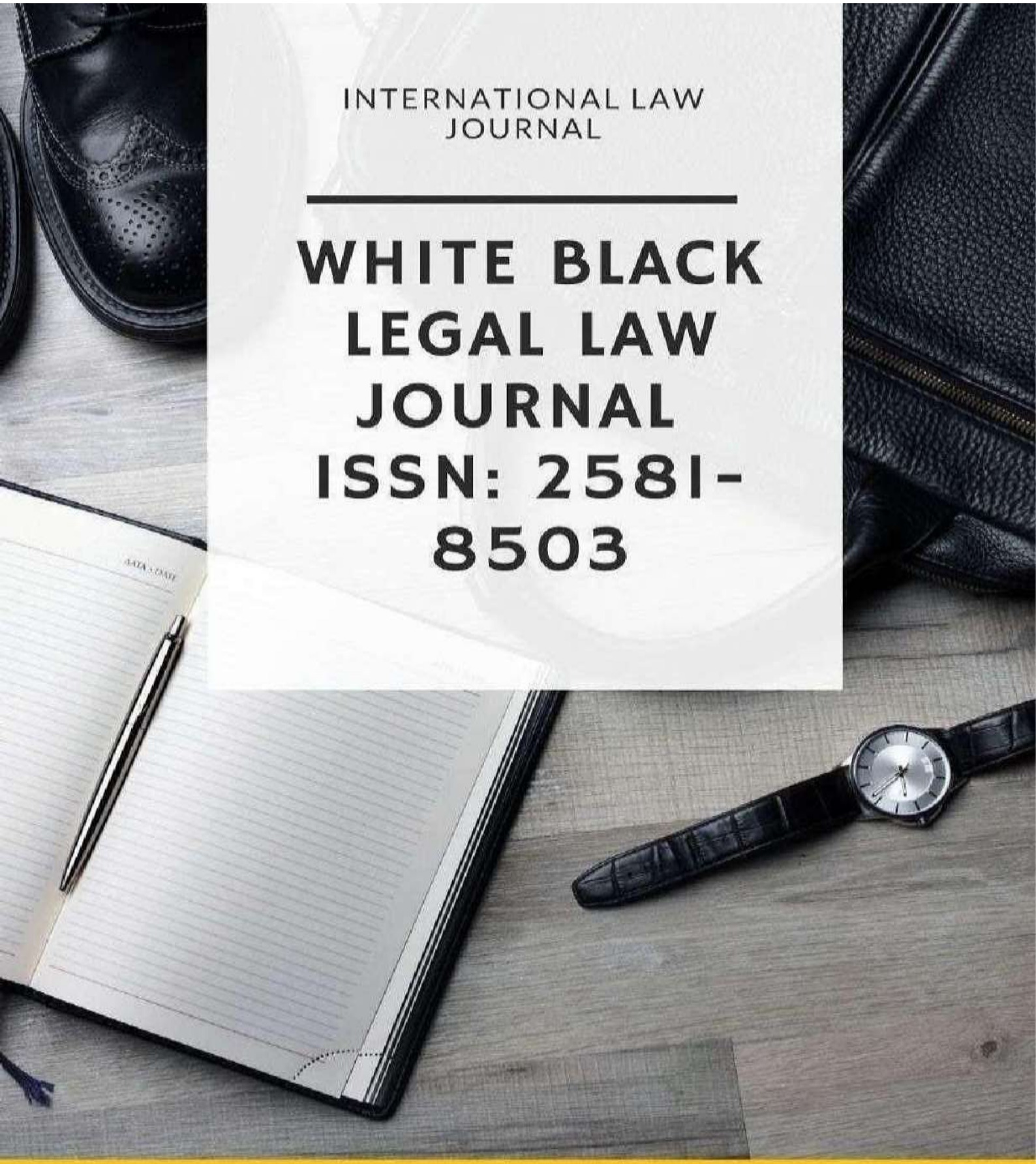

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ABOUT US

WHITE BLACK LEGAL is an open access, peer-reviewed and refereed journal providededicated to express views on topical legal issues, thereby generating a cross current of ideas on emerging matters. This platform shall also ignite the initiative and desire of young law students to contribute in the field of law. The erudite response of legal luminaries shall be solicited to enable readers to explore challenges that lie before law makers, lawyers and the society at large, in the event of the ever changing social, economic and technological scenario.

With this thought, we hereby present to you

THE KUDANKULAM NUCLEAR POWER PLANT ENERGY DISPOSE AND IT DETRIMENTAL EFFECTS ON THE ENVIRONMENT.

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Abstract:

The article examines the Kudankulam Nuclear Power Plant (KKNPP) dispute, which marked a turning point in the development of Indian nuclear energy legislation. The Fukushima-Daiichi event and other concerns about the effects of radioactive waste on human health, the environment, and the potential for a nuclear accident were major factors in the local resistance to the plant's commissioning. Just six of the 17 safety measures that the Atomic Energy Regulation Board (AERB) recommended following Fukushima have been put into effect in India. One important result of the investigation is that AERB's jurisdiction and legal standing with regard to KNPP are inadequate. The paper's first half explores the legal structure, historical background, and erroneous use of the Deep Geological Repository (DGR) in light of the 2018 Supreme Court ruling in G. Sundarrajan v. Union of India Ministry of Environment and Forest Secretary. It also examines the detrimental environmental effects of improperly disposing of spent nuclear fuel (SNF). Changing direction, the second part of the study examines how KKNPP's SNF disposal practises violate the 2010 Civil Liability for Nuclear Damage Act. This section explores the fines and payment schedules for noncompliance. The report highlights noncompliance with regulatory procedures, highlighting the need for a stronger legislative framework to handle the intricate issues surrounding the production, disposal, and use of nuclear energy.

