



TATA CONSULTING ENGINEERS
ENGINEERING A BETTER TOMORROW™



Fifty Years of Nuclear Engineering Excellence

Powering Atomic Energy Future through
Innovation and Global Expertise



www.tataconsultingengineers.com



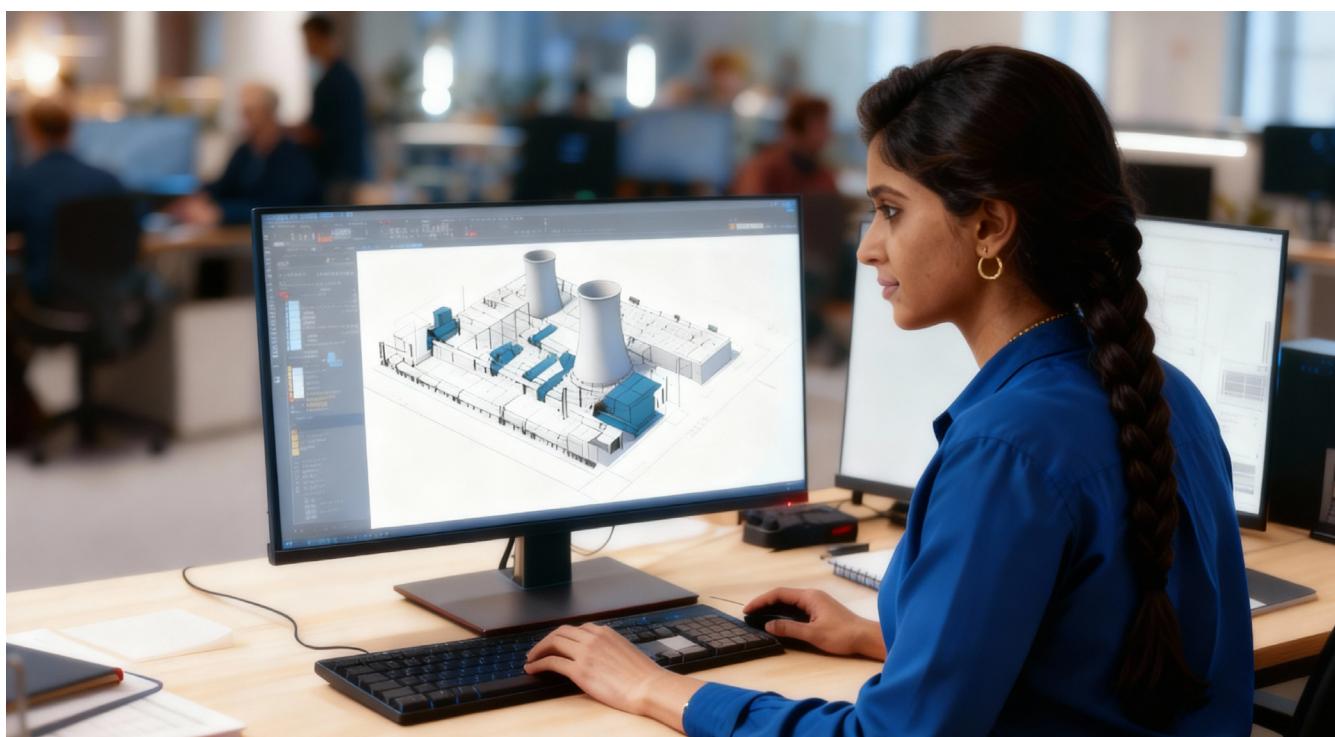
About Tata Consulting Engineers

Founded in 1962, **Tata Consulting Engineers Limited (TCE)** is a global engineering consultancy headquartered in India, offering integrated solutions across **Power, Hydrocarbons and Chemicals, Mining and Metallurgy, Infrastructure, and Advanced Facilities**. With more than six decades of experience and the legacy of the Tata Group, TCE partners with clients worldwide to deliver complex projects that embody innovation, sustainability, and engineering excellence.

The company's multidisciplinary expertise and technology-driven approach enable it to provide comprehensive services across the entire project lifecycle, from concept and design to execution and operation, creating measurable impact and enduring value. Its service portfolio includes **Design and Engineering, Sustainability and Energy Transition Solutions, Project Management and Safety, Digital and Advanced Technology, and Architecture & Planning**.

Headquartered in India, TCE operates globally with offices in the **United States, Europe, Australia, the Middle East, and the Philippines**. We have successfully delivered over **12,000 projects in more than 65 countries**, supported by advanced digital platforms and collaborative engineering systems that ensure consistent quality and seamless coordination across geographies.

