जन जागरूकता ई-संवाद पत्र

कुडनकुलम न्यूक्लियर पॉवर प्रोजेक्ट

जून 2026 अंक – 168

इस अंक में:

तैयारकर्ता एवं संपादक:

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पुनरीक्षणकर्ता :

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संजीव भारद्वाज ,
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जारीकर्ता:

अशोक भाटिया,
स्थल निदेशक,
कुडनकुलम न्यूक्लियर पॉवर प्रोजेक्ट

प्रिय पाठकगण,

भारत के परमाणु क्षेत्र के उपलब्धियों के लिए जून, 2026 एक प्रभावशाली माह रहा है, जिसे कल्पाक्कम में एक बड़े पैमाने पर सफलता से प्रदर्शित किया गया है। परमाणु ऊर्जा विभाग ने विश्व का प्रथम परमाणु प्रक्रिया ताप-आधारित हाइड्रोजन सुविधा का उद्घाटन किया है, जो स्वदेशी सीयू-सीएल ताप-रासायनिक चक्र का उपयोग करके स्वच्छ हरित ईंधन के 24/7 मार्ग पर अग्रणी है। अतुल्य अभियांत्रिकी का प्रदर्शन करते हुए, भारत की सबसे पुरानी वाणिज्यिक संपत्ति, तारापुर इकाइयां 1व2 व्यापक नवीनीकरण के बाद ग्रिड पर वापस आई हैं। इसी तरह , केकेएनपीपी में इकाई 5 के दाब पात्र की सटीक स्थापना तथा कैगा 5व6 में प्रगति के साथ प्रमुख मील का पत्थर हासिल किए गए हैं। पढ़कर आंनदित हों.....

अध्यक्ष, जन जागरूकता समिति

जून 2026 के विशिष्ट बिंदु

1. केकेएनपीपी स्थल पर 32 और स्थल के बाहर 01 जन संपर्क कार्यक्रम आयोजित किए गए
2. 1,228 घंटों का जन संपर्क 935 लोगों से संपर्क
3. 5,932 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 30 जून, 2026 को) अब तक इस प्रकार है।

कुल उत्पादित विद्युत इकाई	130,627 मिलियन यूनिट
केकेएनपीपी द्वारा कुल CO_2 उत्सर्जन में कमी	112,208,877 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

June 2026 Issue –168

In this issue:

Dear Readers,

June 2026 marks a spectacular month of achievements for India's nuclear sector, highlighted by a massive breakthrough at Kalpakkam. The Department of Atomic Energy has inaugurated the world's first nuclear process heat-based hydrogen facility, pioneering a 24/7 pathway to clean green fuel using the indigenous Cu-Cl thermochemical cycle. Demonstrating incredible engineering resilience, India's oldest commercial assets, Tarapur Units 1 & 2, are back on the grid after comprehensive refurbishment. Concurrently, major milestones were achieved with the precision installation of Unit 5's pressure vessel at KKNPP, and progress at Kaiga 5 & 6. Read on happily!

-Chairman, PA Committee

Spotlight of June 2026

1. **32 on-site & 01 Off-site outreach programme organised**
2. **1,228 hours of Public Outreach, reached 935 people**
3. **5,932 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 June 30, 2026**) is given below.

No.of units of electricity generated	**130,627 Million Units**
Total CO_2 emissions avoided by KKNPP	**112,208,877 Tonnes**

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

Nuclear Power Driving India's Hydrogen Future

"The integration of nuclear energy with emerging clean energy technologies, such as hydrogen production represents a strategic pathway towards a sustainable energy future. Nuclear power with its unique ability to provide reliable carbon-free electricity is ideally suited to support large-scale hydrogen production while contributing to India's energy security, decarbonisation goals and long-term sustainable development objectives."

Dr Ajit Kumar Mohanty

Secretary, Department of Atomic Energy

Source: Excerpts from Dr. Mohanty's speech at the inauguration of the world's first nuclear heat-driven Hydrogen Production Facility based on the Copper–Chlorine (Cu–Cl) Thermochemical Cycle at IGCAR, Kalpakkam.

Snap shot

A glimpse of **Indian Peacock** at Anuvijay Township, Chettikulam.

