जन जागरूकता ई-संवाद पत्र

कुडनकुलम न्यूक्लियर पॉवर प्रोजेक्ट

दिसम्बर 2025

अंक – 162

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प्रिय पाठकगण ,

भारत में नाभिकीय ऊर्जा विकास के लिए महत्वपूर्ण प्रयास के तौर पर, लोकसभा ने दिसम्बर 2025 में शांति परमाणु ऊर्जा विधेयक पारित किया। इस कानून का उद्देश्य संरक्षा , नवीनता , तथा दीर्घकालीन ऊर्जा सुरक्षा को ध्यान में रखते हुए देश की परमाणु ऊर्जा की रूपरेखा को सशक्त बनाना है , जो भारत के स्वच्छ व नियोजित विद्युत लक्ष्य की ओर महत्वपूर्ण कदम को दर्शाता है ।

पढ़कर आनंदित हों...

अध्यक्ष, जन जागरूकता समिति

दिसम्बर 2025 के विशिष्ट बिंदु

1. केकेएनपीपी स्थल पर 44 और स्थल के बाहर 02 जन संपर्क कार्यक्रम आयोजित किए गए
2. 1,536 घंटों का जन संपर्क, 1,782 लोगों से संपर्क
3. 9,865 जन जागरूकता प्रकाशन वितरित किए गए

केकेएनपीपी का जलवायु परिवर्तन के न्यूनकरण में योगदान

जलवायु परिवर्तन आज वैश्विक पर्यावरण मुद्दों में सर्वाधिक महत्वपूर्ण है। नाभिकीय विद्युत न्यूनतम कार्बन प्रौद्योगिकियों में से एक है जो बढ़ती हुई आबादी एवं सामाजिक-आर्थिक विकास के लिए विद्युत उत्पादन करते हुए ग्रीन हाउस गैसों (जीएचजी) के उत्सर्जन (अधिकतर CO_2) में कमी लाती है। CO_2 के उत्सर्जन में कमी लाने में केकेएनपीपी का योगदान (दिनांक 31 दिसम्बर **2025** को) अब तक इस प्रकार है।

कुल उत्पादित विद्युत इकाई	122,237 मिलियन यूनिट
केकेएनपीपी द्वारा कुल CO_2 उत्सर्जन में कमी	105,001,219 टन

नोट: कोयले एवं नाभिकीय ऊर्जा के औसत जीवन चक्र ग्रीन हाउस गैस उत्सर्जन क्रमश: 888 एवं 29 (टन/गीगावाट घंटा) है।

Public Awareness e-Newsletter

Kudankulam Nuclear Power Project

December 2025 Issue –162

In this issue:

Snap shot

A glimpse of **Ibis** near Anuvijay Township, Chettikulam.

Photography by
Shri Sunil V P
Chief Superintendent
KKNPP 1&2

Scientific classification	
Kingdom:	Animalia
Phylum:	Chordata
Class:	Aves
Order:	Pelecaniformes
Family:	Threskiornithidae
Genus:	Threskiornis
Species:	T. melanocephalus
Binomial name:	
Threskiornis melanocephalus	

Source: en.wikipedia.org

Dear Readers,

In a significant move for India's nuclear energy landscape, the Lok Sabha passed the SHANTI Atomic Energy Bill in December 2025. The legislation aims to strengthen the country's atomic energy framework, with a focus on safety, innovation, and long-term energy security, marking an important step in India's clean and strategic power ambitions.

Read on happily!

-Chairman, PA Committee

Spotlight of December 2025

1. 44 on-site & 02 Off-site outreach programme organised
2. 1,536 hours of Public Outreach, reached 1,782 people
3. 9,865 PA Publications distributed

KKNPP 's contribution to climate change mitigation

Climate change is the foremost global environmental issue today. Nuclear power is one of the low carbon technologies that can contribute to reducing greenhouse gas (GHG) emissions (mostly CO_2) while generating electricity for growing populations and socioeconomic development. KKNPP's contribution in preventing the CO_2 emissions till now (**As on Dec 31, 2025**) is given below.

No.of units of electricity generated	122,237 Million Units
Total CO_2 emissions avoided by KKNPP	105,001,219 Tonnes

Note: Average lifecycle GHG emissions for Coal & Nuclear is 888 & 29 (tonnes/GWh) respectively.