Guided by its purpose of Engineering a Better Tomorrow, TCE continues to contribute to global progress through responsible, technology-led, and future-ready engineering that enables sustainable growth and transformation.



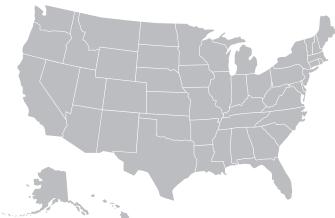
TCE's Nuclear Footprint: Engineering the Future of Clean Energy

For over five decades, TCE has been a trusted partner in India's nuclear power programme, supporting the nation's journey from its first reactors to the emerging generation of advanced and small modular reactors. The company's role spans the entire nuclear value chain from feasibility and conceptualisation to detailed engineering and commissioning covering **Boiling Water Reactors, Pressurised Heavy Water Reactors, Fast Breeder Reactors** and the latest Small Modular Reactor (SMR) concepts.

TCE has executed projects that represent more than **85 percent of India's installed nuclear capacity**, strengthening the country's self-reliant nuclear ecosystem and building capabilities that extend well beyond its borders. Its international projects demonstrate India's engineering leadership in the global nuclear landscape.



India: Engineering for Prototype Fast Breeder Reactor at Kalpakkam, the Tarapur Atomic Power Station Units 3 and 4, the Kakrapar Atomic Power Station Units 3 and 4, the Rajasthan Atomic Power Station Units 7 and 8, and the Gorakhpur Atomic Power Project Tarapur, Kakrapar, Rajasthan, Kalpakkam and Gorakhpur projects.



United States: Collaboration with Holtec International under the U.S. Department of Energy to adapt and deploy Small Modular Reactor technology in India, advancing the country's clean energy and net-zero ambitions.



France: Participation in the International Thermonuclear Experimental Reactor (ITER) at Cadarache, designing critical cooling water systems and providing on-site expertise.



Bangladesh: Civil and review engineering for the Rooppur Nuclear Power Project, India's first international nuclear engineering collaboration.

TCE's Integrated Expertise Across the Nuclear Project Lifecycle

TCE provides end-to-end consulting, design and execution services for nuclear power projects: supporting clients across every phase, from concept to commissioning and long-term operation.



Pre-feasibility and Feasibility Studies:

Site surveys, demand projections and early-stage technical and financial viability assessments

Techno-Functional Assessments and Detailed Project Reports (DPRs):

Comprehensive evaluations of reactor systems, process safety, and regulatory compliance

Site Selection and Nuclear Siting Criteria Assessment:

Geotechnical, seismic and environmental studies for optimal and safe site selection



Conceptual and Detailed Design:

Engineering design for Nuclear Island, Conventional Island and Balance of Plant (BoP) facilities

EPCM and Project Management:

Procurement, construction management, safety oversight, and commissioning support for complex, multi-disciplinary facilities

Operations and Maintenance Support:

Reliability analysis, plant digitalisation, life-extension engineering and safety reviews for operating plants

Engineered 85% of India's Nuclear Power Capacity

Rajasthan Atomic Power Station

- Unit 1, PHWR CANDU 100 MWe (1972)
- Unit 2, PHWR CANDU 200 MWe (1980)
- Unit 5, PHWR IPHWR 220 MWe (2009)
- Unit 6, PHWR IPHWR 220 MWe (2010)
- Unit 7, PHWR IPHWR 700 MWe (2025)
- Unit 8, PHWR IPHWR 700 MWe (ongoing)

Gorakhpur Nuclear Power Plant

- Unit 1, PHWR IPHWR 700 MWe (ongoing)
- Unit 2, PHWR IPHWR 700 MWe (ongoing)

Kakrapar Atomic Power Station

- Unit 1, PHWR IPHWR 220 MWe (1992)
- Unit 2, PHWR IPHWR 220 MWe (1995)
- Unit 3, PHWR IPHWR 700 MWe (2021)
- Unit 4, PHWR IPHWR 700 MWe (2024)

Narora Atomic Power Station

- Unit 1, PHWR IPHWR 220 MWe (1989)
- Unit 2, PHWR IPHWR 220 MWe (1992)

Tarapur Atomic Power Station

- Unit 1, BWR 160 MWe (1969)
- Unit 2, BWR 160 MWe (1969)
- Unit 3, PHWR IPHWR 540 MWe (2006)
- Unit 4, PHWR IPHWR 540 MWe (2005)

Madras Atomic Power Station

- Unit 1, PHWR IPHWR 220 MWe (1983)
- Unit 2, PHWR IPHWR 220 MWe (1985)
- Unit 3, FBR PFBR 500 MWe (ongoing)

