



National Seminar
on
NUCLEAR POWER: AN ASSESSMENT THREE YEARS
AFTER FUKUSHIMA

Monday, March 3, 2014,

At

Air Force Auditorium, CAPS, Subroto Park,

New Delhi





REPORT: National Seminar on Nuclear Power: An Assessment Three Years After Fukushima

Organised by

Centre for Air Power Studies, Subroto Park, New Delhi

On March 3, 2014, at Air Force Auditorium, Subroto Park

In continuation of the efforts of the Centre for Air Power Studies (CAPS) to deliberate upon issues relating to global nuclear energy trends, social acceptance, nuclear waste management, innovative technological pursuits and India's stand on these, a national seminar on "Nuclear Power: An Assessment Three Years After Fukushima" was held on 03 March 2014. As Air Marshal Vinod Patney, Director General of the Centre, mentioned in his welcome address, CAPS is among the few think tanks that focuses equally on issues pertaining to both 'nuclear power' and 'nuclear strategy'. It has been especially focussed on the future of nuclear power in the wake of Fukushima and has held several seminars since then to evaluate the trends and issues relating to nuclear energy and safety.

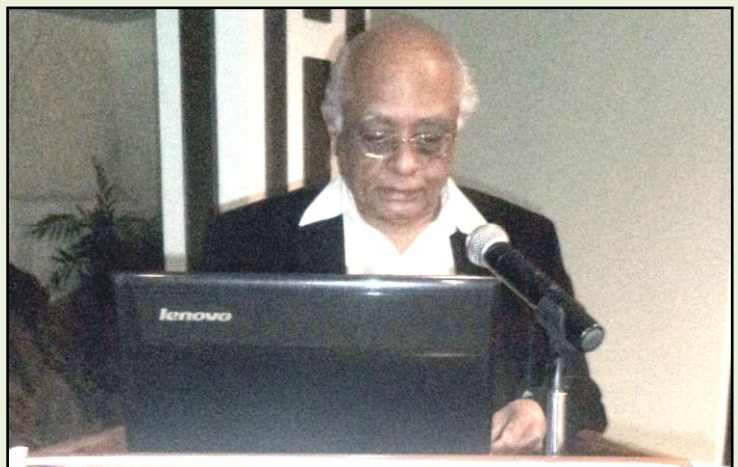
It was brought out by Air Marshal Patney that Japan which was fetching 30% of its electricity from nuclear energy before the Fukushima disaster had to increase imports of oil and natural gas to make up for the shortfall owing to the temporary suspension of all nuclear plants, which resulted in a \$204 billion trade deficit between March 2011 and the end of 2013. Meanwhile, greenhouse gas emissions by Japan's electricity industry have increased manifold. Giving a bird's eye view of the global nuclear power status, Air Marshal Patney highlighted the changes and





continuity in nuclear energy policies of many countries post-Fukushima. While Germany had decided to phase out its entire nuclear energy programme, France and many other European countries had gone in for safety revaluations. China too had halted its expansion programme for a while to assess safety but has since resumed it aggressively. India, on the other hand, is cautiously inching ahead while facing sporadic public resistance. Given the current pace and magnitude of nuclear energy programmes in Asia, one can observe that though Fukushima disaster has slowed down the nuclear energy renaissance, it has not been able to diminish the importance of nuclear power at large.

In his inaugural address Dr. R. Chidambaram, Principal Scientific Advisor to the Government of India, said “expanded use of nuclear technologies offers immense potential to meet important development needs”.



He pointed out that, “if you live the way the Americans are living, world would need five and half times of energy”. He warned of the consequences of depleting fossil fuel and the limited energy options available. Therefore, all countries including those that are endowed with abundant fossil fuels are looking for other energy sources.

Dr Chidambaram identified two major challenges before the 21st century: i) how to satisfy the growing energy demands; and ii) how to mitigate the threat of climate change. Both issues can be addressed effectively by exploiting advanced nuclear technology. At the same time, there is an urgent need for states to concentrate on ‘nuclear safety culture’. With regard to India’s nuclear energy pursuits, Dr Chidambaram emphasized the country’s strong nuclear safety culture which had enabled a good nuclear safety track record. He also stated that the DAE and BARC are paying utmost importance to nuclear waste management. While emphasising the importance and potential of nuclear energy in addressing India’s growing energy demand,



Dr Chidambaram also identified a role for renewable energy in the national energy mix. He revealed that new designs and materials are being researched and developed to increase the efficiency of solar cells and to bring down their cost. He even exhorted the nuclear community which has expertise in this field to work on non-nuclear technologies. He also mentioned the efforts being made to develop the Advanced Ultra Critical Thermal Plant, which would have zero carbon emissions. Dr Chidambaram concluded that the global trend on nuclear power is clear, especially for developing countries. As he said, for developed countries nuclear power may be an 'icing on the cake', but for developing countries, it is a matter of 'bread and butter.'

