Opening the door to India’s next energy transition with SHANTI Bill

manufacturing.economictimes.indiatimes.com/news/energy/opening-the-door-to-indias-next-energy-transition-with-shanti-bill/126212999

Amit Sharma, ET Manufacturing December 28, 2025

Private participation could unlock substantial capital over the next two decades, creating a multiplier effect across design, engineering, manufacturing, construction and specialist services.

India now stands at an inflection point in its energy journey. The passage of the Sustainable Harnessing and Advancement of Nuclear Energy for Transforming India Bill, known as the SHANTI Bill, is more than a legislative reform. It is a bold statement of intent. The SHANTI Bill marks a pivotal transformation in India’s energy trajectory by fundamentally reshaping its nuclear policy. As a result, civil nuclear power will open to responsible private participation, moving from an exclusively state led framework to a collaborative model between government and industry.

This is not just a policy change. It is a structural reset that will shape how India meets its energy needs, climate commitments and industrial ambitions. SHANTI lays new legal, financial and strategic foundations to accelerate the country’s nuclear deployment and bolster its clean energy ambitions. As business leaders, we must understand both the promise and the responsibility that come with this moment.

Why the SHANTI Bill Matters

The SHANTI Bill replaces the Atomic Energy Act of 1962 and consolidates the Civil Liability for Nuclear Damage Act of 2010 into a unified framework. It

grants statutory status to the Atomic Energy Regulatory Board, introduces graded liability caps for operators and removes statutory supplier liability in favour of contractual terms. Sensitive parts of the fuel cycle remain under government control, while foreign investment of up to forty nine per cent is permitted.

At its core, the Bill seeks to make nuclear power a central pillar of India's energy strategy. The target is ambitious, scaling nuclear capacity from today's 8.88 gigawatts to 100 gigawatts by 2047. This is not only about adding capacity. It is about securing clean, reliable baseload power at scale, which is essential for economic growth and for achieving net zero emissions by 2070. The legislation also promotes small modular reactors, recognising that innovation and capital infusion are vital for meeting India's goals.

The Economic and Industrial Opportunity

The economic potential is significant. Nuclear projects require large upfront investments, often running into billions per plant. Private participation could unlock substantial capital over the next two decades, creating a multiplier effect across design, engineering, manufacturing, construction and specialist services.

Job creation will span the entire value chain, from highly skilled nuclear engineers and regulatory professionals to construction workers and plant operators. The emphasis on indigenous reactor designs, including pressurised heavy water reactors and thorium based technologies, positions India as a credible exporter of nuclear expertise.

Strategic and Climate Imperatives

India continues to depend heavily on coal imports and remains exposed to global energy price risks. Nuclear power offers strategic energy independence. Unlike solar and wind, nuclear power provides constant twenty four hour baseload supply, making it a strong complement to renewables. India's electricity demand is expected to triple by 2050.

The climate case is equally compelling. Nuclear energy produces very low carbon emissions during operation, making it essential for meeting climate goals without slowing economic growth.

Small Modular Reactors as a Game Changer

Small modular reactors are designed to be modular, optimally sized, safer and faster to build than traditional large reactors. They can be deployed in clusters, scaled up as demand grows and located closer to industrial users. For India, SMRs offer a practical solution for captive power in sectors such as steel, cement, chemicals, semiconductors, hydrogen production and data centres.

They can also repurpose land from retiring coal plants, reducing environmental impact and speeding deployment. India must leverage its proven Bharat Small Reactor and the 220 megawatt pressurised heavy water reactors by modularising them to enable bulk procurement and economies of scale, while also accelerating the development of the proposed modular fifty, one hundred and two hundred megawatt light water reactors.While large reactors are essential to meeting economic growth driven energy demands for the grid and large scale industrial plants, SMRs play a distinct and critical role. SMRs are needed to provide baseload, uninterrupted, clean energy for industrial captive plants, including data centres, semiconductors, speciality chemicals and manufacturing. Their optimal size ensures a reasonably sized and affordable capital investment by the private sector, enables efficient land selection, adheres to higher safety norms and reduces exclusion zone requirements.

As India moves up the global manufacturing value chain, reliable baseload power becomes a competitive advantage. SMRs will enable captive clean power and support industrial decarbonisation, aligning Indian manufacturing with international sustainability standards.

The government has already announced plans for Bharat Small Reactors, which can be adopted within a year, while the proposed Bharat Small Modular Reactors are targeted for the early nineteen thirties. These designs will serve both grid and industrial needs, and Tata Consulting Engineers is ready to play a key role in their development and deployment.

