



drishti

Kakrapar Atomic Plant Achieves Criticality

 drishtias.com/printpdf/kakrapar-atomic-plant-achieves-criticality

Why in News

Recently, the third unit of the **Kakrapar Atomic Power Project (KAPP-3)** in Tapi district of Gujarat achieved its first **criticality**.

Key Points

- **Criticality:**
 - Criticality is the **first step towards power production**. **nuclear reactor** is said to be critical when the nuclear fuel inside a reactor sustains a **fission chain reaction**.
 - Each fission reaction releases a **sufficient number of neutrons** to sustain a series of reactions. **Heat is produced in the event**, which is used to **generate steam** that **spins a turbine** to create electricity.
 - **Fission** is a process in which the **nucleus of an atom splits into two or more smaller nuclei**, and some byproduct.
 - When the nucleus splits, the **kinetic energy** of the **fission fragments (primary nuclei)** is transferred to other atoms in the fuel as heat energy, which is eventually used to produce steam to drive the turbines.

- **KAPP-3:**
 - KAPP-3 is the **country's first 700 MWe (megawatt electric) unit**, and the **biggest indigenously developed** variant of the **Pressurised Heavy Water Reactor (PHWR)**.
 - Until now, the biggest reactor size of indigenous design was the 540 MWe, two of which have been deployed in Tarapur, Maharashtra.
 - **PHWR is a nuclear power reactor**, commonly using unenriched **natural uranium as its fuel**, that uses **heavy water (deuterium oxide DO) as its coolant and moderator**.
 - PHWR technology was started in India in the late 1960s with the construction of the first 220 MWe reactor, Rajasthan Atomic Power Station (RAPS-1).
 - State-owned **Nuclear Power Corporation of India Ltd (NPCIL)** had awarded the reactor-building contract for both KAPP-3 and 4 in 2010.
- **Safety Features:**

The 700 MWe PHWRs have advanced safety features like **steel lined inner containment, passive decay heat removal system, containment spray system, hydrogen management system**, among others.

 - The '**passive decay heat removal system**' can remove decay heat (released as a result of radioactive decay) from the reactor core without requiring any operator actions.
 - This is on the lines of similar technology adopted for **Generation III+ plants** to negate the possibility of a **Fukushima-type** accident that happened in Japan in 2011.
- **Significance:**
 - KAPP-3 addresses the issue of excess **thermal margins**.
Thermal margin refers to the extent to which the operating temperature of the reactor is below its maximum operating temperature.
 - KAPP-3 would constitute the **biggest component in the nuclear power capacity expansion plan**.
 - India is working to ramp up its existing nuclear power capacity of 6,780 MWe to 22,480 MWe by 2031.
 - Currently, nuclear power capacity constitutes less than 2% of the total installed capacity of 3,68,690 MW (end-January 2020).
 - It will also **help for the future construction** for the PHWRs.

Nuclear Power Corporation of India Limited

- The Nuclear Power Corporation of India Limited (NPCIL) is an Indian public sector undertaking, Headquartered at Mumbai.
- It is wholly owned by the Government of India and is **responsible for the generation of nuclear power for electricity**.

- NPCIL is administered by the **Department of Atomic Energy (DAE)**.

Source: IE