged on its tehcnical and economical performance and not as the only way to ensure long term perspektive for nuclear power.

In view of this some of the overal energy cost dependencies of FBR have been investigated. Better utilisation of uranium in FBR requires costly fuel reprocessing in order that plutonium be recycled. In final analysis uranium saving in FBR relative to thermal reactors has to be compared with additional cost of fuel reprocessing and with additional capital cost charges of FBR reactors. The fact that uranium cost is a relatively small fraction of energy cost reduces the effect of better uranium utilisation.

A limiting uranium cost, defined as uranium cost which allows thermal reactor and FBR to produce energy at the same price has been calculated. For water cooled reactors of the PWR and HWR type a limiting uranium cost in the range of \$ 350 - \$ 600 was obtained, for the range of capital cost ratio of FBR to thermal reactors from 1,3 to 1,6 (1).

Reference:

V. Knapp: Uvodjenje oplodnih reaktora; neka tehno-ekonomska razmatranja
Energija, No 7-8, 1981