SOCIAL ACCEPTANCE OF NUCLEAR POWER IN INDIA

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"Science, technology and society constitute a dynamically interactive triad" influencing each other in significant ways.[1] The body of scientific knowledge that a society assimilates determines its technological prowess, and technological innovations, in turn, generate new social contents. The three, therefore, are not passive partners but the question is regarding whether society always responds wisely to the scientific march and whether the evolution of technology is committed to the sustainability of society. Nuclear technology seems to be standing at the societal crossroads today. Many countries such as Taiwan, India, China, Sweden, the USA, etc. confront social acceptance as the key issue when they try to expand or restart their nuclear plant operations. However, in very few countries have the anti-nuclear activists succeeded – not in America, France, Britain, South Africa, Brazil, Russia, South Korea, Sweden, China or Canada. And, it is expected that they will not prevail in Japan either. Germany is a dramatic exception.[2] However, there have been cases in Australia and the US where near-complete reactors have been halted by the weight of public opinion. Will India join this list?

Scepticism over nuclear energy in India in the aftermath of the Fukushima disaster in general, and the anti-nuclear protests at Kudankulam and Jaitapur

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1. Vinod Gaur, "Why this Seminar?", in Vinod Gaur, ed., *Nuclear and Public Safety* (New Delhi: Indian National Trust for Art and Cultural Heritage, 1996), p. xi.
2. John B. Ritch, "Will The Nuclear Power Industry Regain Public Trust?", *Forbes India Magazine*, December 29, 2011.

How smoothly are the issues involving project induced displacement and rehabilitation, and the necessity of harnessing nuclear energy sorted out?

in particular, seems symptomatic of the lasting predicament of "how much risk society is willing to accept to realise the promise of emerging technologies" at a certain point.[3] Misperceptions leading to anti-nuclear sentiments in India have certainly risen over a period of time. Sensing the enormity of discontent, the Government of India and the nuclear agencies now seem to have embarked on a mission to allay the fears about nuclear power plants.[4] However, the assumption that there will be a linear progression from public education to public understanding, further to public support for, and social acceptance of, nuclear projects needs careful planning and introspection.

BASICS OF SOCIAL ACCEPTANCE

In India, a modicum of resistance by the public around some nuclear facilities could be seen since the 1980s. However, during the last few years, with the expansion of the nuclear energy programme and setting up of new nuclear facilities, the anti-nuclear sentiments of the local population and civil society groups seem to have intensified. If positively interpreted, now a context has been created by the localised opposition to nuclear power in India, which the nuclear establishment and the government must utilise to put across the correct information.

First, how early is the benefit of "nuclear to rural" (population) that constitutes 68.84 percent of India's population, achieved?[5] Also how smoothly are the issues involving project induced displacement and rehabilitation, disaster preparedness, safe decommission of nuclear

3. Rick Borchelt and Kathy Hudson, "Engaging the Scientific Community with the Public", at, http://www.scienceprogress.org/wp-content/uploads/2008/06/print_edition/engaging_scientific_community.pdf, p. 81
4. The Nuclear Power Corporation of India Limited (NPCIL) and Department of Atomic Energy (DAE) in a special scientific meet on "Occupational Health Safety" organised at the World Trade Centre recently, are trying to reach out to the people.
5. R. Chidambaram, "India's Technology Needs: Nuclear to Rural", Second Darbari Seth Memorial Lecture, 2003, Energy and Resources Institute (TERI), New Delhi, August 26, 2003.

residues, and the necessity of harnessing nuclear energy sorted out? Of course, the concerns of the public are valid and, after all, while spending public money, public accountability must be accepted. In a sense, the sensibilities of society must be kept alive to help the authorities arrive at rational judgments and judicious courses of action.[6] However, the people's right to information on matters relating to their safety, though paramount, should not be based on whims.

Considering the manner in which nuclear power is presented to the public – a complex technology that has centralised control and a potential for a high consequence even in the event of a single failure – the issue of public acceptance remains conspicuous. In fact, the problem has been acute from the very beginning of the nuclear age.[7] The fundamental question remains as to "why the public holds views of nuclear-related risks different from the people working in the field of nuclear safety"?[8] The reasons could be lack of appropriate information dissemination or misinformation overdrive on nuclear-related issues by the network of actors that govern social acceptability of nuclear power.

First, nuclear technology, compared to other technologies, elicits an extraordinary level of concern because of the characteristics of the hazards it poses. The nature of nuclear technology itself is complex with emission of invisible radiation and, to that extent, the media always presents the worst case scenario. Consequently, the public's concept of risk is heavily influenced by the imagination of consequences of catastrophic accidents, and is built on values, attitudes and sets of attributes which are different from those of the policy-makers and nuclear experts.[9] Therefore, each time a problem related to nuclear technology arises anywhere, a section of the media and some civil society groups draw parallels to India's programme. They tend to forget that the nuclear risks, to a great extent are location-, and

6. Gaur, n. 1.
7. Tamaki Ipponmatsu, "Public Acceptance: A Japanese View", http://www.iaea.org/Publications/Magazines/Bulletin/Bull142/14210091218.pdf, p. 12.
8. M.A. Meyer, "The Nuclear Community and the Public: Cognitive and Cultural Influences on Thinking About Nuclear Risk", in D.A. Copinger, ed., "General Safety Considerations", *Nuclear Safety*, vol. 37, no. 2, April-June 1996, p. 97.
9. Joop Van Der Plight, "Public Attitudes to Nuclear Energy: Salience and Anxiety", *Journal of Environmental Psychology*, no. 5, 1985, p. 90.