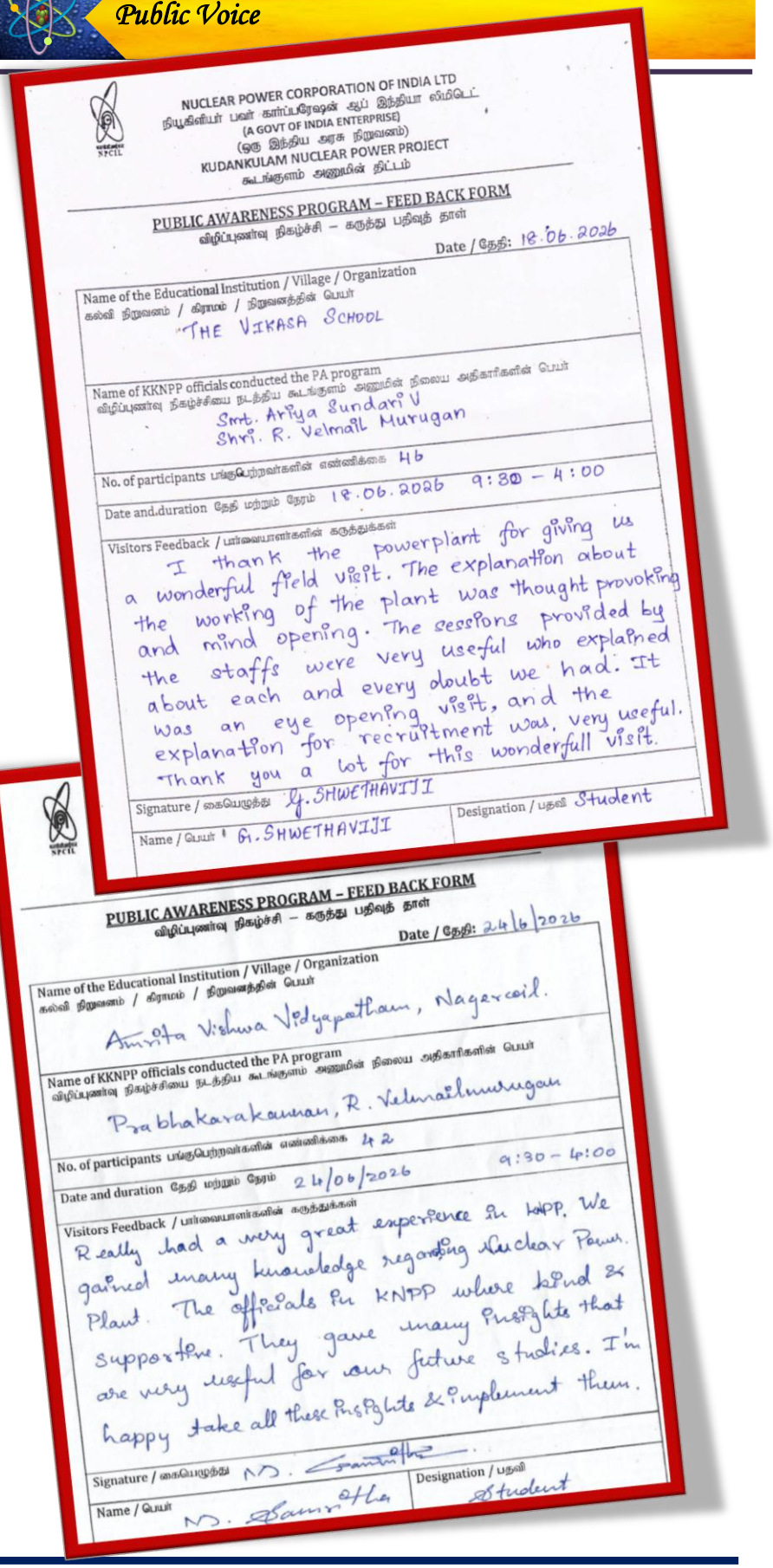
Photography by
Shri Sunil V P
Station Director
KKNPP 1&2

Scientific classification	
Kingdom:	Animalia
Phylum:	Chordata
Class:	Aves
Order:	Galliformes
Family:	Phasianidae
Genus:	Pavo
Species:	P. cristatus
Binomial name:	
Pavo cristatus	

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: 18.06.2026

Name of the Educational Institution / Village / Organization
கல்வி நிறுவனம் / கிராமம் / நிறுவனத்தின் பெயர்
"THE VIKASA SCHOOL

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

No. of participants பங்குபெற்றவர்களின் எண்ணிக்கை 46

Date and.duration தேதி மற்றும் நேரம் 18.06.2026 9:30 – 4:00

Visitors Feedback / பார்வையாளர்களின் கருத்துக்கள்
I thank the powerplant for giving us a wonderful field visit. The explanation about the working of the plant was thought provoking and mind opening. The sessions provided by the staffs were very useful who explained about each and every doubt we had. It was an eye opening visit, and the explanation for recruitment was very useful. Thank you a lot for this wonderfull visit.

