India: Prototype Fast Breeder Reactor: **Development of 2nd Stage**

March 19, 2024

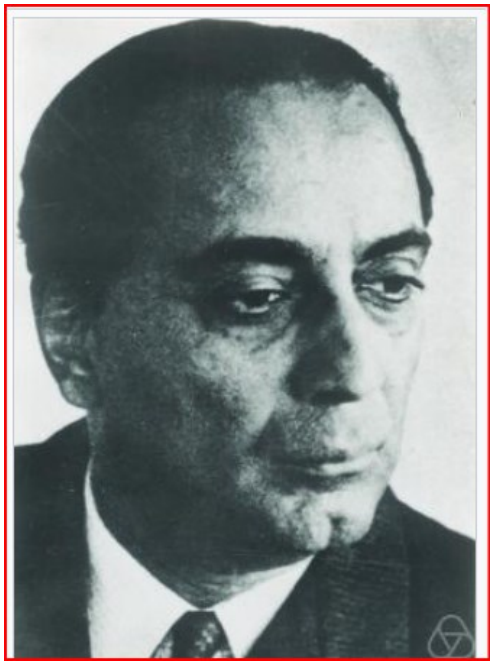
In a historic milestone marking a successful entry into the vital second stage of India's three stage nuclear program, Prime Minister, **Narendra Modi** witnessed commencement of "**Core Loading**" at India's first indigenous Fast Breeder Reactor (500 MWe) at Kalpakkam, Tamil Nadu.

*March 4, 2024: **Kalpakkam**, Tamil Nadu, India:*
Successful Development of Second Stage of 3-Stage Cycle

India has developed comprehensive capabilities spanning the entire spectrum of the nuclear fuel cycle. **Bhartiya Nabhikiya Vidyut Nigam Ltd** (BHAVINI), a fully-owned of Government of India enterprise, has been set up for constructing and operating India's most advanced nuclear reactor-**Prototype Fast Breeder Reactor** (PFBR). The PFBR has been fully designed and constructed indigenously by BHAVINI with significant contribution from more than 200 Indian industries including MSMEs.

When the 3rd stage of the FBR is successfully designed and implemented, it would permit India to generate electrical energy from nuclear reactors, which would use **India's abundant thorium reserves**. Making import of Uranium unnecessary.

In terms of safety, the PFBR is an advanced third generation reactor with inherent passive safety features ensuring a prompt and safe shut down of the plant in the event of an emergency. Notably, despite the advanced technology involved, both **the capital cost** and the **per unit electricity cost** is comparable to other nuclear and conventional power plants. Since it uses the spent fuel from the first stage, FBR also offers great advantage in terms of significant reduction in nuclear waste generated, thereby avoiding the need for large geological disposal facilities.



Homi Jehangir Bhabha**, the Architect of Indian three-stage (thorium) program the **founding Chairman** of India's **Atomic Energy Commission

----Some TERMS, used in NUCLEAR REACTOR TECHNOLOGY----

A **Pressurized Heavy-Water Reactor** (PHWR) is a nuclear reactor that uses heavy water (deuterium oxide D2O) as its coolant and neutron moderator. PHWRs frequently use natural uranium as fuel, but sometimes also use very low enriched uranium.

Reference: https://en.wikipedia.org/wiki/Pressurized_heavy-water_reactor

CANDU type PHWR: (CANDU stands for "CANada Deuterium Uranium"): It's a Canadian-designed power reactor of PHWR type that uses heavy water (deuterium oxide) for moderator and coolant, and natural uranium for fuel.

Reference: https://canteach.candu.org/Info/Pages/CANDUReactors.aspx

The **Light-Water Reactor** (LWR) is a type of thermal-neutron reactor that uses normal water, as opposed to heavy water, as both its coolant and neutron moderator; furthermore a solid form of fissile elements is used as fuel.

Thermal-neutron reactors are the most common type of nuclear reactor, and light-water reactors are the most common type of thermal-neutron reactor.

There are three varieties of light-water reactors:

- the Pressurized Water Reactor (**PWR**),
- the Boiling Water Reactor (**BWR**), and (most designs of)
- the Supercritical Water Reactor (**SCWR**).

Reference: https://en.wikipedia.org/wiki/Light-water_reactor

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