Russia ready to provide uninterrupted fuel shipments to India

"Bilateral trade has reached around USD 65 billion annually, and our goal is to increase this volume to USD 100 billion. We note good progress in the construction of the Kudankulam Nuclear Power Plant, and once it reaches full capacity, we believe that the development of small modular reactors and floating nuclear power plants could also be relevant, along with the use of nuclear technologies for non-energy purposes, including healthcare, agriculture and other sectors."

Vladimir Putin
Владимир Путин
President of Russia

Source: www.world-nuclear-news.org dated 08 Dec 2025, Wikipedia

NPCIL Mission:

To develop nuclear power technology and to produce Nuclear Power as a safe, environmentally benign and economically viable source of electrical energy to meet the increasing needs of country.

SHANTI Bill framework on liability finally aligns India with CSC and international practice

"Private sector entry into nuclear power is an imperative, not a choice. In the SHANTI BILL 2025, the three key controls – SAFETY, SECURITY AND SAFEGUARDS lie with the Central Government and not with the Operator whether it is PSU or Private."

Dr. Arun Kumar Nayak
Head, Nuclear Control and Planning Wing, DAE

Source: economictimes.indiatimes.comdated 23 Dec 2025

Electricity and Energy Storage

(Source: World Nuclear Association)

- Electricity storage on a large scale has become a major focus of attention as intermittent renewable energy has become more prevalent.
- Pumped storage is well established. Other megawatt-scale technologies are being developed. These can provide dispatchable capacity as required by demand.
- The storage to complement intermittent renewables if they are to replace base-load capacity must be able to meet demand over many days, not simply hours.
- At household level, behind the meter, battery storage is being promoted to complement solar PV installation. It reduces demand on the grid during evening peaks especially.

The rapid increase in many parts of the world of generating capacity by intermittent renewable energy sources, notably wind and solar, has led to a strong incentive to develop energy storage for electricity on a large scale. Due to the (desired or imposed) growing annual share of electrical energy originating from renewable technologies subject to naturally-fluctuating power flows (like solar PV and wind), characterised by relatively low load factors, the combined installed capacities of those technologies in the future are expected to be much larger than typical/conventional electrical peak power demand.*

•"The regrettable habit in some circles to blindly use the word 'power' as a synonym of 'electricity' must be avoided in the context of storage. 'Power' is charged into or discharged from a storage device, but it is 'energy' that is stored." – Projected Costs of Generating Electricity 2020, International Energy Agency & Nuclear Energy Agency.

•The extent to which electricity storage can be developed will determine the extent to which those intermittent renewable sources can displace dispatchable sources, taking surplus power on occasions and bridging intermittency gaps. There are questions of scale – power and energy capacity – which are indicated below in particular cases. Also some stored energy usually needs to be available as electricity over days and weeks, though there is plenty of scope for short-term storage over minutes and hours. Cost-effectiveness is key so both value and cost must be clearly determined to compare different electrical storage technologies in a variety of applications and services.

To be continued in Jan 2026

OPERATIONAL REACTORS

Country	MWe #	No. of Reactors
ARGENTINA	1641	3
ARMENIA	416	1
BELARUS	2220	2
BELGIUM	2056	2
BRAZIL	1884	2
BULGARIA	2006	2
CANADA	12714	17
CHINA	56446	58
CZECH REP	3963	6
FINLAND	4369	5
FRANCE	63000	57
HUNGARY	1916	4
INDIA	7550	21
IRAN	915	1
JAPAN	12631	14
KOREA	25609	26
MEXICO	1552	2
NETHERLANDS	482	1
PAKISTAN	3262	6
ROMANIA	1300	2
RUSSIA	26802	36
SLOVAKIA	2308	5
SLOVENIA	688	1
SOUTH AFRICA	1854	2
SPAIN	7123	7
SWEDEN	7008	6
SWITZERLAND	2973	4
UKRAINE	13107	15
UAE	5348	4
UK	5883	9
USA	96952	94
Total	**375980**	**415**