Signature / கையெழுத்து G.SHWETHAVIJI
Name / பெயர் G.SHWETHAVIJI
Designation / பதவி Student

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

Date / தேதி: 24/6/2026

Name of the Educational Institution / Village / Organization
கல்வி நிறுவனம் / கிராமம் / நிறுவனத்தின் பெயர்
Amrita Vishwa Vidyapeetham, Nagercoil.

Name of KKNPP officials conducted the PA program
விழிப்புணர்வு நிகழ்ச்சியை நடத்திய கூடங்குளம் அணுமின் நிலைய அதிகாரிகளின் பெயர்
Prabhakarakannan, R. Velmailmurugan

No. of participants பங்குபெற்றவர்களின் எண்ணிக்கை 42

Date and duration தேதி மற்றும் நேரம் 24/06/2026 9:30 – 4:00

Visitors Feedback / பார்வையாளர்களின் கருத்துக்கள்
Really had a very great experience in KNPP. We gained many knowledge regarding Nuclear Power Plant. The officials in KNPP where kind & supportive. They gave many insights that are very useful for our future studies. I'm happy take all these insights & implement them.

Signature / கையெழுத்து M. Samritha
Name / பெயர் M. Samritha
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 Power: Essential for Clean Energy and Grid Reliability

"If our goal is to double our grid and build a low-carbon economy in less than 25 years, there is no credible plan to do that without nuclear energy and the clean, reliable baseload power is provides."

Hon. Tim Hodgson

Minister of Energy and Natural Resources, Canada

Source: globalnews.ca, ici.radio-canada.ca,

Electricity and Energy Storage

(Source: World Nuclear Association)

Pumped hydroelectric storage:

In some places pumped storage is used to even out the daily generating load by pumping water to a high storage dam during off-peak hours and weekends, using the excess base-load capacity from low-cost coal or nuclear sources. During peak hours this water can be released through the turbines to a lower reservoir for hydro-electric generation, converting the potential energy into electricity. Reversible pump-turbine/motor-generator assemblies can act as both pumps and turbines*. Pumped storage systems can be effective in meeting peak demand changes due to rapid ramp-up or ramp-down, and profitable due to the differential between peak and off-peak wholesale prices. The main issue apart from water and altitude is round-trip efficiency, which is around 70%, so for every MWh of input only 0.7 MWh is recovered. In addition, relatively few places have scope for pumped storage dams close to where the power is needed.

* Francis turbines are widely-used for pumped storage but have a hydraulic head limit of about 600 m.

This schematic of the Gordon Butte project is typical of off-river pumped storage (Gordon Butte)

Most pumped storage capacity is associated with established hydro-electric dams on rivers, where water is pumped back to a high storage dam. Such dammed hydro schemes can be complemented by off-river pumped hydro. This requires pairs of small reservoirs in hilly terrain and joined by a pipe with pump and turbine.

To be continued in Jul 2026

OPERATIONAL REACTORS

Country	MWe #	No. of Reactors
ARGENTINA	1631	3
ARMENIA	416	1
BELARUS	2220	2
BELGIUM	2056	2
BRAZIL	1884	2
BULGARIA	2006	2
CANADA	12714	17
CHINA	58812	60
CZECH REP	3963	6
FINLAND	4369	5
FRANCE	63000	57
HUNGARY	1916	4
INDIA	7730	23
IRAN	915	1
JAPAN	12631	14
KOREA	25609	26
MEXICO	1552	2
NETHERLANDS	482	1
PAKISTAN	3262	6
ROMANIA	1300	2
RUSSIA	27969	34
SLOVAKIA	2308	5
SLOVENIA	688	1
SOUTH AFRICA	1854	2
SPAIN	7123	7
SWEDEN	7012	6
SWITZERLAND	2973	4
UKRAINE	13107	15
UAE	5348	4
UK	5883	9
USA	96952	94
Total	**379700**	**417**

