IMPACT OF ACCIDENT AT FUKUSHIMA ON NUCLEAR ENERGY PROGRAMMES OF INDIA AND CHINA

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*[**Abstract:** Both India and China at the highest level, within a few days of the tragedy at Fukushima Nuclear Power Plant in Japan on 11th March 2011, ordered a review of safety aspects of existing nuclear reactors and such plans and sites where programmes were under implementation or would be implemented. Both the countries have decided to increase Nuclear Energy generation and are deeply committed towards implementation of the plans underway. The halt in implementation by the Chinese Government and call of safety audit by the Indian Government will not affect the programmes devised by the governments. A consequential step proposed by both the governments is towards creating an independent regulatory body with teeth to ensure safety of the Nuclear Reactors. However, both the countries have to address emerging public concerns and more particularly Democratic India, which faces many issues related to public rights, beyond safety. There are concerns about the suitability of sites which in some cases were firmed up way back in 1985–88 where, in the meantime, many developmental projects have come up or have been proposed thereby increasing the stress on the environment many times over. Political management of all such issues would include forecasting of such concerns in advance and addressing the same at all stages of conceptualisation, implementation and thereafter. Failure to do so would multiply the events that have been surrounding Jaitapur causing not only delays and cost over runs, but also would have security and safety implications. As the countries expand their network of nuclear plants, a review of cluster approach built in the plans may be called for in the light of events at Fukushima. Further, self actuating well-equipped disaster management plans both at the plant level and national level would be in order. For ensuring safe nuclear energy, delays may become inevitable which should be taken in stride as there is enough breathing space since nuclear energy will continue to be a small fraction in the total mix even by 2030 and a shortfall can be easily met by better management of transmission losses and using energy efficiently. Further, the planners need not over commit themselves for too distant a future, as there are breakthroughs possible in Solar Wind and Hydrogen technologies which may become preferable on cost and safety concerns.]*

Discussion Note on "Triple Tragedy of 11th March in Japan on World Economy and Nuclear Energy Industry"[1] observed that post Fukushima, the global nuclear industry's future would be impacted and the aspirations of countries like India, seeking accelerated nuclear energy programmes, would get affected.

Not surprisingly, following the Fukushima accident, almost all countries with operating nuclear power stations or plants under construction have taken a decision

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1 Sardana, M.M.K. (2011), "Impact of Triple Tragedy of 11th March in Japan on World Economy and Nuclear Energy Industry," ISID Discussion Note DN1105, March.

to pause, evaluate their nuclear programmes and systems, and take required corrective steps.[2]

Within three days of Fukushima event, on 14th March, 2011 Indian Prime Minister Manmohan Singh told the Parliament that, "The Department of Atomic Energy and its agencies in charge like NPCIL have been instructed to take a review of all safety systems of our nuclear power plants, particularly with a view to ensuring that they would be able to withstand the impact of large scale natural disasters such as tsunamis and earthquakes."

State Council of China, headed by Prime Minister Jinato, within two days of the above statement of Prime Minister Manmohan Singh, announced on March 16 that it would suspend approvals for new nuclear power stations and conduct comprehensive safety checks on all nuclear projects, including those under construction[3]. Worldwide, there are 443 nuclear reactors supplying electricity to 30 countries. In recent years, there has been a nuclear renaissance of sorts with an additional 17 countries wanting to join the nuclear energy bandwagon. In all, 62 new reactors are under construction, 158 have been ordered and as many as 342 are proposed. This would push up nuclear energy production by an additional 545,000 MW in coming decades[4].

Japan has 55 nuclear reactors supplying almost 30% of the nation's energy needs; most were built in the 70's. All of them are on the coast and had been built according to very stringent quake proof standards as Japan is one of the most earthquake prone places on earth. Fukushima was built to withstand 7.9 magnitude earthquakes and 6.5 metre high tidal ways. The monster quake on March 11 was of magnitude 9 and the tidal wave was over 7 meters by the time it reached the Fukushima reactors[5].

[2] Gopalakrishnan, Dr A. (2011), "Nuclear power: The missing safety audits," *Daily News & Analysis* (DNA), April 26, www.dnaindia.com

[3] World Nuclear Association, "Nuclear Power in China," May 2011, www.world-nuclear.org

[4] Varma, Subodh (2011), "Safety Fears Cloud Nuclear Sunrise," *Times of India*, March 15.