 # Net Electrical Capacity

Source: https://pris.iaea.org/PRIS
www.nucnet.org

Nuclear Database

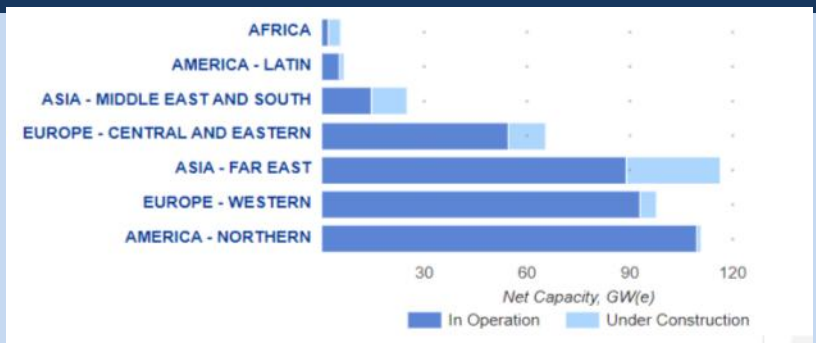
Updated as on Jan 17, 2026

Source: https://pris.iaea.org/PRIS

Current Status:

NUCLEAR POWER REACTORS IN OPERATION	415
TOTAL NET INSTALLED CAPACITY	375 980 MWe
NUCLEAR POWER REACTORS UNDER CONSTRUCTION	63
REACTOR-YEARS OF OPERATION	20 550

Regional Distribution of Nuclear Power Plants:



New connections to the grid: (Year 2025)

RAJASTHAN-7 (700 MW(e) *, PHWR, INDIA) on 17 March 2025

- ❖ Construction Start Date : 18 Jul, 2011
- ❖ First Criticality : 19 Sep 2024
- ❖ Gird Connection : 17 Mar 2025

ZHANGZHOU-2 (1126 MW(e), PWR, CHINA) on 22 November

- ❖ Construction Start Date : 04 Sep, 2020
- ❖ First Criticality : 03 Nov 2025
- ❖ Gird Connection : 22 Nov 2025

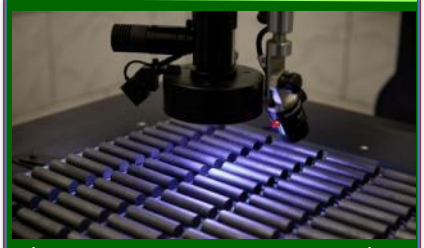
* Gross Electrical Capacity

India's Lok Sabha passes SHANTI atomic energy bill Dec 18

The lower house of India's parliament has passed the bill proposing a new legal framework for India's nuclear sector - including clearing the way for private sector participation - and discussions have begun in the upper house. The Sustainable Harnessing and Advancement of Nuclear Energy for Transforming India Bill, 2025 - or SHANTI, for short - was tabled before the Lok Sabha on 15 December and approved by the lower house on 17 December. The bill has now been presented to the upper house, the Rajya Sabha, by Minister of State Jitendra Singh, who described it as "landmark legislation" for India.

Source: www.world-nuclear-news.org

Rosatom reports successful tests of HTGR fuel in extreme conditions Dec22



The Russian state nuclear corporation says that tests have been successfully completed on fuel samples for high-temperature gas-cooled reactors under extreme conditions. "Using specially designed irradiation devices, the pre-irradiated fuel compacts successfully passed tests for over 500 hours at a temperature of 1,600°C. Furthermore, HTGR fuel samples with a burnup of 8% h.a. were tested under even more extreme conditions: the fuel compacts were irradiated at a temperature of approximately 1,700°C for over 380 hours," Rosatom said.

Source: www.world-nuclear-news.org

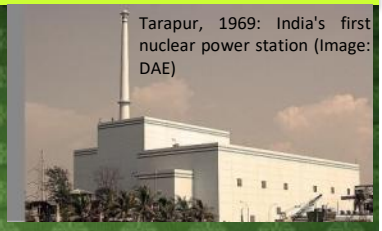
Nuclear News

First nuclear fuel delivered for Kudankulam unit 3 Dec 05

The first delivery has taken place of nuclear fuel for the initial loading of Kudankulam nuclear power plant's unit 3 in India. The fuel assemblies, manufactured in Russia at the Novosibirsk Chemical Concentrates Plant, for the VVER-1000 reactor, were flown by cargo plane. In total seven flights will be required to deliver the full reactor core and reserve fuel. When it is launched, the unit will be the first VVER-1000 power unit to start with an 18-month fuel cycle. The first two units at the plant have been supplied with the advanced TVS-2M nuclear fuel since 2022, enabling their operating cycle to increase from 12 to 18 months. TVEL, which is Russian state nuclear corporation Rosatom's fuel division, said the TVS-2M fuel "ensures more reliable and cost-effective operation of the power units due to its rigid structure, a next-generation anti-debris filter, and a higher uranium mass". The fuel was delivered under a contract signed in 2024 which covers the fuel supply for units 3 and 4 for the entire operating life of the units.