 # Net Electrical Capacity

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

Nuclear Database

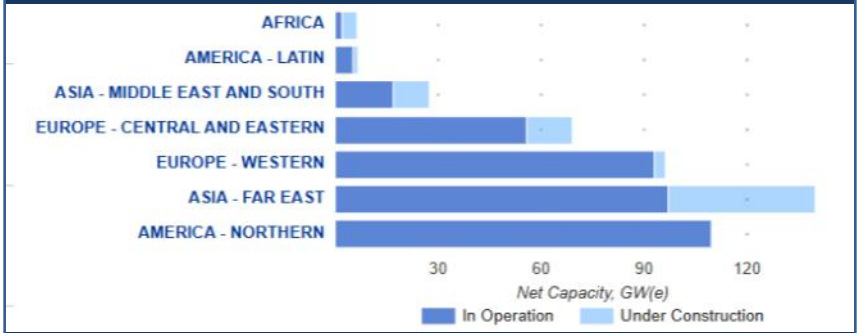
Updated as on Jul 02, 2026

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

Current Status:

NUCLEAR POWER REACTORS IN OPERATION	417
TOTAL NET INSTALLED CAPACITY	379 700 MWe
NUCLEAR POWER REACTORS UNDER CONSTRUCTION	77
REACTOR-YEARS OF OPERATION	20 738

Regional Distribution of Nuclear Power Plants:



New connections to the grid: (Year 2026)

SANAO-1 (1117 MW(e), PWR, CHINA) on 12 March)
- ❖ Construction Start Date : 31 Dec, 2020
- ❖ First Criticality : 14 Feb, 2026
- ❖ Gird Connection : 12 Mar, 2026

Source: www.nucnet.org & www.neimagazine.com

TAIPINGLING-1 (1116 MW(e), PWR,CHINA) on 13 Feb)
- ❖ Construction Start Date : 26 Dec, 2019
- ❖ First Criticality : 03 Feb, 2026
- ❖ Gird Connection : 13 Feb, 2026

Nuclear News

Major component milestone for Indian reactor 23 Jun

NPCIL says the successful unloading of the first End Shield is a major milestone for the Kaiga 5 and 6 construction project. Manufactured by L&T Heavy Engineering, at its Hazira facility, the component weighs 107 tonnes and is about 9.3 metres across with a thickness of nearly a metre. "The complex unloading operation was executed flawlessly through meticulous planning and seamless coordination using a 500-tonne crane, 70-tonne crane and 10-tonne chain pulley block," NPCIL said.

Source: www.world-nuclear-news.org

India launches world's first nuclear process heat-based hydrogen production facility 27 Jun

India has inaugurated the world's first plant that makes hydrogen using nuclear reactor heat instead of electricity. Built at Kalpakkam, the copper-chlorine cycle points to a cleaner, round-the-clock route to green hydrogen. On June 26, 2026, the Department of Atomic Energy inaugurated what it describes as the world's first hydrogen production facility driven by the heat of a nuclear reactor rather than by electricity. It sits at the Indira Gandhi Centre for Atomic Research in Kalpakkam.

Source: www.indiatoday.in, newsonair.gov.in

Fuel manufactured for Kudankulam 4's initial loading 09 Jun

Nuclear fuel for the initial loading of India's Kudankulam unit 4 has been manufactured at Elektrostal Machine-Building Plant, part of Rosatom's TVEL fuel division. Under the contract agreed in 2024 with the Russian state nuclear corporation, TVEL will supply fuel for the lifetime of the VVER-1000 units, which comprise units 3 and 4 at the plant. The first nuclear fuel was delivered for unit 3 in December. Rosatom says that during operation of the first two units, its specialists, together with Indian specialists "have significantly improved their efficiency through the introduction of advanced nuclear fuel and extended fuel cycles. Since 2022, the Kudankulam NPP has been supplied with advanced TVS-2M nuclear fuel. It 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".

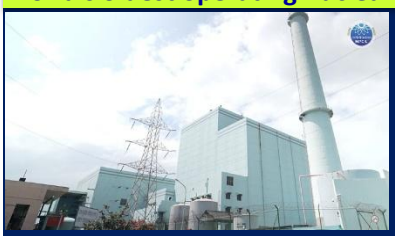
Source: https://dae.gov.in & www.world-nuclear-news.org

Reactor pressure vessel installed at Indian nuclear plant 16 Jun

The 320-tonne vessel which will house the core of unit 5 at the Kudankulam Nuclear Power Plant in India was lifted by crane into place in a precision operation as the VVER-1000 construction project enters its next phase. The pressure vessel, which was manufactured at the Atommash plant of Rosatom's Machine Building Division in Volgodonsk, in Russia, was delivered to the construction site in 2025. The installation was carried out using the "open top" method, using a heavy-duty crane to lift it into the building before the reactor dome is closed, the Russian company said. This method was previously used by the Russian-Indian team during the construction of Kudankulam units 3 and 4.