[5] *Ibid.*

Even more worrying are reports that Tokyo Electric Power Co. (TEPCO) that runs this facility was caught fudging repair and maintenance reports on 29 counts in 2002, and again in 2006, it was found to be using falsified reports from 1985 in inspections till 2005. In 2007, a well-known Japanese seismologist, Ishibashi Katushiko, had warned that Fukushima is vulnerable[6].

China has the biggest expansion plans with 27 new reactors already under construction and 50 more on the anvil. In India, 5 reactors are under construction and 18 more are in the pipeline. Both the countries perceive that nuclear fuel in replacement of carbon emitting thermal plants is the best-suited fuel to meet their growing need for energy in disregard of the decision of matured economies of European Union deciding to cry halt[7].

Nuclear power has been given a role of primacy in recent years in China, especially in the coastal areas remote from coal fields. It is perceived that Nuclear plants can be built close to centres of demand, whereas suitable wind and hydro sites may be remote from demand areas. Moves to build nuclear power commenced in 1970, and, since 2005 it has moved into a rapid development phase. Technology has been drawn from France, Canada and Russia with local development based largely on French element. The latest technology acquisition has been from the USA (via Westinghouse, owned by Japan's Toshiba) and France. The Westinghouse AP 1000 is the main basis of technology development in the near future. By the end of 2010, installed power generation capacity in China was 962,000 MW, out of which nuclear capacity was 10,800 MW. By 2020, the installed nuclear capacity is projected to increase from 70,000 to 80,000 MW to constitute 5% of the total installed capacity. The share of nuclear energy is stated to increase progressively further in the decades ahead and in absolute term, it would be 200,000 MW by 2020 and 400,000 to 500,000 by 2050.[8]

[6] *Ibid.*
[7] *Ibid.*
[8] *Ibid.*

India's nuclear energy programme commenced in 1969 with the Tarapur Atomic Power Station becoming operational through sustained encouragement from the Government. With dedicated manpower, it was possible to carry forward the programme under the denial of technological regime brought on India by the International Nuclear Power establishments. Despite constraints, it modestly contributes about 2.5% to the total installed capacity of power in the country. With the availability of facilitating regime[9] coming up in 2008, India has set up ambitious targets of increasing nuclear power output to 64,000 MW by 2032 from the existing 6,000 MW. Within the next 25 years, Nuclear Energy is slated to contribute 9% of the total generation capacity.[10]

In the light of ever increasing demand of power and blue print of expansion of nuclear energy in position, both the countries do not seem to slow down their programmes despite announcements of safety audits and comprehensive safety checks. Both the countries have a powerful nuclear interest group that is not likely to yield quietly to restrictions, and intermingling of business interests and politics strengthens nuclear advocates in China, India and the United States. In the summits that have taken place between US-India and US-China, the nuclear industry related projects and tie ups have been on the agenda. The nuclear lobby operating in China and India did not skip a beat in responding to Beijing's post Fukushima freeze. Representative from the China National Nuclear Corporation issued a statement that its nuclear safety standards were higher than the world average[11]. In India, also, soon after the 14th March statement in Parliament calling for safety review, CMD of NPCIL seems to have gone on record that such safety reviews will not slow down their nuclear power programmes. The Chairman of Atomic Energy Commission also followed with a statement that Indian Power Reactors are 100% safe[12].

[9] Sardana, M.M.K. (2010), "India's Quest for Nuclear Energy," ISID Discussion Note DN1006, December.
[10] *Op. cit.*, 3
[11] Green-Weiskel, Lucia (2011), "China Rethinks Nuclear Power," *The Nation*, April 21, wwwthenation.com
[12] *Op. cit.*, 2

The existing Regulatory Framework both in China and India has been lacking independence and has been toothless. In China, while the Nuclear Establishments are directly under the National Council headed by the Prime Minister, the Regulatory Body is many steps down as a division of the Ministry of Environment. In India, the Regulator reports to the Chairman of the Atomic Energy Commission. Safety audit reports have never been in public domain to inspire confidence about the status of compliance[13].

Anticipating public pressure post Fukushima, both the countries have foreseen the wisdom of setting up independent Regulatory Bodies with teeth and means. However, one has to wait and watch the proposals in legislative forms to express a view on the actual efficacy of the Regulatory System that would be placed in position. It is expected that the governments in both the countries, would take note that accidents and disaster in nuclear plants and systems are fraught with irreversible and long term effects and thus checks have to be of matching severity irrespective of additional costs that may be devolving on the plants to put in place additional safeguards. There can be no room or scope of compromises in regard to standards which may be devised by the Regulator. Both the countries have unsavoury records of financial skimming off during the implementation of large projects and thereby could be causing dilution of standards. It has to be clearly understood that there cannot be any room for accommodation or laxity in capital intensive and fragile projects like Nuclear Power Plants. Thus, the Regulatory Framework has to have full autonomy to the extent of vetoing power. Further it has to have sufficient financial independence and resources to avail of or develop expertise as appropriate to deal with a mix of technologies that are being deployed in different types of Reactors. The Regulatory Board has to be necessarily multi-disciplinary and include men of eminence in Public apart from experts. There needs to be an appellate body to which orders of the Board can be appealed against.