Source: www.world-nuclear-news.org

Maharashtra and Andhra Pradesh proposed for first Indian SMRs Dec 10


Tarapur, 1969: India's first nuclear power station (Image: DAE)

Lead units for three small modular reactor designs being developed by India's Bhaba Atomic Research Centre will be built at Tarapur in Maharashtra and the Vizag campus in Andhra Pradesh. Information on India's small modular reactor (SMR) plans has been given in several written answers from Minister of State Sh Jitendra Singh to both houses of the Indian parliament at the start of its winter session.The Tarapur Atomic Power Station site in Maharashtra is proposed for construction of the lead BSMR-200 unit. The SMR-55 lead unit is also proposed to be constructed at Tarapur. The 5 MWt high-temperature gas-cooled reactor - which is intended to be coupled with a chemical process for hydrogen production - is proposed for construction at BARC's Vizag R&D campus in Andhra Pradesh. "In respect of Bharat Small Reactors for captive use by industries, NPCIL floated a Request for Proposal (RFP) on December 31, 2024 in line with the business model approved by the Government," Mr Singh said in a written answer to the Lok Sabha published on 3 December.

Source: *www.world-nuclear-news.org*

Japan takes final step to restart world's largest NPP Dec 22

Japan has taken a final step to allow restarting the world's largest nuclear power plant with a regional vote today. The decision marks a major moment in Japan's return to nuclear energy, nearly 15 years after the Fukushima disaster. The Kashiwazaki-Kariwa plant was one of 54 reactors shut down after the 2011 earthquake and tsunami. Since then, Japan has restarted 14 of the 33 reactors that remain operable. The government aims to reduce its reliance on imported fossil fuels. Niigata Prefecture's assembly passed a vote of confidence in Governor Hideyo Hanazumi. He endorsed the restart last month. The vote effectively allows the plant to resume operations.

Source: www.newsonair.gov.in

QUICK FACTS

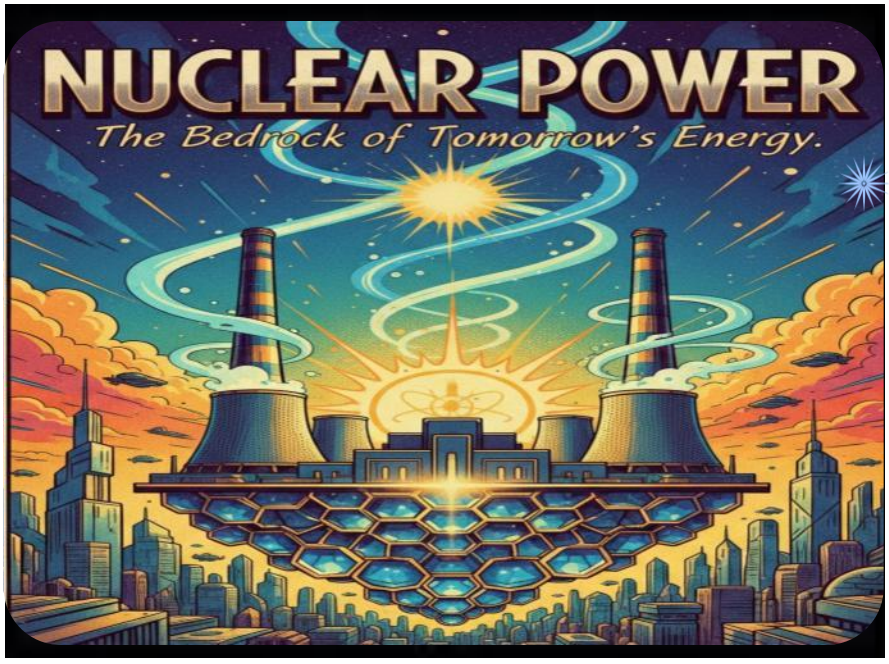
Atomic Juncture

The SHANTI Act, 2025 marks a major shift in India's nuclear policy by allowing private and foreign participation (up to 49% FDI) in the nuclear sector. It repeals earlier nuclear laws and aims to boost clean energy, targeting 100 GW nuclear capacity by 2047.

This has already led to agreements by NTPC with firms such as Rosatom, EDF, and Clean Core Thorium Energy.

