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Legal Architecture and Regulatory Control of India's Nuclear Sector: A Critical Appraisal of the SHANTI Rules, 2026

ORIGINAL ARTICLE



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Abstract

The promulgation of The Sustainable Harnessing and Advancement of Nuclear Energy for Transforming India (SHANTI) Rules, 2026 [Draft], framed under the Sustainable Harnessing and Advancement of Nuclear Energy for Transforming India Act, 2025 (Act No. 39 of 2025), marks a transformative epoch in India's energy jurisprudence. By superseding six legacy statutory instruments ranging from the Atomic Energy (Working of Mines, Minerals and Handling of Prescribed Substance) Rules, 1984, to the Civil Liability for Nuclear Damage Rules, 2011 the 2026 framework establishes a unified, comprehensive legal architecture. This paper critically examines the structural contours of the SHANTI Rules, 2026 [Draft], evaluating their impact on private sector integration, the tripartite "3S" (Safety, Security, Safeguards) paradigm, and the civil liability and claims adjudication machinery.

Key Words

Nuclear Energy Jurisprudence, Nuclear Legal History, Atomic Energy Act 1962, Nuclear Liability, Atomic Energy Regulatory Board (AERB), SHANTI Rules 2026 [Draft].

Introduction and Legislative Genesis

India's nuclear energy sector has historically operated under a state-monopoly framework governed by the Atomic Energy Act, 1962. However, contemporary energy demands, decarbonization targets, and the necessity to leverage advanced technologies such as small modular reactors (SMRs), fusion energy, and high-performance applications necessitated a modernized legislative framework. The enactment of the Sustainable Harnessing and Advancement of Nuclear Energy for Transforming India Act, 2025, laid the statutory foundation, which is operationalized through the SHANTI Rules, 2026 [Draft].

The 2026 Rules systematically repeal six legacy rules, consolidating diverse domains—ranging from mining and ore processing to power generation, waste management, foreign trade, and civil liability—into a single, harmonized regulatory instrument.

Research Objectives

1. To trace the chronological evolution of India's nuclear legislation from the post-independence state-monopoly era to the contemporary private-inclusive framework of 2026.
2. To examine major global nuclear disasters (Chernobyl and Fukushima) and evaluate how their lessons shaped modern nuclear safety culture, emergency preparedness, and containment strategies.

3. To analyze the legislative transition from legacy rules (1984–2015) to the unified SHANTI Rules, 2026 [Draft], particularly regarding operator liability and environmental remediation.
4. To critically analyze the statutory transition from state-monopoly frameworks to a regulated, private-inclusive nuclear energy market under the SHANTI Rules, 2026[Draft].
5. To examine the operational efficacy of the composite licensing regime for nuclear power plants, fuel fabrication facilities, and mining operations.
6. To evaluate the legal interface between safety, nuclear security, and international safeguards (3S paradigm) mandated for licensees.
7. To appraise the mechanics of strict operator liability, financial security instruments, and the adjudication jurisdiction of Claims Commissioners and the Nuclear Damage Claims Commission.

Method And Methodology

This study adopts a doctrinal and analytical legal research methodology. It relies on primary statutory sources, specifically 'The Sustainable Harnessing and Advancement of Nuclear Energy for Transforming India Act, 2025,' and the subordinate 'SHANTI Rules, 2026.[Draft]'

- **Legal Exegesis:** Systematic textual interpretation and statutory construction of provisions governing licensing hold points, exclusion zones, and liability exemptions under Section 44 of the Act.
- **Comparative and Institutional Analysis:** Evaluation of administrative checks and balances separating promotional bodies (Department of Atomic Energy) from independent regulators like the Atomic Energy Regulatory Board (AERB) and the Atomic Energy Redressal Advisory Council.
- **Policy Appraisal:** Assessment of socio-economic objectives, including energy transition targets, captive power applications for hard-to-abate industrial sectors, and international convention frameworks (such as the Convention on Supplementary Compensation for Nuclear Damage).

Limitations

1. **Lack of Empirical Operational Data:** As the SHANTI Rules, 2026, [Draft] represent a newly enacted prospective framework, empirical metrics regarding the practical execution of private commercial participation and long-term waste management fund accruals remain nascent.
2. **Exclusion of Classified Security Protocols:** Certain operational dimensions of the National Security Policy, Design Basis Threats (DBTs), and specific physical protection measures are restricted under official secrets and restricted information provisions (Section 39 of the Act), limiting exhaustive public critique of tactical security measures.
3. **Evolving Post-Fukushima Standards:** International nuclear safety standards continue to evolve in real-time, meaning that current domestic frameworks must constantly adapt to emerging technological insights from ongoing decommissioning efforts at international sites.
4. **Jurisdictional Scope:** The study is strictly confined to the domestic Indian legal framework and federal administrative bodies, excluding an in-depth comparative analysis of foreign nuclear regulatory models (e.g., USNRC or EURATOM frameworks).

