जन जागरूकता ई-संवाद पत्र

कुडनकुलम न्यूक्लियर पॉवर प्रोजेक्ट



अक्टूबर 2026

अंक – 172

इस अंक में:

- नाभिकीय नारे
- तकनीकी सत्र
- नाभिकीय आंकड़ा
- नाभिकीय समाचार
- शब्द कोश
- आपको मालूम है?
- विशेष आलेख
- नाभिकीय सामान्य ज्ञान

तैयारकर्ता एवं संपादक:

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टीएलडी प्रयोगशाला
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संजीव भारद्वाज ,
प्रशिक्षण अधीक्षक एवं अध्यक्ष,
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जारीकर्ता:

अशोक भाटिया,
स्थल निदेशक,
कुडनकुलम न्यूक्लियर पॉवर प्रोजेक्ट

प्रिय पाठकगण ,

अक्टूबर 2026 में भारत के नाभिकीय ऊर्जा क्षेत्र में महत्वपूर्ण प्रगति दर्ज की गई है । रशिया के रोसएटम ने 2047 तक हमारे 100 गीगावाट के लक्ष्य में तेजी लाने के लिए शांति अधिनियम, 2025 के तहत प्रमुख भारतीय सार्वजनिक और निजी बिजली उत्पादकों के साथ विचार-विमर्श शुरू की। स्वदेशी विस्तार को आगे बढ़ाते हुए, एनपीसीआईएल ने गुजरात में संभावित रिएक्टर स्थलों की पहचान करने के लिए जीएसईसीएल के साथ एक समझौता ज्ञापन पर हस्ताक्षर किए, साथ ही काकरापार इकाइयों 5व6 के लिए तकनीकी अध्ययन शुरू किया।

प्रौद्योगिकी विस्तार को चिह्नित करते हुए, एनपीसीआईएल एवं बीएआरसी ने स्वदेशी एसएमआर-55 रिएक्टर के लिए विस्तृत परियोजना रिपोर्ट जारी की, जबकि एनएफसी ने स्वदेशी रूप से उत्पादित वाष्प जनित्र ट्यूबों का अपना 12वां सेट पूरा किया।

जानकार बनें, जागरूक रहें।

अध्यक्ष, जन जागरूकता समिति

अक्टूबर 2026 के विशिष्ट बिंदु

1. **केकेएनपीपी स्थल पर 29 और स्थल के बाहर 01 जन संपर्क कार्यक्रम आयोजित किए गए**
2. **1332 घंटों का जन संपर्क, 1,783 लोगों से संपर्क**
3. **10,355 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 अक्टूबर 2026** को) अब तक इस प्रकार है।

कुल उत्पादित विद्युत इकाई	**136,080 मिलियन यूनिट**
केकेएनपीपी द्वारा कुल CO_2 उत्सर्जन में कमी	**116,892,978 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

October 2026 Issue –172

In this issue:

- Nuclear Slogan
- Technical session
- Nuclear Database
- Nuclear News
- Lexicon
- Did you know?
- Feature article
- Nuclear Trivia

Dear Readers,

October 2026 recorded significant strides in India's nuclear energy vision. Russia's Rosatom initiated discussions with leading Indian public and private power majors under the SHANTI Act, 2025, to accelerate our 100 GW target by 2047. Advancing domestic expansion, NPCIL signed an MoU with GSECL to identify potential reactor sites in Gujarat, alongside initiating technical studies for Kakrapar Units 5 & 6.

Marking technological independence, NPCIL and BARC released the Detailed Project Report for the indigenous SMR-55 reactor, while NFC completed its 12th set of domestically produced steam generator tubes. Stay Informed, Stay Aware.

-Chairman, PA Committee

Spotlight of October 2026

1. **29 on-site & 01 Off-site outreach programme organised**
2. **1,332 hours of Public Outreach, reached 1,783 people**
3. **10,355 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 Oct 31, 2026**) is given below.

No.of units of electricity generated	**136,080 Million Units**
Total CO_2 emissions avoided by KKNPP	**116,892,978 Tonnes**

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

India's Nuclear Programme Dedicated to Peaceful Purposes

"India's nuclear programme is dedicated to peaceful purposes and not warfare, reaffirming the vision that has guided the country's nuclear journey since its inception. nuclear energy would play an increasingly important role in meeting India's future energy requirements, including the growing demand for reliable electricity to support Artificial Intelligence (AI) and data centres. With the country targeting 100 GW of nuclear power capacity by 2047 and Net Zero emissions by 2070, nuclear energy is expected to complement other sources of power by providing a continuous and reliable supply of clean electricity."