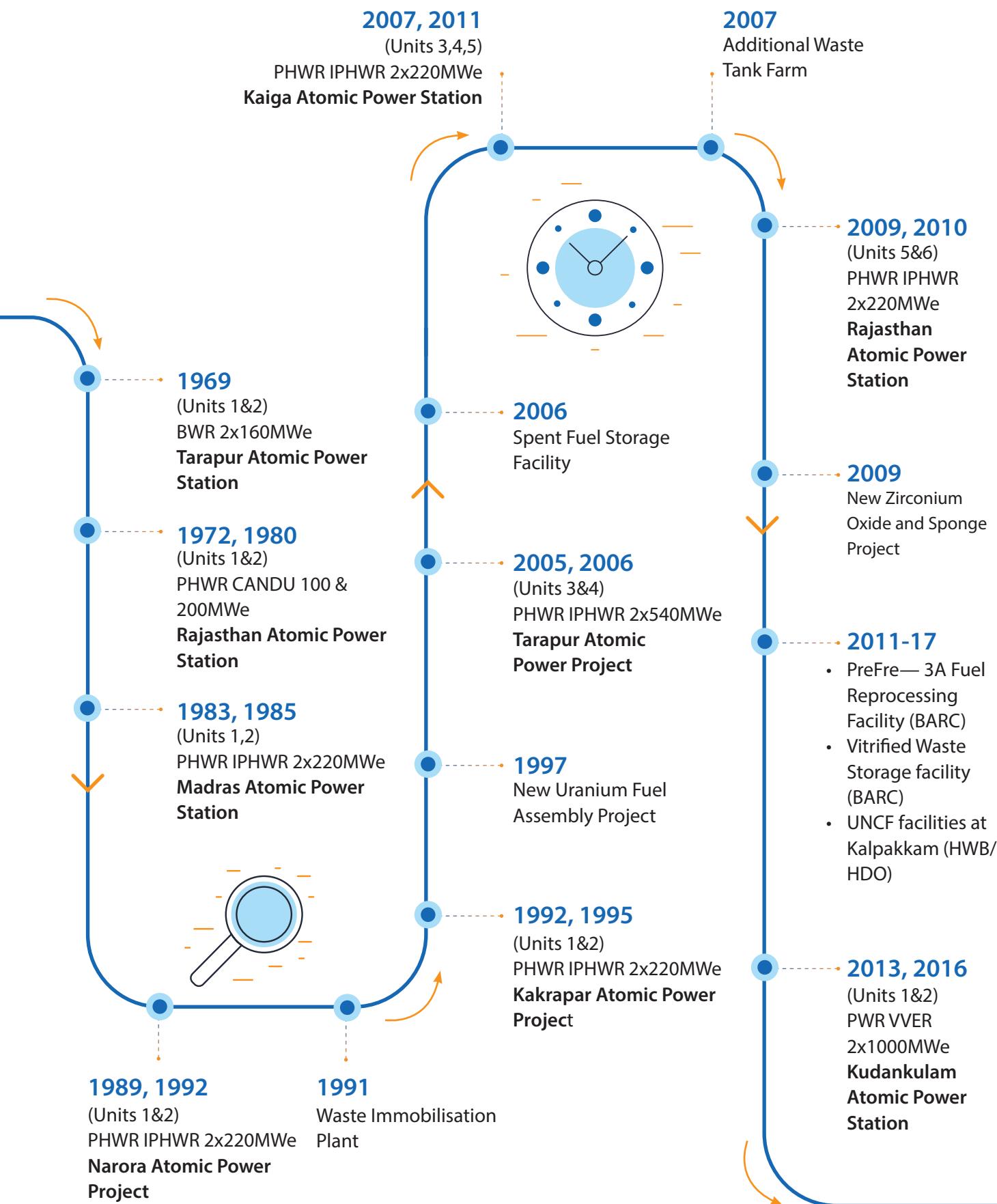
Kaiga Atomic Power Station

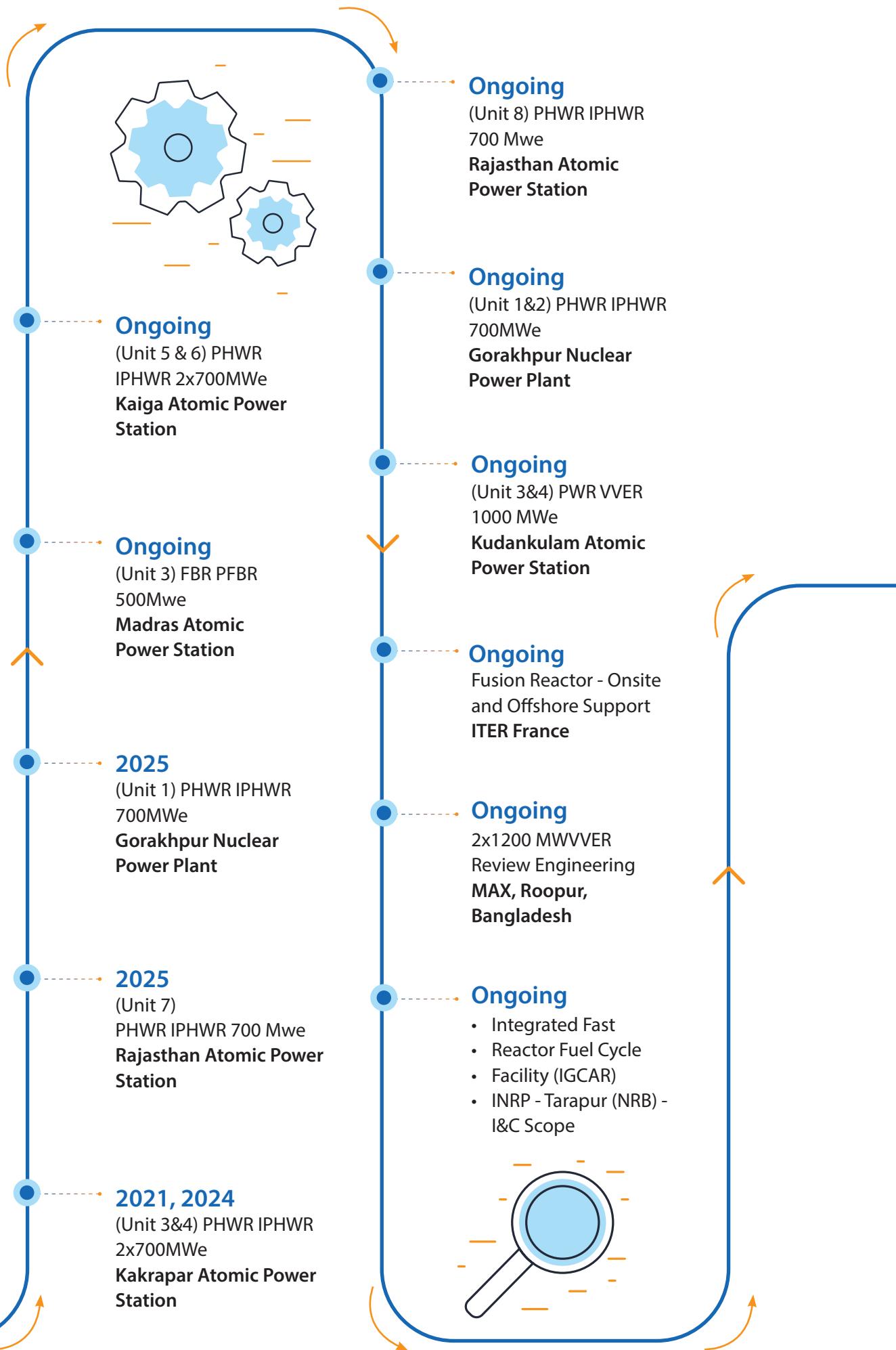
- Unit 3, PHWR IPHWR 220 MWe (2007)
- Unit 4, PHWR IPHWR 220 MWe (2011)
- Unit 5, PHWR IPHWR 700 MWe (ongoing)
- Unit 6, PHWR IPHWR 700 MWe (ongoing)

Kudankulam Atomic Power Station

- Unit 1, PWR VVER 1000 MWe (2013)
- Unit 2, PWR VVER 1000 MWe (2016)
- Unit 3, PWR VVER 1000 MWe (Ongoing)
- Unit 4, PWR VVER 1000 MWe (Ongoing)

TCE's select credentials in Indian Nuclear sector





Our Nuclear Segments Across the Value Chain

TCE's multidisciplinary expertise spans the entire nuclear ecosystem from fuel to power generation to waste management and operating plant services.



Nuclear Power Plants

Comprehensive design and engineering for nuclear island, conventional island and balance of plant facilities

Engineering Capability

- **Reactor Systems:** Compressed Air, DM Water, Fire Protection, HVAC
- **Civil & Structural Systems / Piping:** Entire plant
- **Reactor Auxiliary Systems:** Cooling systems, Calandria, End Shield
- **Power Conventional Systems:** Entire plant
- **Balance of Plant Systems:** Sea water intake/outfall, CWS, water treatment
- **Electrical / I&C Systems:** Power evacuation and system studies

Special Capabilities:

Integrated 3D/4D Engineering, Fire Hazard Analysis, Advanced FEA/CFD/blast Analysis, Special Component Design (Fueling Machine), Industrial Automation & Remote Handling.