The Nuclear Safety Authority is not answerable to the government's ministers, but, as part of the French state, answers to the French Parliament.

technology-specific. The public panic, based on the idea that 'nuclear activity anywhere is a threat to humanity everywhere' seems to be misplaced and overemphasised, and, in the process, the specificities of nuclear projects are overlooked. Hence, any public acceptance programme must take into account the process of the formation of the people's attitude towards nuclear energy that is assumed as a function of beliefs about the possible consequences of its use.

Second, the stature of the organisation that promotes nuclear energy, the organisation that oversees and regulates the nuclear projects and, above all, the image of the incumbent government and its leaders that formulate nuclear policies matters the most in building public confidence. The integrity of the nuclear regulatory structure, while ensuring safe performance of the industry, helps in shaping confidence and a positive attitude among the public. Every country which relies on, or plans to rely heavily on, nuclear power has to put in place a firm and independent regulatory structure to ensure that the use of nuclear materials and facilities is consistent with the protection of public health, safety, environment and national security.

For example, countries like France, the USA and Canada have relied heavily on nuclear power but their regulatory laws and structures are certainly more stringent and independent. The French safety regulatory practice is considered one of the best in the world. A distinguishing feature of the French regulation is the legislative emphasis on the associated acts under transparency; public communications are institutionalised through structured clauses, rules and procedures. Under the Act on Transparency and Security in the Nuclear Field (TSN Act, 2006), the Nuclear Safety Authority is not answerable to the government's ministers, but, as part of the French state, answers to the French Parliament. The US Nuclear Regulatory Commission with the Advisory Committee on Reactor Safeguards was constituted under the 1972 US Federal Advisory Committee Act that ensures transparent, unbiased and stringent regulation. The Canadian

Nuclear Safety Commission (CNSC) established by Canada's Nuclear Safety and Control Act (2000) is an independent federal government agency that reports to the Canadian Parliament through the Minister of Natural Resources in the Cabinet. Comparatively, India does not have such legislations and autonomous agencies endowed with regulatory powers.

If societal consensus on "the benefits of nuclear energy outweigh the risks" involved, "the Faustian bargain is worth the price".

Third, the interaction between the public and nuclear power agencies as an entity and the manner in which nuclear power is presented to the public is the key. In this sense, "the problem of public acceptance is time-dependent…. for the public is changeable, just as nuclear power is subject to technical progress and 'social' improvement".[10] First, the image of the group of the people involved in the nuclear industry reflects much on the general public's perception on nuclear technology. Second, "the quantitative and abstract view of risks" that the technical experts generally take in contrast to the public[11] must be disseminated through increasing interaction with the citizens at large.

Fourth, if societal consensus on "the benefits of nuclear energy outweigh the risks" involved, "the Faustian bargain is worth the price".[12] Even though the benefits that have accrued out of the use of nuclear technology in different fields – health, food processing, infrastructure, energy – over the years have been enormous, the public still perceives nuclear power as a very risky technology. In some cases, association with nuclear facilities is even subject to stigma.[13] The "perceived lack of control, dread, catastrophic potential, fatal consequences, and the inequitable distribution of risks and benefits" of nuclear technology are pervasive in the society.[14] Certainly, nuclear energy's problem is radiation. But most people don't understand or try to understand

10. Ipponmatsu, n. 7, p. 12.
11. Meyer, n. 8, p. 100.
12. Roger E. Kasperson, et.al., "Public Opposition to Nuclear Energy: Retrospect and Prospect", *Science, Technology, & Human Values*, vol. 5, no. 31, Spring 1980, p. 11.
13. M.V. Ramana, "Nuclear Power and the Public", http://www.thebulletin.org/web-edition/features/nuclear-power-and-the-public, August 3, 2011.
14. Meyer, n. 8.

it. On the other hand, there is equally lackadaisical dissemination of nuclear information by the concerned agencies to eradicate the confusion among, and the misperceptions of, the public. This leads to ridiculous situations culminating in public resentment against nuclear projects. There is also a large section of the public with no firm views for or against nuclear energy. The attitude of this middle ground population will be critical for the future of the nuclear energy programmes.[15]

For effective application of the nuclear policy, the measurement of social Willingness to Accept (WTA) and Willingness to Pay (WTP) by evaluating the social cost of nuclear energy is essential.[16] In the process, the nuclear power industry has generated enormous arguments both in favour of, and against, nuclear energy in the context of its social acceptance. Opponents and proponents alike have fashioned interpretations of the attitudes and behaviour of the public, and many of them are reasonable at first glance. According to the *trust-based explanation*, the general masses do not actually form an independent opinion concerning high technological issues because it is beyond their comprehension; rather, they tend to decide which group of people to trust in its management. On the other hand, the *technology-based explanation* people form an opinion based on their understanding of the available evidence on whether a particular technology is acceptable. The technology-based explanation assumes that a better informed public will support industrial projects by the governments as they are ultimately planned for their benefit.