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

World's oldest operating nuclear units back on India's grid 19 Jun



Nuclear Power Corporation of India Limited says that following extensive modernisation and refurbishment the first two units at India's oldest nuclear power plant, Tarapur Atomic Power Station, are now back delivering power. Tarapur 1 and 2 are BWR units commissioned at the site in Maharashtra in 1969 as India's first commercial nuclear power plant. Built by GE on a turnkey contract, the units were originally rated at 200 MWe but were subsequently downrated to 160 MWe (gross). They underwent six months' refurbishment in 2005-06, and have both been offline since 2020 for major refurbishment work. NPCIL said, in a post on social media site X, that the reconnection of both units was "a major milestone in India's nuclear power programme … this achievement reaffirms the enduring legacy of India's first nuclear power station and reflects the dedication, technical expertise and unwavering commitment of Team NPCIL. For over five decades, TAPS-1 & 2 have contributed to the nation's energy security and development while providing clean, reliable and low-carbon electricity.

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

QUICK FACTS

AI's global electricity demand

AI's global electricity demand is exploding — projected to reach nearly 200 TWh in 2026, up from 85 TWh in 2024 — making it one of the fastest-growing loads on the planet.

Data centers powering generative AI models now consume more energy than some nations, driving urgent interest in nuclear and other zero-carbon baseload sources.

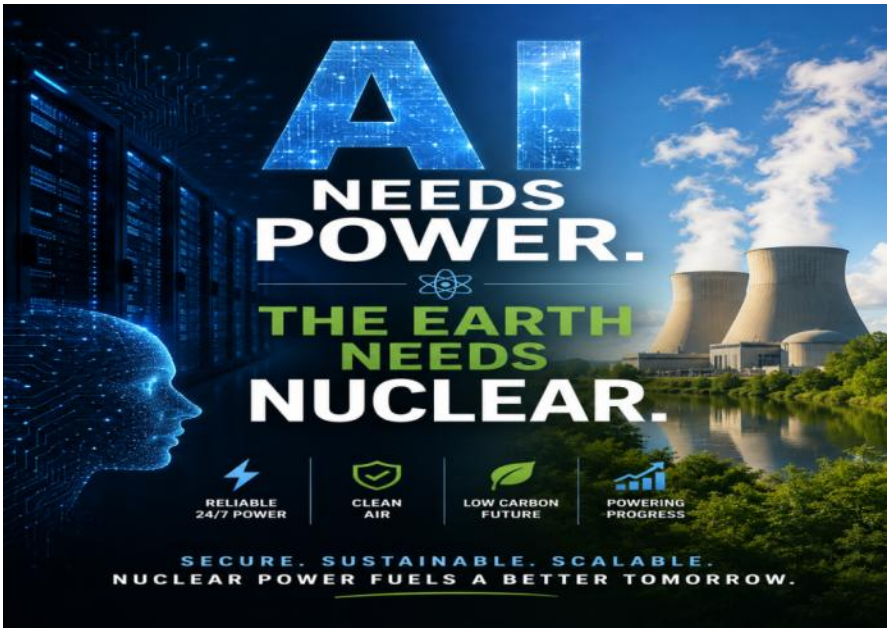
Metric	2025	2026 (proj.)	2030 (IEA base)
Total data-center electricity (TWh)	470	545	945
AI-specific share (TWh)	135	200	430
AI share of total (%)	29	37	46

Why Nuclear Fits the AI Era:

- ❖Baseload reliability
- ❖Zero-carbon scalability
- ❖Energy security

Source: https://acecloud.ai/

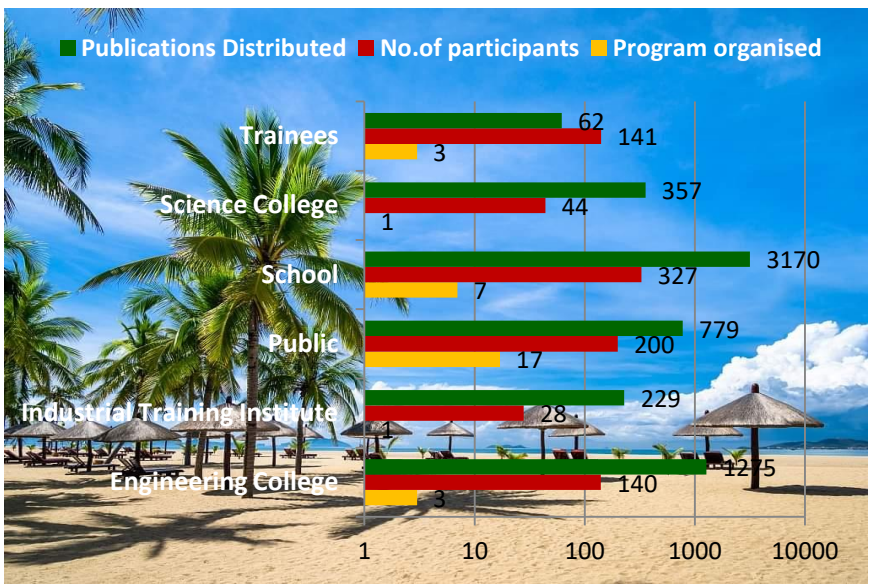
Nuclear Slogan



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

Inplant Trainees (II Batch), Kudankulam.
(02 June)

Members from Association of Kerala Government College Retired Teachers (AKGCRT) Thiruvananthapuram
(04 June)

Nandha Engineering College (Autonomous) Vaikkal Medu, Erode
(05 June)

University of Kerala, Thiruvananthapuram
(09 June)

Few glimpses from Site Visit

At site

Amrita Vishwa Vidyapeetham Nagercoil (10 June)

Mount Hilton Public School Old Courtallam, Tenkasi (11 June)

Achariya School Kovilpatti (16 June)

Amrita Vishwa Vidyapeetham,Nagercoil (17 June)

Few glimpses from Site Visit

At site

The Vikasa School Millerpuram,Tuticorin (18 June)

Govt. V. & H.S.S. Kulathoor Thiruvananthapuram (19 June)

Government ITI Radhapuram (22 June)

Visit of Officials from NDRF Kudankulam (22 June)

Few glimpses from Site Visit

At site

Govt. L.V.H.S.S. Arayoor Thiruvananthapuram (23 June)

Amrita Vishwa Vidyapeetham Nagercoil (24 June)

The Vikasa School Millerpuram, Tuticorin (25 June)

Inplant Trainees Kudankulam (30 June)

Nuclear Terminology

Lexicon

Mark-0

The **Mark-0** is an advanced microreactor and zero-power demonstration experiment developed by Antares Nuclear. The newly built demonstration microreactor achieved its **first criticality on June 4, 2026**, at Idaho National Laboratory. It is the first privately developed, non-light-water reactor in the U.S. to reach this milestone in over 40 years, marking a major step in advanced nuclear innovation. Designed as a validation platform rather than a power-generating plant, the Mark-0 allows scientists to test core physics, reactivity control systems, and passive safety features without generating measurable thermal output or electricity

Key Details & Capabilities :

Reactor Design: It is a sodium heat-pipe cooled microreactor that uses High-Assay Low-Enriched Uranium (HALEU) in TRISO fuel compacts.

Historic Milestone: On June 4, 2026, the Mark-0 achieved initial zero-power criticality. This made it the first privately developed, non-light-water advanced reactor to reach criticality in the U.S. in over four decades.

Regulatory First: The Mark-0 is the first reactor under the U.S. Department of Energy's (DOE) Reactor Pilot Program to reach this milestone.

Comparison Snapshot

Feature	Mark-0 Reactor	Traditional Light-Water Reactor
Fuel	HALEU TRISO particles	Low-enriched uranium rods
Cooling	Sodium heat-pipe (no moving parts)	Water-based cooling
Scale	Microreactor (portable, modular)	Large-scale, centralized
Deployment	Military bases, space, remote sites	National grid infrastructure
Criticality Milestone	Achieved June 4, 2026	Most built before 1980s

See left

More on Mark-0

Future Roadmap

The data gathered from the Mark-0 will inform the design, licensing, and construction of Antares's upcoming power-producing reactors.

2027: The company plans to begin operating the Mark-1, which is designed to produce commercial electricity.

2028: Initial production deployments are aimed at the U.S. military to provide resilient and reliable power to defense-critical sites.

