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Nuclear Energy – Reassurances Don't Guarantee Safety: M V Ramana

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by Nivedita Menon

This is a guest post by M V RAMANA

On 23 March 2013, NDTV featured one of its Walk the Talk features with **Shekhar Gupta interviewing Yukiya Amano** (<http://www.ndtv.com/video/player/walk-the-talk/walk-the-talk-with-yukiya-amano-director-general-iaea/269404>), the Director General of the International Atomic Energy Agency (IAEA). This was reproduced a few days later in the **Indian Express** (<http://www.indianexpress.com/news/nuclear-fears-have-to-be-addressed-scientifically.-the-indian-government-must-be-as-transparent-as-possible/1093407/>). Coming shortly after the second anniversary of the multiple accidents at Fukushima, the purpose of the interview is made clear by Gupta late in the interview when he says:

...some of us who support the idea of [expanding] nuclear power [in India] need more reassurance from people like you.

And Amano does oblige by asserting,

with more caution, with further measures, I am very confident that nuclear power is much safer than before.

To those already supportive of more nuclear reactors, the interview is likely to have been successful in offering them the assurance that they need, not so much for themselves, but to silence those skeptical of the expansion. But if one reads the interview more carefully, it is clear that the assurance is not really a guarantee that no catastrophic accidents will happen.

The interview is a strange mixture of candid admissions and misleading or disingenuous assertions, and it is worth teasing out some of these. [The whole interview could, of course, be subject to a much more elaborate analysis, but that task is well beyond what is attempted here.] Further, the assertions about safety and what is needed to achieve safety are in contradiction with what is known about the state of nuclear power and safety in India. Likewise, Amano's admissions also deviate from the "party line" offered by nuclear officials in India. Unfortunately, the interviewer let all of them pass without further comment.

Perhaps the most important and candid of the admissions is this - **"We cannot say there is 100 per cent**

safety” when it comes to nuclear power plants.”

Contrast this with the multiple statements made by various high functionaries of the Department of Atomic Energy (DAE) and Nuclear Power Corporation of India Limited (NPCIL) claiming complete safety.

On March 20, 2011, an interview of the Secretary of the Department of Atomic Energy (DAE) by the science journalist Pallava Bagla for NDTV, **involved this dramatic exchange (<http://www.ndtv.com/article/india/why-nuclear-reactors-are-100-per-cent-safe-92815>):**

NDTV: Are Indian reactors safe?

Srikumar Banerjee: One hundred per cent.

In a similar vein, Banerjee asserted in November 2011 that the odds of accidents at nuclear plants **was “one-in-infinity” or zero (<http://www.thehindu.com/news/national/aec-chief-puts-odds-of-nplant-accidents-at-1ininfinity/article2615375.ece>)**. But the implication of Amano’s statement—“cannot say there is 100 per cent safety”—is that the odds of a severe accident at any nuclear plant is necessarily greater than zero.

The statements by Banerjee are by no means exceptional. As I document in *The Power of Promise: Examining Nuclear Energy in India* (<http://kafila.org/2013/03/21/understanding-the-empty-promises-of-nuclear-energy-nityanand-jayaraman/>), the DAE has a long history of indulgence in the misguided belief that accidents are impossible—and an even longer history of accidents, albeit small, at its facilities.

The second area where Amano diverged from what Indian nuclear officials have asserted was his acknowledgment that **“Fukushima was a very huge accident and a very severe accident”**. A number of statements from NPCIL and DAE, on the other hand, were evidently aimed at denying or trivializing what happened at Fukushima. The Chairman and Managing Director of NPCIL set the tone when he claimed, “there is no nuclear accident or incident in Japan’s Fukushima plants. It is a well planned emergency preparedness programme which the nuclear operators of the Tokyo Electric Power Company are carrying out to contain the residual heat after the plants **had an automatic shutdown following a major earthquake.**” (http://articles.economictimes.indiatimes.com/2011-03-15/news/28691538_1_japan-nuclear-crisis-nuclear-accident-nuclear-operators) This reference to residual heat, produced by the radioactive elements generated during the fission process did not do justice to the gravity of the situation—as was clear when it melted the cores of the Fukushima reactors. The difficulty with dealing with this physical phenomenon is well expressed by physicist Robert Socolow in the *Bulletin of the Atomic Scientists*, when he pointed out that the residual heat is “the fire that you can’t put out, the generation of heat from fission fragments now and weeks from now and months from now, **heat that must be removed.**” (<http://thebulletin.org/web-edition/op-eds/reflections-fukushima-time-to-mourn-to-learn-and-to-teach>)”

Even the physical phenomenon of residual heat did not find mention in the statement some months later by the Secretary of the DAE, who disingenuously asserted, “It was not a nuclear accident... immediately after the earthquake, the nuclear reactor shut down and **nuclear chain reaction stopped**” (<http://www.thehindu.com/news/national/aec-chief-puts-odds-of-nplant-accidents-at-1ininfinity/article2615375.ece>). The claim that for something to qualify as a nuclear accident the chain reaction has to persist, in effect ignores large classes of severe accidents that could occur even after the reactor is shut down.

According to Article II of the IAEA's Statute, the first of its objectives is to "seek to accelerate and enlarge the contribution of atomic energy to peace, health and **prosperity throughout the world** (<http://www.iaea.org/About/statute.html#A1.2>)". Amano is, after all, the head of the IAEA, and cannot but realize that merely sensitizing people to the severity of what happened at Fukushima or the possibility that such catastrophic accidents will recur would not help with accelerating and enlarging nuclear power capacity around the world. Thus, it is but natural that he would follow up his comment "We cannot say there is 100 per cent safety" with the much more comforting promise "But we can make a nuclear plant as safe as humanly possible and even if an accident takes place, we can mitigate the effects by taking various measures".