List of Abbreviations:

AERB	**A**tomic **E**nergy **R**egulatory **B**oard
AFR	**A**way **F**rom **R**eactor
DAE	**D**epartment of **A**tomic **E**nergy
DGR	**D**eep **G**eological **R**epository
KKNPP	**K**udankulam **N**uclear **P**ower **P**lant
MoEF	**M**inistry **o**f **E**nvironment and **F**orests
NPCIL	**N**uclear **P**ower **C**orporation of **I**ndia
SNF	**S**pent **N**uclear **F**uel

List of cases :

- *G.* Sundarrajan v. Union of India Ministry of Environment and Forest Secretary, (2018) 17909 (SC)
- Sundarrajan v. Union of India, (2013) 6 SCC 620.

CHAPTER -I:

1.1. ABSTRACT:

The article examines the Kudankulam Nuclear Power Plant (KKNPP) dispute, which marked a turning point in the development of Indian nuclear energy legislation. The Fukushima-Daiichi event and other concerns about the effects of radioactive waste on human health, the environment, and the potential for a nuclear accident were major factors in the local resistance to the plant's commissioning. Just six of the 17 safety measures that the Atomic Energy Regulation Board (AERB) recommended following Fukushima have been put into effect in India. One important result of the investigation is that AERB's jurisdiction and legal standing with regard to KNPP are inadequate. The paper's first half explores the legal structure, historical background, and erroneous use of the Deep Geological Repository (DGR) in light of the 2018 Supreme Court ruling in G. Sundarrajan v. Union of India Ministry of Environment and Forest Secretary. It also examines the detrimental environmental effects of improperly disposing of spent nuclear fuel (SNF). Changing direction, the second part of the study examines how KKNPP's SNF disposal practises violate the 2010 Civil Liability for Nuclear Damage

Act. This section explores the fines and payment schedules for noncompliance. The report highlights noncompliance with regulatory procedures, highlighting the need for a stronger legislative framework to handle the intricate issues surrounding the production, disposal, and use of nuclear energy.

1.2. INTRODUCTION:

The "Kudankulam Nuclear Power Plant (KKNPP) controversy is a significant turning point in India's nuclear energy legal framework. Strong opposition to the power plant's commissioning was shown by the people nearby. One of the primary reasons was the radioactive waste from KNPP and thereby affecting human health and the environment, as well as the terrifying threat of a nuclear power plant catastrophe. A sizable portion of this opposition was motivated by the Fukushima-Daiichi accident, among other things. The Atomic Energy Regulation Board (AERB) had proposed 17 safety measures for the plant following the nuclear disaster in Fukushima, but they were never implemented. So far only 6 safety precautions have been undertaken in India. The report's most important finding was that the AERB's legal standing and authority were inadequate with regard to KNPP. Henceforth the article on the first half covers the brief history and the regulatory framework which is associated with the issue and also the improper implementation of DGR on the order of *G. Sundarrajan v Union of India Ministry of Environment and Forest Secretatry*[1] 2018 Supreme court judgement . Along with it, the article also analyses the improper disposal of SNF and its negative impact on the environment. Whereas the second half of the article analyses the non - compliance of SNF disposal of KKNPP with Civil Liability for Nuclear Damage Act, 2010 thereby the penalties and also the compensation for non-compliance.

1.3. STATEMENT OF PROBLEM:

The KKNPP energy release and its detrimental impact on human health along with its noncompliance with the regulatory framework of nuclear power legislations and compensation that can be claimed.

1.4. RESEARCH OBJECTIVES:

- To analyse the problem with regard to improper structure of DGR in kudankulam Nuclear Power Plant

[1] (2018) 17909 (SC)

- To analyse the negative impact of SNF from Kudankulam Nuclear Power Plant to environment
- To analyse the non-compliance of SNF released from Kudankulam Nuclear Power Plant with the Atomic Energy Act, 1962 and Civil Liability for Nuclear Damage act, 2010.

1.5. RESEARCH QUESTIONS:

- Whether improper implementation of DGR carried out by KKNPP has any impact on the environment?
- Whether release of SNF from KNPP is in compliance with the regulations laid down by the Atomic Energy Act, 1962 and Civil Liability for Nuclear Damage act, 2010.
- Whether the release of SNF from KNPP has any negative impact on the environment?

1.6. RESEARCH METHODOLOGY:

The article titled "The Kudankulam Nuclear Power Plant Energy Dispose and Its Detrimental Effects on The Environment" is analytical in nature.

Sources:

Therefore, it mostly includes secondary sources such as books, articles, journals, newspapers, editorials etc and some primary sources such as statutes like The Atomic Energy Act, 1962 etc. With these sources, the paper analysis whether the release of SNF from Kudankulam nuclear power plant is in compliance with the legality of the Atomic Energy Act, 1962 and also the Civil Liability for Nuclear Damage Act, 2010.