Fuel Chain: BWXT and Project Pele

The Mark-0 operates on HALEU—uranium enriched to less than 20% U-235—in TRISO fuel compacts, loaded to less than 120 kilograms total for the reactor's operational life. TRISO particles coat uranium kernels in successive layers of carbon and silicon carbide, which contain fission products under high temperature and irradiation. Most advanced non-light-water designs require HALEU because their neutron physics demand higher enrichment than the roughly 4% U-235 used in conventional light-water reactor fuel.

Source: WNA, www.energy.gov, www.powermag.com

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

PA lecture at UGC-Malaviya Mission Teacher Training Centre Uty of Kerala Trivandrum

As part of the 186th Faculty Induction Programme organized by the UGC–Malaviya Mission Teacher Training Centre (MMTTC), University of Kerala, Thiruvananthapuram.

Date: **Jun 03, 2026**

Shri A.V. Sathish, Scientific Officer, OIC-Nuclear Information Centre, KKNPP, delivered an engaging lecture on **"Nuclear Energy is Clean and Green Energy"** on 3 June 2026. The session highlighted the role of nuclear energy in sustainable development, climate action, and India's energy security. The interactive programme was attended by **55 faculty members** from universities and colleges across the country.

PA outreach programme conducted outside KKNPP:

Outside KKNPP

Date	Name of the Institution	No. of participants	Publications distributed
03 Jun	UGC-Malaviya Mission Teacher Training Centre (MMTTC), University of Kerala	55	60
	Grand Total	**55**	**60**

Few glimpses

PA lecture at UGC-Malaviya Mission Teacher Training Centre (MMTTC) University of Kerala , Trivandrum on Jun 03, 2026

No. of awareness publications distributed	60

World Environment Day (WED) 2026

On the occasion of World Environment Day 2026, Kudankulam Nuclear Power Project organized a tree plantation drive on 5th June 2026 under the theme "**Inspired by Nature. For Climate. For Our Future.**" The programme was jointly organized by the Environmental Survey Laboratory, Pelican Nature Club (ESP), Civil (Township), Civil 1 & 2, and Civil 3–6. Saplings were planted at three locations: Anuvijay Township, KK 1 & 2 near the Miyawaki Forest, and KK 3–6 near the Punching Gate. The initiative reaffirmed KKNPP's commitment to environmental conservation, biodiversity enhancement, and sustainable development.

Few glimpses

Outside KKNPP

Tree plantation drive organized on 5 June 2026

World Ocean Day 2026 celebration at KKNPP

On the occasion of World Ocean Day 2026, the Pelican Nature Club (ESP), Kudankulam Nuclear Power Project (KKNPP), organized a Beach Clean-Up Drive at Anu Vijay Township Beach on 9 June 2026 under the global theme **"Strong Marine Protected Areas for Our Blue Planet."** Employees and volunteers enthusiastically participated in the drive, collecting plastic waste and other marine litter to help preserve the coastal ecosystem. The initiative highlighted the importance of protecting marine biodiversity, reducing ocean pollution, and promoting responsible environmental practices. The programme reaffirmed KKNPP's commitment to environmental conservation and encouraged collective action towards cleaner and healthier oceans.

Few glimpses

Outside KKNPP

Beach Clean-Up Drive at Anu Vijay Township Beach on 9 June 2026

Did you know?

Projected Uranium Demand by 2050

Current Situation (2025–2026)

- Global nuclear capacity: ~390–400 GWe
- Annual uranium requirement: ~59,000 tonnes of uranium (tU)
- This uranium fuels about 440 operating reactors worldwide.

Projected Uranium Demand by 2050:

Annual uranium requirements are projected to rise from roughly 59000 tonnes today to between 90000 and 142000 tonnes by 2050, an increase of one and a half to nearly two and a half times. The high-case scenario assumes global nuclear capacity reaching 900 GWe by 2050. Tripling capacity implies closer to 1200 GWe by mid-century.

Scenario	Nuclear Capacity	Uranium Requirement
Low Case	~514 GWe	~90,000 tU/year
High Case	~950 GWe	~142,000
Tripling Goal	~1200 GWe	~180,000–200,000

Source: IAEA, tdb.oecd-nea.org

Nuclear Energy and Sustainable Development

Source: World Nuclear Association

The social pillar

Human health – air pollution

Nuclear power plants emit virtually no air pollutants during operation, and because they are reliable and can be deployed on a large scale, they can directly replace fossil fuel plant. NASA's Goddard Institute for Space Studies and Columbia University's Earth Institute estimated that the ***use of nuclear power prevented over 1.8 million air pollution-related deaths between 1971 and 2009.***

There are numerous non-power uses of nuclear technology that contribute to fulfilment of human 'needs'. For example: the provision of nuclear medicine; helping to control the spread of infectious diseases; and securing reliable supplies of clean water, sanitation and food (see Figure 9).