However, the *post-material explanation* asserts that changes in the social structures of modern societies with expansion of education, economic security and the service sector give rise to 'post-material values' – greater consciousness on social security, politics and environment, in other words, civil society consciousness. This, in turn, would strengthen anti-nuclear opinion slowly and gradually along with structural changes and

15. Nuclear Energy Agency, OECD, Public Attitude to Nuclear Power, NEA No. 6859, 2010
16. Eunju Jun, et al., "Measuring the Social Value of Nuclear Energy Using Contingent Valuation Methodology", *Energy Policy*, vol. 38, 2010, pp. 1470-1476.

new values.[17] So, the explanations based on 'change of values' predict gradual, relatively steady increase in anti-nuclear attitudes on the part of the public.[18] But the *issue attention theory of opinion*, viewing technological controversies as dynamic social processes with a specific life of their own, asserts that as media coverage drops, so will public attention and thereby opposition to the issue – denoting a "wave" pattern.[19] In that sense, change of public attitude towards nuclear issues takes place with the pattern of media coverage, therefore, a desired public attitude can be generated by setting the agenda of public debate through adequate and appropriate information dissemination.

The correlation among fundamental social values, beliefs, politics, prevailing environment and media can be channelised for greater public understanding on, and acceptance of, the technology.

The essence of such explanations is that the correlation among fundamental social values, beliefs, politics, prevailing environment and media can be channelised for greater public understanding on, and acceptance of, the technology. But technological controversy is a dynamic social process that cannot readily be predicted or managed due to the variety of participants, factors and environment involved where each tries to influence the other.[20] However, all agree that citizens are getting more involved in nuclear policy-making; therefore, the issue is whether the public is being led to the "right" decision.[21]

17. Stephen Cotgrove, "Catastrophe or Cornucopia", in *The Environment, Politics and the Future* (Wiley, 1982); Ronald Inglehart, "Post-Materialism in an Environment of Insecurity", *American Political Science Review*, vol. 75, 1981, pp. 880-900; Ronald Inglehart, "The Persistence of Materialist and Post-Materialist Value Orientations: Comments on Van Deth's Analysis", *European Journal of Political Research*, vol. 11, 1983, pp. 81-91.
18. James M. Jasper, "The Political Life Cycle of Technological Controversies", *Social Forces*, vol. 67, no. 2, December 1988, p. 359.
19. Anthony Downs, "Up and Down with Ecology: The Issue Attention Cycle", *The Public Interest*, vol. 28, 1972, pp. 38-50.
20. Paul C. Stern and Roger E. Kasperson, "Public Acceptance of Energy Technology", in Stern and Kasperson, eds., *Facilitating Climate Change Responses* (Washington D.C.: National Academic Press, 2010), pp. 45-60.
21. Kasperson, et.al., n. 12, p. 17.

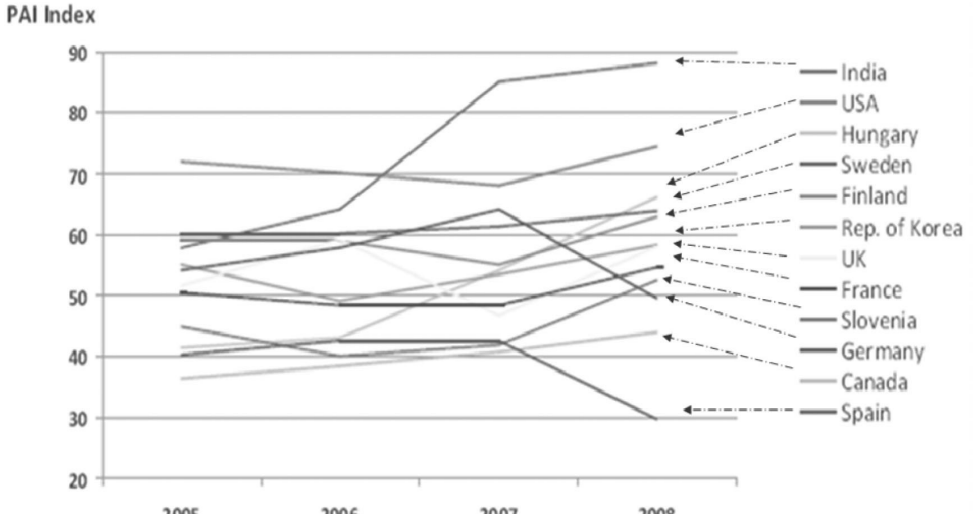
'BURDEN OF PERCEPTION' AND OPINION 'FRAMEWORKS'

So far, no serious nuclear accidents have occurred in India. However, India's ambitious nuclear energy programme seems to be experiencing the "burden of perception".[22] For the last few years, the propagated view has been that the Indian Atomic Energy Regulatory Board (AERB) suffers from "regulatory capture".[23] Even the proposed Nuclear Safety Regulatory Authority has been criticised as "a nuclear regulator without teeth".[24] The "130 safety issues in Indian nuclear facilities of which 95 are of top priority",[25] as alleged by former Chairman of AERB Dr A. Gopalakrishnan, give an impression that all is not well in the Indian nuclear industry.

