



## The environmental impact assessment process for nuclear facilities: An examination of the Indian experience

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### ABSTRACT

India plans to construct numerous nuclear plants and uranium mines across the country, which could have significant environmental, health, and social impacts. The national Environmental Impact Assessment process is supposed to regulate these impacts. This paper examines how effective this process has been, and the extent to which public inputs have been taken into account. In addition to generic problems associated with the EIA process for all kinds of projects in India, there are concerns that are specific to nuclear facilities. One is that some nuclear facilities are exempt from the environmental clearance process. The second is that data regarding radiation baseline levels and future releases, which is the principle environmental concern with respect to nuclear facilities, is controlled entirely by the nuclear establishment. The third is that members of the nuclear establishment take part in almost every level of the environmental clearance procedure. For these reasons and others, the EIA process with regard to nuclear projects in India is of dubious quality. We make a number of recommendations that could address these lacunae, and more generally the imbalance of power between the nuclear establishment on the one hand, and civil society and the regulatory agencies on the other.

### 1. Introduction

India plans a large expansion of nuclear power. The Indian Department of Atomic Energy (DAE) projects that hundreds of nuclear reactors will be constructed over the next few decades (Grover and Chandra, 2006). There is widespread concern about the potential environmental impact of these projects. At those sites that have been selected for new reactors, there has been significant grassroots level opposition. The formal manner in which this has been expressed most often is through the public consultation part of the environmental impact assessment (EIA) process.

The Environment Impact Assessment Notification of 2006 (EIAN2006) lists “nuclear power projects and processing of nuclear fuel” as requiring environmental clearances. However, not all facilities that are involved in the processing of nuclear fuel are subject to this procedure, for example, the reprocessing plants that chemically process radioactive spent fuel discharged from nuclear reactors, including civilian reactors.<sup>1</sup> Barring such exceptions, nuclear facilities

do have to be granted environmental clearances by the Ministry of Environment and Forests (MoEF).

This paper examines the effectiveness of the environmental impact assessment process for nuclear facilities in India. We focus on the three key components: the EIA study itself, the public consultation, and the expert committee that oversees the clearance. By analyzing a number of nuclear projects that have received environmental clearances so far, we investigate if the process has actually identified the project’s potential adverse impacts, the quality of the impact assessment, and the extent to which public concerns have been incorporated into decision making.

We end with a number of recommendations that could help improve this process. Broadly speaking, the thrust of these recommendations is to improve the balances of power between the nuclear establishment on the one hand, and the regulatory agencies and civil society on the other hand. As our discussion below shows, currently the DAE and associated organizations possess overwhelming political power and can ensure favorable decisions in almost all cases.

### 2. Environment impact assessment studies

The EIA for nuclear projects is commissioned by the project authorities themselves. As Wathern (1988) has identified, the problem is that in the absence of “adequate safeguards, proponents may be tempted to regard EIA simply as a means of obtaining project authorization and present only those results which show proposals in

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<sup>1</sup> According to an official in the Ministry of Environment and Forests who preferred not to be identified, reprocessing activities avoid the clearance process because they “take shelter under the strategic program”, i.e., they claim that there may be nuclear weapons related activities which cannot be disclosed.

a favorable light". This has been the case in India, and nuclear authorities have sought to make the environmental impacts of projects look more benign than they are, both through their choices of the potential impacts studied, and the care with which those impacts are studied. An example of the former is the document that lists the environmental and social concerns related to uranium mining at Turamdih (MoEF, 2008). In response to a question about the project's use of hazardous substances, the document does not identify the most obvious entry: 'uranium and its compounds'.

