



India's nuclear programme: A study of adjacent areas of the nuclear plants

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Abstract

Nuclear energy is believed to be one of the most important source to meet the future requirements of India. India has adopted the three-tier nuclear system where uranium, plutonium and thorium are used for weapon development as well as for electricity generation. However, adjacent areas of the nuclear plants in India have protested against India's nuclear programme due to varied reasons. Similarly, India more or less has violated the international safety provisions by constructing some nuclear plants in seismic zones which might be hazardous for India. In the name of development, the helpless and hapless people have been evacuated in some areas for construction and operation of nuclear plants. This study tries to explain the reasons of the protests from the villagers and response from the Department of Atomic Energy (DAE). This paper highlights the issue of nuclear radiation in India and recommends some suggestions about tackling these issues peacefully.

This historical account is primarily based on secondary sources, articles from different points of view, websites related with nuclear information, and statements of the authorities (DAE), Uranium Corporation of India Limited (UCIL), and Nuclear Power Corporation of India Limited (NPCIL). Also, some acknowledged and award-winning documentaries form the source material of this paper that highlighted the radioactive impact on the people living in the vicinity of the nuclear plants in India.

Keywords: nuclear energy, NPCIL, DAE

Introduction

The process of nuclear research in India was started by Homi J. Bhabha. Bhabha came from Cambridge after completing his studies in order to help India in nuclear research. He approached Tata Trust for financial assistance for his project in India. After several meetings, the Tata Trust agreed to assist Bhabha. The Government of Bombay (now Mumbai) and Government of India also agreed to share their hand to help the project. After the bill was passed in the Constituent Assembly, the Department of Atomic Energy was established in 1954 in India. Subsequently, Bhabha wrote a letter to then prime minister of India, Jawaharlal Nehru about the censorship. Since then India's nuclear policy is the matter of national security and hardly any nuclear related information is disclosed to public.

Bhabha approached several states like the US, Canada, Soviet Union, the UK, and France to assist India in building nuclear reactors. India also sent several students abroad to study nuclear science in respective universities. India has spent countless money in order to get nuclear reactors operated in India to meet its development goals. Interestingly, the nuclear reactors got constructed as well as operated in several states in India. Currently, India has over twenty nuclear power reactors among them four are under construction and twenty-two are operational according to Power Reactor Information System, International Atomic Energy Agency (IAEA) [1].

Before the construction of nuclear reactors, it is mandatory that the construction site for nuclear reactors meet all the international safety provisions. For instance, the area should not be a seismic zone, high precipitation, prone to floods, strong winds, cyclones, high density of population, and fertile

soil. However, the study by several physicists and academic think tanks reported that India's nuclear power plants are more or less against the safety provisions. It is also reported that India did not share the information of nuclear wastage that has a radioactive impact for about ten years [2]. Moreover, the nuclear accidents also happen in the respective nuclear plants in India and is a great source of alarm. According to Indian parliamentary report, 147 mishaps or unusual safety-related occurrences were reported between 1995 and 1998 in Indian atomic energy plants.

The various issues related with India's nuclear power plants

There is less study available on India's nuclear programme. The Atomic Energy Act of 1962 and Official Secrets Act of 1946 is the restrictive tools implemented by Indian government to restrain people from acquiring nuclear information from DAE. In addition, the Right to information (RTI) ACT, 2005 excluded the DAE from its purview, thus making the information related to it a highly guarded secret. Section 8(1)(a) of the RTI Act emphatically empowers DAE not to disclose nuclear information for security reasons to public. The DAE states that the disclosing of information would 'prejudicially affect the sovereignty and integrity of India, the security, strategic, scientific or economic interests of the state, relation with foreign state or lead to incitement of an offence' [3].

However, although there are several restrictions from the government for seeking nuclear information, few physicists, NGO's and think tanks have highlighted the several nuclear issues in India that are real challenges to India's nuclear

programme. M. V. Ramana, a physicist has extensively studied India's nuclear programme and his book *The Power of Promise* would assist anybody who is interested in studying India's nuclear programme. In addition, the nuclear knowledge available on internet and studies conducted by IAEA on respective nuclear plants outside India help authors to understand the various nuclear issues. The study conducted by the World Nuclear Association on India's nuclear power plants is also helpful in this regard ^[4].