Source: www.downtoearth.org.in

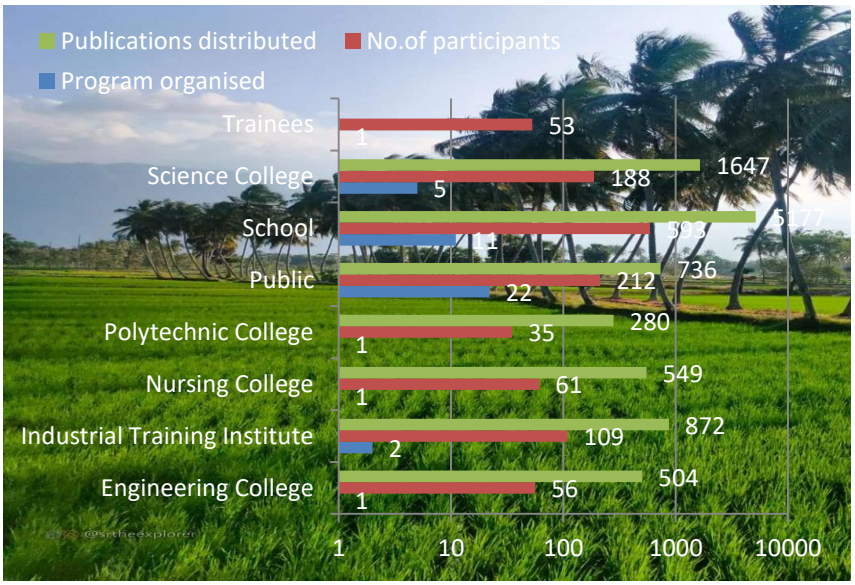
Nuclear Slogan



PA activity conducted at KKNPP Site

At site

As a part of public awareness programme, visits of Public from districts such as Tirunelveli, Kanyakumari and Tuticorin and also from Kerala to KKNPP were organised. The visitors of KKNPP were provided with a detailed information on nuclear power generation and its safety principles.



Few glimpses from Site Visit

At site

Govt.HSS Thirupuram, Thiruvananthapuram (Dec 01)

St.Mary's Matriculation Higher Secondary School, Kanyakumari (Dec 02)

Group of Students from Various Government Schools, Tirunelveli District (Dec 03)

K.R.Govt.Hr.Sec.School, Reddiarpatti (Dec 04)

Few glimpses from Site Visit

At site

Paramedical Staff around KKNPP Site, Anuvijay Township (Dec 04)

Government Higher Secondary School, Karungulam (Dec 05)

Maria Arts and Science College for women, Vallioor (Dec 06)

KSEB Engineers Association (Kottayam Unit), Thiruvananthapuram (Dec 08)

Few glimpses from Site Visit

At site

Narayanapillai Memorial Vidya Kendra CBSE Senior Secondary School, Kanyakumari (Dec 09)

Atomic Energy Central School, Kudankulam (Dec 10)

SMRV Government ITI (Women) , Nagercoil (Dec 11)

Christ College (Autonomous), Thrissur (Dec 12)

Few glimpses from Site Visit

At site

Lekshmipuram College of Arts & Science, Lekshmipuram (Dec 15)

SMRV Government ITI (Women), Nagercoil (Dec 16)

Aladi Aruna College of Nursing, Alangulam (Dec 17)

Sri Vasavi College, Erode (Dec 18)

Few glimpses from Site Visit

At site

HQ Official, Mumbai
(Dec 18)

Site Director with family,
KKNPP,
(Dec 18)

Sankar Polytechnic College
Sankar Nagar
(Dec 19)

University College,
Thiruvananthapuram
(Dec 20)

Few glimpses from Site Visit

At site

Sona College of Arts & Science, Salem (Dec 22)

Inplant Trainees, Kudankulam (Dec 23)

RVS Technical Campus Coimbatore , Coimbatore (Dec 23)

Retired employee with family, Anuvijay Township (Dec 26)

Few glimpses from Site Visit

At site

Karidha Public School, Kovilpatti (Dec 26)

Members from CSI Parasuvaikal, Thiruvananthapuram (Dec 27)

Baliah Marthandam Hr.Sec.School, Avaraikulam (Dec 29)

Family members of KKNPP Official, Anuvijay Township (Dec 30)

Nuclear Terminology

More on SHANTI

"By introducing the Bill, the government has signalled its intent to modernize nuclear governance in line with India's energy transition, technological progress and international obligations".

