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NUCLEAR ENERGY LAW AND ITS ENVIRONMENTAL ASPECTS IN INDIA

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Abstract

Nuclear energy law and its environmental aspects in India form a complex and critical area of study, reflecting the country's dual objectives of meeting growing energy demands and ensuring environmental protection. India has made significant investments in nuclear energy as part of its strategy to diversify its energy mix and reduce reliance on fossil fuels, which are associated with high greenhouse gas emissions. The legal framework governing nuclear energy in India includes both national regulations and international agreements, aiming to balance the benefits of nuclear power with rigorous safety and environmental standards. The primary legal instruments in this domain are the Atomic Energy Act, 1962, and various rules and regulations under this Act, including those pertaining to safety, security, and environmental protection. Additionally, India is a signatory to international treaties such as the Convention on Nuclear Safety and the Convention on Environmental Impact Assessment in a Transboundary Context, which influence domestic regulatory practices. Environmental aspects of nuclear energy in India involve considerations of waste management, radiation protection, and ecological impacts. The Indian regulatory framework addresses these issues through stringent safety protocols and environmental impact assessments. However, challenges remain, particularly regarding the management of radioactive waste and the potential for environmental contamination in the event of accidents.

Keywords

Nuclear energy, Environment, Protection, Safety, Regulation.

Introduction:

The years following World War I were characterized by quick advances in technology and low-cost energy. As the 20th century went on, campaigns for sustainable development and the utilization of renewable energy sources gained traction. The public's fear of nuclear energy stemmed from the nuclear accidents at Three Mile Island in March 1974 and Chernobyl in April 1986, which claimed 65,000 lives and caused damages of up to US \$250 billion. These events made people aware of the potential disaster that lurks beneath nuclear reactors. These mishaps demonstrated the detrimental effects they have on people's health, property, the economy, and the environment. The people, who already feared for their safety and the safety of their families in the event of a nuclear accident, found little solace in the environmental movements. However, as the 1990s came to an end and the twenty-first century began, the public's attention was shifting from radioactivity to global warming as the more pressing and deadly environmental problem. Since the carbon emissions from a nuclear power station are negligible, growing concerns over global warming have suddenly shrouded nuclear energy in respectability.

Since they were first built more than 30 years ago, nuclear reactors and power plants have not caused any major problems or worries to the public. They make a big difference in the world's energy¹, and after strong resistance to nuclear power, some countries have given up on building nuclear weapons and expanding their nuclear power programs. Climate change, lowering greenhouse gas emissions, and worries about running out of fossil fuels, using renewable energy sources, and energy security all led to the growth of nuclear power in both developed and emerging countries around the world.

Energy security has been a fundamental aspect of the foreign and security policy goals of all governments since the First World War. During this time, the British navy switched its ships from coal to oil propulsion in order to gain an advantage over German ships that were still using coal as their power source. Several significant engagements of the Second World War, such as the 1941 German invasion of Russia and Japan's decision to strike the US naval base in Pearl Harbor later that year, were directly or indirectly connected to the issue of energy

¹ Leonardo Maugeri, 'Oil: Never Cry Wolf-Why the Petroleum Age is Far from Over', 304:5674 Science 111415 (2004)

security.²

Growth of Nuclear Power in India

India uses a very small amount of nuclear power compared to the total amount of industrial primary energy it uses. Nuclear power is used to make energy, but it only makes up a very small part of the electricity made in India. Even though it doesn't make a big difference right now, nuclear power could give India "energy independence" after 2050, so its growth is seen as very important³. India, on the other hand, has a lot of thorium ores but not many lowquality uranium ores. So, India's nuclear power program is built around a three-step plan: (i) Pressurized Heavy Water Reactors, (ii) Fast Breeder Reactors, and (iii) Reactors based on the Uranium 233-Thorium 232 cycles. The end goal is to use the country's huge thorium stocks. India, on the other hand, has been banned from getting to its nuclear materials and technology from other countries because it has not signed the Nuclear Non-Proliferation Treaty (NPT) and has performed nuclear tests in 1974 and 1998. India's plans to use nuclear power in the future rely on the country being able to trade nuclear materials with other countries⁴. The International Atomic Energy Agency (IAEA) was created in 1956 to promote and make it easier for nuclear power⁵ to be used by more people. People thought that atomic energy would help bring about "peace, health, and prosperity" around the world. The goals of the IAEA say that different legal systems should be able to handle health and environmental risks by making their own rules and laws while following the IAEA's safety standards.