Session I: Nuclear Power: Global Trends



The session started with an overview of the current trends and issues post-Fukushima in Japan. Dr. Stuti Banerjee, Research Fellow, ICWA, stated that before Fukushima, 30% of the energy consumption in Japan was met by nuclear energy. But, post-Fukushima the percentage came down to zero causing an energy crisis. While Japan is looking at renewables, this would require time and resources. Also it might not be able to generate base-load energy through this option. This would also affect Japanese households who have enjoyed subsidised electricity.



Japan has also suffered from the radiation stigma post-Fukushima. It has had to conduct Radiation Contamination Tests which have had a further bearing on its economy. As it has already invested heavily in the nuclear industry, decommissioning of the entire nuclear infrastructure could impact Japan adversely. To overcome the current complex situation, Japan needs cheap energy urgently and it “cannot let go off the nuclear energy.” Gradually public support for nuclear energy is also ascending. However, the revival and success of nuclear energy in Japan would largely depend on increasing confidence in nuclear safety.



Ms Hina Pandey, Research Associate, CAPS, dwelt upon the post-Fukushima nuclear trends and issues on the American public reaction, government policies and the nuclear energy industry. Having the largest number of nuclear reactors in the world, safety



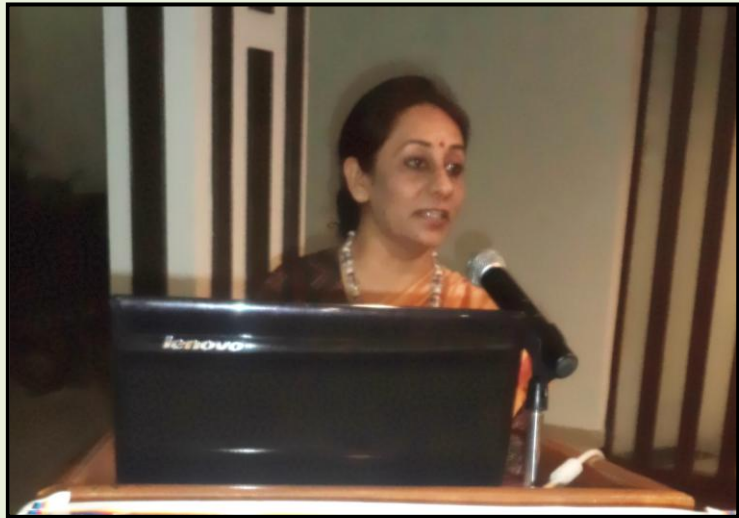
issues have attracted greater public attention. The Government went in for a safety review, and has continued with its nuclear energy program. Despite the shale gas option, United States still finds nuclear energy as a clean energy source. Observing this trend, Pandey said that President Obama “would promote nuclear power both

domestically and internationally.” To address the issue of waste management, USA has developed the fast neutron reactors for waste transmutation. Moreover, fast breeders could also be developed as the Blue Ribbon Commission has stressed on reprocessing of uranium.

Dr. Manpreet Sethi, Senior Fellow, CAPS, focussed on the issue of development of China’s nuclear power programme post-Fukushima. She termed China as the current “nuclear poster boy”. Since Party legitimacy in China demands economic growth and



social stability, generation of electricity, and doing so with respect for public sentiment, is going to impact China's nuclear expansion plans. Three factors provide the rationale for China to pursue a nuclear power programme: rising energy demand, rising concern for climate change and



environment, and economic implications of the environmental policies. With the focus on nuclear and renewable, at present, the total electricity generation from coal has come down to 67% from 80% in 1990s. A unique feature of the Chinese nuclear power energy programme is that it is an amalgamation of different technologies, unlike India which primarily uses Pressurised Heavy Water Reactors. There are at present 17 operational nuclear power plants in China and 29 others are under construction. In the aftermath of the Fukushima disaster, there was a temporary suspension of new approvals of nuclear power plants. A National Inspection Group was set up and a New Safety Plan was announced in October 2012. But it is back to business as usual.

Post-Fukushima, there is an increasing awareness among the aspirational Chinese middle class about the hazards of nuclear disaster. Therefore, Dr Sethi stated that China "would need greater interaction with the public." She pointed out that the Communist Party cadres can penetrate the local population to implement government objectives. Nuclear power expansion programme would continue as China is hungry for energy.