"The proposed legislation seeks to balance expansion of nuclear energy with safety, accountability and public interest, placing nuclear power within the broader national effort towards energy security and a lower-carbon future.".

The SHANTI Bill 2025 is a major policy and legal reform that transforms India's nuclear energy landscape by:

- ❖ Ending exclusive government control in the civil nuclear sector.
- ❖ Allowing private companies and foreign investors to participate. The Times of India
- ❖ Updating liability and regulatory frameworks for safer and clearer nuclear operations.
- ❖ Boosting India's clean energy capacity and investment potential while safeguarding safety and strategic interests.

Lexicon

SHANTI

The **SHANTI** Bill stands for **S**ustainable **H**arnessing and **A**dvancement of Nuclear Energy for **T**ransforming **I**ndia Bill, 2025. It is a new legislative reform introduced by the Government of India in Parliament on December 15, 2025 to modernize and transform the nation's nuclear energy sector. It represents the most significant overhaul of India's nuclear energy laws in over six decades.

It seeks to repeal the Atomic Energy Act, 1962 and the Civil Liability for Nuclear Damage (CLND) Act, 2010, creating a unified framework to modernize the sector and align it with global standards.

Key Features of the SHANTI Bill

- Private Sector Participation
- New Legal & Regulatory Framework
- Reformed Liability & Insurance Rules
- Foreign Investment and Technology Partnerships
- Support for Advanced Technologies

Objectives and Significance:

1. Energy Security & Clean Growth

Nuclear energy provides **reliable 24/7 power** with low carbon emissions — critical for India's growing energy needs and climate goals.

2. Ambitious Capacity Goals

The government aims to expand India's nuclear power capacity from around **8–9 GW today to 100 GW by 2047** — nearly ten times higher — to complement renewables and support industrial growth.

3. Economic & Investment Boost

By opening the sector to private and foreign investment, the bill seeks to mobilise **capital, innovation, and technology partnerships** that can accelerate infrastructure development.

4. Safety and Strategic Concerns

While enabling private participation, the bill retains **government control over strategic areas** such as nuclear fuel production, mining, and radioactive waste handling to protect national security and safety.

Source: https://world-nuclear-news.org/, https://timesofindia.indiatimes.com, Aaj tak, www.business-standard.com

See left

As a part of PA outreach activity, Seminars, Workshop, Lectures and exhibitions were conducted at Educational Institutions and Organizations.

PA outreach programme conducted outside KKNPP:

Outside KKNPP

Date	Name of the Institution	No. of participants	Publications distributed
Nov 07	TDMNS College, Kallikulam	250	0
Nov 22	Mary Matha College of Arts & Science	225	100
	Grand Total	**475**	**100**

Few glimpses

PA Lecture at TDMNS College,Kallikulam Tirunelveli Dist.

Sh Sundara Rajan P, Scientific Officer-F, ESL, KKNPP delivered a Technical Talk on “Innovation and Integration Across Science, Commerce And Languages” during the National level conference held at TDMNS College, Kallikulam Tirunelveli Dist.

Date: Dec 19 2025

A total of 250 students participated in the conference.

PA Lecture at TDMNS College, Kallikulam Tirunelveli Dist. on Nov 07, 2025

PA Lecture at Mary Matha College of Arts & Science, Theni

Department of Chemistry, Mary Matha College of Arts & Science, Theni organized a Special Lecture programme on “The Necessity of Nuclear Power Plants for Sustainable development of India“.

Date: Dec 19 2025

Sh A V SATHISH, Olc-Nuclear Information center, KKNPP participated and delivered lecture to the students during the function. A total of 225 students participated in the event.

PA Lecture at Mary Matha College of Arts & Science, Theni ,Nov 07, 2025

Did you know?

Nuclear Energy Highlights (DAE Year End Review 2025)

- **Record nuclear power generation:** NPCIL achieved its highest-ever electricity generation of 56,681 million units (MUs) in FY 2024–25, avoiding about 49 million tonnes of CO_2 emissions.
- **New nuclear projects:** The Prime Minister laid the foundation stone for the 4 × 700 MW Mahi Banswara Nuclear Power Project in Rajasthan, to be implemented by the NPCIL–NTPC joint venture (ASHVINI).
- **RAPP-7 (700MW)** started commercial operation in April 2025.
- **Kakrapar Units 3 & 4 (700 MW each)** received AERB licence for regular operation.
- **Capacity expansion:** Approval granted for pre-project activities of 10 additional 700 MW PHWR units, beyond the 22.5 GW nuclear capacity planned by 2032.
- **Operational excellence:** Continuous operation exceeding one year achieved 53 times, with notable records at TAPS-3 and KKNPP-2.
- Overall, 2025 marked a milestone year for India's nuclear energy programme, with record generation, new reactor commissioning, and clear momentum toward long-term capacity expansion.