Nuclear Power: The Emergence of Environmental Concerns

The surge in popularity of nuclear power as a solution to the energy crisis of the 1970s finally made long-term health and environmental implications a major global worry. The Stockholm Conference in 1972 had advocated for the establishment of a register to track emissions of radioactivity, as well as promoting international collaboration in the management of radioactive waste disposal and reprocessing⁶. The issue was acknowledged as a burgeoning concern, resulting from the escalating utilization of nuclear energy, although no explicit policy directives

² Jan H. Kalicki and David L. Goldwyn, 'Introduction: The Need to Intergerate Energy and Foreign Policy' in Jan H. Kalicki and David L. Goldwyn (ed.), *Energy and Security: Toward a New Foreign Policy Strategy 9* (Washington, D.C.: Woodrow Wilson Center Press and The John Hopkins University Press, 2005).

³ Anil Kakodar, 'Energy in India for the Coming Decades', paper presented at the Inter-Ministerial Conference on 'Nuclear Power for the 21st Century', organized by the International Atomic Energy Agency, Paris, March 21-22, 2005.

⁴ A. Gopalakrishnan, 'Evolution of the Indian Nuclear Programme', *Annual review of Energy and the Environment* 369-95 (2002).

⁵ International Atomic Energy Agency (IAEA) Statute, Articles III (1) – (4).

⁶ Report of the United Nations Conference on Human Environment, available at: <http://www.undocuments.net/aconf48-14r1.pdf>. Last seen on 23/08/2024

were provided. The practice of disposing nuclear waste in the ocean was partially prohibited in 1972, completely halted in 1983, and ultimately banned by the 1996 Protocol amending the London Dumping Convention. As a result, the only remaining options for disposal are on land or through reprocessing. However, the nuclear accidents at Three Mile Island in the USA and Chernobyl in the Soviet Union⁷ demonstrated the grave hazards to human health, agriculture, and the environment associated with nuclear power. The incident at Chernobyl in 1986 resulted in the widespread pollution of Eastern and Western Europe, highlighting the shortcomings of international policies in managing catastrophic risks and exposing some of the actual expenses associated with nuclear power.

The Chernobyl disaster raised concerns about the effectiveness of both domestic and global oversight of nuclear installations. The situation revealed the inherent limitations of the IAEA's⁸ authority and the lack of consensus about issues of culpability and state responsibility. It heightened the significance of neighbouring states interest in the establishment of nuclear power facilities, the possibilities for discussing safety concerns, and the entitlement to immediate reporting of detrimental accidents. The necessity for stronger worldwide control of safety problems in relation to nuclear power became apparent, highlighting the insufficiency of the first compassionate perspective established in 1950.⁹

Importance of Nuclear Power and Challenges in India

In the past 10 to 15 years, a new book has been written about nuclear power. Many law systems have switched to nuclear energy because of rising prices for fossil fuels and worries about climate change around the world. In fact, the World Nuclear Industry Status Report 2010–2011 says that more nuclear plants were being built around the world in 2010 than in any other year since 1988¹⁰. The world's number of working reactors dropped from 427 in July 2013 to 388 in July 2014. This is a drop of 39 percent, or 50 less than the peak number of reactors in 2002¹¹. It is especially strong in China, India, and South Korea, whose economies are growing quickly but don't have a lot of energy. To reach a nuclear power output of 63,000 MW by 2032, India has made a very ambitious plan. The Indian Government has said many times that nuclear

⁷ IAEA, Summary Report on the Post Accident Review Meeting on the Chernobyl Accident, Vienna, 1986.

⁸ Jack Barkenbus, "Nuclear Power Safety and Role of International Organization", International Organization 41, No. 3, 1987, p 475-90.

⁹ IAEA General Conference, Special Session, 1986.

¹⁰ Daniel Yergin, 'Ensuring Energy Security', Foreign Affairs 65:2 (March/April 2006), p.69.