An example of the latter is how nuclear EIAs in India evaluate the potential public health impact due to radiation releases – a standard component of nuclear EIAs in most countries. In the United States, for example, EIA statements include "calculations...[of the] estimates of the maximum [radiation] dose that would be received by individuals living near the facility and the collective dose... that would be received by the total population potentially affected" (Ginoza, 1982, p. 179). In India, nuclear EIAs often just offer bland assurances about how radiation doses would be within limits. To the extent that EIAs have carried out calculations of potential radiation doses, they have often been based on unreliable assumptions. For example, the EIA for the Koodankulam nuclear reactors uses much smaller radioactive discharge rates compared to other reactors of similar type and did not collect data on people's milk and food consumption levels (Rao and Ramana, 2008).<sup>2</sup>

EIAs on nuclear facilities are also prone to elementary technical errors, which makes their quality suspect. An example is in the EIA for the Prototype Fast Breeder Reactor (PFBR), which states that "a nuclear explosion...can never occur in a reactor" (MECON, 2000, p. 8.1). This demonstrates ignorance of the vast literature on the safety of fast breeder reactors focusing on what are called core disruptive accidents (CDA) (Waltar and Reynolds, 1981).<sup>3</sup> The PFBR design is particularly prone to such accidents, and its containment is not strong enough to ensure that radioactive materials are not expelled into the atmosphere in the event of such an accident (Kumar and Ramana, 2008).

Though the EIA is commissioned by the project proponents, the actual preparation of the document is done by one of a number of environmental consultants that regularly prepare nuclear related EIAs.<sup>4</sup> However, these consultants have to depend on the nuclear establishment for data about baseline levels of radionuclides and expected levels of radioactive discharges. This allows the latter to be completely in charge of determining the main impact of concern: environmental release of radioactive materials. This is also the case with monitoring of the effluents once the project commences.

The argument offered for this state of affairs is that all expertise concerning nuclear matters and necessary monitoring equipment is available in the country only within the DAE and its subsidiaries. As such, there is no reason why the MoEF or the Pollution Control Boards cannot invest in monitoring equipment or develop the expertise.<sup>5</sup> In other countries, wherein greater separation of environmental reg-

ulators and nuclear agencies has been put in place, the monitoring of radiation levels is done by organizations independent of those operating nuclear reactors.<sup>6</sup>

Though it does not play any role in the formal EIA process, another administrative entity involved in monitoring radiation doses and nuclear safety, is the Atomic Energy Regulatory Board (AERB). The AERB reports to the Atomic Energy Commission (AEC), whose Chairman is always the head of the DAE. Its funding comes from the DAE. Thus, the nuclear establishment exercises administrative and financial powers over the AERB. Further, the AERB has to depend on the DAE for its technical staff. The DAE's management has exploited such dependence (Gopalakrishnan, 1999).

For these reasons, an independent examination of the most crucial environmental impacts, those related to radiation, from nuclear facilities is not practically possible. The EIA process for nuclear facilities also relies on the nuclear establishment to carry out studies that do not involve any radioactive materials. Even if the consulting companies do not have in-house expertise (which, in itself, should serve to serve as a disqualification), there are many other organizations in the country that are capable of examining these aspects. For example, in the case of uranium mining at the Lambapur–Pedagattu site, the modeling of water flows into catchment zones and the possibility of overflows of uranium contaminated water into drinking water could have been carried out by any civil engineering department with expertise in hydrology, but this task was undertaken by the Health, Safety and Environment Group of the Bhabha Atomic Research Centre (MoEF, 2005).

### 3. Public consultation

Public consultation includes two components, public hearing and written comments. Since 2001, there have been a number of such public hearings (Table 1). One common feature across these hearings has been participation by the public in large numbers, predominantly local inhabitants, who expressed near-unanimous opposition (Menon and Ramana, 2007; Reporter, 2006; Staff Reporter, 2005; DOSE, 2001). Similarly, several people and groups have submitted written comments that have been critical of the EIAs, not to mention the projects themselves. However, the experience so far suggests that public opinion and inputs count for little in decision making about nuclear projects.

At best, the approach that the nuclear establishment has taken towards the role of the public can be characterized as dealing with participation "as a procedural issue than one of value" (Richardson, 2005). Public hearings for nuclear projects have been always short and rushed affairs with insufficient time for all interested participants to seek information or clarifications. Those questions that are raised are seldom answered satisfactorily by the project proponents.