Dr Jitendra Singh
Union Minister of State (Independent Charge) Science & Technology

Source: Excerpts from Speech at 'Bloomberg Economy Forum 2026' dated 20 Oct2026, www.pib.gov.in

Snap shot



A glimpse of a **Asian stonechat** spotted near Anuvijay Township, Chettikulam

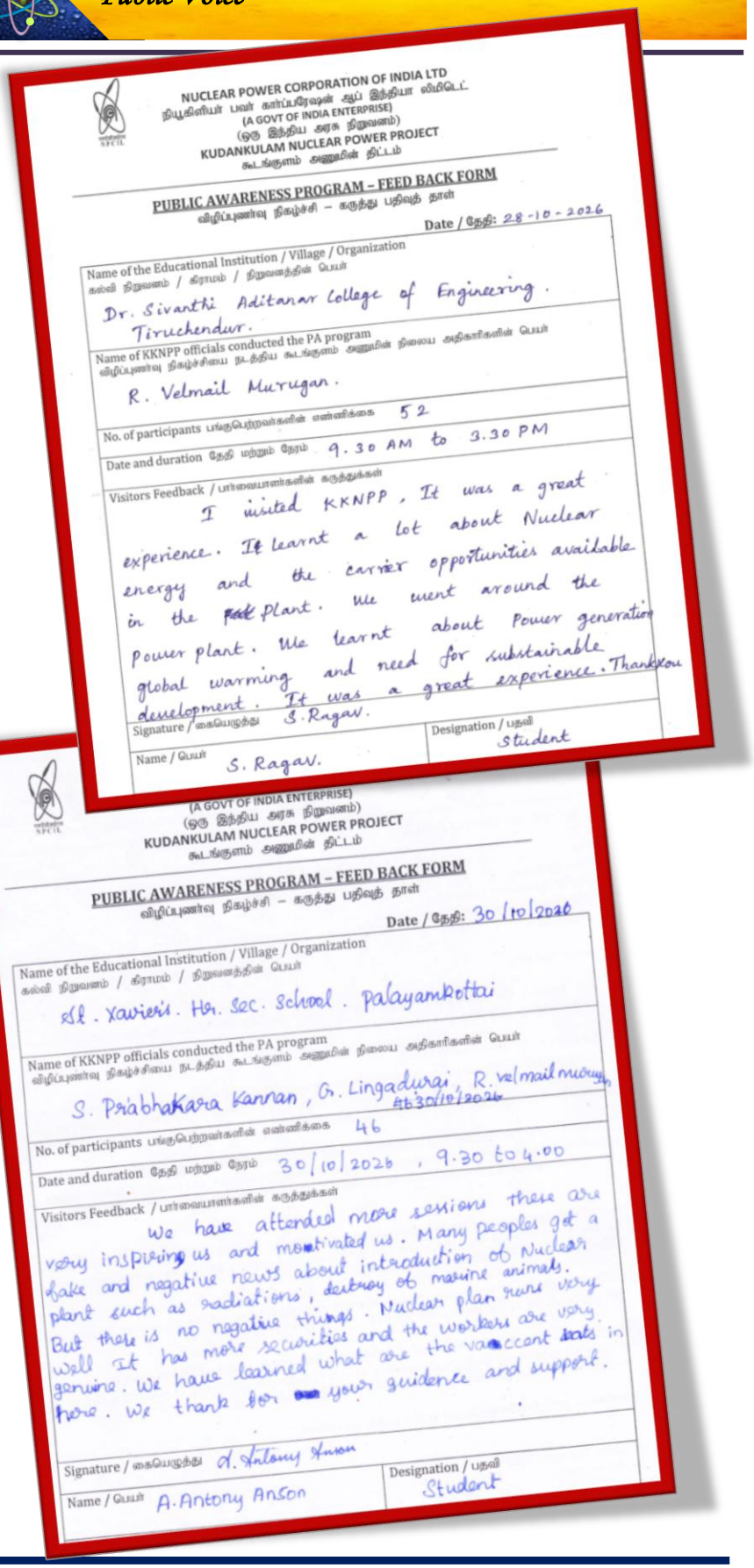
Photo Credit:
Sh Rathina Pandi
Senior Technician/H
MMU, KKNPP

Scientific classification	
Kingdom:	Animalia
Phylum:	Chordata
Class:	Aves
Order:	Passeriformes
Family:	Muscicapidae
Genus:	Saxicola
Species:	S. maurus
Binomial name:	
Saxicola maurus	

Source: en.wikipedia.org

Public awareness Site visits:

Site visit commences with a visit to Nuclear Information Centre(NIC) and a structured lecture programme is conducted for about one hour on nuclear energy & safety features of KKNPP with relevance to the events at Fukushima and also addresses the queries mainly related to protection of marine organism and handling of waste. They are then taken to Model room for familiarization of site layout, simulator facility to visualize the functioning of safety systems and health physics training facility to understand the concept of radiation safety during normal operation & abnormal situation. Subsequently they are taken to the Intake structure and Desalination plant. This programme concludes with a feedback session. Two of the feedback received from the visitors are given in this section.



NUCLEAR POWER CORPORATION OF INDIA LTD
நியூகிளியர் பவர் கார்ப்பரேஷன் ஆப் இந்தியா லிமிடெட்
(A GOVT OF INDIA ENTERPRISE)
(ஒரு இந்திய அரசு நிறுவனம்)
KUDANKULAM NUCLEAR POWER PROJECT
கூடங்குளம் அணுமின் திட்டம்

PUBLIC AWARENESS PROGRAM – FEED BACK FORM
விழிப்புணர்வு நிகழ்ச்சி – கருத்து பதிவுத் தாள்

Date / தேதி: 28-10-2026

Name of the Educational Institution / Village / Organization
கல்வி நிறுவனம் / கிராமம் / நிறுவனத்தின் பெயர்
Dr. Sivanthi Aditanar College of Engineering. Tiruchendur.