Waste Management Facilities

Engineering solutions for safe treatment, handling, and long-term storage of nuclear waste in all forms

Engineering Capability

- **Civil & Structural Systems:** Design of containment structures for waste storage and disposal
- **Electrical / I&C Systems:** Electrical and control systems for waste handling facilities
- **Layout / Piping:** Efficient layout and piping for waste treatment processes
- **Shielding Design:** Radiation protection for personnel and environment
- **Remote Handling Technologies:** Advanced systems for hazardous material handling

Special Capabilities:

Radioactive waste treatment systems, spent fuel storage solutions, shielding design, remote handling technologies

Our Nuclear Expertise Across the Value Chain

TCE delivers safe, efficient, and sustainable nuclear solutions from fuel to waste powered by digitisation and automation.



Fuel Processing Facilities

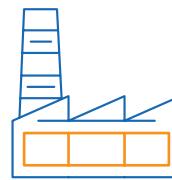
Design of fuel fabrication and reprocessing plants, ensuring safety and efficiency in handling nuclear materials.

Engineering Capability

- **Civil & Structural Systems:** Structural design for fuel fabrication and reprocessing plants
- **Electrical / I&C Systems:** Electrical and instrumentation systems for safe operations
- **Layout / Piping:** Optimised plant layout and piping for efficiency and safety
- **Remote Handling Facilities:** Advanced systems for handling nuclear materials remotely
- **Integrated 3D/4D Engineering:** Digital modelling for precision and lifecycle management

Special Capabilities:

Spent fuel reprocessing facilities, fuel fabrication facilities.



Operating Plant Services

Data digitisation, performance modelling, reliability analysis, and safety review for operating nuclear plants.

Engineering Capability

- **As-built Data Collection and Digitisation:** Accurate data capture for plant documentation
- **3D Plant Modelling and 4D Simulation:** Digital twins for performance and safety analysis
- **Plant Health Monitoring, LA Studies & Upate:** Reliability assessments and life extension studies
- **Remote Handling and Industrial Automation:** Automation solutions for safe and efficient operations

Special Capabilities:

Life extension and uprate programs, plant digitalisation, safety analysis.

Major Nuclear Power Projects: Shaping India's Atomic Energy Landscape



Tarapur Atomic Power Station | Units 1&2 | PHWR IPHWR | 220MWe

Services: Design & Engineering, Project Management and Commissioning

Project Highlights

- Tarapur Atomic Power Project Units 1 & 2, Maharashtra – India's first BWR reactors
- Commissioned in 1969; among the lowest-cost power generators
- Generated over 48,800 million units since commercial operation



Narora Atomic Power Station | Units 1&2 | PHWR IPHWR | 220MWe

Services: Design & Engineering, Structural and Electrical Systems

Project Highlights

- First station with advanced safety features post-Chernobyl
- Connected to India's northern grid
- Strengthened indigenous nuclear capability
- Contributed to energy security and clean power goals



Rajasthan Atomic Power Station | Units 1&2 | PHWR CANDU | 100 & 200MWe

Services: Electrical Engineering, System Integration and Grid Analysis

Project Highlights

- First commercial nuclear power station in northern India
- Key milestone in India's early nuclear power development
- Strengthened India's grid connectivity and indigenous reactor expertise



Madras Atomic Power Station | Units 1&2 | PHWR IPHWR | 220MWe

Services: Multidisciplinary Design & Engineering

Project Highlights

- India's first fully indigenous nuclear power station
- Strengthened India's self-reliance in nuclear technology
- Key contributor to southern grid stability and clean energy goals



Kakrapar Atomic Power Station | Units 1&2 | PHWR IPHWR | 220MWe

Services: Design & Engineering, Electrical Systems and Structural Design

Project Highlights

- Supports India's clean and reliable energy program
- First nuclear power station in western India
- Enhanced grid stability and clean energy supply
- Strengthened India's indigenous reactor design and safety systems

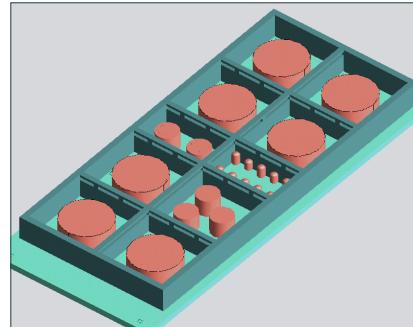
Major Nuclear Waste Management Projects:

Ensuring Safe and Sustainable Operations



Waste Immobilisation Plant, Trombay, Maharashtra (1984)

Design and engineering for immobilisation of radioactive waste, supporting safe long-term storage and environmental protection.