What is striking to most observers of public hearings has been the disparity in power between the project proponent and members of the public. The local administrative officer in charge of conducting the meeting is conspicuously deferential to the project proponents.<sup>7</sup> At the very beginning of the meeting, the proponents are often asked to make a presentation on the benefits that would accrue from the project and the safety precautions that have been taken. Even while responding to questions from the public, members of the nuclear establishment are allowed to get away with answers that do not really address the public's questions.

For the most part, the public has also not been made to feel welcome at hearings. Many public hearings have featured massive police presence (Bidwai and Ramana, 2007). The police have on

<sup>2</sup> Local grassroots organizations confirm that people in the vicinity of the plant have never been surveyed (Personal communication from S. P. Udayakumar, South Asian Community Centre for Education and Research, December 1, 2008).

<sup>3</sup> This kind of accident is specific to fast breeder reactors and during the course of which large energies can be explosively generated through nuclear reactions, i.e. a nuclear explosion, albeit a small one. The potential for CDAs results from the reactor core not being in its most reactive configuration. If conditions during an accident cause the fuel bundles to melt and rearrange, the reactivity could increase. This typically cannot happen in a thermal reactor because moderation of neutrons is necessary to sustain a reaction. The core in such reactors is usually designed so that the fuel is in its optimal configuration and reactivity decreases when it is rearranged.

<sup>4</sup> The leading ones are Metallurgical & Engineering Consultants (MECON) Limited and National Environmental Engineering Research Institute (NEERI).

<sup>5</sup> As early as the 1970s, a senior bureaucrat had suggested that the "inspection of all nuclear installations from the point of view of health and environmental safety should be administered by a body with a suitable name and located in Department of Science and Technology, as that department had been assigned the national responsibility for ensuring the preservation of environmental quality" (Parthasarathi, 2007, pp. 131–132). But this was not accepted by the Atomic Energy Commission.

<sup>6</sup> Examples are the Federal Office of Radiation Protection in Germany and the Swedish Radiation Safety Authority.

<sup>7</sup> One account of the Bandurang public hearing states that the moderator of the hearing "almost acted as a mouth piece" of UCIL (Dubey, 2004).

**Table 1**  
Public hearings for nuclear projects.

Project	Date
<i>Uranium mining</i>	
Badhurang	February 25, 2004
Bagjanta	September 18, 2004
Seripally	March 3, 2005
Lambapur Pedugatta	March 3, 2005
Mouldih	August 29, 2005
Pulivendula, Kadapa	September 10, 2006
Domiasiat, Meghalaya	June 12, 2007
<i>Nuclear power plants</i>	
PFBR, Kalpakkam	July 27, 2001
Kakrapar Units 3 and 4	April 21, 2006
Koodankulam Units 3, 4, 5, and 6	June 2, 2007

occasion tried to intimidate those intending to express opposition. This has included the use of force in a couple of cases, for example at the public hearing for uranium mining at Tummalapalle in the state of Andhra Pradesh (Reporter, 2006). In some cases, people known to object to a project have been refused entry (Correspondent, 2004).

Not only is public participation devalued, it often falls short in procedural terms. At a number of hearings, members of the public have complained that they have not managed to get copies of EIA reports (Dubey, 2004). Authorities have not read out their summary (minutes) of the proceedings and sought the consent of those who participated at many public hearings as mandated in EIAN2006 (Bidwai and Ramana, 2007).

Following the public hearing, the minutes of the meeting are forwarded to the authorities granting clearance. This is the only formal means through which the views of the public are conveyed to the authorities, but these usually focus disproportionately on statements by the project proponents while giving short shrift to the views of the oppositional public. In addition, they often try to explain away opposition. For example, the minutes of the public consultation for the PFBR makes the un-mandated observation that “the public objections on employment opportunities were mainly due to their past experience they had when the existing nuclear power plants were established at Kalpakkam... These are not material to this public hearing” (DC and DEE, 2001).