Name of KKNPP officials conducted the PA program
விழிப்புணர்வு நிகழ்ச்சியை நடத்திய கூடங்குளம் அணுமின் நிலைய அதிகாரிகளின் பெயர்
R. Velmail Murugan.

No. of participants பங்குபெற்றவர்களின் எண்ணிக்கை 52

Date and duration தேதி மற்றும் நேரம் 9.30 AM to 3.30 PM

Visitors Feedback / பார்வையாளர்களின் கருத்துக்கள்
I visited KKNPP, It was a great experience. It learnt a lot about Nuclear energy and the carrier opportunities available in the ~~feet~~ Plant. We went around the power plant. We learnt about Power generation global warming and need for substainable development. It was a great experience. Thankyou

Signature / கையெழுத்து S.Ragav.

Name / பெயர் S. Ragav.

Designation / பதவி Student

NUCLEAR POWER CORPORATION OF INDIA LTD
(A GOVT OF INDIA ENTERPRISE)
(ஒரு இந்திய அரசு நிறுவனம்)
KUDANKULAM NUCLEAR POWER PROJECT
கூடங்குளம் அணுமின் திட்டம்

PUBLIC AWARENESS PROGRAM – FEED BACK FORM
விழிப்புணர்வு நிகழ்ச்சி – கருத்து பதிவுத் தாள்

Date / தேதி: 30/10/2026

Name of the Educational Institution / Village / Organization
கல்வி நிறுவனம் / கிராமம் / நிறுவனத்தின் பெயர்
St. Xavier's Hr. Sec. School. Palayamkottai

Name of KKNPP officials conducted the PA program
விழிப்புணர்வு நிகழ்ச்சியை நடத்திய கூடங்குளம் அணுமின் நிலைய அதிகாரிகளின் பெயர்
S. Prabhakara Kannan, G. Lingadurai, R. Velmail murugan
30/10/2026

No. of participants பங்குபெற்றவர்களின் எண்ணிக்கை 46

Date and duration தேதி மற்றும் நேரம் 30/10/2026, 9.30 to 4.00

Visitors Feedback / பார்வையாளர்களின் கருத்துக்கள்
We have attended more sessions these are very inspiring us and motivated us. Many peoples get a fake and negative news about introduction of Nuclear plant such as radiations, destroy of marine animals. But there is no negative things. Nuclear plan runs very well It has more securities and the workers are very genuine. We have learned what are the vaccant posts in here. We thank for your guidence and support.

Signature / கையெழுத்து A. Antony Anson

Name / பெயர் A. Antony Anson

Designation / பதவி Student



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.

Nuclear energy remains an evolving opportunity

"Technologies such as the Bharat Small Modular Reactor and other indigenous SMR concepts could eventually create new opportunities for reliable low-carbon electricity, industrial energy and potentially hydrogen production"



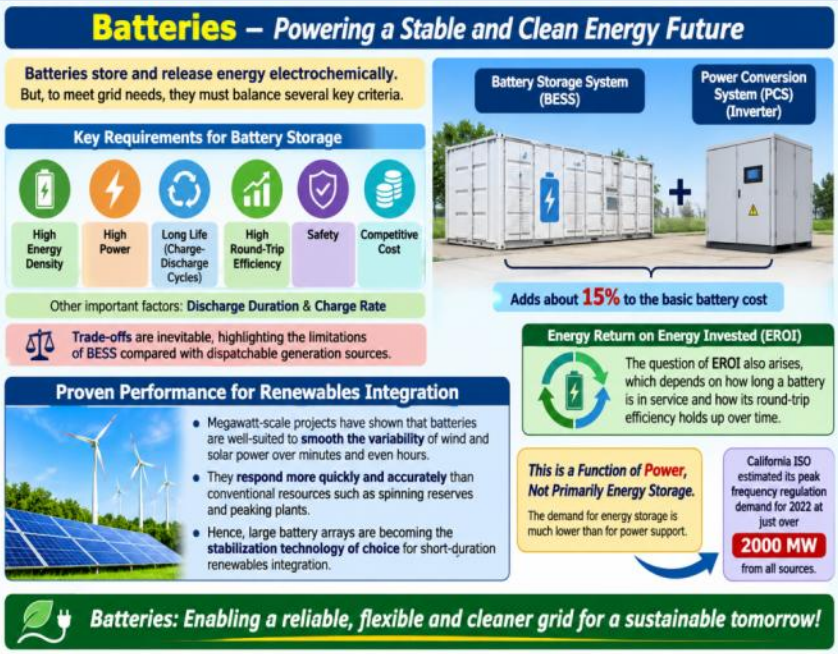
Sh Vineet Mittal
Founder and chairman
Avaada Group

Source: www.financialexpress.com dated 21 Oct 2026

Electricity and Energy Storage
(Source: World Nuclear Association)

Battery energy storage systems :

