ISSN: 2582 - 2942

LEX FORTI

LEGAL JOURNAL

VOL- I ISSUE- V

JUNE 2020

ISSN: 2582 - 2942

DISCLAIMER

ISSN: 2582 - 2942

EDITORIAL BOARD

ISSN: 2582 - 2942

EDITORIAL BOARD

ISSN: 2582 - 2942

ABOUT US

LEXFORTI IS A FREE OPEN ACCESS PEER-REVIEWED JOURNAL, WHICH GIVES INSIGHT UPON BROAD AND DYNAMIC LEGAL ISSUES. THE VERY OBJECTIVE OF THE LEXFORTI IS TO PROVIDE OPEN AND FREE ACCESS TO KNOWLEDGE TO EVERYONE. LEXFORTI IS HIGHLY COMMITTED TO HELPING LAW STUDENTS TO GET THEIR RESEARCH ARTICLES PUBLISHED AND AN AVENUE TO THE ASPIRING STUDENTS, TEACHERS AND SCHOLARS TO MAKE A CONTRIBUTION IN THE LEGAL SPHERE. LEXFORTI REVOLVES AROUND THE FIRMAMENT OF LEGAL ISSUES; CONSISTING OF CORPORATE LAW, FAMILY LAW, CONTRACT LAW, TAXATION, ALTERNATIVE DISPUTE RESOLUTION, IP LAWS, CRIMINAL LAWS AND VARIOUS OTHER CIVIL ISSUES.

Socio-Economic implications of Nuclear Law

Bhargavi G Iyer

ABSTRACT

Nuclear law refers to the body of rules and regulations governing the usage, storage, and disposal of nuclear energy and radioactive substances. The functioning and breakdown of nuclear installations, the liability and responsibility of various parties and the State, intentional misuse and utilisation for military purposes, come under the purview of nuclear law. Various international legal frameworks like the Convention on Nuclear Safety, and the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, were laid down in order to ensure peaceful and productive use of nuclear energy, following incidents raising public concern regarding its use. This research paper hopes to explore the different dimensions of nuclear law with special emphasis on the laws governing storage and disposal of nuclear wastes. This research will also highlight the importance of nuclear law in establishing liability in case of accidents, and the safe usage of nuclear energy. This research aspires to scrutinise the provisions of international legal framework, and investigate its effects on multitudinous aspects of nuclear law. This research paper also looks to propose the future scope of nuclear law, and suggest measures to mitigate the existing loopholes in the same.

Keywords: Nuclear, liability, storage, disposal, Chernobyl, Convention, safety

INTRODUCTION

Nuclear energy is the energy derived or released from the nucleus of an atom during the process of fission or fusion. It is a scientific process that has proven to be immensely useful in the generation of power. As the invention of the century, it has certainly proven its worth as a utilisable source of renewable energy. It is extremely effective as a viable alternative to conventional resources, and has been used for various purposes.

However, as much utility as it may have as a source of energy, it has the capacity to be destructive as well. Hence, it is of utmost importance, that in order to regulate its judicious and cautious use, certain rules and regulations be formulated. The guidelines in place must ensure that there are adequate safeguards in order to prevent nuclear energy, a potentially dangerous resource, from getting out of hands, and maintain control in its production, use, storage and disposal.

The operation of nuclear power plants and other such facilities wherein nuclear power is being generated, must be regulated as per the norms laid down by the competent authority. Nuclear laws must also be customised and tailor-made, as the socio-economic needs and the political scenario in each part of the world play out differently. Thus, it is imperative to understand the various nuances of the ramifications and social and economic implications of nuclear energy, and delve into the legal aspects of the laws governing nuclear energy, accordingly.

A BRIEF HISTORY OF THE INVENTION AND UTILISATION OF NUCLEAR ENERGY

INVENTION AND INITIAL TESTING

With the experiments conducted by various renowned scientists, such as Enrico Fermi in 1934, Otto Hahn and Frizz Strassman in 1938[1], various dimensions, and the possible uses of nuclear energy, began to be explored. The design for a uranium chain reactor was proposed by Leo Szilard in 1941. By November 1942, work began on the world's first nuclear reactor, the Chicago Pile-1, containing uranium, graphite, and cadmium; which began demonstration and operation as a self-sustaining unit on December 2, 1942.[2] The world can be said to have entered the nuclear era on this day, following which, the technology began to be used for miscellaneous purposes.