However, with the global and domestic reaction owing to the March 2011 Fukushima nuclear disaster in Japan, India's several years of safe commercial nuclear power operation are being drowned out. The sections that follow, therefore, attempt to underline the reasons behind public opposition: Does the public lack understanding of the technology and its benefits, and why, in general? Is the public aware of the benefits of India's nuclear projects and what shapes their perceptions in particular? Perceptibly, public awareness on the nuclear programme in India since the last two decades has increased and nuclear related issues are vigorously flashed in the media. The debate over the pros and cons of the Indo-US civil nuclear deal has probably reached every literate Indian. The International Atomic Energy Agency's (IAEA's) "Nuclear Technology Review 2009" observed that the Public Acceptance Index (PAI) of nuclear energy in India has grown from around 60 percent in 2005 to around 90 percent during 2008 and ranks highest in the world.[26]

22. Ritch, n.2.
23. India's nuclear regulatory agency – AERB – has been alleged to have fewer powers and less independence. Though AERB proclaims itself as "independent", its functional and administrative linkages with DAE and AEC are not strictly separated. For example, the safety review report of the AERB is submitted to the AEC in which the Managing Director of NPCIL and Chairman of DAE are members (whose work the AERB is mandated to oversee) and not the Chairman of AERB. Also the AERB depends mostly on the DAE and BARC staff and their research facilities.
24. A. Gopalakrishnan, "A Nuclear Regulator Without Teeth", *The Hindu*, September 16, 2011.
25. A. Gopalakrishnan, "Issues of Nuclear Safety", *Frontline*, vol. 16, no. 6, March 13-26, 1999.
26. "Nuclear Technology Review 2009" at, http://www.iaea.org/About/Policy/GC/GC53/GC53InfDocuments/English/gc 53inf-3_en.pdf, p. 15.

Fig 1: Public Acceptance Index in Countries Using Nuclear Power



Source: http://www.iaea.org/About/Policy/GC/GC53/GC53InfDocuments/English/gc53inf-3_en.pdf, p. 15

However, the anti-nuclear protests (Jaitapur and Kudankulam) in the aftermath of the Fukushima nuclear disaster give the impression that public acceptance of nuclear energy in the country has embarked on a downward trend. While a section of the public, mainly the anti-nuclear groups and retired employees of the nuclear establishment, highlights the dangers of nuclear projects and accuses the nuclear establishment of functioning under the veil of secrecy, the government and the scientific community assert that "adequate provisions exist at Indian nuclear power plants to handle a station blackout situation".[27]

In fact, no single framework can be demarcated in explaining the public attitude in India towards the entire nuclear debate. First, the levels of political conflict and organisation around nuclear issues are the master variables that determine the public's nuclear framework. Moreover, the Indian media that promptly take up every nuclear issue, set the debate that invariably shapes public imagination on anything nuclear. Though the general masses lack comprehensive knowledge about nuclear energy technology, they are

27 NPCIL, "Safety Evaluation of Indian Nuclear Power Plants Post Fukushima Incident" (Interim Report), 2011, p. iii.

Nobody bothers to unravel why such individuals take up these positions; nobody enquires why nuclear is a "good" thing in France and a "bad" thing in India.

influenced by the political and media debate. On the basis of the political and media divide, the general public too is divided into pro-nuclear and anti-nuclear. Of course, there remains a major chunk of the public with no opinion on the subject.

Normally, as is the case with any other country, Indian public frameworks on nuclear issues are partly characterised by nuclear technology "symbols" or images flashed in all forms of the common media—newspapers, TV, cartoons, opinion columns, movies, symbols, etc.[28] Mostly, it is the symbol of a nuclear explosion (mushroom fireball), nuclear plant dome, a nuclear bomb, or the Hiroshima devastation. These have been indicative of feelings of revulsion and fear that may not be amenable to logical thinking.[29] Moreover, the nuclear radiation and effluents are normally considered by the public as "poison one cannot see, touch or smell". The other widespread ideas are that "a reactor is a barely controlled nuclear bomb" and that the population living around a nuclear plant is in danger of being afflicted by leukaemia, cancer, congenital deformities, immunity and organ damage.[30] As in any other country, the Indian public evaluates risks not by the standard scientific computation of probability times consequence, but by a series of *subjective criteria* that place high risk values on the idea that nuclear technology is complex, centrally controlled, and the consequences that would ensue as the result of even a single failure.

More importantly, protest leaders, anti-nuclear persons or critics in India are highly qualified personalities. S.P. Udaykumar, and M. Pushparayan, who led the protest at Kudankulam are highly educated people. It may be recalled that a few years ago, when scientist K. Santhanam said that the 1998 Pokhran II nuclear test had fizzled out with a yield "much lower than what was claimed", it sparked off a nation-wide debate. The irony is, nobody bothers to unravel why these individuals take up such positions;

28. Public Perception", http://sites.google.com/a/ncsu.edu/nuclear-energy/public-perception
29. Meyer, n. 8, p. 99.
30. Praful Bidwai, "People's Power vs. Nuclear Power", *The Daily Star*, October 17, 2011.

nobody enquires why nuclear is a "good" thing in France and a "bad" thing in India. In the Indo-US civil nuclear deal, which created a political rift domestically over the ideological divide, the general public seems to have received an impression that some political groups find the nuclear energy cooperation deal unhealthy. To that extent, the United Progressive Alliance (UPA) government led by the Congress Party, marred with corruption issues, has, undoubtedly, lost public trust. Probably the spill-over of this tarnished image of the government and leadership has contributed in exacerbating popular resentment – witness the unmoved protesters at Kudankulam despite Prime Minister Manmohan Singh's repeated appeals and assurances. Therefore, the first and biggest "misperception that needs to be cured is that governments cannot be trusted to tell the truth about nuclear power".[31]