1.7. REVIEW OF LITERATURE:

- **"Rao, Divya Badami, and M. V. Ramana, "Violating Letter and Spirit: Environmental Clearances for Kudankulam Reactors" 43 *Economic and Political Weekly* 14–18 (2008)[2]"** This article basically The article basically covers the environmental clearance granted to the Kudankulam reactors suited in Tamil Nadu which is not being supported by a thorough

[2] Rao, Divya Badami, and M. V. Ramana, "Violating Letter and Spirit: Environmental Clearances for Kudankulam Reactors" 43 *Economic and Political Weekly* 14–18 (2008).

analysis of the potential impacts that can happen on the environment and also the livelihoods of the people, nor does it take into account the public concerns of the surroundings. To include, the article also gives the brief history of the kudankulam project, the environmental clearance and the compromised standard present. Along with this, the article also analyses the SNF released from kudankulam and the legal grounds with the atomic energy act.

- **"Jayaprakash N.D., "Supreme Court's Judgment on Kudankulam: Worrying Omissions." 48 *Economic and Political Weekly* 18–21 (2013)[3]"**

  This article covers the decision of the Supreme Court of India which has not yet authorised the commissioning of the Koodankulam nuclear power facility in Tamil Nadu. To include, it also did not cover the conclusions of the " Fukushima Nuclear Accident Independent Investigation Commission " and thereby its guidelines applicability in Indian nuclear power plants. To include, it also includes the violations of safety norms in kudankulam and the lessons that have to be learnt from Fukushima. Apart from this, the article also covers the brief history and analyses of SNF release with the atomic energy act and civil liability for nuclear damage act.

- **"Van Ness, Peter, et al. "Lessons of Fukushima: Nine Reasons Why" *Anu Press* 349–60 (2017)[4]"**

  The article is not a consensus assessment but rather, it is the author's personal statement on collective deliberations of nuclear power. Henceforth, this article lists out nine reasons why the nuclear power plants should not be adopted in any country. In addition to it, the article also argues the difficulty in totally eradicating the kudankulam plant and thereby gives certain suggestions and guidelines that can be adopted.

- **"Not a Closed Chapter: Lack of Transparency around the Kudankulam Nuclear Project Should Worry All of Us" 48 Economic and Political Weekly 8–8 (2013)**5**"**

[3] Jayaprakash N.D., "Supreme Court's Judgment on Koodankulam: Worrying Omissions." 48 *Economic and Political Weekly* 18–21 (2013)

[4] Van Ness, Peter, et al. "Lessons of Fukushima: Nine Reasons Why" *Anu Press* 349–60 (2017).

[5] "Not a Closed Chapter: Lack of Transparency around the Kudankulam Nuclear Project Should Worry All of Us" 48 *Economic and Political Weekly* 8–8 (2013).

This article basically covers the lack of transparency in kudankulam nuclear project and thereby also the shaky legal ground on which it is built along with the omissions KNPP is performing. To include, it also covers the risk involved in such conditions of KNPP and the need for the proper implementation of the plant. Along with it, the article also analyses the condition and status of the kudankulam nuclear power plant with the atomic energy act and thereby covers the penalties and punishments available to them.

CHAPTER -II: KKNPP AND HISTORICAL PAST OF NUCLEAR DISASTER EVENTS – LESSON TO BE LEARNT

2.1. BRIEF HISTORY OF KNPP:

The Kudankulam Nuclear Power Project (KKNPP) is one of the largest nuclear power plants in the world and it is situated in Tirunelveli district about 280 kilometres from Chennai-the state capital of Tamil Nadu. Even though the plant's main function is producing plutonium, along with it also releases uranium. The plant's six - 1,000 megawatt nuclear reactors, is one of the largest in India, producing a combined 6000 megawatts of power on average usage[6]. To include, the use of water is associated with the plant as it is used by the units as a coolant and moderator.

The Kudankulam project was officially launched on November 20, 1988, when Prime minister Rajiv Gandhi of India and Michael Gorbachev, the president of Soviet Union entered an intergovernmental agreement for the construction of two 1,000 mw nuclear reactors[7]. Nevertheless, the initiative was not immediately pursued due to the subsequent disintegration of the Soviet Union. Thereby the project was only restarted in 1997. The reactor design and engineering supervision arrangements for KKNPP phase one's development cost was Rs140 billion ($2.47 billion) which were completed by NPCIL and Rosatom in 1998. On a future note, the expected cost will be Rs1.11 trillion to complete for the six units. The first two units of phase one's construction were put into service in 2013 and 2016, respectively. Phase one construction began in 2001. The foundation for units 3 and 4 was laid in February 2016, and the third unit's concrete started in June 2017[8].

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[6] Karthika Sasikumar, "India's Emergence as a 'Responsible' Nuclear Power." 62 *International Journal* 825–44 (2007). [7] Syed Sikander Mehdi, "India's Nuclear Power: How Much Peaceful?" 36 *Pakistan Horizon* 109–40 (1983). [8] "Not a Closed Chapter: Lack of Transparency around the Kudankulam Nuclear Project Should Worry All of Us" 48 *Economic and Political Weekly* 8–8 (2013).