[1] US Department of Energy, Office of Nuclear Energy, Science, and Technology, The History of Nuclear Energy (Jan. 27, 2020, 9.47 am), https://www.energy.gov/sites/prod/files/The%20History%20of%20Nuclear%20Energy_0.pdf .

[2] US Department of Energy, Office of Nuclear Energy, Science, and Technology, The History of Nuclear Energy (Jan. 27, 2020, 9.47 am), https://www.energy.gov/sites/prod/files/The%20History%20of%20Nuclear%20Energy_0.pdf .

UTILISATION IN WAR

Most early atomic research focused on developing an effective weapon for use in World War II.[3] Development of a functional atomic bomb was carried out under the name of the Manhattan Project, with the authorization of the then president of USA, Franklin D Roosevelt. On July 16, 1945, in a remote desert location near Alamogordo, New Mexico, the first atomic bomb was successfully detonated—the Trinity Test.[4] The only usage of nuclear weapons had been observed during the World War II, by the USA against Japan, at Hiroshima and Nagasaki. During the early years of the atomic age, directly following the World War II, USA remained the only country possessing nuclear technology in the world, however, the USSR followed suit, owing to its highly efficient espionage, and discovery of sources in Eastern Europe. Subsequently, it tested its first nuclear bomb in 1949, thus entering a Cold War arms race. Various nations, including Britain, China, France, and others invested heavily in acquiring nuclear warheads. The tension building over time led to the conjecture of a nuclear war-like situation in October 1962. During the following period, nuclear-armed missiles were installed by the Soviet Union in the Cuban islands, less than 90 miles away from the shores of USA; which led to the Cuban Missile Crisis, a political and military deadlock, which ended with a compromise between the USA and the USSR.

Public Acknowledgement of the Risks and hazards posed by Nuclear Energy

With the rising concerns regarding the after-effects and environmental ramifications of the usage of nuclear weapons, the antinuclear movement emerged as a social movement in 1961 at the height of the Cold War.[5] The anti-nuclear movement proliferated, beginning with a demonstration in 1961, and gaining recognition on a national scale in the USA, after the accident at Three Mile Island, in 1979; which was caused by a malfunction leading to a meltdown of the reactor at Three Miles Island, Pennsylvania. Though no direct health consequences were reported, the radiations were said to affect scores of people, with significant economic damage, and unknown ecological damage caused. After the Three Mile Island (or TMI) accident, public support for nuclear energy fell from an all-time high of 69 percent in 1977 to 46 percent in 1979.[6] The protests reached a climax in 1982, with a march by a million people in New York city demanding the Cold War to be brought to an end.

---

[3] US Department of Energy, Office of Nuclear Energy, Science, and Technology, The History of Nuclear Energy (Jan. 27, 2020, 9.47 am), https://www.energy.gov/sites/prod/files/The%20History%20of%20Nuclear%20Energy_0.pdf .

[4] History.com editors, The Manhattan Project, Atomic Bomb History (Jan. 28, 2020, 2.53 pm), https://www.history.com/topics/world-war-ii/atomic-bomb-history .

[5] History.com editors, Three Mile Island, Atomic Bomb History (Jan. 28, 2020, 3.46 pm), https://www.history.com/topics/world-war-ii/atomic-bomb-history .

[6] History.com editors, TMI Impact, Three Mile Island (Jan. 28, 2020, 3.46 pm), https://www.history.com/topics/1970s/three-mile-island .

The Case of the Chernobyl Nuclear Power Plant

On 26 April 1986, the reactor at Chernobyl, Ukraine, exploded during a safety experiment that was being conducted, due to a series of lapses. The radiation spread across the geographical area encompassing Norway, Finland, and Sweden, with small amounts of radiation travelling over the Pacific Ocean. The Chernobyl incident brings into focus the inadequacy of domestic law to protect the global environment.[7] Such disasters overstep and ignore international boundaries, and cause immeasurable economic and social damage at a global scale.