One of the issues of great concern is that India's nuclear power plants are reportedly working against the international safety provisions. For instance, nuclear reactors in India have a long history of leakages, fire, technical faults, delays, minor accidents, shut downs, and finally strike from the workers. All the three nuclear power plants like Tarapur Atomic Power Station, (TAPS), Rajasthan Atomic Power Station (RAPS) and Madras Atomic Power Station (MAPS) have gone through aforementioned problems from time to time. In addition, the Kakrapar Nuclear Power Plant had an issue of being in a seismic zone on hard rock while Narora Atomic Power Station too has a problem of being in a seismic zone but on alluvial soil. The Jaitapur nuclear plant is prone to earthquake too and is in a seismic zone IV area ^[5]. It is important to note that the area has been hit by several tremors in the last few decades. The nuclear plant is also surrounded by fertile soil, large fishing community, and crops.

There have been instances of disaster due to a lackadaisical attitude towards the security norms. The Kashiwazaki-Kariwa Nuclear Power Plant incident in 2007 and Fukushima nuclear disaster in 2011 in Japan happened due to earthquakes. However, the DAE has responded with technical skills that the reactors have been designed to withstand earthquakes. In addition, former secretary of the Atomic Energy Regulatory Board (AERB) went too far by claiming that I will prefer to move to nuclear plant from saving myself from an imminent tremor ^[6].

Not only aforementioned nuclear plants met several problems but the Fast Breeder Test Reactor (FBTR) and Prototype Fast Breeder Reactor (PFBR) have also remained subject of delays and shut downs. In fast breeder reactors, a sodium leak was reported in September 2002 due to defective manufacturing process. In addition, the fire was also reported when Indira Gandhi Centre for Atomic research (IGCAR) tried to replace the nitrogen with regular air for workers to breath. Due to the technical error like noise pick up by the reactor protection logic resulted into shut down of the reactor. The most surprising decision from the DAE is about the design of the PFBR. It is reported that Chernobyl nuclear reactor was using positive coolant void coefficient that resulted into accident and DAE instead going against this design allowed positive sodium void coefficient for fast breeder reactor in India ^[7]. Ramana's prescription in this regard is negative. That is why the breeder reactors worldwide did not win the hearts of the scientists because it is expensive and prone to several problems.

The issue of nuclear radiation is also visible in India. The people living in the vicinity of nuclear plants have been the victims of radiation. For instance, a survey was conducted by Gadekar and Gadekar on 1023 households in Rawatbhata in September 1991. The report shows that people living in the

vicinity of the nuclear plants are more prone to health problems than the people living in distant places ^[8]. The report mentions the chronic problems higher in the areas near the nuclear plant. The thirty cases of solid tumors were also reported in the villages near the nuclear plant. In addition, the women were victim of the football size tumor on the chest and several tennis ball size tumors were reported in the near proximate area and five tumor cases in the control villages.

The health problems like still births, miscarriages, death amongst newborn babies and congenital deformities amongst the living and those who had died were also reported during a survey by Gadekar. The survey in all the households of Jaduguda was also conducted in the three selected villages in September 2000 by the same author. He argued that sixty-three people living in the vicinity of the uranium mining (nearby villages) were suffering from deformities and 13 people in the controls ^[9].

The award-winning documentary film *Buddha Weeps in Jaduguda* highlighted the saga of people living near the Jaduguda uranium mine. The film shows the drastic impacts of nuclear radiation in people living in the vicinity of uranium mine ^[10]. The film also displays the leaking cakes of uranium yellowcake and tailing being dumped into the Subarnarekha River. However, such reports were denied by the DAE. In addition, Uranium Corporation of India Limited (UCIL) even responded that uranium is systematically packed in drums and properly sealed in the presence of scientists ^[11].

The DAE even violates the international safety provision to maintain the exclusion zone of radius 1.6 km around the nuclear facility. Ramana argues that DAE has not implemented the rules it has itself set. In addition, Ramana argued that some nuclear power reactors are constructed where density of population has been undermined which is also violation of an international safety provisions. For instance, advanced heavy water reactor built in the Visakhapatnam campus of the Bhabha Atomic Research Centre (BARC) has a population of 1.7 million according to 2011 census ^[12]. Instead of implementing the international safety provisions, the Nuclear Power Cooperation India Limited (NPCIL) ones argued for reduction of the exclusion zone area because it has constructed safer nuclear power plant designs.