The "Nuclear Power Corporation of India"(NPCIL), a state-owned company, runs the plant. This plant's development got underway in 2002. However, the Local fisherman and the people of the area protested its construction, which caused numerous delays. Due to constant protests by communities and nuclear activists over safety issues, the project was significantly delayed[7]. The 60-year production life of the Kudankulam nuclear power station might be increased by another 20 years because of such delay.

The plan's two most important components were the transportation of the hazardous and risky Spent Nuclear Fuel (SNF) back to the Soviet Union and the second one was with regard to the supply of the enormous volumes of fresh water needed to cool the plant from the Pechiparai dam in Tamil Nadu's Kanyakumari district. On this premise, the Ministry of Environment and Forests (MoEF) subsequently approved the request on May 9, 1989. But until 1997, there was no more development[8].

But, on the actual implementation the project underwent two notable revisions. The first was that the extremely hazardous radioactive SNF was not transported to Russia but rather it had to be stored, transported, and handled in the Indian Environment[9]. The second change with regard to the agreement was similarly significant: instead of transporting piped water from Pechiparai Dam, the freshwater requirement was now to be satisfied by the construction of six desalination plants. The desalination plants on the other hand , had significant concerns on the maritime environment and the fishing community's way of life[10]. Now the article concentrates on the first aspect of spent nuclear fuel stored in India and its impact on the environment.

2.2. FUKUSHIMA-DAIICHI NUCLEAR DISASTER AND CHERNOBYL: THE LESSON TO BE LEARNT

2.2.1. FUKUSHIMA-DAIICHI

In 2011, Fukushima nuclear disaster occurred as a result og which the radioactive materials were

[7] Rao, Divya Badami, and M. V. Ramana, "Violating Letter and Spirit: Environmental Clearances for Kudankulam Reactors" 43 *Economic and Political Weekly* 14–18 (2008) .
[8] "Not a Closed Chapter: Lack of Transparency around the Kudankulam Nuclear Project Should Worry All of Us" 48 *Economic and Political Weekly* 8–8 (2013).
[9] Jayaprakash N.D., "Supreme Court's Judgment on Koodankulam: Worrying Omissions." 48 *Economic and Political Weekly* 18–21 (2013)
[10] Syed Sikander Mehdi, "India's Nuclear Power : How Much Peaceful ?" 36 *Pakistan Horizon* 109–40 (1983). [13] Van Ness, Peter, et al. "Lessons of Fukushima: Nine Reasons Why" *Anu Press* 349–60 (2017).

released to water and atmosphere. The radioactive materials as a result of the disaster dispersed across land and water locally, regionally, and globally. Very severe contamination of radioactive elements happened and today, in Japan almost all the food are still tainted. Most of the food is contaminated with the radioactive material released[13]. Radioactive material entered the ground water also as the result of the nuclear accident. On agricultural produce, such as vegetables and fruits, among other things, radioactive chemicals are also deposited on the leaves[11].

2.2.2 CHERNOBYL DISASTER

Various radioactive elements including uranium and plutonium were released into the atmosphere during the 1986 Chernobyl nuclear power plant accident. The impact of the released radioactive elements in the nearby areas of the Chernobyl nuclear power plant and in Germany is considerably present even today even after three decades after the Chernobyl tragedy[12].

The foods sourced from forests can still have elevated quantities of radioactive elements and along with it the agriculturally produced foods are slightly contaminated with the radionuclide, which is relevant for food absorption... Hence, even after 30 years of the nuclear power plant accident, the crops grown in Germany contain trace amounts of caesium137 activity. Currently, the amount of caesium-137 present in domestically produced agricultural products has a few becquerels per kilogramme and as a result, the average annual intake of caesium-137 per person from foods derived from agricultural output in Germany is nearly 100 becquerels.

CHAPTER III: REGULATORY FRAMEWORK

3.1. RADIOACTIVE WASTE FROM KKNPP AND THE ATOMIC ENERGY ACT:

About 93.4% of the spent fuel is uranium , 5.2% are fission products, plutonium are 12 % , and 0.2% are other minor transuranic elements[13]. Spent nuclear fuel (SNF) makes up the highest of high-level nuclear waste. Only after approximately 100,000 years does the radioactive concentration of SNF

[11] Van Ness, Peter, et al. "Lessons of Fukushima: Nine Reasons Why" *Anu Press* 349–60 (2017).
[12] Samuel Walker.J, "Nuclear Safety, the Atomic Energy Commission, and the States." 65 *The Wisconsin Magazine of History* 158–75 (1982)
[13] Syed Sikander Mehdi, "India's Nuclear Power : How Much Peaceful ?" 36 *Pakistan Horizon* 109–40 (1983).

degrade to levels that are comparable to the naturally occurring uranium mined to produce fresh fuel. During this time, it is necessary to guarantee some time for the isolation of radioactive materials from the biosphere.

Currently, an approach that accomplishes this involves cooling down the fuel elements after they fission in the reactor, followed by deep geological disposal. This is actually absent in the kudankulam nuclear power plant and thereby leads to improper disposal of the spent nuclear fuel[14] . Now , being the case of improper disposal of Spent Nuclear Fuel at kudankulam which has the components of uranium and plutonium - the non-compliance of such disposal with the Atomic Energy Act , 1962[15] is analysed under this chapter .