Following such incidents, the concepts of nuclear law were further deliberated upon, and suitable international conventions were adopted.

NUCLEAR LAW

Nuclear law can be defined as the body of special legal norms created to regulate the conduct of legal or natural persons engaged in activities related to fissionable materials, ionizing radiation and exposure to natural sources of radiation.[8] Nuclear law aims to ensure adequacy of procedural and legal safeguards and regulation of activities in the field of nuclear energy, before, during and after the course of its use, in order to protect individuals and society, the environment, as well as property from the possibility of the damage that may ensue. There exist certain fundamental principles that make it distinctive in comparison to other facets of national law. These principles may be enlisted as follows-

(a) The safety principle-reasonable and practicable balance must be established between social risks and benefits in order to achieve prevention and protection of society from harm;

(b) The security principle-protection must be provided against accidental or intentional deviation from the legally permitted usage of such resources;

(c) The responsibility principle-liability of the primary authority responsible to meet the requirements or standards, or recompense in any arising adversity, must be recognised;

(d) The permission principle-owing to the inherent risks posed by nuclear technology, it is necessary to acquire permission before carrying out related activities;

(e) The continuous control principle-even after granting of permission, regulatory bodies retain the right to free access in order to monitor and inspect the premises used for usage and storage;

[7] Linda A Malone, The Chernobyl Accident: A Case Study in International Law Regulating State Responsibility for Transboundary Nuclear Pollution, Faculty Publications, 590, 1987 (Feb. 1, 2020, 23.05 pm), https://scholarship.law.wm.edu/cgi/viewcontent.cgi?article=1603&context=facpubs .

[8] Carlton Stoiber et al., Handbook on Nuclear Law, International Atomic Energy Agency (Jan. 26, 2020, 2.35 pm) https://www-pub.iaea.org/MTCD/publications/PDF/Pub1160_web.pdf .

(f) The compensation principle-due to the inevitability of the actualisation of the risk of damage, measures for compensation after such an accident must be in place;

(g) The sustainable development principle-adequate precautions must be undertaken in order to ensure no undue pressure on the future generations due to damage to the environment, thus ensuring long-term safety;

(h) The compliance principle-in order to prevent the usage of territory in such a way that it is detrimental to the neighbouring States, adoption of international treaties should suffice, else additional domestic legislation ensuring compliance with international obligations would be required;

(i) The independence principle-There is a necessity to establish a regulatory body whose decisions are impartial and independent of intervention of any parties carrying out nuclear development;

(j) The transparency principle-the bodies regulating or maintaining nuclear energy for its use, storage or disposal must disclose all relevant information to the public, especially concerning abnormal occurrences which may have an impact on the welfare of the public and society;

(k) The international co-operation principle-the potential to have effects beyond boundaries requires that nuclear energy legislation must provide for collaboration and co-operation between private and public entities on an international scale.

In line with the above principles, in order to codify and enforce legislations concerning nuclear energy, various international conventions and statutes have been adopted.

THE STATUTE OF THE INTERNATIONAL ATOMIC ENERGY AGENCY

The Statute of the International Atomic Energy Agency was approved on 23 October 1956 by the Conference on the Statute of the International Atomic Energy Agency, which was held at the Headquarters of the United Nations. It came into force on 29 July 1957.[9] The Statute lays down the international legal framework for the peaceful use of nuclear energy, and for monitoring and controlling military activity in the field of nuclear energy, and stipulates the role of the IAEA in such activities. It has been amended thrice in the past by procedure specified in paragraphs A and C of Article XVIII of the Statute[10].

CONVENTION ON NUCLEAR SAFETY

Adopted on the 17 June 1994, at Vienna, alternatively thus known as the Vienna Convention, the Convention on Nuclear Safety came into force on 24 October 1996. The Convention was drawn

[9] Overview, Statute, International Atomic Agency, (Jan. 26, 2020, 2.47 pm) https://www.iaea.org/about/overview/statute .