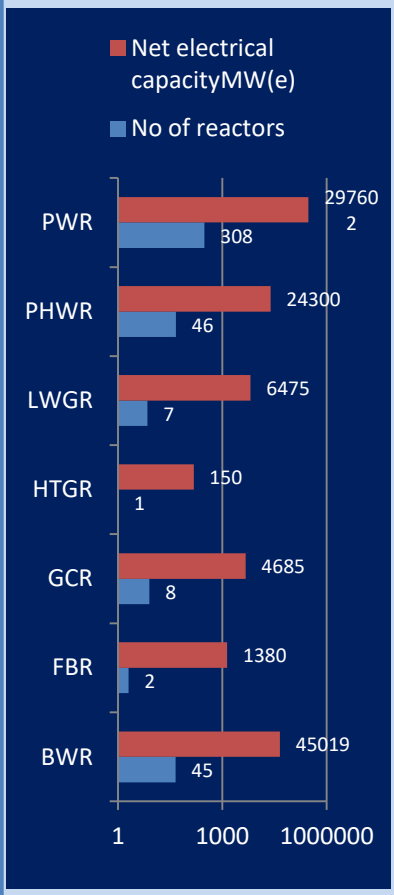
Batteries store and release energy electrochemically. The requirements for battery storage are high energy density, high power, long life (charge-discharge cycles), high round-trip efficiency, safety, and competitive cost. Other variables are discharge duration and charge rate. Various compromises are made among these criteria, underlining the limitations of battery energy storage systems (BESS) compared with dispatchable generation sources. The question of energy return on energy invested (EROI) also arises, which acutely relates to how long a battery is in service and how its round-trip efficiency holds up over that period.



Batteries require a power conversion system (PCS) including inverter to link into a normal AC system. This adds about 15% to the basic battery cost.

To be continued in Nov 2026

OPERATIONAL REACTORS



Type	Number of reactors	Net electrical capacity MW(e)
BWR	45	45019
FBR	2	1380
GCR	8	4685
HTGR	1	150
LWGR	7	6475
PHWR	46	24300
PWR	308	297602
Total	**417**	**379611**

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

Nuclear Database

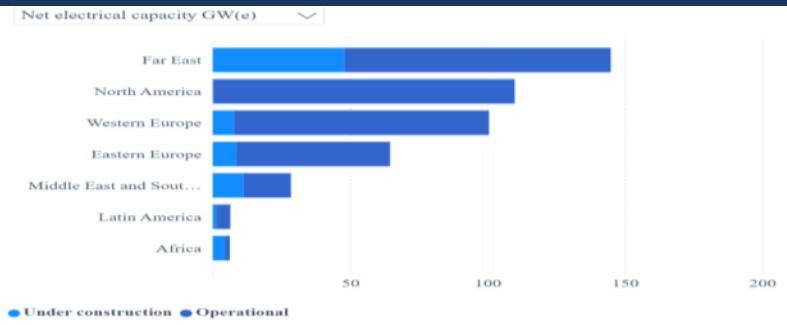
Updated as on Nov 04, 2026

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

Current Status:

NUCLEAR POWER REACTORS IN OPERATION	417
TOTAL NET INSTALLED CAPACITY	379 611 MWe
NUCLEAR POWER REACTORS UNDER CONSTRUCTION	78
REACTOR-YEARS OF OPERATION	20,959

Regional Distribution of Nuclear Power Plants:



New connections to the grid: (Year 2026)

Sl. No.	Reactor / Unit	Country	Reactor type	Grid connection date	Net capacity (MWe)
1	Taipingling-1	China	Hualong One (PWR)	13 Feb 2026	1,116
2	San'ao-1	China	Hualong One (PWR)	12 Mar 2026	1,208
3	Taipingling-2	China	Hualong One (PWR)	04 Jul 2026	1,116
4	Changjiang-3	China	Hualong One (PWR)	01 Aug 2026	1,100
5	Tianwan-7	China	VVER-1200 (PWR)	08 Oct 2026	1,100
6	Mochovce-4	Slovakia	VVER-440 (PWR)	15 Oct 2026	440
	Total	2 countries			6,080

Nuclear News

Multiple milestones for India's nuclear projects Oct 16



Technical studies have begun onsite for Kakrapar units 5 & 6, two 700 MWe reactors planned for construction in Gujarat; India's Nuclear Fuels Complex (NFC) is making steam generator (SG) tubes to support the fleet mode construction project; and India's small modular reactor project has reached a design milestone. NFC has marked the completion of its 12th set of SG tubes to support India's fleet-mode PHWR construction. Previously, these tubes were imported and now, NFC has emerged as a single Indian supplier of these critical tubes for indigenous nuclear applications," NFC said.

Source: www.world-nuclear-news.org

Floating nuclear power plant 'has boosted air quality' Oct 30



According to the operators of the Akademik Lomonosov floating nuclear power plant in Chukotka, on eastern Russia's Arctic coast (pictured above), "after transferring a significant portion of the city's heating load to the floating nuclear power plant, gross emissions of pollutants into the atmosphere decreased almost fivefold - from 11.64 to 2.281 tonnes". The Akademik Lomonosov began commercial operation in May 2020.