To start with the definition of radioactive substance or radioactive material under the act. The act defines radioactive substances under section 2 (1) (i) as "any substance or material which spontaneously emits radiation in excess of the levels prescribed by notification by the Central Government". Here as we know SNF in its plain sense itself emits high levels of radioactive elements. Now in the situation of it not being stored properly and disposed of - SNP will emit even more high levels of radioactive elements. So from the interpretation of the section we can include the SNF under the ambit of radioactive substance[16].

Section 4 of the act covers the notification of discovery of uranium or thorium to the central government after three months of commencement of act or after the discovery of the substance whichever is later. Section 6 covers with regard to the disposal of uranium - It covers that no minerals or concentrates or any other materials that exceed the proportion of uranium in their original natural state that is prescribed by the notification from the Central Government may be disposed of without the prior written consent and in compliance with any restrictions that the Central Government may set. Here although after the supreme court judgement there is an improper disposal of the content of uranium i.e. the SNF. So this section would be relevant here and thereby it also contains the compensation applicable to them under section 6 (3) in accordance with section 21 of the act.

[14] Sundarrajan v. Union of India, (2013) 6 SCC 620.
[15] The Atomic Energy Act, 1962 (Act .33 of 1962)
[16] The Atomic Energy Act, 1962 (Act .33 of 1962)

Whereas Section 15 relates to the requisitioning of any substance for the purpose of extracting uranium or plutonium - In the calculation of the quantity, no consideration will be given to the value of uranium, plutonium, or one or more of their isotopes extracted from the substance, provided that such an unit shall in no event surpass the cost incurred either by person in the production, mining, as well as radiation of the substance. Section 16 is with regard to control over the produced radioactive substance - here the section claims that the central government may prohibit the use, manufacture, sale or otherwise without the actual written consent itself.

Section 17 is with regard to the special safety measures that can be adopted in the plant which basically includes measures to prevent the injury out of the radioactive substance, to secure the waste and also the clause 2 of the section covers the power of the central government to transport the radioactive substance which is dangerous to health and thereby preventing the injury17. Section 24 is with regard to the offences and penalties that can be covered under this act and section 21 is with regard to the principles regarding the compensation, here this section is read with section along with section 6 of the act.

Now in case KKNPP is claiming itself as a company rather than an industry - in this case also they will be held liable under section 25 if the act. Which basically covers the offences covered by the companies- where it basically covers that every individual who was in control of and accountable to the company for the conduct of the company's business at the time the offence being perpetrated shall be held liable of the offence and shall be subject to legal action and punishment as appropriate under this act[18].

CHAPTER IV: KKNPP RELEASE OF SNF AND ITS IMPACT ON ENVIRONMENT

4.1. THE PROBLEM WITH THE NON- IMPLEMENTATION OF DGR:

The AFRs for the currently operating units 1 and 2 will be left behind as the Union government, its Department of Atomic Energy (DAE), and also (NPCIL) intend to construct the halfway storage

[17] The Atomic Energy Act, 1962 (Act .33 of 1962), s.17
[18] The Atomic Energy Act, 1962 (Act 33 of 1962), S. 4,6,15,16,17,21,24,25.

facility known as the "Away From Reactor" (AFR) for the underconstruction units 3 and 4 - rather than first covering for 1 and 2 , where the anti-nuclear activists and on the other hand the other civil society organisations, contend that the plant needs a precise plan for its ambitious nuclear power programme and also that the nuclear waste management cannot be haphazard or ambiguous as they exist a very bad past back in history[19]. As held in the case of *Sundarrajan vs. Union of India*[23],it is of which before installing the AFRs at KKNPP and other similar reactor sites , the DGR must be planned and prepared. Because building of a DGR by 2018 was actually one of 15 requirements the nuclear department had to meet in order for the Supreme Court to approve the operation of Kudankulam reactors 1 and also reactor 2 [20]. When this claim was not fulfilled the nuclear department requested additional time and thereby the SC thereby extended the deadline to April 30, 2022 on July 2, 2018 in the case of *G. Sundarrajan v. Union of India Ministry of Environment and Forest Secretary*[21] - On the DGR front, however, no such arrangement has happened to date[22].

Three different forms of waste are produced by nuclear power plants: Wastes at low, mid, and high levels. Mops and gloves are examples of very low-level waste that can be actually disposed of in landfill-like facilities. To include, the exclusion zone can be used to bury lowlevel waste that contains large concentrations of short-lived radionuclides and decreased concentrations of long-lived radionuclides in leak-proof subterranean structures including reinforced cement concrete vaults, trenches, and tile holes. The wastes that need to be sequestered in DGRs are the mid- and high-level wastes. The spent nuclear fuel at the reactors is typically used to store heat-emitting and highly radioactive spent fuel rods for five years while they are still in operation[27]. Borated water is actually used to cool the spent fuel pools because it absorbs neutrons and halts the chain reaction that was occurring inside the reactor. The spent fuel rods are transferred to the AFR and treated as the pool fills.

According to the terms of the October 1997 agreement, the spent fuel rods would be shipped back to Russia, but on June 21, 1998, a new agreement was signed between that of the head of the DAE, R.