[10] The Statute of the IAEA as amended up to 28th December 1989 (1956).

up in the aftermath of the Three Mile Island and Chernobyl accidents at a series of expert level meetings from 1992 to 1994, and was the result of considerable work by States, including their national regulatory and nuclear safety authorities, and the International Atomic Energy Agency (IAEA).[11] The provisions of the Convention apply to any land-based civil nuclear power plant under a Contracting Party's jurisdiction, including such storage, handling and treatment facilities for radioactive materials as are on the same site and are directly related to the operation of the nuclear power plant.[12]

Nuclear waste management was an aspect that was expected to be covered in the Convention, which was, however, debated against by a number of states owing to the impact of covering the complexities of both nuclear facilities and waste management in one instrument. However, the issue was tacitly included through the provisions of the Convention. Among other provisions, Article 19 (viii) of the Convention suggests the steps to be taken by the countries who constitute the Contracting Parties, to minimise the generation of radioactive wastes and their safe disposal by the respective nuclear installation. The Supreme Court of India, in the case of *G. Sundarrajan v. Union of India*[13], taking cognizance of the Convention, states that-

"The aforesaid Convention, as is demonstrable from the various articles, lays down the priority to nuclear safety, comprehensive and systematic safety assessments at all stages including the lifespan of the plants, verification by analysis, surveillance, testing and inspection, regard being had to the safety requirements, emergency planning and preparedness to take care of the people in the vicinity of the nuclear installation, necessary engineering and technical support in all safety related fields available throughout the lifetime of the nuclear installation, constant reporting by the operator to the regulatory body pertaining to safety and the handling of radioactive waste resulting from the operation and the measures of safety carried thereon."

The Convention also defines nuclear damages, and imposes liability on the operator of the nuclear installation upon establishment of a causal link between the nuclear installation, the occurrence, and the damage suffered, by the person claiming compensation. The Convention further applies the principle of strict liability, which holds the operator responsible irrespective of any fault on his part, by virtue of the very nature of the activity being carried out.

[11] Convention on Nuclear Safety, International Atomic Energy Agency (1996).
[12] Convention on Nuclear Safety, International Atomic Energy Agency (1996).
[13] G. Sundarrajan v. Union of India, (2013) 6 SCC 620.

JOINT CONVENTION ON THE SAFETY OF SPENT FUEL MANAGEMENT AND ON THE SAFETY OF RADIOACTIVE WASTE MANAGEMENT

The Joint Convention was adopted on 5 September 1997 by a Diplomatic Convention, and opened for signature at Vienna, on 29 September 1997. It entered into force on 18 June 2001 with 42 signatories and 80 states as party to the Joint Convention. The Joint Convention is the first international instrument that deals with the safety of management and storage of radioactive waste and spent fuel in countries with and without nuclear programs.[14] It aims to formulate regulations and lay down firm plans pertaining to the storage and final disposal of spent fuel and radioactive waste management.

It also focusses on the secure transport of such nuclear wastes across State boundaries, subsequently defining transboundary movement. The Joint Convention defines radioactive waste and spent fuel, their management, as well as the facilities built and maintained for the purpose of their management. The Joint Convention is applicable specifically to civilian nuclear programmes, and excludes military or defence programmes unless specified by the Convention or transferred permanently for management by civilian parties. It also emphasises the responsibility of the license holder or the Contracting Party with jurisdiction for the safety of the disposed or stored wates. It lays down guidelines for national legislation in the field of nuclear energy.

STORAGE AND DISPOSAL OF RADIOACTIVE WASTES

It is imperative that the disposal of radioactive wastes is undertaken with utmost care and caution. The various types of nuclear waste include uranium tailings, transuranic (TRU) waste, low-level nuclear waste, intermediate-level waste, high-level waste and spent fuel rods.[15] The environmental consequences and after-effects of activities such as production and disposal of nuclear fuels is pertinent to consider[16], and is mandated by various international conventions as well as the national legislations of many countries.