Second, there seems to be persisting public distrust of centrally controlled large organisations in India. So far, India's nuclear establishment has gradually grown, has become cohesive and hierarchical while enjoying many prerogatives and non-interference. In fact, over the years, the nuclear energy production targets have never been met, not due to the incapability of the programme but because of the international embargo imposed on India. These factors could have been addressed much earlier, but, unfortunately, were not, partly because of the gulf between the nuclear community and the public. V. Venugopal, former Director, Radio Chemistry, Bhabha Atomic Research Centre (BARC), once rightly said that "the major problem with Indian scientists was that they were not meticulous in documentation and that there was a communication gap between the scientific community and the public". Therefore, he was of the view that the Kudankulam protest is "not a nuclear disaster but a public relations disaster".[32] In addition, the success of India's nuclear project, its uniqueness and the benefits accrued so far are not brought into the public domain promptly. For example, India has achieved more than 365 nuclear years of safe operation; despite global non-cooperation, India could sustain its nuclear industry; the

31. Ritch, n.2.
32. "Public Acceptance Paramount While Setting up Nuclear Plants", *The Hindu*, September 26, 2011.

Nuclear energy matters today would involve more politics than in the previous decades due to the recurring anti-nuclear protests that are bound to crop up against new projects.

nuclear sector provides employment to many, and has phenomenally improved the livelihoods of people in the plant's locality; and its nuclear plants have withstood tsunamis and earthquakes though of lesser degree.

Third, the public *idea of nuclear power* is that the industry is in the hands of governments and industrial houses that are eager to make money out of India's nuclear energy programme. At the local level, the impression is that no immediate benefit to the surrounding population would accrue out of the project, only health hazards or livelihood disturbances owing to having to shift to a new location as a result of the project. Apprehensions have been raised about how the nuclear plant would destroy the livelihoods of 7,500 fishermen in Idunthakkarai (Kudankulam) as it may harm the marine life. It is clear that nobody has drawn attention to the fact that around Kalpakkam and Tarapur, the local population is able to carry on fishing without hindrance; rather the livelihoods of the population have improved.

Four, though India today has equally visionary and competent nuclear scientists, the current leaders of the nuclear community perhaps do not have the stature of scientists like Dr. Homi Bhabha and others. In other words, the public image of the current nuclear scientists and their integrity is not as high as that of the early batch of scientists. Only Dr A.P.J. Abdul Kalam seems to have that popularity and has individually reached out to the masses; however, he is known more as a missile expert than a nuclear scientist.

Lastly, with the expansion of the nuclear sector in India, the role of the state governments would be a more determining one than that of the central government as a chain of new nuclear facilities are set to be sited in different states. Therefore, nuclear energy matters today would involve more politics than in the previous decades due to the recurring anti-nuclear protests that are bound to crop up against new projects. For example, the local election

in Tamil Nadu has reflected the Kudankulam protest just as it happened over the Kaiga issue in 1989 when Dr Shivaram Karanth contested for the Parliamentary election, but got defeated.[33] Probably, for the scheduled local election in Tamil Nadu, the political parties and leaders, including Chief Minister Jaylalithaa, did not wish annoy the protesters by questioning their safety concerns. Moreover, the social affiliation of the villagers seems to have been used to organise them. Reportedly, the protests are centred round the Lourde Mary Church and the activists could enter the village only after the Roman Catholic Father Jayakumar gave the nod. The key variable for the public of India as a whole and their support for, or opposition to, nuclear energy is definitely *safety*. "But concerns about safety correlate highly with scales of political ideology" and "attitudes towards nuclear energy in key leadership groups are related to broad social and political perspectives".[34] It is also seen that some of these groups in India have persuaded segments of the public to share their scepticism concerning nuclear safety and social insecurity due to the nuclear energy projects.

INDIA'S NUCLEAR LINEAR PROGRESSION

The increasing gap between the public and the scientific community, the callous attitude of the nuclear establishment and government in clarifying certain information and the propagandist attitude of certain vested interests and disgruntled people alongwith the media misinformation overdrive have contributed to such developments. However, this was not the case when India's early political and nuclear scientists envisioned a nuclear roadmap. The linear progression of the nuclear energy acceptance index in India can be demarcated into three phases. The trust-based optimism phase (1947 to the 1970s) marks popular trust in the stalwart nuclear scientists and the political leader Nehru during which nuclear projects were viewed as symbols of modernity and prestige. The quest for nuclear energy in India, in a way, goes back to two things: one of which was a kind of conviction that

33. Kusuma Sorab, "People's Movement Against Nuclear Projects: The Kaiga Case", in Gaur, ed., n. 1, p. 158.
34. Stanley Rothman and S. Robert Lichter, "Elite Ideology and Risk Perception in Nuclear Energy Policy", *American Political Science Review*, vol. 81, no. 2, June 1987, p. 390.

was pretty much global which was that nuclear energy was going to be a magical energy source that would solve India's socio-economic problems. So the commitment goes back to the 1940s with Homi Bhabha and Jawaharlal Nehru who wanted India to be among the leaders in industry, and science and technology. Like leaders in many newly independent countries, they felt that the prestige associated with the symbols of modernity was going to put countries on the map.[35] India, of course, had global ambitions in this regard and there was no technology that was more a symbol of modernity than nuclear energy. In 1944, Homi Bhabha said, "When nuclear energy has been successfully applied for power production, in, say, a couple of decades from now, India will not have to look abroad for its experts but will find them ready at home".[36]

As a result, a country-wide network of laboratories and scientific organisations was established to groom batches of technocrats and basic researchers. Programmes were initiated for uranium mining and processing, fuel making, heavy water production, reactor building, fuel processing and waste management. Therefore, the 1950s and 1960s are considered as the infrastructure-building phase followed by a reorientation in the late 1960s and 1970s toward protecting the legal, technical and knowledge environment for indigenisation.[37] There was a political consensus among all factions for utilising atomic energy for the socio-economic uplift of Indian society. Both nuclear research and nuclear scientists gained greater autonomy. It was only in the late 1970s, that BARC and the Department of Atomic Energy (DAE) faced critical reviews about their activities and achievements.