Source: www.pib.gov.in dated 10 Dec 2025

Feature article

Nuclear Energy and Sustainable Development

Source: World Nuclear Association

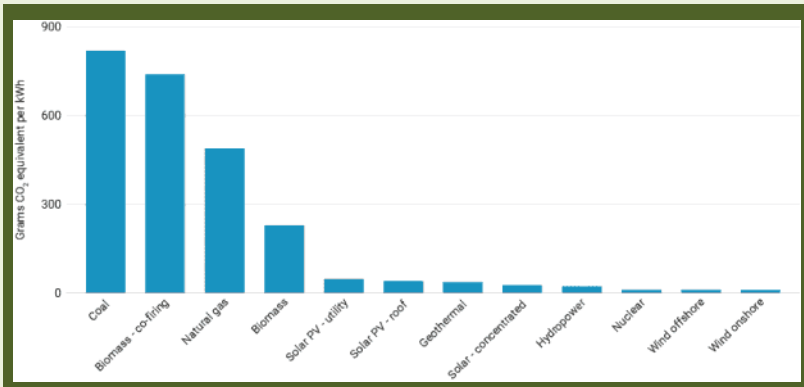
The environmental pillar

The environmental pillar of sustainable development encompasses issues including air and water pollution, waste management, ecosystem management, and protection of natural resources, wildlife and endangered species.

Climate change :

The United Nations recognizes climate change as "the most systemic threat to humankind". As such, addressing it is generally considered the most significant and urgent sustainability challenge. Climate change is resulting from increasing concentrations of CO2 in the Earth's atmosphere. Given that three-quarters of anthropogenic CO2 emissions result from the burning of fossil fuels for energy, the main focus should be on deploying energy technologies that emit only small amounts of CO2 per unit of energy.

On a life-cycle basis, nuclear power emits just a few grams of CO2 equivalent per kWh of electricity produced. A median value of 12g CO2 equivalent/kWh has been estimated for nuclear – similar to wind, and lower than all types of solar.



Average life-cycle CO_2 equivalent emissions (source: IPCC)

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Nuclear Trivia

Trivia

"Which nuclear reactor is nicknamed a 'nuclear battery'—and why?"

Scientists call LFRs (Lead-cooled Fast Reactors) a "nuclear battery" because their design and operating philosophy resemble how a battery quietly stores and delivers energy over long periods with minimal intervention. The term is informal but captures several key features:

1. Long-life, sealed core
Many LFR concepts are designed to operate 10–30 years without refuelling. Once loaded, the reactor runs continuously, much like a battery that provides power until its charge is exhausted.

2. High fuel utilization (fast spectrum)
LFRs use a fast neutron spectrum, which allows:
•Better use of uranium fuel
•Potential burning of plutonium and minor actinides
This is analogous to a battery extracting more usable energy from the same material.

3. Passive, low-maintenance operation
•Lead coolant operates at atmospheric pressure
•Very high boiling point (~1740 °C)
•Strong passive safety (decay heat removal without active systems)
This makes LFRs suitable for remote or off-grid locations, similar to how batteries are valued for reliability and autonomy.

4. Steady, predictable power output
Like a battery delivering constant voltage, LFRs are designed for stable, baseload power rather than frequent load-following, especially in small or modular designs.

See left

5. Compact and modular concepts
Some LFR designs (especially small or microreactors) are:
•Factory-built
•Transportable
•Installed and operated as a single unit
This "install-and-run" model reinforces the battery analogy.

6. Energy-dense and long duration
Compared with chemical batteries:
•Nuclear fuel stores millions of times more energy per kg
•LFRs can supply power for decades, far exceeding even long-duration energy storage systems

LFRs earn this nickname because they are designed to run for 10–30 years without refueling, much like a battery that steadily delivers energy until it is replaced.

Source: Wikipedia , WNA, www.gen-4.org