Storage and disposal differ in the fact that storage is accompanied by the intention to retrieve the nuclear products for future use or further steps for disposal, whereas disposal implies no intention to retrieve the same. The law does not specify the maximum duration for storage of nuclear

[14] Convention Provisions, Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Management (Jan. 31, 2020, 6.12 pm) https://www.nti.org/learn/treaties-and-regimes/joint-convention-on-the-safety-of-spent-fuel-management-and-on-safety-of-radioactive-waste-management/ .

[15] Types of nuclear waste that release radioactivity, NS Energy, 12 Jan. 2018 (Feb. 01, 2020, 6.33 pm) https://www.nsenergybusiness.com/news/newsmajor-types-nuclear-waste-that-produce-radioactivity-6027468/ .

[16] Baltimore Gas & Electric Co. v. Natural Resources Defense Council, Inc., 462 U.S. 87 (1983).

products; however it must not be so lengthy such that storage in itself becomes de facto disposal,[17] as in the case of orphan nuclear wastes. There also arises the issue of planning for the long-term disposal of radioactive wastes, that have the potential to retain some semblance of their current state without undergoing complete degradation for time spans seemingly beyond human comprehension[18], and thus posing risks to life and property due to leakage arising because of exposure to hostile forces of nature, or deliberate release for unlawful or military purposes.

Due to the sensitive nature of the nuclear wastes, the packaging and sorting of radioactive wastes must be in compliance with the safety requirements, undergoing pre-treatment, treatment and conditioning in most cases.[19] The possibility of gradual or negligible release of radioactivity from sites of disposal must also be considered.[20] The legal owner of the wastes must be held answerable for its safe disposal; in the case that such an owner is unknown, such a responsibility vests with the State.

Being the last stage of any nuclear related activity, when considering nuclear waste disposal, its effects on future radioactive waste management should be taken into account when any nuclear related activity is being contemplated. The interdependencies among all steps in radioactive waste generation and management must be taken into account.[21]

[17] Carlton Stoiber et al., Handbook on Nuclear Law, International Atomic Energy Agency (Jan. 26, 2020, 2.35 pm) https://www-pub.iaea.org/MTCD/publications/PDF/Pub1160_web.pdf .
[18] State of New York v. NRC, No. 14-1210, D.C. Cir. (2016).
[19] Carlton Stoiber et al., Handbook on Nuclear Law, International Atomic Energy Agency (Jan. 26, 2020, 2.35 pm) https://www-pub.iaea.org/MTCD/publications/PDF/Pub1160_web.pdf .
[20] Baltimore Gas & Electric Co. v. Natural Resources Defense Council, Inc., 462 U.S. 87 (1983).
[21] Carlton Stoiber et al., Handbook on Nuclear Law, International Atomic Energy Agency (Jan. 26, 2020, 2.35 pm) https://www-pub.iaea.org/MTCD/publications/PDF/Pub1160_web.pdf .

CONCLUSION

Nuclear energy is a developing and constantly evolving field with novel challenges arising with the advent of newer technologies as per the needs and demands of the society. In light of disasters and accidents such as the Three Mile Island accident and the Chernobyl Accident, there is a need for enforceable laws governing nuclear energy; and its utilisation, and imposing liability on governments and private parties involved in case of an accident; on a global level, due to the magnitude and complexity of the issue. Various international conventions such as the Convention on Nuclear Safety, Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, and others; as well as organisations such as the International Atomic Energy Agency, play a vital role in helping implement international law into national legislation and enforce the same. Laws governing the usage, storage, and disposal of nuclear and radioactive substances are effective in maintaining a socio-economic balance in society as they mitigate the potential for damage and establish credibility amongst the people in order to ensure the smooth functioning of such nuclear installations for the betterment of the world on the whole.

RECOMMENDATIONS AND SUGGESTIONS

One of the primary loopholes observable in the present model is the lack of a stipulated timeframe for storage of nuclear wastes, which results in de facto disposal, which may lead to confusion due to antiquity of records and exhaustion of ownership or liability. Therefore, imposing a time limit for regular and periodic inspection of storage facilities, as well as laying down regulations and time limits for storage as per the half-life period of the substance being stored, would be a useful measure to curb the problem of orphan nuclear wastes. Another lacuna lies wherein the preservation of disposal sites in case of residual radioactivity comes into question; which is important in order to protect the future generations from potential harm and ensure sustainable development. Apart from inspection every 100 years for nuclear waste to be stored for a period of 10,000 years, diversification of maintenance of records of such sites must be ensured, such that even upon destruction of certain records due to inevitable circumstances, the remaining maybe retrieved and referred accordingly.