This led to the subsequent phase, spanning around two decades, the doubt-based pessimism phase (1980s to 2000), which was marked by public protests (Kaiga protest in October 1988), criticism for not meeting the target energy production, and nuclear accidents and incidents both outside and

35. "India Should Choose Iran, Not US", *The Rediff Interview*, December 28, 2005, http://www.ieer.org/latest/indiairan.html
36. S.K. Jain, "Nuclear Power in India — The Fourth Revolution", *An International Journal of Nuclear Power*, vol. 18, no. 2-3, 2004, http://www.npcil.nic.in/pdf/nu-power-cmd.pdf, p. 13.
37. Ashok Jain and V.P. Kharbanda, "Strengthening Science and Technology Capacities for Indigenization of Technology: The Indian Experience", *International Journal of Service Technology and Management*, vol. 4, no. 3, 2003, pp. 234-53.

within India. Immediately after construction was started at Kaiga, the local population and environmental groups severely opposed the project. On October 2, 1988, around 4,000 people took out a rally and a massive protest took place all over the Uttara Kannada district. The public opposition to the project was mainly against the site selection process, highlighting the environmental impact and disaster proneness of the site. The protest continued for several months, including a district-wide *bandh* on February 2, 1989.[38] There were differences in terms of political parties' mobilisation of the public on the nuclear plant at Kaiga. While the Congress Party and Janata Dal approved the project, the CPI/CPM (Communist Party of India/Communist Party-Marxist) took an inconsistent stand on it; only the Bharatiya Janata Party (BJP) passed a resolution against it. A public debate was demanded and Prime Minister Rajiv Gandhi agreed in Parliament that a debate was necessary but it did not materialise till November 1988.

During this period, nuclear accidents like Three Mile Island, 1979, (US), Chernobyl, 1986 (USSR), the Narora fire, 1993, Kakrapar flooding, 1994, Kaiga containment dome collapse, 1994, had generated enormous criticism and concern about the safety of nuclear plants. At the time of the Three Mile Island accident, Tarapur Atomic Power Station (TAPS)-1&2 and Rawatbhata Atomic Power Station (RAPS)-1 were in operation and another five 220 MWe Pressurised Heavy Water Reactor (PHWR) units were under various stages of construction. Prime Minister Morarji Desai ordered a safety audit of all Indian nuclear reactors. After the Chernobyl accident (1986) Prime Minister Rajiv Gandhi promptly asked the DAE to assess the safety of India's nuclear installations. It is alleged by A. Gopalakrishnan that after reviewing the reports, he was "appalled at the clearly dangerous lack of safety in the various hazardous nuclear installations at that time due to unattended safety problems accumulated over the previous 15 or so years, while the DAE continued to operate these installations at extremely high risk to the public".[39] But the AERB document

38. P. Vishnu Kamath and Sanjay Havanur, "Kaiga as a Site for an Atomic Power Plant: A Re-examination", in Gaur, ed., n. 1, p. 31.
39. A Gopalakrishnan, "Nuclear Power: The Missing Safety Audits", http://www.dnaindia.com/mumbai/report_nuclear-power-the-missing-safety-audits_1536223, April 26, 2011

says the nuclear establishment learnt lessons from all these accidents and discovered many weak areas by the review process. Also, the whole range of remedial measures to the loopholes identified was carried out and since the process was time consuming, the Operating Plants Safety Division, the Unit Safety Committees and SARCOP were assigned to periodically take stock of the progress and status of implementation.[40]

In the midst of all these safety issues, two important developments took place during this phase. First, despite the global denial nuclear regime, the former USSR came forward to set up the Kudankulam reactor. An Inter-Governmental Agreement on the project was signed on November 20, 1988, by Prime Minister Rajiv Gandhi and Soviet President Mikhail Gorbachev, for the construction of two reactors. The project remained in limbo due to the break-up of the Soviet Union and the objections by the United States, on the grounds that the agreement did not meet the 1992 terms of the Nuclear Suppliers Group (NSG). However, the construction of the plant eventually began in 1997. Second, though unrelated to the nuclear energy programme, India conducted a second series of nuclear tests at Pokhran in May 1998 and the public mood was marked by jubilation across the country, though the political and strategic debate revolved around who would get the credit and what strategic advantage would accrue to India *vis-a-vis* Pakistan. Overall, though fallacies in belief, and loopholes in the nuclear establishment coloured the nuclear energy debate, perceptibly "this phase marked the maturity of the Indian nuclear power programme" as potential safety gaps were exposed and addressed.[41] Subsequently, the total installed nuclear capacity reached 2,720 MWe and is currently at 2,770, after EMCCR at MAPS-2.