¹¹ Raju G C Thomas, 'India's Energy Policy and Nuclear Weapons Programme', in D R Sardesai Ahomas (ed.) Nuclear India in the Twenty First Century, 282-87 (Palgrave-Macmillan, New York, 2002).

energy will be an important part of the country's efforts to find a clean and environmentally friendly energy mix. But while the Asian countries and the global nuclear energy industry have been getting ready for this renaissance, the recent accident at Fukushima in 2011¹² has served as a stark warning of how dangerous nuclear power can be and why strict safety rules are needed. It's not a surprise that scholars and experts have given the task of making safety rules for civil nuclear sites a lot of thought¹³. The Indian economy is growing at a good rate of 8% per year¹⁴. To keep up this rate of growth, the country needs to put more effort into building facilities and getting more inputs, like energy. India's total industrial energy needs are expected to grow by 7.5 times in the next thirty years, but the rate of growth is only 3.29 percent right now¹⁵. Because climate change and pollution are both very dangerous, it is also important that the energy that is made doesn't hurt the earth. This can be done with both nuclear fuels and energy sources that don't waste energy. At the moment, India gets its energy from the following sources.

All India Energy Sector at a Glance (as on 31.03.2018)¹⁵

Fuel	MW	Percentage
Total Thermal	188,898	70.6
• Coal	164,636	61.5
• Gas	23,062	8.6
• Oil	1200	0.4
Hydro (Renewable)	41,267	15.4
Nuclear	5,780	2.2
Renewable Energy Sources	31,692	11.8
Total	2,67,637	

When combined with thermal power stations, hydropower plants have been responsible for the generation of the majority of India's energy over the course of its history. During the same time

¹² Sudha Mahalingam, 'Diversification and Energy Security', The Hindu, March 30, 2006.

¹³ Convention on Nuclear Safety 1994; Convention on the Safety of Spent Fuel and Radioactive Waste Management 1997, The Convention on Assistance in Cases of Nuclear Emergency 1986.

¹⁴ India GDP Growth Rate, Trading Economics, <http://www.tradingeconomics.com/india/> Last seen on 23/08/2024 ¹⁵ The Government of India planned to achieve a GDP growth rate of 10% in the Eleventh Five Year Plan (200712) and maintain an average growth rate of about 8% in the next 15 years.

¹⁵ Pravin Sawhney, 'India's First Airpower Doctrine Takes Shape', 30(6) Jane's International Defence Review 33-38 (1997)

period, the production of energy from nuclear power stations experienced a decline, despite the fact that the National Electricity Policy, 2005 depicts a requirement for a considerable rise in the proportion of nuclear power by increasing investments from the public sector. In 2013–2014, the overall growth rate of energy in the thermal, hydro, and nuclear sectors was 6.04%, while the development rate for 2014–2015 is 8.4% (provisional). According to the category, the performance of the generation is as follows:

Overview of Power Generation in India (2018-19)¹⁶

Energy	Inclined/Declined	Percentage
Thermal	Improved by	4.18
Hydro	Improved by	18.58
Nuclear	Improved by	4.14
Overall growth rate	Improved by	6.04

About sixteen percent of the world’s energy comes from nuclear power¹⁷. More than 15% of the world’s energy came from nuclear power just in 2009¹⁹. Besides this, nuclear power has been used to build more than 150 military ships around the world. India currently has 19 nuclear power plants running, which are producing 4,560 MW of electricity. Another 4 are being built, which will add another 2,720 MW²⁰ of electricity. India also wants to raise the share of nuclear power in its total electricity generation potential from 4.2% to 9% in 25 years. Official reports say that India wants to build a nuclear power plant with a capacity of 63,000 MW by 2032¹⁸. Recent protests against building new nuclear power plants, on the other hand, have put this goal at risk. Public protests against a 9900 MW nuclear power project in Jaitapur, Maharashtra, and a 2000 MW nuclear power plant in Koodankulam, Tamil Nadu, have never been seen before. Similarly, the West Bengal state government has turned down a plan for a 6000 MW plant in Haripur, saying that safety worries were too high.