Source: world-nuclear-news.org/

Rosatom in talks with Adani Group, RIL, NTPC for nuclear power push in India Sep 29



Russia's state-owned nuclear energy corporation Rosatom is in talks with some of India's biggest corporate and government-owned power companies, including Adani Group, Reliance, Jindal and NTPC. The company seeks to explore participation In India's rapidly expanding nuclear power programme, Kirill Komarov, First Deputy Director General for Corporate Development and International Business at Rosatom, told businessline. The development follows India opening its nuclear power sector to wider private participation through the Sustainable Harnessing and Advancement of Nuclear Energy for Transforming India (SHANTI) Act, 2025, and seeks to increase nuclear capacity from the current 8.78 gigawatt (GW) to 100 GW by 2047.

Source: www.thehindubusinessline.com

NPCIL signs MoU for Gujarat nuclear power projects Oct 02



Nuclear Power Corporation of India Limited (NPCIL) and Gujarat State Electricity Corporation Limited have signed a memorandum of understanding to explore and identify suitable sites in India's Gujarat state for new nuclear power plant projects. In what it called "a significant step towards exploring new horizons for nuclear power development in Gujarat", Nuclear Power Corporation of India Limited (NPCIL) said the MoU would "facilitate collaboration between the two organisations for discussions, relevant information sharing, identification of potential sites and assessment of their technical suitability for nuclear power development". The initiative marks an important step in exploring Gujarat's potential to contribute to India's expanding nuclear energy programme and its long-term pursuit of reliable, clean and low-carbon electricity.

www.world-nuclear-news.org

NPCIL, BARC release DPR for indigenous 55 MW small modular reactor Oct 05



NPCIL and BARC have released the Detailed Project Report (DPR) for the SMR-55, an indigenous Small Modular Reactor (SMR) technology being jointly developed by the two organisations. The DPR was officially released on October 1, 2026, marking another development in India's programme to deploy indigenous small modular reactor technology. The SMR-55 is a compact Pressurised Water Reactor (PWR)-based nuclear power plant designed to provide safe, reliable and continuous low-carbon electricity. NPCIL and BARC said the technology is intended to support applications where reliable power supply is required across a range of locations and industrial uses. The envisaged applications include electrification of remote and off-grid locations, power supply for energy-intensive data centres, and captive power generation for heavy industrial applications.

Source: *https://powerpeakdigest.com*

QUICK FACTS

Uranium in seawater

❖**Massive Scale:** The world's oceans contain an estimated **4.5 billion tonnes of uranium**, which is roughly **1,000 times greater** than all known terrestrial land-based reserves.

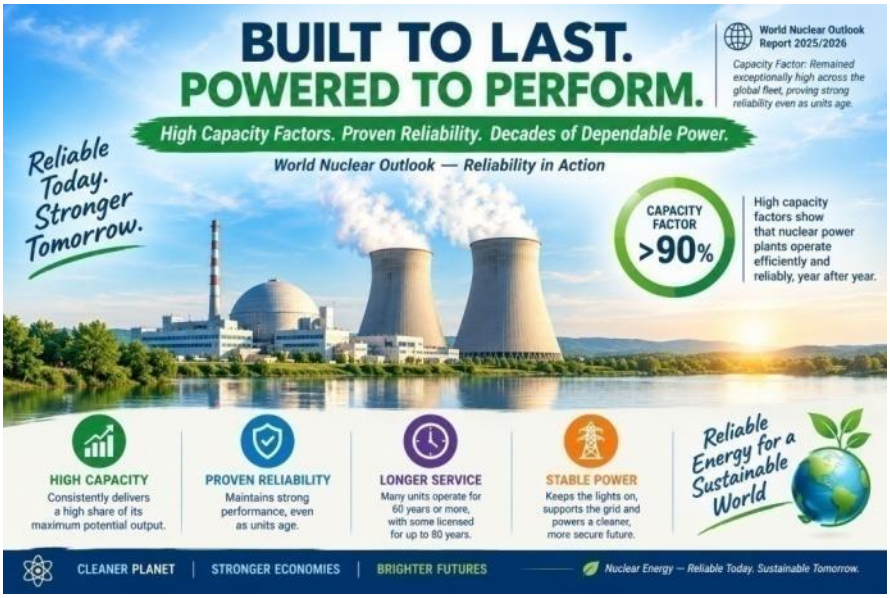


❖**Ultra-Low Concentration:** Uranium exists in seawater in extremely diluted forms—roughly **3 parts per billion (ppb)** (or about 3.3 milligrams per cubic meter).

❖**The Volume Challenge:** To yield just 1 kilogram of uranium, an operation must passively or actively process over **300 million liters** of seawater.