The other component of the public consultation involves the project proponent providing written responses to those questions or comments on the EIA submitted at the time of the hearing or through mail or fax to the Pollution Control Board. This is often not followed. When given, the responses are largely unsatisfactory, and sometimes even irrelevant. In the case of the Koodankulam reactors, where we obtained the written responses through the Right to Information (RTI) Act, the Nuclear Power Corporation (NPC) that was to operate these reactors offered mostly cut-and-paste responses.<sup>8</sup> Again, it is clear that the nuclear establishment treats this component of public consultation as merely a procedural hurdle.

#### 4. Expert appraisal committee

The Expert Appraisal Committee (EAC) wields a lot of power within the clearance process as it is the body that reviews the robustness of an EIA, and recommends clearance against conditions. Having a mixed and balanced EAC composition would ideally promote a more methodical process of scrutinizing the EIA and reports of the public consultation to decide about the project's clearance. However, this has not happened with nuclear projects.

One major contributing factor is the composition of EACs for nuclear projects. These have been dominated by members who are

currently part of the nuclear establishment or were formerly so. For example, the EAC that dealt with the clearance for the Kakrapar Atomic Power Plant Units 3 and 4 included the Secretary of AERB, the Former Secretary of the AERB, Former head of the Risk Studies Division, Indira Gandhi Centre for Atomic Research, the Former Managing Director of Indian Rare Earths, and a Retired Senior Executive Director of NPC. Thus five of the twelve members were or had been associated with DAE. Similarly, the EAC that considered the Kaiga Atomic Power Project Units 3–6 was headed by a member of NEERI, the organization that had prepared the EIA for the project.

In some cases, EACs have suggested carrying out a few studies of environmental impact, though they have gone ahead and recommended clearing the project without waiting for the results of these studies. Nor were the clearances conditional upon the studies demonstrating that there were no significant impacts. This part of the clearance process also seems to be aimed at “checking the boxes”, rather than ensuring compliance with environmental laws.

#### 5. Discussion

In many countries, it has been argued, the adoption of “EIA has made a difference to patterns of development through design modifications, institutional learning, and stakeholder involvement” and that the “quality of decisions involving EIA has improved as a result of the increased use of modification or mitigation, the use of more stringent conditions upon permissions and, occasionally, the non-implementation of potentially environmentally damaging proposals which might previously have been approved” (Jay et al., 2007). As the cases outlined here show, this does not seem to have been the case with nuclear projects in India.

Almost all nuclear projects have received environmental clearances. The one exception involved a processing plant to deal with uranium ore from the Lambapur–Peddagattu deposit in the state of Andhra Pradesh. The initially proposed site for the processing plant was about 4km from a major water reservoir (Anand and Gokhale, 2003). Years earlier the state government had ordered that no hazardous industry can be located within 10 km of the drinking water sources for Hyderabad, the capital city; this order was upheld by the Supreme Court. Since the original site – Mallapuram – did not meet that standard, the uranium processing plant could not be located there, but had to be shifted to another site about 30 miles away. What is of relevance to our examination of the EIA process is that the pathway for contamination and its potential impact were not identified in the EIA, which merely offered the assurance that “effluents generated at the plant shall be treated to standards specified” before discharge (MECON, 2003, p. 5-1).

In practically all cases, participants at public hearings for nuclear facilities have been overwhelmingly opposed to the project. But their views have been uniformly ignored in decision making. Local administrative authorities conducting the public hearings have clearly sided with project proponents and prepared minutes of the meetings that make it appear as though there was little or no public opposition.

How the EIA process has been carried out in the case of nuclear projects in India has reflected how it has operated with regard to other (non-nuclear) projects in the country (Menon and Kohli, 2007; Paliwal, 2006). However, there are important ways in which the environmental decision making in the case of nuclear power is especially weakened. One is the necessary involvement of the project proponent in providing information and making measurements of radioactivity levels, the biggest environmental hazard associated with nuclear projects. A second is that some nuclear activities are exempt from having to obtain clearance. This is not because these do not have environmental impacts. The best example is reprocessing, arguably the most polluting part of the nuclear fuel chain producing large amounts of solid, liquid and gaseous radioactive waste.