The third phase, starting from 2001 onwards, can be termed as the post-material-support-oppose phase where "post-material" factors, to a greater extent, went to shape public acceptance of nuclear energy projects. The post-material issues related to "quality of life" such as climate change, environment pollution, energy security, displacement, rehabilitation

40. A.R. Sundararajan, K.S. Parthasarthy and S. Sinha, "Atomic Energy Regulatory Board: 25 Years of Safety Regulation", AERB, November 2008, p. 90.
41. Jain, n. 36, p. 13

and the issue of safety-security of nuclear installations that are linked to support for, or opposition to, the nuclear policy. During the last one decade, a number of Public Interest Litigation (PIL) cases and Right to Information (RTI) applications on these issues were lodged by Indian citizens. The civil society consciousness in India has visibly increased. It indicates that rising industrial and societal prosperity in India will gradually liberate the public from the stress of basic acquisitive or materialistic needs and people will look for quality of life and sustenance. This can be marked from the patterns of public responses to a series of issues like maintaining order in the nation, more say by the people in important political decisions, rising prices, corruption, black money, protecting freedom of speech, etc. Within this framework, one can judge public support for, or opposition to, nuclear projects in India. While the new projects are facing opposition, the public living around the existing facilities is reaping the benefits. While the academia and media are divided, the majority of the Indian public is observing and calculating the pros and cons, but does not seem to have formed any concrete opinion. So there is scope for the nuclear establishment and the government to engage the public by providing the correct information and clarifying their concerns.

Rising industrial and societal prosperity in India will gradually liberate the public from the stress of basic acquisitive or materialistic needs and people will look for quality of life and sustenance.

This phase will continue till the time the majority of the public starts supporting the nuclear energy projects: when the spectacular amount of cheap electricity from the nuclear source becomes available to them without any major nuclear accident, public support is likely to ensue, or, the government may succumb to the anti-nuclear pressure and find nuclear energy unviable, which is unlikely.

RESOLVING UNCERTAINTIES IN LEAD TIME

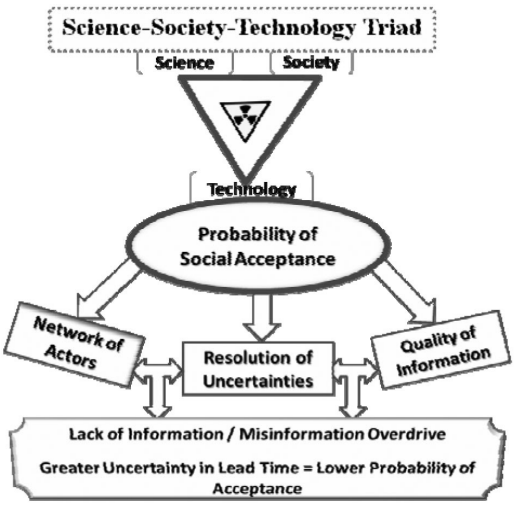
Despite the anti-nuclear activism, the Indian public does not view nuclear power as a problem as such. Certainly, it is a risky technology and one

problem is due to the type of reactors used to produce it. For example, if the reactors at the Fukushima nuclear plant had been Liquid Fluoride Thorium Reactors (LFTRs), the Tokyo Electric Power Co. would not have had such a disaster on its hands. The second problem is the rehabilitation management of the project induced displacement or plant affected persons. A major example is the concerns of the fishermen around the Kudankulam facility. It is clear that the local community has no information on how TAPS has transformed the lives of the local people in Thane district (Maharashtra). Nearly 60 to 70 percent claimants of the rehabilitation package there were fishermen. The people here have generated life-time assets, and received life-time services like a school, post office, hospital, community centre, shops, electricity, and housing enclaves (Popharan and Akarpatti villages located in the tribal areas).[42]

This does not mean that people have no right to ask questions and raise their concerns. Prompt clarification by the concerned authorities or the government is necessary as delay in engaging with the public and sharing of information leads to the "intuitive attribution process," resulting in formation of negative attitudes. Nuclear technology today is associated more with negative values (such as incomprehensibility, involuntariness, dread, etc.); therefore, lack of communication about risks or delay in clarification tends to generate further negativity.[43] In fact, the amount of information dissemination and the lead time of response to public concerns determine considerably the probability of adoption of the projects.[44]

42. Ratan Mani Lal, "At 42, Tarapur Remains an Icon of N-Power Stability", www.news24x7.com, November 14, 2011.
43. Ortwin Renn, "Nuclear Energy and the Public: Risk Perception, Attributes and Behaviour", http://elib.uni-stuttgart.de/opus/volltexte/2011/5927/pdf/ren109.pdf, p. 256.
44. Paul Sommers, "The Adoption of Nuclear Power Generation", *The Bell Journal of Economics*, vol. 11, no. 1, 1980, p. 283.

Fig 2



There remain many uncertainties and misperceptions relating to the nuclear energy programme whose clarification within a reasonable timeframe will determine the degree of public support for nuclear energy in India. First, the siting of new nuclear facilities is the foremost step that invites public attention and becomes a matter of controversy. The people's reaction to the setting up of a heavy industry at a particular site is always negative as they have a one-sided, imaginary consideration of displacement and miseries only. The positive effects of development, employment and the benefits of the rehabilitation programme are not generated in the first instance. For example, the anti-nuclear protest at Jaitapur during April-June 2011 led to a high-handed response by the state government, that resulted in the killing of one protester, and then to political factions getting involved in shadow boxing. From the safety and security point of view, it is alleged that the proposed site is vulnerable to seismic hazards. A study by Roger Bilham and Vinod Gaur in the *Current Science* journal reveals that the Jaitapur region lies in the "compressional downwarp" plate – the same as the Latur and Koyna regions that have experienced earthquakes.[45] On the

45. Roger Bilham and Vinod Gaur, "Historical and Future Seismicity Near Jaitapur, India", *Current Science*, vol. 101, no. 10, November 25, 2011, p. 1279.

