

The Risks of Nuclear Power

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Designing and running nuclear power requires an entirely different mode of planning and assessment than possible with conventional risk analysis. There is little indication that the existing organisational culture of the Department of Atomic Energy permits such “over-the-horizon” creative thinking as is required.

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Jairam Ramesh, Minister of State for Environment and Forests, has written to Prime Minister Manmohan Singh expressing the following concerns (*The Hindu*, 1 April 2011). The letter begins by pointing to a concern expressed by many, including a former head of the Atomic Energy Regulatory Board (AERB), that the AERB is too “deeply embedded” in the Department of Atomic Energy (DAE, the body that controls India’s nuclear programme), in order to be a credible regulatory authority.

Ramesh proposes that AERB should become a “fully independent body drawing its powers directly from Parliament” in order to address the “huge drop in public confidence in nuclear energy”. The letter points out that given plans to import new reactors from Russia, US, and France, Indian regulators will

always be playing catch-up due to their lack of expertise and skills. The minister suggests instead that the country build new nuclear capability through Indian-made reactors, possibly upgrading their size to 1,000 MW, to allow the regulatory system to be meaningful. The letter also questions the political rationale of building multi-reactor nuclear parks, suggesting that the public would be less concerned with two reactors at the same site, but are alarmed at the possibility of having six reactors at the same site, as is currently planned for Jaitapur.

While in his communication the union minister of state for environment and forests confronts issues of grave concern to us all, it does not address directly the structural safety problems made visible by the Fukushima tragedy.

More and scaled-up CANDU reactors do not solve the core problems associated with nuclear reactors. As the editorial “Can India Learn from Fukushima?” (EPW, 19 March 2011) points out, major accidents can be provoked by natural causes or by

technical failures. "Neither the Three Mile Island nor the Chernobyl accident (nor Windscale, for that matter) needed a natural disaster to start them off". This is why it is vital to acknowledge that these are nuclear disasters, not natural disasters ("Fukushima: Consequences of Systemic Problems in Nuclear Plant Design", Francois Diaz Maurin, *EPW*, 26 March 2011), even if the precipitating event is an earthquake or a tsunami.

In the wake of the ongoing Japanese nuclear disaster, Prime Minister Manmohan Singh announced that the safety of all India's nuclear reactors will be reviewed. The DAE/AERB, it can confidently be assumed, will report back that all is well. Indeed, they may even be telling the truth as they see it.

The most rigorous of safety checks do not ensure that a reactor is absolutely safe. Rather, checks assess whether the performance of the reactor meets the standard of risk deemed acceptable by the designers. The first rule in the practical engineering handbook is that safety and costs are directly correlated. Put another way, if you want 100% safety, the machine will cost too much to be economically viable. So, already we know we are working with reactors that have a degree of risk built into them. But even this is not the real issue. The problem is elsewhere.

As Maurin also points out, standard risk assessment is probabilistic. Risk evaluators ask themselves what are the chances that a catastrophic event like an earthquake or tsunami will take place, and turn to historical data to measure the likelihood and scale of such catastrophes. So, if a risk assessment of India's nuclear reactors had been conducted in August 2004, it would not have taken into account the likelihood of a tsunami, as there had been no recorded tsunami in the data. Yet, six months later, a massive tsunami did take place, and we should consider ourselves very, very lucky that the damage to the Kalpakkam and Koodankulam reactor complexes was apparently relatively limited. This needs to be repeated: it was luck, not engineering, because the possibility of a tsunami hitting the reactor was not factored into the design. Indeed, it could not have been, as risk is measured on the basis of past events that have taken

place, not events that have never been known to happen before.

Creative Thinking?

In other words, the best possible report on the safety of the Indian reactor complex can only inform us that reactors are protected against all prior catastrophic events adjusted for scale. It will say little about future events that are imaginable but have never taken place, "unknown knowns" in former US Defense Secretary Donald Rumsfeld's words, like sabotage or a terrorist attack, i.e., events that can be imagined but the probability of which cannot be measured with any confidence; or "unknown unknowns", events that are neither imaginable nor measurable because they are possible incidents beyond the horizon of our imagination. These kinds of events include the 11 September 2001 attack on the World Trade Center in New York and the "impossible" concatenation of unexpected events that led to the 1998 meltdown of the infamous US hedge fund, Long-Term Capital Management. Addressing unknown unknowns requires an entirely different mode of planning and assessment than conventional risk analysis; there is little indication that the existing organisational culture of the DAE permits such "over-the-horizon" creative thinking. This is the real danger we face.

Jairam Ramesh's proposal to make the AERB independent of the DAE moves in the right direction. If the AERB can be made

truly independent, it will be a huge step forward in reclaiming public oversight on one of the most secretive – and given their mission, dangerous – agencies of the Indian state. The battle over this proposal, however, will make the "debate" over the India-US nuclear agreement look like a childish spat.

Jairam Ramesh's letter ostensibly seeks to address the public's lack of trust in nuclear energy. In fact, his proposal to restructure the nuclear energy complex speaks to the political elite's lack of trust in the DAE. Restoring trust in the DAE cannot come from cosmetic change and improved public relations. Practical measures to assure the public will only come from concrete steps, such as the following:

Allow independent experts to assess the quality of current DAE thinking by releasing full documentation on (a) how the department has handled and intends to handle the highly radioactive nuclear wastes that have built up since the early 1970s, when India's first power reactor went critical; (b) the emergency plans that are required to be in place in order to protect the public in case of a reactor accident or core meltdown. Neither of these two critical issues impinge on national security or trade secrets, the usual fallback excuses of the DAE. Releasing this information would go a lot further towards reassuring an insecure Indian public that, for all its official secrecy, the DAE indeed has the best interests of the nation in mind.

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