Additional Waste Tank Farm, Trombay, Maharashtra & Kalpakkam, Tamil Nadu (2007)

Front-end and detailed engineering, 3D modelling, nuclear-specific equipment integration, inspection, procurement, construction supervision, and project management for expanded waste storage capacity.



Spent Fuel Storage Facility, Tarapur, Maharashtra & Kalpakkam, Tamil Nadu (2006)

Design and engineering for spent fuel storage, including front-end and detailed engineering, 3D modelling, equipment integration, inspection, procurement, construction supervision, and project management.

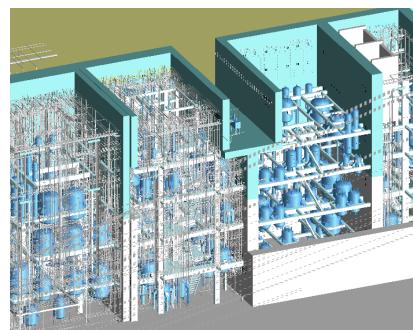


Integrated Fast Reactor Fuel Cycle Facility, Kalpakkam, Tamil Nadu (Ongoing)

Comprehensive design and engineering across all phases:

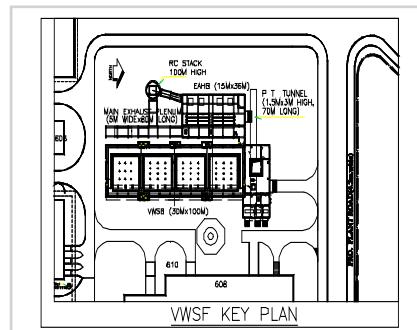
- Fuel reprocessing plant
- Waste management plant
- Fuel fabrication plant
- Reprocessed uranium oxide plant
- Central analytical laboratory
- Core sub-assembly plant
- Common services and utilities

Services include front-end and detailed engineering, regulatory documentation, tender preparation, construction, and commissioning.



PreFre-3A Fuel Reprocessing Facility, Kalpakkam, Tamil Nadu (Ongoing)

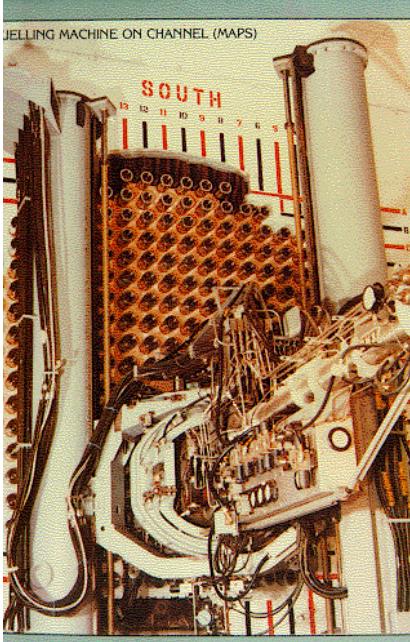
Front-end and detailed engineering, 3D modelling, nuclear equipment integration, inspection, procurement, construction supervision, and project management for advanced fuel reprocessing.



Vitrified Waste Management Facility, Kalpakkam, Tamil Nadu (Ongoing)

Civil and structural design for multiple facility buildings, electrification, fire fighting systems, and construction supervision for vitrified waste storage and handling.

Major Nuclear Fuel Processing Projects: Strengthening the Nuclear Fuel Cycle



Fuel Handling System for CANDU Type Reactor, 235 MW (Various Sites, India)

Design adaptation for indigenous manufacture, preparation of drawings, reliability and remnant life assessment, and special purpose equipment design.

Location: Various PHWR sites across India

Year: Not specified (CANDU PHWRs commissioned from 1972 onwards)



Self-Elevating Straddle Carrier Platforms (Nuclear Facilities, India)

Design and development of specialised handling equipment for nuclear facilities.

