



Russia's Advanced Fuel Option for KKNPP

For Prelims: Nuclear Energy, Nuclear Plants of India

For Mains: Nuclear Energy, Significance of Nuclear Energy, Nuclear Plants of India

Why in News?

Recently, the **Russian state-owned Nuclear Energy** corporation **Rosatom** has offered a more **Advanced Fuel Option** to India's **largest nuclear power station** at Kudankulam, Tamil Nadu.

- It will allow its **reactors to run for an extended two-year cycle** without stopping to load fresh fuel.



What did Russia Offer to India?

- **Update to KKNPP Reactors:**
 - Rosatom's nuclear fuel division, **TVEL Fuel Company**, is the current supplier of **TVS - 2 M fuel for the two VVER 1,000 MWe reactors**, generating power in the **Kudankulam Nuclear Power Project (KKNPP)**. This fuel has an 18-month fuel cycle, meaning that the reactor **has to be stopped for fresh fuel loading every one-and-a-half years**.
 - TVEL has now offered the more modern **Advanced Technology Fuel**

(ATF), whose **fuel cycle is 24 months.**

▪ **Benefits of the Update:**

- It will ensure **more efficiency, additional power generation** due to prolonged operation of the reactor and **sizeable savings of the foreign exchange** needed to buy fresh fuel assemblies from Russia.

What is Nuclear Energy?

▪ **About:**

- **Nuclear energy** comes from **splitting atoms in a reactor to heat water** into steam, **turn a turbine** and **generate electricity.**
- Inside nuclear power plants, nuclear reactors and their equipment **contain and control the chain reactions**, most commonly fueled by **Uranium-235**, to produce heat through fission.
- **Emissions from Nuclear Power Generation:**
 - Nuclear power is **zero-emission**. It has **no [greenhouse gases](#)** or air pollutants.
- **Land Usage:**
 - According to US government data, a 1,000-megawatt nuclear plant requires 360 times less land than a similar-capacity wind farm and 75 times less land than solar plants.

▪ **Significance for India:**

- **Availability of Thorium:**
 - India is the **leader of the new resource of nuclear fuel called Thorium**, which is considered to be the **nuclear fuel of the future.**
 - With the availability of Thorium, India has the **potential to be the first nation** to realise the dream of a fossil fuel-free nation.
- **Cuts Import Bills:**
 - Nuclear energy will also **relieve the nation of about \$100 billion annually** which we spend on importing petroleum and coal.
- **Stable and Reliable Source:**
 - The **greenest sources of power** are definitely [solar](#) and [wind](#).
 - But solar and wind power, despite all their advantages, **are not stable** and are **dependent excessively on weather** and sunshine conditions.
 - Nuclear power, on the other hand, provides a relatively clean, high-density source of reliable energy with an international presence.

What are India's Initiatives Regarding Nuclear Energy?

- India has consciously proceeded to explore the possibility of tapping nuclear energy for the purpose of power generation.
 - In this direction a [three-stage nuclear power programme](#) was formulated by **Homi Bhabha in the 1950s.**
- **The Atomic Energy Act, 1962** was framed and implemented with the set objectives of using two naturally occurring elements [Uranium](#) and **Thorium** as nuclear fuel in Indian Nuclear Power Reactors.
- In December, 2021, the Government of India informed [Parliament](#) about building ten indigenous [Pressurised Heavy Water Reactors \(PHWRs\)](#) to be set up in fleet mode and had granted **"in principle approval"** for 28 additional reactors, including 24 to be imported from France, the U.S. and Russia.
- In December, 2021, the Centre has given in-principle (first step) approval for setting up of [six nuclear power reactors at Jaitapur in Maharashtra.](#)
 - The Jaitapur Project is a key component of the **strategic partnership between India and France.**
 - **Jaitapur would be the world's most powerful nuclear power plant.** There would be **six state-of-the-art Evolutionary Power Reactors (EPRs)** with an installed capacity of **9.6 GW that will produce low carbon electricity.**
 - The six nuclear power reactors, which will have a capacity of 1,650 MW each, **will be set up with technical cooperation from France.**

How many Nuclear Power Plants does India have?

- Presently, India has **22 operating nuclear power reactors**, with an installed capacity of 6780 MegaWatt electric (MWe). Some major power plants are:
 - **Tarapur Atomic Power Station (TAPS)**, in Maharashtra
 - **Rajasthan Atomic Power Station (RAPS)**, in Rajasthan
 - **Madras Atomic Power Station (MAPS)**, in Tamil Nadu
 - **Kaiga Generating Station (KGS)**, in Karnataka
 - **Kudankulam Nuclear Power Station (KKNPS)**, in Tamil Nadu
 - **Narora Atomic Power Station (NAPS)**, in Uttar Pradesh
 - **Kakrapar Atomic Power Station (KAPS)**, in Gujarat
- Among these, 18 reactors are **Pressurised Heavy Water Reactors (PHWRs)** and 4 are Light Water Reactors (LWRs).

UPSC Civil Services Examination Previous Year Questions (PYQ)

Prelims

Q1. The known forces of nature can be divided into four classes, viz., gravity, electromagnetism, weak nuclear force and strong nuclear force. With reference to them, which one of the following statements is not correct? (2013)

- (a) Gravity is the strongest of the four
- (b) Electromagnetism acts only on particles with an electric charge
- (c) Weak nuclear force causes radioactivity
- (d) Strong nuclear force holds protons and neutrons inside the nucleus of an atom

Ans: (a)

Q2. The function of heavy water in a nuclear reactor is to (2011)

- (a) Slow down the speed of neutrons
- (b) Increase the speed of neutrons
- (c) Cool down the reactor
- (d) Stop the nuclear reaction

Ans: (a)

Mains

Q1. With growing scarcity of fossil fuels, the atomic energy is gaining more and more significance in India. Discuss the availability of raw material required for the generation of atomic energy in India and in the world. (2013)

Q2. Give an account of the growth and development of nuclear science and technology in India. What is the advantage of fast breeder reactor programme in India? (2017)

Q3. With growing energy needs should India keep on expanding its nuclear energy programme? Discuss the facts and fears associated with nuclear energy. (2018)

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