The Indian Parliament passed the Civil Liability for Nuclear Damage Act, 2010 to set up a clear way to handle compensation claims after a nuclear accident. This was done because global

¹⁶ Available at: <http://www.powermin.nic.in/Overview> Last seen on 23/08/2024

¹⁷ Nicolas Blarel and Manjeet S. Pardesi, ‘Price of Failure’, Daily News & Analysis, November 13, ¹⁹ Id at p. 4 ²⁰ Ibid.

¹⁸ Ashley J. Tellis, India as a New Global Power: An Action Agenda for the United States 19-54(Washington, D.C.: Canegie Endowment for International Peace, 2005) ²² John Cherian, ‘Safety Last’ Frontline, 2010, p.28.

sanctions had been lifted and the country's energy needs were growing. There was also more nuclear commerce. The bill was passed by the Lok Sabha, and Prime Minister Manmohan Singh said it was the "end of a journey to end the apartheid against India in the field of atomic power"²². However, the question is not just how much compensation should be paid in case of an accident, but also who would pay, the owners or the suppliers, and how much.

International Atomic Energy Agency as an International Inspectorate and Review Body

The International Atomic Energy Agency (IAEA) was formed as a result of a compromise reached after the US failed to agree on suggestions for international single-head control of all nuclear power facilities by an international agency. Its primary responsibilities were to encourage and facilitate the development and inspection of nuclear power¹⁹, as well as to ensure that it was only used for peaceful purposes²⁴ through non-proliferation safeguards. It has the critical role of setting human health and safety standards in partnership with other international institutions²⁵. The IAEA has only little authority to function as an important nuclear safety inspectorate under its legislation.²⁰ However, if requested, the Agency can provide safety advice and conduct a review of safety practices for any nuclear installation or waste disposal facility.

The IAEA has laid down certain principles to be followed by its member states for nuclear safety and precautions.²¹ They principles are as follows:

- a) **The Safety Principle:** These principal lays emphasis that the legal regimes in a country should adopt certain minimum standards of safety for the purposes of protecting health and minimize the danger to life and property from exposure to radiation. This principle is further divided into two subsidiary principles. They are as follows:
 - i. **Prevention and Protection Principle:** This principle lays down that every legal regime should adopt standards of safety for radiation protection, transport and handling of radioactive materials, radioactive waste disposal and safety of nuclear installations.

¹⁹ IAEA Statute, Articles III (1)-(4) ²⁴

IAEA Statute, Articles III (5). ²⁵

IAEA Statute, Articles III (6).

²⁰ Juli A. Mac Donald and Bethany Danyluk, 'Pursuit of Energy Security can enhance its Relationship with the US', Force, September 2006.

²¹ Ibid.

- ii. **Precautionary Principle:** This principle lays emphasis on establishing basic international minimum safety standards and guiding principles regulating the design, construction, siting and operation of nuclear power plants. The utmost priority should be given to protecting public health, security, safety and the environment.
- b) **Security Principle:** The Security Principle suggests the legal system should include the provisions against, both accidental and intentional radiation which can pose threat to the life and property of the people. This principle also cautions against illegal acquisition of nuclear materials by criminal or terrorist groups.
- c) **Responsibility Principle:** When there are Trans boundary nuclear accidents, it becomes difficult to find most preferred method for ensuring safety and reallocating the costs for accident. Generally, the principle of equal access and non-discrimination to nuclear risks and a number of national legal systems facilitate trans-boundary proceedings.
- d) **Permission Principle:** Prior permission is required to do those things, which may pose serious threat or injury to persons or environment. Use of nuclear technology inherently involves some risk; prior permission is always required. The law also clearly needs to identify those activities that require prior permission.
- e) **Continuous Control Principle:** A continuous monitoring of the activities to provide safety advice and a review of safety practices for any nuclear installation or waste disposal site. IAEA safety inspections are valuable to governments because of their independence and the reassurance they provide.
- f) **Compensation Principle:** The states should create a common scheme for loss distribution among the victims, focusing liability on the operator of a nuclear installation, based on the principle of absolute or strict liability and re-enforced by state-funded compensation schemes.
- g) **Sustainable Development Principle:** The principle of sustainable development has special relevance in nuclear energy production. It is “because some fissile material and sources of ionizing radiation can pose health, safety and environmental risks for very long periods of time.”
- h) **Compliance Principle:** Nuclear energy production involves particular risks of radiological contamination transcending national boundaries. There are many bilateral and multilateral instruments that aim at determining an international law of nuclear energy. The fundamental question is to what extent a particular state has adhered to

these international legal regimes. It is also important that the national legal regime incorporates the provisions of customary international law also.