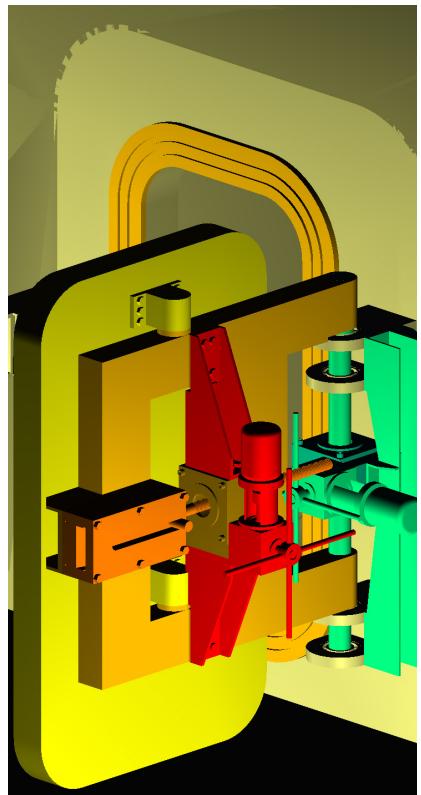


Zirconium Oxide & Sponge Facility, Pazhayakayal (Tuticorin), Tamil Nadu (2009)

Front-end and detailed engineering, inspection, procurement, construction supervision, and project management for reactor-grade sponge production.

Location: Pazhayakayal (Tuticorin), Tamil Nadu

Year: 2009



Airlock for Prototype Fast Breeder Reactor, Kalpakkam, Tamil Nadu (2024)

Special equipment and machine design for advanced reactor applications.

Location: Kalpakkam, Tamil Nadu
Year: 2024 (commissioning phase)



Uranium Fuel Assembly Facility, Telangana (1997)

Design engineering for plant layout, civil structures, utilities, and automation; construction management and commissioning support.

Major Operating Plant Service Projects:

Enhancing Performance and Reliability



Additional Waste Tank Farm, Trombay & Tarapur, Maharashtra (Completed)

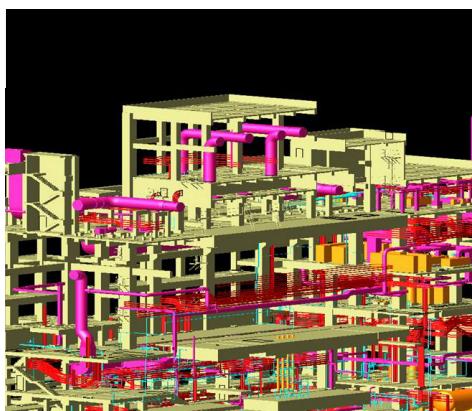
3D modelling and engineering for expanded waste storage facilities, enabling safe and efficient operations. Scope includes digital plant documentation, integration of nuclear-specific equipment, and support for ongoing plant services.

Tarapur Atomic Power Plant, Maharashtra (Ongoing/Completed)

3D modelling and engineering for turbine generator building layouts and plant systems, supporting plant upgrades, digitalisation, and enhanced operational performance.

PreFre-3A Fuel Reprocessing Facility, Kalpakkam, Tamil Nadu (Engineering completed, construction in progress)

Advanced 3D modelling and engineering for fuel reprocessing, with a focus on all systems and equipment integration to support operational reliability and regulatory compliance.



Fast Breeder Reactor, 500 MWe, Kalpakkam, Tamil Nadu (Ongoing)

Comprehensive 3D modelling and engineering for all major buildings and systems, supporting life extension, digitalisation, and operational efficiency. Scope includes the Reactor Containment Building (RCB), Steam Generator Buildings (SGB1 & SGB2), Fuel Building (FB), Reactor Waste Building (RWB), Electrical Buildings (EB1 & EB2), Control Building (CB), as well as sodium storage tanks, steam generators, pumps, heat exchangers, air conditioning, ventilation, and cable tray layouts.

Partnering in India's Nuclear Future

India is entering a transformative phase in nuclear energy, with **Small Modular Reactors (SMR)** and **Bharat Small Reactors (BSR)** at the core of this change. These technologies promise clean power for cities and industries, flexible deployment for diverse needs, and a pathway to energy independence. **Tata Consulting Engineers (TCE)** is proud to be at the leading edge, enabling safe, efficient, and future-ready solutions.

Why SMR & BSR Matter?



Clean Energy Expansion

Small reactors can be installed closer to demand centres, reducing transmission losses and making clean electricity accessible to remote regions and growing urban hubs. Their modular design allows phased deployment, speeding up energy availability.



Industrial Decarbonisation

Energy-intensive sectors like steel, cement, and chemicals need dependable, low-carbon power. SMRs and BSRs provide continuous energy for processes that cannot rely on intermittent renewables, helping industries meet sustainability targets without compromising productivity.



Repurposing Thermal Sites

Existing coal plant sites already have land, water, and grid links. Converting them for small reactors avoids greenfield development, cuts project timelines, and optimises existing infrastructure for a cleaner future.