Source:https://bigthink.com/

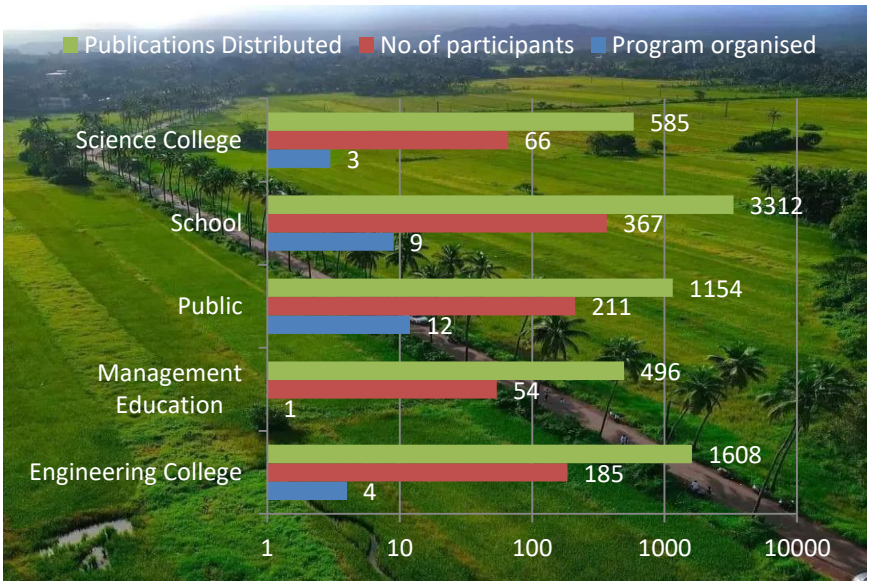
Nuclear Slogan



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

Amrita Vidyalayam Senior Secondary School , Kanyakumari (01 Oct)



St. Joseph's College (Autonomous), Tiruchirappalli (01 Oct)



Members from Coconut Producers and Eco Society Moonnilavu, Kerala (03 Oct)



Mar Ephraem College of Engineering & Technology, Kanyakumari (05 Oct)



Few glimpses from Site Visit

At site

K. L. N. College of Engineering (I Batch), Sivagangai (06 Oct)



Hebron Matriculation Hr. Sec. School (I Batch), Nagercoil (07 Oct)



Sree Devi Kumari Women's College, Kanyakumari (08 Oct)



Kings College of Engineering (Autonomous), Thanjavur (09 Oct)



Few glimpses from Site Visit

At site

Hebron Matriculation Hr. Sec. School (II Batch), Nagercoil (12 Oct)



PM SHRI Kendriya Vidyalaya, Vijayanarayanam (13 Oct)



K. L. N. College of Engineering (II Batch), Sivagangai (14 Oct)



Amrita Vidyalayam Senior Secondary School (IIIBatch), Kanyakumari (15 Oct)



Few glimpses from Site Visit

At site

Mannar Thirumalai Naicker College (Autonomous), Madurai
(16 Oct)



Members from DOS Retired Employees Association (DREA),Nagercoil
(21 Oct)



L. M. S. Higher Secondary School, Kanyakumari
(23 Oct)



Officials with family from Bar Association, Radhapuram
(24 Oct)



Few glimpses from Site Visit

At site

Zion International School, Nagercoil (26 Oct)



Hilleya Matric. Hr. Sec. School, Tirunelveli (27 Oct)



Dr. Sivanthi Aditanar College of Engineering, Tiruchendur (28 Oct)



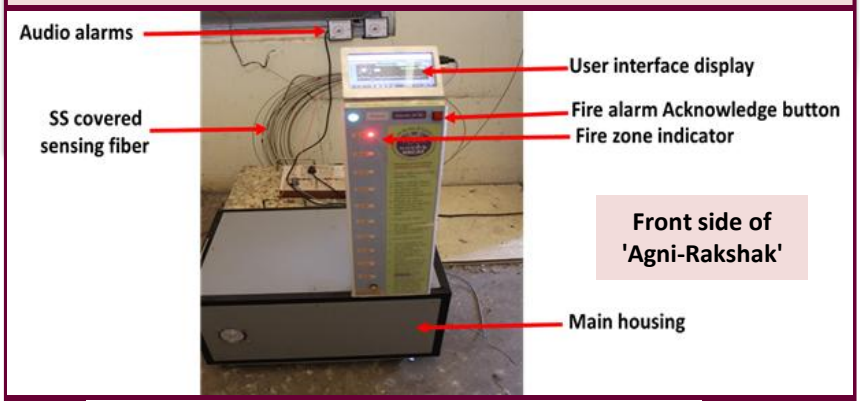
St. Xavier's Higher Secondary School, Palayamkottai (30 Oct)

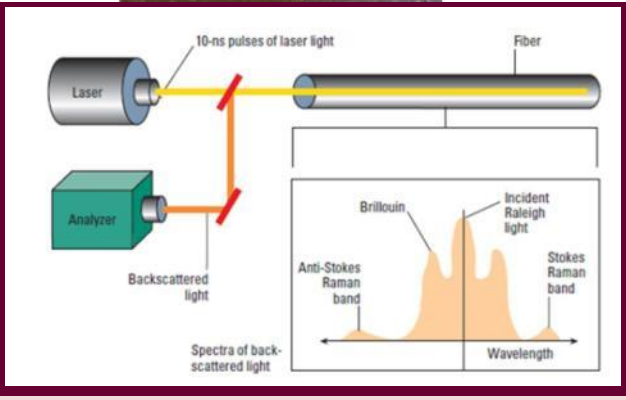


Lexicon

Agni Rakshak

Agni-Rakshak is a Raman optical fiber-based distributed temperature sensor (DTS) system developed by the **Raja Ramanna Centre for Advanced Technology (RRCAT)** that turns a single strand of optical fiber into an array of thousands of passive sensing elements to detect local heat anomalies and trigger early fire warnings. By utilizing a combination of Raman backscattering—analyzing the ratio between temperature-sensitive anti-Stokes and temperature-insensitive Stokes light signals—and Optical Time Domain Reflectometry (OTDR), the system pinpoint the precise location, width, and temperature profile of an emerging hazard.