[19] Van Ness, Peter, et al. "Lessons of Fukushima: Nine Reasons Why" *Anu Press* 349–60 (2017). [23] (2013) 6 SCC 620
[20] (2013) 6 SCC 620.
[21] (2018) 17909 (SC)
[22] G. Sundarrajan v. Union of India Minstry of Environment and Forect Secretatry,(2018) 17909 (SC) [27] Jayaprakash N.D., "Supreme Court's Judgment on Koodankulam: Worrying Omissions." 48 *Economic and Political Weekly* 18–21 (2013)

Chidambaram, and the Russian minister of atomic energy, Yevgeny Adamov, that called for keeping the "national asset" in India. It is crucial to remember that spent fuel rods in halfway homes like AFR have just as much radioactivity as fuel rods in nuclear power reactors, if not in most of the cases the level is more. These rods lack supplementary containment devices like those used in nuclear power reactors and contain a more dangerous combination of radioisotopes[23].

The nuclear tragedy at Fukushima Daiichi shows that radiation from storage facilities harms the general public to a greater extent[29].As a result of which the local population is actually at risk from a number of hazards, including long-term radiation concerns, potential explosions, great negative impact on groundwater, air contamination, and illnesses.

4.2. SNF AND ITS NEGATIVE IMPACT ON ENVIRONMENT

The generation of radioactive wastes such as SNF from reactors containing uranium mill tailings, and other radioactive wastes is a significant environmental hazard associated with nuclear power. Over millions of years, these substances may continue to be radioactive and hazardous to human health. To safeguard public health and the environment, radioactive wastes are subject to strict rules that govern their treatment, transportation, storage, and disposal. The potential for the discharge of the deadly chemical element plutonium into the environment is present in spent nuclear fuel, which is severely radioactive[24].

In actuality, exposure to radioactive waste can result in genetic disruption or mutation in both animals and plants as well as cancerous growths in people. Hence, these modifications might limit long-term reproduction and furthermore the radioactive waste from the reactor's spent fuel can continue to be radioactive for millions of years. Nuclear waste would pose a grave threat to the ecosystems of people, animals, and plants in case of improper disposal of the SNF. There are numerous carcinogenic radionuclide isotopes, including strontium-90, iodine-131, and caesium-137, in spent nuclear fuel from nuclear reactions using uranium-235 and plutonium-239.

[23] Samuel Walker.J, "Nuclear Power and the Environment: The Atomic Energy Commission and Thermal Pollution, 1965-1971." 30 *Technology and Culture*, 964–92 (1989),

[24] Rao, Divya Badami, and M. V. Ramana, "Violating Letter and Spirit: Environmental Clearances for Kudankulam Reactors" 43 *Economic and Political Weekly* 14–18 (2008).

Some of the most durable transuranic elements, like americium-241 and plutonium isotopes, can be found in such waste. The most persistent radioactive wastes, such as spent nuclear fuel, typically require a lengthy period of containment and isolation from the environment. The majority of the issue with SNF is the storage. Among the countries that have rejected the repository solution are France, the United Kingdom, and Japan.

Long-term storage of these wastes is best accomplished by disposal in specially designed subsurface repositories. According to the International Panel on Fissile Materials, it is generally acknowledged that spent nuclear fuel is a high-level reprocessing waste, and plutonium waste and thereby it actually requires a well-designed storage for lengthy periods of time in order to reduce environmental radiation it releases. Thereby it would be better to store spent nuclear material in repositories hundreds of metres below the surface than to keep it there indefinitely not in contact with the environment[25].

CHAPTER V: COMPENSATION AND THE GUIDELINES THAT CAN BE ADOPTED

5.1. COMPENSATION: THE CIVIL LIABILITY FOR NUCLEAR DAMAGE ACT, 2010

The Civil Liability for Nuclear Damage Act, 2010,[26] also known as the Nuclear Liability Act, seeks to establish civil liability for the nuclear damage, timely compensation for the victims who have suffered from the nuclear accidents, and also the appointment of a claim's commissioner, thereby also the establishment of a nuclear damage claims commission and other related or incidental matters through the no-fault liability to the operator.

This law was passed to implement the 2008 Indo-U.S. civilian nuclear agreement since the U.S. nuclear reactor manufacturing companies will need to obtain insurance in their home states under the liability statute. It basically limits the maximum amount of the liability for any nuclear accident at the amount of 15 billion which has to be paid by that of the nuclear plant operator and in case the cost of

[25] "Not a Closed Chapter: Lack of Transparency around the Kudankulam Nuclear Project Should Worry All of Us" 48 Economic and Political Weekly 8–8 (2013).
[26] The Civil Liability for Nuclear Damage Act, 2010 (Act 38 of 2010)

the losses exceeds this particular level, special drawing rights up to 300 million would be reimbursed by the Central Government. The Atomic Energy Act of 1962 gives the government the jurisdiction to generate, develop, use, and dispose of nuclear energy either directly or through any corporations or authorities that it has formed.

Now in the case of Kudankulam nuclear power plant the operator is Nuclear Power Corporation of India. Being this the case , to start with the definition of the nuclear damage - section 2 (g) of the act covers the definition of nuclear damage as any loss of life , personal injury , any economic loss , loss of income etc [27]. Here the issue concerned with KKNPP is the impact or the injury because of the disposal of SNF has on the environment and thereby on the individual. So, in this context the possibility of improper disposal of SNF has the possibility of loss of life or personal injury including long term health impact, damage to property and also economic losses in the future. This is also evident from the history of Chernobyl and Fukushima. Henceforth nuclear damage will be caused by the improper disposal of SNF from KKNPP and thereby falls under the definition of section 2 (g).