Challenges We Must Address

Optimism must be balanced with realism. The liability framework remains sensitive and continues to evolve. In line with global norms, by limiting operator liability and removing explicit supplier liability, the Bill aims to attract international participation.

Regulatory readiness is another important issue. The Atomic Energy Regulatory Board gains statutory status under the Bill, but questions remain about the level of independence required. Strong regulatory autonomy will be vital as the sector expands.

Project execution challenges exist across all large capital projects, and nuclear power is no exception. Nuclear projects have historically faced delays and cost overruns. While standardised fleet deployment for large reactors can help reduce such risks, the smaller, modular and cluster based SMR approach will also improve predictability in project timelines and investment returns.

Private participation will bring much needed capital and can improve productivity and efficiency. However, success will depend on careful planning, investment in skills and long term capability building across both capital and operational phases. Public trust will be essential, particularly around land acquisition, safety assurance and community engagement.

Tata Consulting Engineers' Perspective and Role

The passage of the SHANTI Bill marks a significant milestone for India's nuclear energy framework. At Tata Consulting Engineers, our service to the nation in the nuclear field spans more than fifty years. We have been deeply involved in technical, design, engineering and techno financial work with NITI Aayog, the Department of Atomic Energy, the Department of Science and Technology, NIAS and other institutions.

Our contributions include policy inputs, feasibility studies, design, engineering, simulation and testing, core technical support and partnerships for advanced reactor technologies. We have worked on projects ranging from nuclear island design to safety analysis and have supported government think tanks with techno economic assessments of SMRs. Our experience in integrating nuclear systems with industrial processes gives us a strong perspective on how these technologies can accelerate India's clean energy transition.

This legislation brings clarity, confidence and accountability, paving the way for responsible growth. We remain committed to translating this vision into safe, resilient and future ready nuclear projects that strengthen India's energy security and clean energy transition. Private sector involvement in nuclear will be transformational. It will unlock advances in manufacturing, materials science and reliable baseload power for both grid and captive requirements through SMR adoption.

In my view, it would be valuable to establish an independent body under the Ministry or the Department of Science and Technology to guide new Indian private sector entrants who will require expert advice and technical support. With over five decades of nuclear experience, Tata Consulting Engineers is ready to support such an entity and guide Indian industry players through this complex and technology intensive domain, helping deliver the objectives of the SHANTI Bill.

Building Skills and Innovation for the Future

The success of this transition will also depend on building a skilled workforce and fostering innovation. Nuclear engineering demands deep technical

expertise, and India must invest in education and training programmes to prepare the next generation of professionals. Partnerships between industry, academia and research institutions will be essential to develop advanced reactor designs, digital safety systems and new materials.

Tata Consulting Engineers is committed to supporting this ecosystem through knowledge sharing, training modules and collaborative research. We believe that innovation in reactor design, modular construction and digital monitoring will make nuclear projects safer, faster and more cost effective.

Four Actions to Move from Intent to Impact

1. **Create an independent guidance body**
   Establish a small expert team with strong links to the Atomic Energy Regulatory Board, the Department of Atomic Energy and industry. Provide a clear remit for siting support, safety culture and design review. Use transparent processes and publish learning.
2. **Pilot a cluster of SMR projects**
   Select brownfield sites near retiring thermal stations, data centres and heavy industry. Set measurable goals for cost, schedule and safety, and capture lessons for scale up. Back this with Nuclear Energy Mission funding.
3. **Strengthen risk pooling and public communication**
   Continue improving insurance and liability structures, and implement an open information programme on safety, emergency planning and community benefits to build long term public trust.
4. **Enable stable funding mechanisms**
   Explore long term debt instruments such as green bonds for nuclear power projects. Tap ESG focused capital markets. Support the creation of the required insurance ecosystem, sector specific contractual frameworks and a clear understanding of liability and risk frameworks so that the private sector can fully leverage the Bill’s intended benefits.

The SHANTI Bill opens the door. Navigating it will require discipline, openness and care. If ambition is matched with responsibility, speed with safety and clean energy growth aligned with net zero objectives, India can build a nuclear programme that is powerful, clean and trusted.

At Tata Consulting Engineers, we see this as both an opportunity and a responsibility. We will continue to partner with government and industry to make this vision a reality through engineering excellence, safety leadership and innovation that serve the nation.

(Disclaimer- The author is MD & CEO, Tata Consulting Engineers. Views are personal)

- Published On Dec 28, 2025 at 12:10 PM IST