How the System Works:

Laser Pulse Emission: A laser sends ultra-short pulses (e.g., 10-ns pulses) of light down the optical fiber.

Light Scattering: As the light travels through the fiber, it constantly interacts with the glass molecules. Most light passes through, but a tiny fraction is scattered back toward the source (Backscattered light). The intensity of the Stokes and anti-Stokes components of the scattered light varies with temperature.

Signal Analysis: A directional coupler or mirror guides this backscattered light into an Analyzer, which measures the intensity and wavelength shifts of the returning signals. By measuring the time the system can pinpoint the exact location and magnitude of temperature changes anywhere along the entire length of the fiber.

See left

More on Agni-Rakshak

The system can generate the audio-visual alarms for various fire zones in the fiber. 'Agni-Rakshak' has its applications in fire monitoring in hospitals, buildings, road & rail tunnels, stations, cable trays of power cables, high capacity transformers, coal conveyors, warehouse and storage, cement industry, oil & gas Industry, Nuclear industry and sensitive installations etc.

Advantages of Agni Rakshak:

❖Ability to react to distributed and local fire events for rapid action and effective troubleshooting.
❖Single sensor is able to detect fire over a wide spread area.
❖Provides information about the onset of fire well before the actual fire takes place.
❖Hassle free installation, no complex wiring of numerous point sensors. Based on single fiber optic sensing cable. No individual sensors are required.
❖Uses optical fiber as passive sensing element, no hazard of fire due to spark in areas dealing with inflammable material like coal, gasoline, diesel etc.
❖Effective even in harsh environments of high EMI.

Source: www.rrcat.gov.in, www.barc.gov.in

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
Oct 22	Stella Mary's College of Engineering & Technology	900	3200
	Grand Total	**900**	**3200**

Few glimpses

Public Awareness Outreach at Stella Mary's College of Engineering KK Dist.

Kudankulam Nuclear Power Project (KKNPP) actively participated in a technical expo organized as part of the "Joulefest '26" National Level Technical Symposium at Stella Mary's College of Engineering, Kanyakumari District.

Date: **Oct 22, 2026**

The event served as an excellent platform to foster public awareness regarding nuclear energy generation, safety systems, and technological innovations.

A total of 900 participants, including engineering students, faculty, and industry professionals, visited the exhibition stall. To promote broader understanding, 3,200 public awareness publications were distributed during the successful outreach program

Public Awareness Outreach at Stella Mary's College of Engineering , Kanyakumari district on Oct 22, 2026





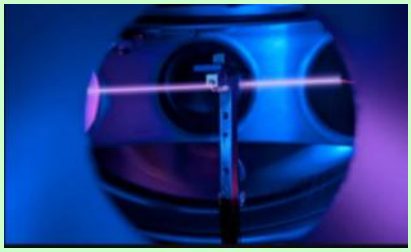




Did you know?

New nuclear clock

- Independent scientific teams in Vienna, Austria, and Beijing, China, have developed the world's first operating nuclear clocks.



- **Conventional atomic clock:**
  - ➢Tracks transitions between electron energy levels.
  - ➢Uses atoms such as cesium or strontium.
  - ➢Already achieves extraordinary precision.
- **New nuclear clock**
  - ➢Tracks energy transitions in the nucleus of thorium-229.
  - ➢Uses laser light to excite the nucleus.
  - ➢Could be less sensitive to external disturbances and achieve even greater precision.
- The crucial feature is thorium-229's unusually low-energy nuclear transition, which can be excited with laser light.