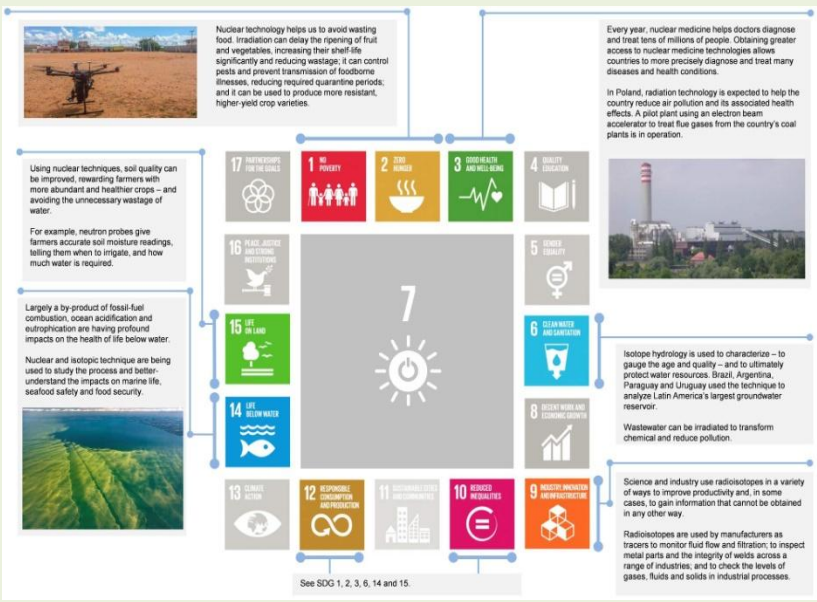


Figure 9: Examples of the contribution of non-power nuclear technologies to the SDGs

To be continued in Jul 2026

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Nuclear Trivia

Trivia

How was the age of the Moon determined?

Scientists determined the Moon's age to be about 4.46 billion years using uranium–lead dating of zircon crystals found in Apollo lunar samples. These crystals act as "time capsules," recording when the Moon's mantle cooled after its violent formation.

How Uranium–Lead Dating Works

✓**Zircon crystals:** Zircon ($ZrSiO_4$) incorporates uranium atoms into its crystal lattice when it forms, but excludes lead.

✓**Radioactive decay:**
- Uranium-238 decays to lead-206 with a half-life of 4.47 billion years.
- Uranium-235 decays to lead-207 with a half-life of 704 million years.

✓**Dual decay chains:** Measuring both U-238→Pb-206 and U-235→Pb-207 provides two independent clocks.

✓**Concordia diagram:** Plotting both decay systems together allows scientists to detect disturbances (like lead loss) and still calculate accurate ages.

✓zircon crystals are directly linked to **zirconium**. In fact, zircon is a mineral made of **zirconium silicate ($ZrSiO_4$)**.

Source: www.discovermagazine.com, https://eos.org/

How the Age Was Measured

❖ Apollo Samples: Dust and rock collected during Apollo 17 (1972) contained tiny zircon crystals.
❖ Zircon Crystals: Extremely durable minerals formed as the Moon's magma ocean cooled.
❖ Uranium–Lead Dating: Zircons often trap uranium atoms. Over billions of years, uranium decays into lead at a known rate.
❖ Laser Analysis: Scientists sharpened zircon tips and evaporated atoms with ultraviolet lasers to measure uranium/lead ratios.
❖ Result: The Moon is at least 4.46 billion years old, about 40 million years older than earlier estimates.

Context of Formation:
❖ The Moon likely formed when a Mars-sized body (Theia) collided with the young Earth (~100 million years after Earth's birth).
❖ Debris from this impact coalesced into the Moon.
❖ As the molten mantle cooled, zircon crystals locked in isotopic "clocks," allowing precise dating.

Why Zircons Are Ideal?	
Property	Benefit for Dating
Durability	Survive billions of years without alteration
Uranium Content	Provides a radioactive clock
Lead Retention	Ensures accurate decay measurement
Microscopic Size	Found even in lunar dust

See left