Energy Security

By reducing reliance on imported fuels and diversifying India's energy mix, SMRs and BSRs strengthen long-term energy independence. Their scalability ensures resilience against demand fluctuations and supports strategic goals for self-reliance.

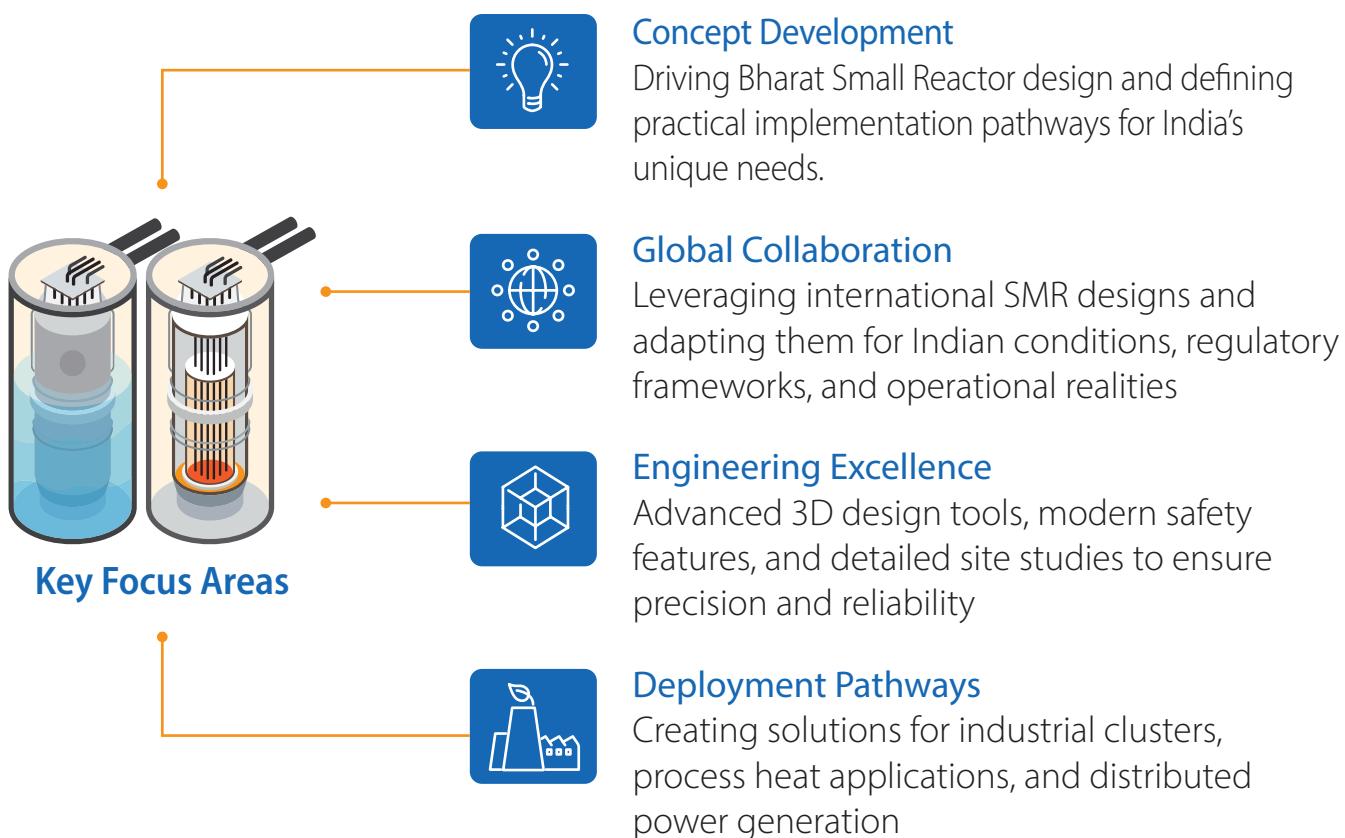


Small Modular Reactors (SMR)



Bharat Small Reactors (BSR)

Our Role in SMR and BSR



The TCE Advantage in India's Nuclear Future



50+ Years of Nuclear Engineering Excellence
Our legacy is built on strong foundations of innovation and trust.



Strategic Partnerships
Decades-long association with DAE, BARC, and NPCIL, enabling trusted collaboration.



Proven Project Delivery
Successful design and execution of major civilian nuclear projects across India.



Depth of Expertise
Comprehensive capabilities in safety engineering and risk assessment, site selection and feasibility studies, and end-to-end EPCM support for complex nuclear projects.



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