India has not signed the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management. The reason for not signing these conventions is that India stands that spent fuel is not waste in the closed nuclear fuel cycle, but a valuable source of energy. For instance, the plutonium-239 produced and the balance uranium-235 available in the fuel are valuable fissile material in the plutonium and uranium cycles ^[13]. India further stated that spent fuel in Light Water Reactors (LWRs) contains more uranium-235 than natural uranium and is a potential fuel for Heavy Water Reactors (HWRs) which use natural uranium as fuel ^[14]. Same perspective is regarding India's thorium cycle. Thus, India's perspective regarding aforementioned conventions is objectionable to consider spent fuel as waste and hardly it will join the any convention that equates spent fuel as waste.

I managed to set an interview with known physicist, M.V. Ramana, who has extensively studied India's nuclear policy

and his work is appreciated globally by the academic scholars and physicists. I asked him about the India's reprocessing process and waste. He answered me: "I disagree with the official statement because reprocessing does not solve the waste problem, and in fact some of the waste streams produced during reprocessing are more difficult to deal with and more hazardous than spent fuel."^[15]

The case of Kudankulam nuclear power plant is unique and has been challenged by villagers from its inception. Kudankulam plant is the result of the Soviet-India intergovernmental agreement in November 1988 signed by Indian Prime Minister, Rajiv Gandhi and Soviet President, Mikhail Gorbachev. The agreement concludes to construct two 1000-MV VVER-1000 reactors in Kudankulam with soviet assistance. However, the villagers challenged the project and massive protests from local inhabitants were organized with the support from the Samathuva Samudaya Iyakkam (Social Equity Movement) and National Fish Workers Union. The protests were seen in 2011 and 2012. It is reported that VVER-1000 reactors are prone to problems like control rod problems. For instance, 51 control rod problem in Czech Republic were reported by 2006 and in Bulgaria, the serious rod problems were reported on 1st March 2006. In 2003, over seventy thousand people from three districts (Tuticorin, Tirunelveli, and Kanyakumari) gathered to protest against the project. There is a tussle between the protestors, Environment Impact Assessment (EIA) reports, and prescription or responses of the NPCIL. The nuclear radiation is one of key issue which people want to know from the DAE. It is reported that the people living in the vicinity of the plant have never been studied or surveyed. Ramana argued that the spent fuel contains the bulk of radioactivity and the reports from the authorities are silent about the spent fuel. It is also reported that EIA reports have not been disclosed in Tamil language to the people of Tamil Nadu. The meeting for responding the challenges from the protesters was organized in July 2007 where 800 people participated to present their viewpoints. However, without answering the questions from the participants, the officials closed the meeting and announced that NPCIL had clarified all the doubts of the people^[16].

In addition, the task for environmental clearance and public hearing proceedings regarding the project rests on the EAC, however, EAC members that met for the first time on 31 August 2007 where representatives of the NPCIL. It is also reported that members of the EAC were drawn from organizations that have relationship with the Department of Atomic Energy and all affiliated nuclear centres. The former Chief Minister of Tamil Nadu, Jayalalithaa even stated in a public rally in October 2011 that "I will be one among you in the issue." However, in March 2012, Jayalalithaa turned her face and stood with the project. In September 2012, people continued their protest supported by People's Movement against Nuclear Energy (PMANE) led by S. P. Udayakumar and his friends when news broke that plant was getting loaded with uranium fuel. The Supreme Court responded the Public Interest Litigation (PIL) that, if found, plant against the safety provisions will be stopped for operation. However, in October 2012, the fuel got loaded in the reactor and is expected to go critical shortly. The protest against the construction of nuclear

plants is because of the reports from the NPCIL that was unsatisfactory for the people living near the plants. The threat to biodiversity from the nuclear plants has been undermined in the name of development and security in India. These challenges are real and DAE has to find a solution how to respond, otherwise, it will be difficult for DAE to tackle the problem when people in abundance begin protesting against the India's nuclear programme. The DAE has to implement all international safety provision at its earliest in order to save its people from any nuclear disaster. In addition, the nuclear information should be disclosed to public and study should be conducted in all the adjacent areas of nuclear plants to save the biodiversity in India.