Secondly comes the definition of operator - the Central Government or any authority or corporation established by it or a government company who has been granted a licence pursuant to the Atomic Energy Act, 1962 (33 of 1962)[34] for the operation of that installation. It is covered under section 2 (m) of the act. To include , the definition of radioactive products or waste is also defined under section 2 (p) of the act - any radioactive material generated during the use or production of nuclear fuel, or any material made radioactive by exposure to radiation is known as radioactive waste[28] .

Being this said section 3 of the act is in relation to the atomic energy act and thereby covers the process of AERB notifying the nuclear incident. Now in case of the operator , as per the Section 13.1 of the bilateral agreement between Russia and India - "The Operator of the power units of the NPP at Kudankulam Site shall be the Indian Side and its authorised organisation at any time and at all stages of the construction and operation of the NPP power units to be constructed under the present Agreement and shall be fully liable for any damage both within and outside the territory of the Republic of India caused to any person or property as a result of a nuclear incident occurring at the

[27] The Civil Liability for Nuclear Damage Act, 2010 (Act 38 of 2010) [34] [34] The Atomic Energy Act, 1962 (Act .33 of 1962).
[28] The Civil Liability for Nuclear Damage Act, 2010 (Act 38 of 2010), s. 2 (m), 2(p) ,3.

NPP and also in relation to a nuclear incident"[29] Thereby India i.e. the Nuclear Power Corporation of India is liable as an operator for the compensation.

In the event of a nuclear accident, the operator and the government are legally and financially obligated to assist the affected people. This act specifies the financial liability's proportion. The liability of an operator for each nuclear incident is stated to be as follows (section 4): for nuclear reactors with power equal to or above 10 MW Rs. 1,500 crores (or Rs. 15 billion) in respect of spent fuel reprocessing plants, and Rs. 300 crores in respect of research reactors with thermal power below 10 MW, and Rs. 100 crores in case of fuel facilities besides spent fuel reprocessing plants, and transportation of nuclear materials.

The Central Government may, however, periodically review the Operator's Liability and designate a greater amount and the Remaining Amount will be actually paid by the government of India and thereby limits the time to 10 years to make the claim. Apart from this , chapter 3 section 9 covers the compensation in case of the nuclear damage and thereby the adjudication and also the appointment of the claims commissioner for providing the compensation[30].

5.2. GUIDELINES THAT CAN BE IMPLEMENTED TO AVOID FUTURE DISASTER:

In many cases with regard to kudankulam the judgements delivered were with the safety norms that should be adopted in the nuclear power plant. Many claims of safety norms and procedures, but little information on whether these standards adequately address the particular issues brought up by the protestors, and much less information on how effective and democratic these processes are.

Finding a Deep Geological Repository (DGR) for KKNPP and safely storing spent nuclear fuel (SNF) have received a lot of attention. And this is the major concern that was raised in the article. These are universal problems that affect all nuclear reactors, and the nuclear industry has been searching for solutions for many years. It comes as no surprise that there are ready-made and highly flimsy solutions: the NPCIL has therefore should actually establish a depository for SNF storage and as a

[29] Karthika Sasikumar, "India's Emergence as a 'Responsible' Nuclear Power." 62 *International Journal* 825–44 (2007).
[30] The Civil Liability for Nuclear Damage Act, 2010 (Act 38 of 2010), s. 9.

result of which it can be safely stored and thereby disposed later. It has been extensively discussed and determined that the AERB's code of "Management of Radioactive Waste" is enough to address the issue.

One of the important things that be remembered is the impact of the not so properly stored and as it is forgotten that reprocessing produces longer-lasting and more hazardous wastes and thereby can cause severe damage to the environment at large.

So, the implementation of DGR beyond technical difficulty is more of a socio-political matter[31]. Although the Kudankulam reactor's spent fuel pool is located inside the primary containment and has the potential to store fuel for seven years of reactor operation at full power. Of course, nothing is said about how the presence of SNF near the reactor core worsened the Fukushima accident and continues to be a worry in Japan today. Thereby proper implementation of DGR is very essential as per the order of the supreme court to store the SNF and thereby dispose of it later.

CHAPTER VI: FINDINGS, SUGGESTIONS AND CONCLUSION

6.1. FINDINGS:

Now being the Spent nuclear fuel (SNF) makes up the majority of high-level nuclear waste. Only after approximately 100,000 years does the radioactive concentration of SNF degrade to levels that are comparable to the naturally occurring uranium mined to produce fresh fuel. During this time, it is necessary to guarantee isolation of these radioactive materials from the biosphere. Currently, an approach that accomplishes this involves cooling down the fuel elements after they fission in the reactor, followed by deep geological disposal. Being the case of improper disposal of Spent Nuclear Fuel at kudankulam the anti-nuclear activists and on the other hand the other civil society organisations, contend that the plant needs a precise plan for its ambitious nuclear power programme and also that the nuclear waste management cannot be ambiguous as they exist a very bad past back in history like the Fukushima or Chernobyl accident[32].

[31] Sundarrajan v. Union of India , (2013) 6 SCC 620 .
[32] Van Ness, Peter, et al. “Lessons of Fukushima: Nine Reasons Why” *Anu Press* 349–60 (2017).