The use of clichés like "as humanly possible" is clearly intended to assure the reader that everything is being tried to ensure safety, but it is completely disingenuous. To start with, no reactor is designed to be as safe as humanly possible. It is humanly possible, always, to think of more ways of enhancing safety. To take a somewhat extreme example, if one were primarily concerned about potential releases of radionuclides to the atmosphere, one could construct the entire nuclear reactor a couple of hundreds of metres underground—a pet idea of **Edward Teller** (http://www.osti.gov/bridge/product.biblio.jsp?osti_id=325423), who developed the hydrogen bomb. However, both for economic and operational reasons, this idea has not found favour with people constructing nuclear reactors.

Even in non-nuclear cases, it has been pointed out by safety theorists like Nancy Leveson and her collaborators that,

For most organizations, however, the mission is something other than safety, such as producing and selling products or pursuing scientific knowledge. In addition, it is often the case that the non-safety goals are best achieved in ways that are not consistent with designing or operating for lowest risk. Management statements that safety is the primary goal are often belied by pressures on employees to bend safety rules in order to increase production or to meet tight deadlines (<http://oss.sagepub.com/content/30/2-3/227>).

Let us also turn to the idea of mitigating the effects of an accident. The first level of mitigation is, of course, at the reactor itself. Any good design will put insufficient barriers to withstand the most severe accident that is considered plausible. Important among these barriers is the reactor's containment building, the most visible structure from the outside of any nuclear plant. In India, the containment building of the Prototype Fast Breeder Reactor (PFBR) that is being constructed in Kalpakkam is relatively weak and incapable of containing a **severe accident that releases a large amount of energy**. (<http://www.thebulletin.org/web-edition/features/the-safety-inadequacies-of-indias-fast-breeder-reactor>) Direct evidence that the containment design is not adequately safe comes from work around the world on accident possibilities in fast breeder reactors, including from safety studies conducted by the **Indira Gandhi Centre for Atomic Research at Kalpakkam** (<http://scienceandglobalsecurity.org/archive/sgs16kumar.pdf>). When confronted with these criticisms, the DAE has adopted various diversionary tactics, hardly the approach of an organization that is trying to make a nuclear plant **as safe as humanly possible** (<http://www.epw.in/insight/limits-safety-analysis-severe-nuclear-acciden-possibilities-pfbr.html>).

As for mitigation through emergency procedures to be followed in the event of an accident, the DAE's experience leaves much to be desired. As I illustrate with examples in my book, the DAE's emergency plans are unrealistic and often fail during trial exercises. Even the Comptroller and Auditor General reported in its 2012 report that "Offsite emergency exercises carried out **highlighted inadequate emergency preparedness**" (http://saiindia.gov.in/english/home/Our_Products/Audit_report/Government_Wise/union_audit/recent_reports/union_performance/2012_2013/SD/Report_9/ReportNo_9.html).

Another case of balancing the bad news with a disingenuous comment is the claim that “in the case of Fukushima, hundreds of people were evacuated but no one was killed or injured”. This claim ignores the well-established finding that one of the primary impacts of exposure to radiation, the incidence of cancer, occurs many years after the exposure. Therefore, while no one is likely to have died of cancer so far, the Fukushima accidents will likely lead to something of the order of a thousand cancers globally over the next few decades. See **THIS** (<http://pubs.rsc.org/en/Content/ArticleLanding/2013/EE/C2EE24183H>) and **THIS**. (<http://bos.sagepub.com/content/67/5/27.abstract>)

Further, what is left unsaid is that all of these evacuated people will probably be unable to return to their homes for decades because of contamination by Cesium-137, which has a radioactive half-life of 30 years.

Finally, let us consider Amano’s call for the Indian government to be “as transparent as possible”. This is unobjectionable and there can be no doubt that we need more transparency. But the question is whether this call is translated in some way into actual revelation of critical information. Coming just to cases in recent years after the Fukushima accidents, NPCIL has refused to be transparent about the Site Evaluation and Safety Analysis Reports **for the Koodankulam reactors** (<http://www.firstpost.com/india/anti-nuclear-activists-sue-npcil-for-violating-transparency-order-432878.html>). The IAEA has not publicly released the **full** Operational Safety Review Team (OSART) report about its examination of the Rajasthan III and IV reactors on 14 November 2012, although the **press release** (<http://www.iaea.org/newscenter/pressreleases/2012/prn201227.html>) put out on the occasion said that the “final report will be submitted to the Government of India within the next three months”. If the IAEA is convinced of the importance of transparency, it could have insisted that any future OSART missions will be undertaken only under the condition that the host country, India in this case, make public the full report. Indeed, further transparency would require not just the final report, but even the field notes and intermediate drafts to be made public.

Further, the idea that transparency will solve the Koodankulam problem is also disingenuous. Amano doesn’t discuss the possibility that the locals opposing the plant might look at all the information that the government might provide, if they follow Amano’s prescription, and then decide that they don’t want the nuclear plant to operate. Indeed, transparency is a two-edged sword. It can engender greater levels of trust; it can also reveal incompetence or worse.

The important question that underlies discussions of nuclear accidents is not whether nuclear facilities *can* be safer but *will* they in fact be safer. The evidence so far offers little reason to believe in the latter.

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