

Nuclear Power and Fast Reactor Program

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India is pursuing a three stage, self-reliant and indigenous nuclear power programme, linking the fuel cycles of Pressurised Heavy Water Reactors (PHWR), Sodium Cooled Fast Reactors(SFR) and self-sustaining ^{232}Th – ^{233}U reactor systems. Fast reactors form the centre stage of the nuclear power programme for long term energy security and also for the judicious utilization of modest uranium and vast thorium resources. Fast Reactors offer great advantage in terms of fuel efficiency and nuclear waste reduction.

A fast breeder test reactor (FBTR) with uranium plutonium carbide fuel core has been in operation since October 1985. The reactor has operated successfully at its rated power of 40 MWth for more than 200 Effective Full Power Days (EFPD) producing more than 50 MU of electricity. The experience and expertise gained in FBTR is being utilised for the Prototype Fast Breeder Reactor (PFBR) of 500 MW(e) which is now an advanced stage of integrated commissioning at Kalpakkam.

India has embarked on a closed fuel cycle. Towards this, a well-structured fast reactor reprocessing development program has been established, starting with a pilot facility called the Compact Reprocessing of Advanced fuels in Lead mini cells (CORAL) which is operating since 2003. This facility has served as a test bed to develop the process, equipment and systems and also understand the nuances of the reprocessing of high plutonium mixed carbide fuel. With the experiences gained, a industrial scale Demonstration Fast Reactor Fuel Reprocessing Plant (DFRP) has been successfully commissioned and dedicated to the nation. DFRP would reprocess FBTR spent fuel and is also capable of reprocessing PFBR spent fuel on a campaign basis. DFRP would be the test bed for the first of its kind equipments for large scale commercial fast reactor fuel processing plant which is underway as part of the Fast Reactor Fuel Cycle Facility (FRFCF) being built at Kalpakkam, India.

Successful fast reactor program requires an holistic and multidisciplinary approach encompassing design, materials development, and characterization, post irradiation examination, sodium electronics and instrumentation, sodium safety, reprocessing and robust QA for the entire fuel cycle. This talk would provide an overview of the fast reactor program nationally and internationally.