History of Laws Governing Nuclear Energy in India

India's nuclear legislative history reflects a deliberate transition from an isolated state monopoly to a regulated, commercially integrated ecosystem:

- **The Atomic Energy Act, 1948:** Enacted shortly after independence, this initial legislation laid the groundwork for state-controlled research and development under the guidance of the Department of Atomic Energy (DAE).
- **The Atomic Energy Act, 1962 (Act No. 33 of 1962):** This landmark statute established absolute Governmental control over atomic energy, radioactive substances, and radiation-generating equipment, prohibiting private ownership or operation of nuclear reactors for decades.

- **The Legacy Subordinate Rules (1984–2015):** The various Rules those are fragmented for a long interval of time period, governed distinct sectors, including:
    1. The Atomic Energy (Working of Mines, Minerals and Handling of Prescribed Substance) Rules, 1984.
    2. The Atomic Energy (Safe Disposal of Radioactive Wastes) Rules, 1987.
    3. The Atomic Energy (Radiation Protection) Rules, 2004.
    4. The Civil Liability for Nuclear Damage Rules, 2011.
- **The Civil Liability for Nuclear Damage Act (CLNDA), 2010:** This Act is a critical legislative turning point which establishing a strict, no-fault liability regime for nuclear operators with a statutory cap on damages.
- **The SHANTI Act, 2025, and SHANTI Rules, 2026 [Draft]:** Superseding all legacy rules, the 2026 framework consolidates safety, security, safeguards, and trade into a single unified code while opening doors for eligible private entities and joint ventures in power generation, hydrogen production, and advanced technology applications.

Major Nuclear Disaster Incidents in History and Their Regulatory Impact

Global nuclear history has been profoundly shaped by major accidents, each forcing sweeping international and domestic legal reforms:

A. Chernobyl Nuclear Power Plant Accident (1986)

- **Incident Summary:** A flawed reactor design combined with severe operator violations during a late-night safety test led to an uncontrolled power surge, triggering steam explosions and a graphite fire. This destroyed Reactor No. 4 and released massive quantities of radioactive fallout across Europe.
- **Regulatory and Legal Impact:** Exposed the catastrophic dangers of poor safety culture, inadequate operator training, and the absence of independent regulatory oversight. It prompted the creation of the World Association of Nuclear Operators (WANO) and drove home the necessity of robust international early-notification conventions. In modern frameworks like the SHANTI Rules, 2026 [Draft], this is reflected in strict human reliability programs, mandatory safety culture requirements (Rule 36), and rigorous training certification mandates for all radiation workers.

B. Fukushima Daiichi Nuclear Disaster (2011)

- **Incident Summary:** A massive Tohoku earthquake of 9.0 magnitude occurred which leads to 15-meter tsunami which overwhelmed the coastal defenses of the Fukushima Daiichi plant, it leads to knocking out of external power and emergency diesel generators. Due to it the nuclear power station blackout, which led to prolonged cooling failures, therefore the nuclear core meltdowns, and ultimately resulted into hydrogen explosions.
- **Regulatory and Legal Impact:** it demonstrated the adverse impact on the nuclear power plant due to external power dependencies, the impact of extreme natural disaster risks, and incidents of nuclear disaster due to inadequate long-term spent fuel management. It demanded the safety and security which caused due to extreme external hazard mitigation, insist on development of severe accident management guidelines (SAMGs), and to avail the enhanced financial security for decommissioning and site remediation. Therefore this SHANTI Rules, 2026, codified in rigorous site suitability criteria (Rule 6), and mandatory safety-security interfaces (Rule 61), and segregated financial security funds for decommissioning (Rule 111).

Comprehensive Licensing Framework and Private Sector Integration

A pivotal reform under the SHANTI Rules, 2026 [Draft], is the establishment of a transparent, structured licensing regime that permits eligible entities (including private enterprises, subject to Governmental notification under Section 3(1) of the Act) to engage across the nuclear fuel cycle.

A. Composite Licensing for Nuclear Power Plants and Reactors

The Rule-3 introduces a **single composite licence,** which authorising the subjected building, the owning, their operating, and their decommissioning of a Nuclear Power Plant or reactor associated with it. Therefore, it

is essential to eliminates sequential fragmentation by bundling lifecycle phases into a unified authorization mechanism. The eligible entities may deploy reactors for:

- To grid electricity supply and captive power generation for hard-to-abate sectors (e.g., the aluminium, the cement, the semiconductor fabrication, and the AI-enabled data centres).
- To process heat applications, hydrogen production, and hybrid systems.
- For Medical isotope production, education, training, and research (including nuclear fission and Deuterium-Tritium fusion reactors).