Issue of displacement

One of the key questions in Kudankulam has been an issue of displacement. Displacement is an immediate consequence which the population around most of the nuclear power plants are going to face and is becoming an assembling point for protests against these nuclear plants. The area for construction of nuclear plants consume vast area of land from 2 km to 5 km radius. The people displaced due to Tarapur nuclear power plant are still waiting for the Maharashtra government's decision for rehabilitation. Interestingly, the Bombay High Court has directed the government to rehabilitate the displaced people, however the Maharashtra government has continuously failed to do so^[17].

In Jaitapur (Maharashtra), the area for nuclear plants will consume over 968 hectares of land. It is reported that five villages namely Madban, Nivel, Karel, Mithgavane, and Varliwada with population of 4, 000 lives will be displaced. NPCIL claims that the land is barren and will not cause any displacement. However, the people living in these villages reacted against the statement of the NPCIL because the land is highly fertile and producing rice, mango, cashew, coconut, kokum, betel nut, pineapple, and other valuable fruits^[18]. Surprisingly, in Jaitapur, the people have been sent notice by the authorities to refund the money that has been given to them as compensation and their bank accounts have been blocked^[19].

In Fatehabad (Haryana), the three villages like Gorkhpur, Badopal, Kajal Heri have been warned by the notification for the acquisition of the land for construction of nuclear power plant. The anxiety increased after the news spread among the villagers. Despite the farmers agitation, the government sent another notice under section 6 of the archaic & colonial Land Acquisition Act 1894 to vacate the land^[20]. The same is the case with Chutka (Jabalpur district, Madhya Pradesh) and Kovada, Andhra Pradesh, where people will be displaced due to nuclear plant projects. In Chutka, the project will culminate into second round of displacement for the people after the Barghi dam on Narmada river when villagers were displaced in 1980s. Also, the projected site for nuclear power park in Kovada will affect 20 villages.

Conclusion

India's ambition to fulfil its development goals is largely supported by Indian scientists, who are busy in respective governmental atomic centres. Nuclear hawks worship nuclear science because they believe that nukes are an important

element for nuclear deterrence. However, they are silent about the internal threat. The people living in the vicinity of the nuclear plants have different prescription and are unhappy with the decision of the DAE by constructing nuclear plants in their area. The reason put forth is lack of international safety provisions by the DAE and unsatisfactory responses from the DAE after reports showed some people were victims of nuclear radiation in the adjacent areas of the nuclear plants in Jharkhand and Rajasthan. In addition, the study conducted by several physicists and NGO's in India make people aware about the impacts of radioactive fallout. The Fukushima nuclear disaster throws the people in anxiety in India and that is why they are protesting against the Kudankulam and Jaitapur nuclear power projects. The DAE has denied all such reports and is fully confident about its success in nuclear field to achieve the target goals. However, the study conducted by Ramana and others predicted the bad future for India, because the promises/predictions have not been fulfilled yet by DAE and people are becoming more aware day by day due to numerous technical errors in the respective nuclear plants that resulted into the shutdown of nuclear reactors. The radioactive fallout cannot be ruled out in India because of the numerous problems which are still continuing in the respective nuclear plants in India. The plutonium is very dangerous and India's three tier nuclear programme which is unique in nature has been challenged by several physicists across the globe.

All the nuclear plants located in seismic zone IV should be shut down at its earliest. The study conducted by experts should be given weightage by implementing all the international safety provisions in India. Also, the surveys should be conducted in all the adjacent areas of the nuclear plants for safety of the public. The tailings ponds must be closed for the protection of the people and animals. The DAE should organize programmes for nuclear radiation awareness for people living in the vicinity of nuclear plants. The displaced people should be rehabilitated in safer zones with compensation and the supreme court of India must intervene to save the fertile land from nuclear plant projects. In addition, the autonomous team (outside of the DAE) should be organized under the directions of supreme court to investigate all the areas near the nuclear plants in India for protection of the Indian lives. The electricity generated from nuclear reactors is expensive, therefore, an alternative method like solar energy might replace nuclear energy for electricity generation in India. Further, Section 8(1)(a) of the RTI Act should be amended to provide access to the people regarding the nuclear information.

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