Session II: Nuclear Expansion in India: Concerns and



Challenges

Dr RB Grover, Director, HBNI, gave an update on India's nuclear energy achievements. He listed out the number and types of reactors operating in India and also those that are planned. On future technology options, the use of slightly enriched uranium was suggested to increase the burn up rate and to cut down reprocessing cost. Dr Grover focused on the national nuclear legislative framework and elaborated on the civil liability regime in the event of a nuclear accident. He highlighted that India's Liability Act is comprehensive incorporating some important features like prompt compensation, no-fault liability, channeling of liability to the operator, limited liability of the operator, no limit on compensation to individual victim, insurance and financial security, speedy mechanism for claim settlement, definite jurisdiction for claim settlement, recourse against supplier, etc. He categorically mentioned that the provision of this Act shall be in addition to, and not in derogation of, any other law for the time being in force. Dr Grover also mentioned some important articles (Article 35, 46, 17) of the Liability Act, especially Article 17 that ensures operator's Right to Recourse which has been subject of controversy. The speaker highlighted how some legal experts have opined that Indian law is not compatible with countries on supplementary



compensation (CSC) because of Article 17 (b). On the implementation status of the Act,

he revealed that the Indian insurance companies have to offer an insurance policy and

this is a work in progress. On the future roadmap, Dr Grover clarified that future projects will be setup based on designs developed by NPCIL or BHAVINI or in technological



cooperation with foreign vendors, but not on turnkey basis. Procurement of equipment will be made from Indian industry or even from foreign vendors.

Dr Sitakanta Mishra, Research Fellow, CAPS, focused on the public acceptance of nuclear power in India. On why people hold negative views on nuclear energy, he highlighted the fact that lack of information on nuclear matters among the public and reluctance to believe the information provided by the government were the main reasons for such negative views on nuclear energy. Only three major nuclear accidents have occurred in the world out of 15000 reactor years of safe commercial nuclear operation. India has a safe operating experience of 380 years of commercial nuclear operations. He explained that four stakeholders – government, public, media and nuclear establishment – form an intricate circle and the gap between the nuclear establishment and the public is manipulated by the vested interests.

On India's nuclear programme, he identified three phases: The Trust-based Optimism phase (1947-1970); the Doubt-based Pessimism Phase (1970-2000) and the Post-Material Support-Oppose Phase (2001-onwards) where civil society consciousness is on the rise. As





nuclear establishment need to engage with them. On the safety issue, he explained the public misperceptions on the effects of radiation and also discussed the various safety-security layers around a nuclear power plant in India. Mishra emphasised on the nuclear information management as the key to making the public an effective stakeholder in the nuclear projects.

Ambassador Sheel Kant Sharma gave an elaborate response to the critics of Indian nuclear energy programme. He said that nuclear power in India has been a subject of intense scrutiny since its inception. The critics come from diverse fields. The speaker broadly categorised these critics into four kinds: the rival groups of nuclear science and technology; those demanding rigorous economic criteria for the nuclear programmes in terms of its financial viability and cost-benefit analysis; those questioning record on radiation protection, safety and technological claims; and the internal dissidents who could be those disillusioned with nuclear scientists and nuclear technology or those who are ideologically driven and reject nuclear power on socialistic grounds. Sharma also critiqued M.V. Ramana's arguments in his book *The Power of Promise*.





SESSION III: FUTURE HORIZONS FOR NUCLEAR POWER: HOW NEAR, HOW FAR

The last session took a long term view of India's nuclear future. Two eminent speakers from Indian nuclear establishment brought out India's advances in the field of nuclear waste management and fusion technological endeavours.

Mr PK Wattal, Director Nuclear Recycle Group, BARC, explained the rationale for India's closed fuel cycle since the country has limited uranium resources. Most of the spent fuel can be recycled



and only 3% of the spent fuel then remains as waste. He also mentioned that thorium fuel gives out fissionable U-233 and very little waste. In that cycle, all the spent fuel would be reprocessed for better resource utilisation and waste burden minimisation. He pointed out that for every nuclear reactor in India there is a waste management plant and highlighted the fact that India is the second country to have a vitrification plant to cater for its high level waste.

Moreover, it was stated that, at present, India does not need a nuclear repository. He brought to light India's nuclear partitioning plant, the first ever in the world which will further help minimise nuclear waste. As India has a massive granite area without faults and fissures, they can be used for building repositories when the need arises.

Professor Dheeraj Bora, Director, IPR, DAE, explained the fusion process and its advantages. Subsequently he elaborated on India's participation in the ITER project. He explained the unique magnetic confinement method used in the ITER project and the benefits that India will gain from its participation in this international collaborative



effort. On the progress in fusion technology, he stated that the advances in technology in this field have been doubling every eighteen years.

While highlighting the advantages of ITER, Professor Bora told that it will give ten times more power for the fuel used. With seven partners (China, Europe, India, Japan, South Korea, Russia and USA) engaged in



the pioneering project, each nevertheless has full IPR rights of the entire ITER technology. India has so far contributed immensely to the project in terms of technology and constructing the components. He concluded by saying that both fission and fusion will be required to meet future energy needs and that the technology spin-offs from the ITER project will be significant.

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