B. Pre-Licensing Scrutiny, In-Principle Approvals, and Capabilities

The licensing process mandates rigorous pre-licensing consultations and multi-layered capability assessments:

- **Suitability of Site (Rule 6):** Requires Governmental land acquisition consents, strict adherence to exclusion zone parameters (where public habitation is prohibited under licensee control), and rejection criteria compliance.
- **Acceptability of Design (Rule 7):** Mandates design certification or approval from the regulatory body of the country of origin for foreign designs, alongside domestic safety validations.
- **Financial, Managerial, and Technical Capabilities (Rule 8):** Applicants must submit comprehensive cost estimates, financial stability credentials (SEBI-registered credit ratings, banker certificates), assured fuel supply arrangements, and organizational safety culture frameworks. Newly formed entities face heightened scrutiny, requiring parent company indemnification undertakings and detailed shareholder agreements.

Safety, Security and Safeguards Interface (3s Paradigm)

The SHANTI Rules, 2026 [Draft], institutionalize an integrated approach balancing safety, nuclear security, and international safeguards.

A. Prime Responsibility for Safety: To reaffirming international nuclear law principles, Rule 49 establishes that the prime responsibility for safety rests unequivocally with the employer, facility occupier, or mine owner. This responsibility cannot be delegated, diminished, or substituted by regulatory oversight or contractual outsourcing.

B. Nuclear Security Framework: Under Chapter III (Part C), the Central Government designates nuclear facilities and premises as Prohibited Areas under Section 40 of the Act, with overlying airspaces classified as No-Fly Zones (Red Zones). Licensees must deploy physical protection systems, implement human reliability programmes, maintain trustworthiness vetting, and appoint approved Nuclear Security Officers to manage contingency plans against design basis threats (DBTs), including cyber threats.

C. Safeguards and Material Accountancy: Chapter III (Part D) operationalizes India's national system of accounting and control for source materials, fissile materials, and heavy water. Licensees must maintain strict material balance areas, conduct physical inventory verifications, ensure measurement control programmes, and appoint Facility Safeguards Officers to interface with national authorities and international inspectors.

Liability Regimes and Claims Adjudication

The rules bifurcate liability and compensation mechanisms into two distinct domains.

The first one nuclear damage governed by the Act's statutory framework and secondly radiation damage governed by administrative and expert-led procedures.

A. Strict Liability for Nuclear Damage and Financial Security

- **No-Fault Liability:** In accordance with Section 15 of the Act and Rule 76, the operator's liability for nuclear damage (including during transport) is strict and based on a no-fault principle.
- **Financial Security and Pledging:** Operators must maintain irrevocable financial security or insurance policies pledged to the Central Government with a security margin of **1:1.33**. Central Government-owned installations operating under specific statutory exemptions are absolved from commercial insurance obligations, with the state assuming direct liability.

- **International Conventions:** Rule 76 outlines mechanisms for invoking public funds under the Convention on Supplementary Compensation for Nuclear Damage (CSC) when claims exceed domestic statutory limits.

B. Claims Adjudication Machinery

Chapter VI (Part A) and Chapter IX (Part D) detail the procedural jurisprudence of Claims Commissioners and the Nuclear Damage Claims Commission. Petitioners must file formal applications (Form-A) accompanied by affidavits, medical certificates, and proof of identity. The adjudication authorities are empowered to adopt summary trial procedures under Order XXXVII of the Code of Civil Procedure, 1908, direct medical boards for disability assessments, and establish protective financial trusts (fixed deposits) for minors, illiterate, or semi-literate claimants to secure long-term welfare.

C. Radiation Damage (Non-Nuclear Incidents)

For radiation accidents outside the purview of major nuclear incidents (localized events under Rule 101), licensees must maintain mandatory financial security ranging from INR 1 Lakh to INR 50 Lakhs based on hazard potential (Schedule-II). An Expert Advisory Committee investigates doses and bio-dosimetry studies to recommend compensation awards payable by the custodian or the Central Government in cases involving orphan sources.

Institutional Governance and Regulatory Oversight

The institutional machinery established under the rules ensures functional separation between promotional bodies (like the Department of Atomic Energy) and independent regulatory oversight.

- **Atomic Energy Regulatory Board (AERB):** Chapter IX (Part A) sets strict eligibility criteria, 30-year professional experience requirements, search-cum-selection mechanisms, and tenure rules for the Chairperson and Members of the Board to guarantee regulatory independence.
- **Atomic Energy Redressal Advisory Council:** Functions as a specialized appellate and dispute-resolution forum under Section 48 of the Act to resolve grievances, review enforcement actions, and negotiate settlements without compromising safety or security.
- **Appellate Tribunal:** Appeals against orders of the Council or Adjudicating Officers lie with the Appellate Tribunal for Electricity, supported by designated Technical Members (Atomic Energy).

Conclusion

The SHANTI Rules, 2026 [Draft], represent a progressive, highly structured leap in Indian nuclear governance. By meticulously balancing commercial incentives for private sector innovation with stringent safety culture mandates, multilayered security protocols, and equitable victim-compensation mechanisms, the rules establish a world-class legal benchmark. This framework not only safeguards national energy security and public health but also aligns India's domestic nuclear jurisprudence with rigorous international standards of safety, transparency, and civil liability.

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