<sup>8</sup> By our reckoning, there were at least 45 different questions, whereas NPC only had 31 responses.

Once a project has been cleared, MoEF is supposed to monitor it for compliance with the conditions imposed. However, even though there are occasional reports of violations of various regulations at some reactors, NPC has not been asked to shut down any of these facilities. This suggests that MoEF and the various Pollution Control Boards do not appear to have the power to enforce their regulations.

The EIA process should be particularly stringent in the case of nuclear facilities, both because of the unique characteristics of the nuclear fuel cycle and because the vast majority of the population in India has little understanding of radiation and its associated hazards (MAI, 1993). In principle the EIA process could be a way for the DAE to improve its decision making, helping it set public fears at ease. Instead, the DAE's approach has been to comply with the legal requirements to the barest minimum, and avoid them whenever possible. To the extent that legal requirements have been complied with, and the EIA process has been carried out, the quality of the process has been questionable.

Following (Joyce and MacFarlane, 2001), we can identify three levels of conflicts of interest in the EIA process for nuclear facilities. First, the EIA is prepared by consultants who are retained to work on behalf of, and by implication act in the interests of, their client – the nuclear organization proposing the project. Second, the organization that has been tasked with preparing the EIA to support its proposal for a project, is the same organization that will benefit from the project. Both of these conflicts can in principle be ameliorated by having an organization that is interested in ensuring better environmental standards when the EIA. But herein lies the third conflict of interest – the MoEF, which is supposed to safeguard the environment and public health, is an organ of the government, and successive Indian governments have unambiguously demonstrated their interest in expanding nuclear power rapidly. Therefore the MoEF will naturally be under great pressure to clear all nuclear projects expeditiously.

In addition, the nuclear establishment in India enjoys unique access to political authority and is protected from external oversight. Unlike most policy matters where the cabinet has the ultimate authority, the Atomic Energy Commission is under the direct charge of the Prime Minister. This structure makes it difficult for the MoEF, and indeed most politicians or bureaucrats, to challenge nuclear policies or practices (Ramana, 2009).

## 6. Recommendations

A number of steps can be taken to address the various lacunae in the EIA process for nuclear facilities in India. We divide these into steps related to the EIA and steps related to public participation. To start with, all facilities, including reprocessing plants, should be subject to the EIA process. There is no justification for allowing for the possibility that any facility, even those used for weapons purposes, may contaminate the environment at unacceptable levels. The second step that can help achieve greater accountability is that if an EIA is found to be faulty at the technical or factual levels, the proposer should be required to go through the public comment process again with revised EIA. Third, an agency should be set up, completely independent of the nuclear establishment, perhaps under the administrative and financial control of the Ministry of Environment and Forests or the Department of Science and Technology, and tasked with developing expertise in measuring radiation levels as well as calculating likely radiation doses to various population groups living around nuclear facilities. Likewise the Atomic Energy Regulatory Board should be kept outside the administrative and financial purview of the Atomic Energy Commission. With these changes, the role of the personnel from the nuclear establishment in the Expert Appraisal process can and should be progressively eliminated.

In parallel, steps should be taken to make public participation more meaningful. One measure, which has been practised in other countries such as Canada, is to establish some mechanism for funding committed members of the public to participate in the EIA process, including for developing expertise or hiring external experts to examine EIA reports. In the case of nuclear projects, this will require that these members of the public be allowed to use the services of the agency tasked with measuring radiation levels and calculating radiation doses. Another measure, that has been followed in countries like Sweden, Finland, and Canada in the context of identifying geological disposal sites for high level waste, is to allow local governments to veto a project if they are not in favor of it.

At a larger level, the role of the Ministry of Environment and Forests cannot be that of promoting nuclear power but that of an evaluator and a regulator. This role is necessarily adversarial, and the organization should develop the capability and the mindset to play this role adequately.

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