FUTURE SCOPE

Nuclear energy, being an indispensable resource to humanity, and an irreversible process once begun, must be guarded and carried out carefully. Further incorporation of nuclear law into the national legislation is possible, along with the demarcations of the intersection of nuclear law with several other domains of law, such as the law of contracts, the law of torts, civil law, criminal law, and other such areas. Stricter norms for the treatment of wastes before disposal, can be brought

about, with safety and security as the top priority, while the same does not hinder development. The potential establishment of a nuclear law tribunal in order to address questions of law concerning legitimate storage and disposal of nuclear wastes is another possibility to envision.

BIBLIOGRAPHY

STATUTES

1. The Statute of the IAEA as amended up to 28th December 1989 (1956).
2. Convention on Nuclear Safety, International Atomic Energy Agency (1996).

CASES

1. G. Sundarrajan v. Union of India, (2013) 6 SCC 620.
2. Baltimore Gas & Electric Co. v. Natural Resources Defense Council, Inc., 462 U.S. 87 (1983).

BOOKS

1. Common Sense on Weapons of Mass Destruction**,** Thomas Graham Jr.**,** University of Washington Press, 2004.

ARTICLES

1. The History of Nuclear Energy, US Department of Energy, Office of Nuclear Energy, Science, and Technology, https://www.energy.gov/sites/prod/files/The%20History%20of%20Nuclear%20Energy_0.pdf .
2. The Manhattan Project, Atomic Bomb History, https://www.history.com/topics/world-war-ii/atomic-bomb-history .
3. Three Mile Island, Atomic Bomb History, https://www.history.com/topics/world-war-ii/atomic-bomb-history.
4. TMI Impact, Three Mile Island, https://www.history.com/topics/1970s/three-mile-island .
5. The Chernobyl Accident: A Case Study in International Law Regulating State Responsibility for Transboundary Nuclear Pollution, by Linda A Malone, Faculty Publications, 590, 1987, https://scholarship.law.wm.edu/cgi/viewcontent.cgi?article=1603&context=facpubs .
6. Handbook on Nuclear Law, International Atomic Energy Agency, https://www-pub.iaea.org/MTCD/publications/PDF/Pub1160_web.pdf .
7. Overview, Statute, International Atomic Agency, https://www.iaea.org/about/overview/statute.
8. Convention Provisions, Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Management, https://www.nti.org/learn/treaties-and-regimes/joint-convention-on-the-safety-of-spent-fuel-management-and-on-safety-of-radioactive-waste-management/ .

9. Types of nuclear waste that release radioactivity, NS Energy, 12 Jan. 2018 (Feb. 01, 2020, 6.33 pm) https://www.nsenergybusiness.com/news/newsmajor-types-nuclear-waste-that-produce-radioactivity-6027468/ .
10. India's Status as a Nuclear Weapons Power under Customary International Law, by James A Green, National Law School of India Review, vol. 24, no. 1, 2012, pp. 125–146.
11. Legal Problems in Inter-American Nuclear Energy Developments, by Carlos A Dunshee De Abranches, pp. 46-52**,** Proceedings (American Bar Association. Section of International and Comparative Law), August 7-12, 1964.
12. The Impact of the Chernobyl Accident on International Nuclear Energy Law, by Norbert Pelzer, pp. 294–311, Archiv Des Völkerrechts, vol. 25, no. 3, 1987.

REPORTS AND STUDIES

1. The Peaceful Nuclear Energy Program in the United Arab Emirates: Background and history, by Amani Al Shamsi, Nuclear Law Bulletin No. 100, Volume 2018/1, Nuclear Energy Agency, OECD Publication.
2. Quarterly Uranium Market Report, 3rd Quarter, 2019, prepared by Dariusz Kozak, Niina Palomaki, Euratom Supply Agency, European Commission.