The generation of radioactive wastes such as SNF from reactors containing uranium mill tailings, and other radioactive wastes is a significant environmental hazard associated with nuclear power. Over millions of years, these substances may continue to be radioactive and hazardous to human health. The potential for the discharge of the deadly chemical element plutonium into the environment is present in spent nuclear fuel, which is severely radioactive. In actuality, exposure to radioactive waste can result in genetic disruption or mutation in both animals and plants as well as cancerous growths in people. Hence, these modifications might limit long-term reproduction and Furthermore the radioactive waste from the reactor's spent fuel can continue to be radioactive for millions of years.

6.2. SUGGESTIONS:

The article on the first half covers the background of the KKNPP, history of Fukushima and Chernobyl nuclear accident and also about the problems with regard to the improper implementation of DGR and its negative impact on the environment. In the second half the article analyses the noncompliance of improper disposal of SNF with Atomic Nuclear Energy act and Civil Liability for Nuclear Damage act and thereby the guidelines that can be adopted to solve the problem. So, some of the suggestions that can be adopted are Finding a Deep Geological Repository (DGR) for KKNPP and safely storing spent nuclear fuel (SNF) have received a lot of attention. And this is the major concern that was raised in the article. These are universal problems that affect all nuclear reactors, and the nuclear industry has been searching for solutions for many years. It comes as no surprise that there are ready-made and highly flimsy solutions, the NPCIL has therefore should actually establish a depository for SNF storage and as a result of which it can be safely stored and thereby disposed later.

Because it is evident in the case of the Fukushima nuclear accident, the radioactive material disposed in groundwater and the radioactive substances also deposited on the leaves of agricultural produce, like vegetables and fruits etc.,

The amount of caesium-137 present in domestically produced agricultural products has a few becquerels per kilogramme and as a result, the average annual intake of caesium-137 per person from foods derived from agricultural output in Germany is nearly 100 becquerels. The NPCIL has therefore should actually establish a depository for SNF storage and as a result of which it can be safely stored and thereby disposed of later.

6.3. CONCLUSION

To summarize, the main objective of the article is with regard to the improper disposal of the spent nuclear fuel at kudankulam nuclear power plant due to nonimplementation of DGR at the plant 1 and 2. This in turn have greater impact on the environment and can cause unimaginable damage to the living beings, moreover it the improper disposal of SNF will have impact cared over the generations similar to the situations of Fukushima and Chernobyl. Being this said, the first half of the article covers the background history of KKNPP and also the other two nuclear disasters that have taken place back in history and their present condition. Then it also covers the problem with regard to the non-implementation of DGR and thereby the negative impact of SNF on the environment. The second half covers the non-compliance of SNF disposal with the Atomic Energy act and the compensation out of Civil Liability for Nuclear Damage Act. Finally concludes with the guidelines that can be adopted in order to address this problem.

Thereby it is very essential to have a proper cut mechanism for the storage of SNF, Nuclear power poses a serious environmental risk due to the production of radioactive wastes like SNF from reactors that include uranium mill tailings and other radioactive wastes. These compounds might remain radioactive and dangerous to human health for millions of years. Spent nuclear fuel is highly radioactive and has the potential to release the deadly chemical element plutonium and uranium into the environment.

In reality, exposure to radioactive waste can cause cancerous growths in humans, as well as genetic disruption or mutation in both plants and animals. So, it is very essential to look into this issue and find solution to address and repair the problem before any huge impact on environment.

6.4. BIBLIOGRAPHY:

Primary Source:

Statues

- The Atomic Energy Act, 1962 (Act 33 of 1962)
- The Civil Liability for Nuclear Damage Act, 2010 (Act 38 of 2010) Secondary Sources:
- Journal Articles:

- Karthika Sasikumar, “India’s Emergence as a ‘Responsible’ Nuclear Power.” 62 International Journal 825–44 (2007).
- Syed Sikander Mehdi, “India’s Nuclear Power: How Much Peaceful?” 36 Pakistan Horizon 109–40 (1983).
- Geethanjali Monto, “Nuclear India – to Be or Not to Be?” 102 Current Science 973– 85 (2012)
- Ruebhausen, Oscar M., and Robert B. von Mehren, “The Atomic Energy Act and the Private Production of Atomic Power.”66 Harvard Law Review 1450–96 (1953.
- Van Ness, Peter, et al. “Lessons of Fukushima: Nine Reasons Why” Anu Press 349–60 (2017).
- Samuel Walker.J, “Nuclear Power and the Environment: The Atomic Energy
- Commission and Thermal Pollution, 1965-1971.” 30 Technology and Culture, 964–92 (1989),
- Samuel Walker.J, “Nuclear Safety, the Atomic Energy Commission, and the States.” 65 The Wisconsin Magazine of History 158–75 (1982)
- Jayaprakash N.D., “Supreme Court’s Judgment on Koodankulam: Worrying Omissions.” 48 Economic and Political Weekly 18–21 (2013)
- Rao, Divya Badami, and M. V. Ramana, “Violating Letter and Spirit: Environmental Clearances for Kudankulam Reactors” 43 Economic and Political Weekly 14–18 (2008).
- Shankar Sharma, “Nuclear Power in the Context of Global Warming.” 49 Economic and Political Weekly 24–27 (2014)
- “Not a Closed Chapter: Lack of Transparency around the Kudankulam Nuclear Project
- Should Worry All of Us” 48 Economic and Political Weekly 8–8 (2013).