- i) **Independence Principle:** It is very important that the powers, functions and decisions of the Regulatory Authority that is constituted under the nuclear law are not interfered by the executive or other branches of the State and also from entities involved in the development or promotion of nuclear energy.
- j) **Transparency Principle:** Erstwhile, information of nuclear materials was guarded, categorizing it as 'sensitive' and 'confidential'. In the recent past, however, the emphasis is "with the development of the peaceful uses of nuclear energy, however, public understanding of and confidence in the technology have required that the public, the media, legislatures and other interested bodies be provided with the fullest possible information concerning the risks and benefits of using various nuclear related techniques.

The Civil Liability for Nuclear Damage Act, 2010

The law says that people who run nuclear facilities are responsible for any damage they cause. The workers are responsible for everything, even if they made a mistake. This is called "strict liability", and it doesn't matter who made the mistake. This damage won't just happen in the country where it happened; it will also spread to countries nearby. Most of the time, the people who run nuclear plants are responsible for some of the damage, which they may pay for with insurance. After that, international law and practice say that states are responsible as the last option insurers²².

Currently there are three major international agreements, which form the international framework of nuclear liability. They are:

- The Paris Convention of 1960²³
- The Vienna Convention of 1963²⁴ along with the Protocol to amend the Vienna Convention, 1997.
- The Convention on Supplementary Compensation for Nuclear Damage of 1997.

India has only signed the Convention on Supplementary Compensation for Nuclear Damage.

²² Available at: <http://www.world-nuclear.org> Last seen on 23/08/2024

²³ The (Paris) Convention on Third Party Liability in the field of Nuclear Energy, 1960.

²⁴ The (Vienna) Convention on Civil Liability for Nuclear Damages, 1963.

However, it has made a number of bilateral deals with other countries, such as the USA, UK, Russia, France, and Canada, to work together on using nuclear energy for peaceful purposes²⁵. The agreement between India and France makes it clear that India needs to set up a civil nuclear liability system to pay for damage caused by accidents involving nuclear materials and facilities.

There are more than 400 nuclear reactors in use around the world, but only three big accidents²⁶ have killed people²⁷. But a big nuclear accident like Chernobyl²⁸ did a terrible amount of harm. It is the goal of the Civil Liability for Nuclear Damage Act, 2010 to make sure that people get paid quickly after a nuclear disaster. There are some things that all international deals on this subject have in common:

- Fixing no-fault liability on operators and requiring them to take insurance or provide financial security.
- Limiting no-fault liability in time and amount.
- There is a process for expeditious distribution to victims by fixing which court/ authority has jurisdiction.

The president signed the Civil Liability for Nuclear Damage Act, 2010 into law on September 21, 2010. This bill's main goal is to make sure that people who are hurt by nuclear accidents can get quick and fair compensation. It does this by establishing a "no-fault liability regime" that puts responsibility on both the operator and the state. The other goals of this Act are to create a Nuclear Damage Claims Commission and name a Claims Commissioner. It also says that it is being passed to cover liability in case of a nuclear accident and because of the "need to join an international liability regime". According to the Act, nuclear damage can happen in or over the oceans outside of India's territorial waters, in or over the exclusive economic zone, on a ship registered in India, or on or by an artificial island, installation, or building that is controlled by India. Also, it only covers nuclear installations that are owned or managed by the Central Government, either directly or through a government company, authority, or business.

²⁵ For details see: <http://www.iaea.org/newscenter/news/2010/indiaconvention.html> Last seen on 23/08/2024

²⁶ World Nuclear Power Reactors & Uranium Requirements, <http://www.world-nuclear.org> Last seen on 23/08/2024

²⁷ Appendix 2: Serious Nuclear Reactor Accidents, Safety of Nuclear Power Reactors, <http://www.worldnuclear.org/info/inf06app.html> Last seen on 23/08/2024

²⁸ Backgrounder on Chernobyl Accident, available at: <http://www.nrc.gov/reading-rm/doc-collec-tions/factsheets/chernobyl-bg.html> Last seen on 23/08/2024

Liability for Nuclear Damage

Chapter II of the Act (parts 3–8) establishes the legislation and procedures governing liability for nuclear damage. The Atomic Energy Regulatory Board (AERB) must inform a nuclear incident within 15 days of its occurrence if it believes the intensity of the hazard and risk is significant. Once alerted, the Board will make the occurrence widely known so that individuals can be cautious and take all required precautions. However, the use of the word ‘insignificant’ in this section appears to be unclear. It allows the AERB to assess what is and is not relevant because no criteria are specified.