Some of the sites like Jaitapur were identified way back in 1985–88 where work towards setting up of reactors is yet to commence effectively. Since then many more

[13] *Ibid.*

projects of infrastructural nature have come up or are being envisaged. At this point in time, the total power generating capacity proposed on a narrow strip of coastal land 50 to 90 km wide and 200 km long is around 33,000 MW. Therefore in such areas, one has to go beyond project wise assessments and look at cumulative impact of a large number of power plants, mining projects, port projects and other pollution intensive industries on the anvil. Being aware of these factors, the observation of Environment Minister[14]—"The decision to accord environmental clearance for Jaitapur power generating complex has been difficult. On the one hand there have been many issues raised on the preservation of marine diversity, an area in which India has been very weak. But at the same time there are weighty strategic and economic reasons in favour of the grant of environmental clearance now"—is apologetic and not matching with the standards that should be governing the required clearance for a sensitive nuclear power plant which would consist of a cluster of nuclear reactors. Perhaps in 1985–88 site selection, the coming up of so many projects in the area was not in reckoning. Therefore, on an assessment based on developments since 1985–88, the suitability of site needs to be re-established including the desirability of the establishment of a cluster of reactors. The experience which is being gained at Fukushima would provide valuable input for taking a decision. Such a course of action would provide an opportunity to the Regulators and decision-makers to ask that, Should an accident occur at the site, is there a safe evacuation zone which can be identified? Further whether a Disaster Management Plan would be in order which becomes operational on the first signal of a disaster or accident and is well equipped and networked with expertise that may be required. After all, the French Atomic Energy Agency (CFB) has concluded that technical innovation cannot eliminate the risk of human errors in nuclear plant operation. An interdisciplinary team from NIT has estimated that given the expected growth of nuclear power 2005–2055 (which would be largely in China and India), at least four serious nuclear power accidents would be expected in that period[15]. Thus, the scenario is that while more and more safety features would be retrofitted in the

[14] Gadekar, Surendra (2011), "Those Thirty Five Conditions on Environmental Clearance to the Jaitapur Atomic Power Plant," South Asia Citizens Wire, January 12, www.sacw.net

[15] "Nuclear power accidents by country," Wikipedia, http://en.wikipedia.org

nuclear plant, the nuclear establishments have to build in strong Disaster Management Plans nevertheless.

In the Discussion Note on "India's Quest for Nuclear Energy"[16], it has been observed that the aspects of cost, safety and waste management make the nuclear industry unique; requiring complex and wide ranging partnerships between public institutions and private enterprises. The costs and risks to public safety are so enormous that government must take an active role in supporting, regulating and monitoring nuclear industry. Governments of China and India have been giving unstinted support to nuclear industry and have masked the actual investments that have gone into attaining the required confidence levels. Perhaps, as observed earlier in this Discussion Note, that was in order at the relevant stage. The Nuclear Energy establishments seem to have become insular to the public opinion in the process. Now those huge public investments are being planned demanding increasing financial, land and water resources. Questioning by the public both in China and India is quite natural. The Nuclear establishments have to come out of the protected environment of government and face the financial institutions and the public the way entrepreneurs do and should be ready to hold out assurances to public on all aspects of cost, safety, risks and benefits before the public is asked to relent and make way for the facilitation required by the Industry. The need for such assurances has sharpened in the post Fukushima disaster where there was failure on all aspects with evidence and record of mismanagement in maintenance. The apprehensions in public mind in India and China would be significantly deeper considering the belief that culturally Japanese have better track record of building and maintaining large projects compared to India and China.