Source: www.reuters.com, www.indiatoday.in

Feature article

Nuclear Energy and Sustainable Development

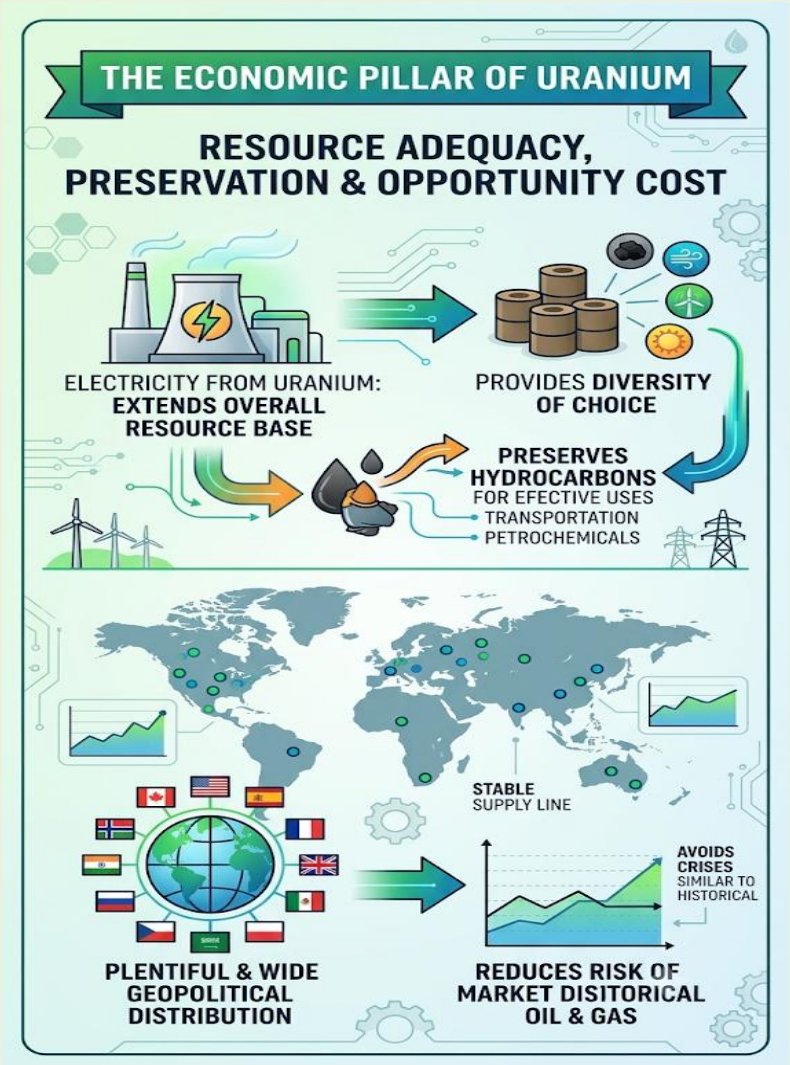
Source: World Nuclear Association

The economic pillar

Resource adequacy, preservation & opportunity cost

Uranium has no significant use other than nuclear energy production. Producing electricity with uranium extends the overall resource base available for human use, provides greater diversity of choice and allows the use of other resources, such as hydrocarbons, where they are most effective e.g. for transportation or petrochemicals.

Uranium is plentiful and is distributed among a wide range of geopolitically diverse countries. The distribution of uranium reduces the risk of market disruptions of the nature experienced during historical oil and gas crises.



To be continued in Nov 2026

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Disclaimer:
This newsletter is prepared for public awareness and educational purposes. Information and articles have been compiled from publicly available internet sources and other references. While reasonable efforts have been made to ensure accuracy, readers are advised to verify important information from original and authoritative sources.

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Nuclear Trivia

Trivia

The eerie, beautiful blue glow seen underwater in spent nuclear fuel pools is known as Cherenkov radiation. What unusual physical condition creates this light?

It is the optical equivalent of a sonic boom. High-energy charged particles (usually beta particles/electrons) travel through water faster than the speed of light in that medium (though still slower than the speed of light in a vacuum).



Blue glow in a spent nuclear fuel pool is one of the most striking visible effects of nuclear physics.

1. The Core Condition: Defying the Local Speed Limit: Nothing can exceed the speed of light in a vacuum (c). However, when light travels through a transparent dielectric medium (like water, glass, or air), it interacts with the medium's atoms and molecules, causing its phase velocity to drop. In pure water, the refractive index (n) is ≈1.33 across the visible spectrum. Consequently, the local phase velocity of light (v) in water is reduced to: v = c/n =0.75. This creates a window where high-energy charged particles (beta/electrons ejected during fission product decay) can travel at speeds (v) exceeds local speed of light while still remaining below the vacuum speed of light:

$$(c/n) < v < n$$

2. The Mechanism: Optical Shock Waves and Polarization: When a fast-moving electron plows through water, its electric field violently disturbs the surrounding molecules.

Dielectric Polarization: The electric field of the particle polarizes the molecules along its trajectory, momentarily shifting their electron clouds.

Relaxation and Wavelet Emission: As the particle moves past, these polarized molecules instantly snap back to their ground state, emitting minute electromagnetic wavelets (secondary photons).

See left

Why is the Glow Distinctly Blue?
While a massive amount of the emitted Cherenkov radiation is actually in the invisible ultraviolet spectrum, the portion spilling into the visible spectrum is heavily weighted toward violet and blue. Water absorbs longer wavelengths (reds and yellows) more readily, leaving the sharp, brilliant blue signature that is visible to the human eye.

Cherenkov radiation has applications beyond spent fuel pools:

1. **Nuclear fuel inspection:**
2. **Particle physics:** Cherenkov detectors help determine particle velocities and identify particle types.
3. **Neutrino observatories:** Large water detectors, such as Super-Kamiokande, detect faint Cherenkov light produced by charged particles created when neutrinos interact in or near the detector.
4. **Radiation monitoring and research:** Cherenkov emission can provide information about energetic charged particles in suitable experimental systems.

Source: www.energy.gov, pdg.lbl.gov, https://doi.org/