If there is a nuclear accident, the Operator is responsible for any “Nuclear Damage” that happens to the “nuclear installation” or “nuclear materials” that it is in charge of. If there are more than one operator and the damage can’t be separated, each operator is responsible for the whole thing. This is called “Joint and Several.”²⁹ But even if a number of people are responsible, each user will still only be responsible for what is stated in Section 6(2). Additionally, if more than one nuclear installation owned by the same person is involved in a nuclear accident, that person is responsible for each individual nuclear installation to the amount set out in Section 6 (2).

Liability of an Operator to be ‘Strict Liability’ based on the principle of ‘NoFault Liability’

The Indian version of strict liability is called “absolute liability”. It says that if a business is doing a hazardous or naturally dangerous activity and someone gets hurt because of an accident during the operation of that hazardous or naturally dangerous activity, like toxic gas escaping, the business is strictly and absolutely liable to compensate all those who were hurt. This liability is not subject to any of the exceptions that apply to the tortious principle of strict liability under the rule in *Rylands v. Fletcher*³⁰. To put it another way, absolute responsibility means strict liability in every case. This level of responsibility was set by the Indian Supreme Court in the case of *M.C. Mehta v. Union of India*³¹ (*Oleum Gas Leak Case*).

But it is not clear what kind of responsibility India would have in the event of a nuclear disaster.

²⁹ Preamble to the Civil Liability for Nuclear Damage Act, 2010.

³⁰ *Id.* S. 4(2).

³¹ (1868) LR 3HL 330.

There are some rare situations in which an operator is not responsible according to the Act. However, even in these cases, the victim will still get money because the Central Government is now responsible. In these situations, we have the following:

- A grave natural disaster of an exceptional character³². However, the phrase ‘exceptional character’ has not been defined under the Act. This leaves a lot of discretion with the authorities.
- An act of armed conflict, hostility, civil war, insurrection or terrorism.³⁹

If these circumstances directly cause the nuclear damage, the Central Government assumes liability instead of the operator³³. Further the list continues to include any nuclear damage that is caused to:

- The nuclear installation itself and any other nuclear installation, fully or partially constructed, on the site where such incident occurred.
- To any property on the same site which is used or to be used in connection with such installation.
- To the means of transport upon which the nuclear materials involved was carried at the time of nuclear incident³⁴.

These provisions, though aimed at preventing the operator from getting compensation for nuclear incident caused by him, may go against the interest of another party whose property at the time of the nuclear incident was on the same site.

Conclusion

The nuclear energy industry has had a tremendous expansion over the course of the last few decades, mostly as a consequence of the growing concern that the international community has shown over the issue of global warming. The transfer of the ultimate obligation to compensate the victims to the government, as well as the channelling of duty to the operator and the limitation of this liability, are characteristics that are shared by all international liability regimes for nuclear harm. In addition, the authority to compensate the victims is transferred to the government. In the event of a nuclear accident, relieving the provider of all duty carries with it

³² Id. at 39. ³⁹

Id. S. 5.

³³ Id. S.7.

³⁴ Id, S. 5

a high amount of risk, which, in turn, has the effect of leaving the supplier with less reason to design nuclear reactors that are safer. In accordance with the Indian civil nuclear liability system, the operator has been granted the right of recourse against the supplier in the event that the nuclear incident happened as a consequence of the supplier supplying equipment or material with patent defects, latent defects, or inadequate services. This right of recourse is also applicable in the event that the nuclear incident occurred. In addition to the transfer of obligation to the operator, the limitation of this liability, and the transfer of the ultimate responsibility to recompense the victims to the government, this is also included in the transfer of liability.

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