In their quest for accelerating the nuclear power generation, China and India propose to adopt a variety of power plant designs with technology imported from Russia, Canada and the US, as well as domestic nuclear design. The engineers will take time to grasp unfamiliar technologies, a dangerous situation in an accident

[16] *Op. cit.*, 9

where quick reaction is vital[17]. There is also concern that the rapid growth pressures in nuclear facilities presents not only a potential danger from the plants, but also puts stress on the nuclear supply chain, including nuclear fuel supplies, transport systems and waste disposal sites.[18]

If the Nuclear Establishments are sanguine about the safety standards placed in position which has spurred the governments of India and China in going ahead with operations of their blue prints despite the accident at Fukushima, they should take the public into confidence. Activists in India at least blame the sensitive Indian nuclear establishment for the lack of debate on safety. Very little is known to the public about the internal capacity to deal with a crisis or the safety provisions of our existing infrastructure because the nuclear science establishment shies away from discussion. Sunita Narain, Director, Centre for Science and Environment, has called for the need of a public debate on nuclear energy. Her perception is that Nuclear Scientists are opinionated and don't feel the need of answering the public as they question the capacity of the public to appreciate technical issues. They simply wish the public to accept the argument that as the public is power hungry, nuclear energy is must[19]. The prevalence of such a perception in the mind has to be dispelled in the spirit of scientific temperament that scientists should be imbued with.

Governments are committed to go ahead in the face of sceptism with a large cross section of society. Besides there are agitations by some groups opposing acquisition of their resources to accommodate the nuclear plants. So the issue boils down to deft political Management of Concerns of different sections as was observed in the Discussion Note on "India's Quest for Nuclear Energy"[20]. Such a responsibility lies with the Governments who should foresee and provide timely responses otherwise there are bound to be delays and cost overruns and pushing back of targets.

[17] Unnithan, Sandeep (2011), "Is India a Nuclear Time Bomb?" *India Today*, March 19, http://indiatoday.intoday.in

[18] Huus, Kari (2011), "China's nuclear energy policy: 'Build, baby, build!'" May 19, www.msnbc.msn.com

[19] "Mirrors on Moon to light up Earth?" *The Times of India*, May 27, 2011, http://articles.timesofindia.indiatimes.com

[20] *Op. cit.*, 11

While governments are pushing ahead with the programmes of Nuclear Energy for significant reasons in the face of several concerns and are preparing blue prints up to 2050 and beyond, a note should be taken that there is a scope for a breather. In the foreseeable time span of next 20 years, the share of nuclear energy in the total mix would not be significant even if all the targets are achieved. Accretion to availability can be augmented by matching extent by reducing T&D losses, improved appliances and through energy efficiency measures. Therefore, if the Regulatory Framework being envisaged in the two countries advises a slow down for reasons of safety and seeks to establish stringent standards including change of a site, the lobbying against such a move by Nuclear Industry stakeholders should be brushed aside with conviction and confidence. No relaxation of standards should be brooked because of catastrophic consequences that may follow.

Further, planners and policy makers need not over-commit themselves to the distant future. There are competing technologies awaiting fruition not only in Wind Energy and Solar Energy, but also in Hydrogen Fuels which in years ahead may establish supremacy over nuclear fuels in costs and safety aspects. Japanese have unveiled plans to tune the moon into a gigantic ball manned by robots to provide all the Earth's energy needs[21]. An announcement to this effect is to be made at the G-8 summit in France, where green energy generation will be high on agenda. There should be internationally co-ordinated efforts in developing such initiatives which provide inexhaustible, non polluting solar energy as the ultimate source of green energy. Already, some analysts opine that it is possible that one consequence of terrific meltdown in Japan will be China's accelerated development of clean and safe energy. With its huge economy, drawn by Central planning and aggressive government investment, China is the only country building a green-technology industry on a scale that could bring down global prices of solar panels and wind turbines, making them affordable in developing world. This should be a key part of the global strategy to keep emissions under 350 parts per million, the maximum threshold recommended by climate scientists. For this to happen, solar and wind

[21] *Op. cit.*, 19

energy must become cost competitive not only with nuclear, but also fossil fuels[22]. Given China's and India's size and unique role as world manufacturers and exporters it is fair to say that it is the best way of giving solar and wind energy the much needed boost. In fact the international community, who wishes to see a nuclear free energy scene, should work on joint ventures in manufacturing and research to tap the full potential of such clean resources to give a befitting economic response by pricing out the nuclear energy which would be the best response to the safety concerns. After all, Germany, which meets 30% of its requirements from Nuclear Energy has decided to close down all its nuclear plants by 2022 and has visualized filling the gap through wind and solar energy[23].

[22] *Op. cit.*, 11

[23] Parashar, Sachin (2011), "Germany move to shut N-plants may affect Jaitapur plan," *The Economic Times*, May 31, http://economictimes.indiatimes.com

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