"There is no doubt", "that India needs a multi-technology approach to become self-reliant and efficient in energy".

other hand, the Indian Meteorology Department says the proposed Jaitapur nuclear plant site lies in Seismic Zone III but close to Sesmic Zone IV.[46]

The second important question that arises is: why is the government promoting only nuclear energy when other potential renewable energy sources can be harnessed? It is true that large nuclear plants have huge construction costs, and "nuclear power has never succeeded anywhere without enormous government backing".[47] In India, where the government is keen to go down the nuclear road, and not much is highlighted on other renewable resources, whatever the government says on the imperatives of nuclear energy and safety matters is doubted by the people who are reluctant to believe the information provided. The urgent need, therefore, is to address the emerging notion among the public that the "government is wrong" by clarifying that nuclear energy is one of the viable energy options in India's energy security basket. The advocacy that "renewables have only a marginal role to play in India's energy mix", and that nuclear energy is the "inevitable and indispensable option" to address both sustainability as well as climate change issues, should be avoided. "There is no doubt", says Ashok Parthasarathy, "that India needs a multi-technology approach to become self-reliant and efficient in energy".[48] The appointment of Dr Anil Kakodkar as the Chairman of the newly set up Solar Energy Corporation of India (SECI)[49] is a positive move that suggests that the government is seriously considering promotion of alternative sources of energy.

Third, there is a perception floating around that the possible radiation emanating from the nuclear plants causes cancer both among the workers in the nuclear plant and the population in the surrounding area. This is bound

46. "Seismic Zone of Jaitapur Nuclear Power Project Site in Maharashtra", http://npcil.nic.in/main/Siesmic_Zone_of_JNPP.pdf
47. Charles D. Ferguson, "Think Again: Nuclear Power", *Foreign Policy*, November 2011, http://www.foreignpolicy.com/articles/2011/10/11/think_again_nuclear_power
48. Ashok Parthasarathy, "Go Back To the Labs", *Hindustan Times*, December 21, 2011.
49. Dinesh C. Sharma, "PM Manmohan Singh Appoints Nuclear Scientist Anil Kakodkar as National Solar Mission Head", http://indiatoday.intoday.in/story/pm-appoints-nuclear-scientist-anil-kakodkar-as-solar-mission-head/1/167425.html, January 6, 2012.

to happen when the cancer incidence profile of the nuclear workers and the local population is not available in the public domain to reveal whether there is any link between radiation exposure and cancer incidence. A recent study—late but better than never—conducted by the Nuclear Power Corporation of India Limited (NPCIL) over the last 15 years has concluded that employees working in nuclear power plants are less prone to diseases, including cancer, than the general public. The NPCIL brought out a 54-page analysis of the health profile of its employees from its 20 operating plants for the period 1995-2010. The report said the average incidence rate of cancer and average death rate in males, females and combined population (both sexes) was less than the respective national rates in each category. Of the total 80 cancer cases, 41 were from among radiation workers. The average incidence rate was reported at 55.73 per cent against the national incidence rate of 92.9 per cent measured for the average total population of 8,634 (males) during this period.[50] The fact that there is no additional risk of employees developing cancer by virtue of their working in radiation areas could have been brought to the notice of the public much earlier. It is observed that prevalence of hypertension and diabetes in the NPCIL operating sites' employees is less than that found in other studies done for the general public.

The report on the Retrospective Analysis of Health Profile of Employees of the NPCIL (Operating Sites) reveals that "the prevalence of coronary heart disease and COPD is far less than found in various studies done for the general public. The prevalence of anaemia is negligible. The average incidence rate and death rate of cancers, in NPCIL is less than the respective national rates."[51] This suggests that the health of the employees working in NPCIL operating sites is much better compared to those in other studies conducted for the general public across the country.

The initiative by the Tata Memorial Centre to start a cancer registration

50. "Scientific Meet on Occupational Health Safety", http://www.npcil.nic.in/pdf/Press_Note_with_photos.pdf
51. NPCIL, "Retrospective Analysis of Health Profile of Employees of Nuclear Power Corporation of India Ltd. Operating Sites [1995 – 2010]", http://www.npcil.nic.in/pdf/all_sites_health_datas_of_15_years_AME.pdf

A detailed account on the compulsions, imperatives, specificities and achievements of India's nuclear programmes, addressing all apprehensions, needs to be highlighted.

project that will undertake door-to-door surveys outside the exclusion zone of nuclear power plants to check if there is any unusual increase in the number of cancer cases, though a belated step, is undoubtedly a significant one to clear the misperception that the authorities are lackadaisical when it comes to public health. As the effort is the first of its kind in India to establish an independent database, the first three registers will come up in Kaiga, Kakrapar and Rawatbhatta.[52] Also the nuclear establishment is about to take another significant step in which 120 of its environment safety laboratories will release the background radiation level of major cities and localities – similar to roadside weather boards – to convey to the public that radiation is always present in nature and there is nothing unusual or frightening about it.[53] The public's idea of the 'radiation' mystery needs to be streamlined.

Fourth, the specificities of India's nuclear energy programme in contrast to other countries' nuclear programmes need to be highlighted. Otherwise, whenever a nuclear disaster takes place anywhere in the world, the public tends to draw parallels with India's nuclear reactors. For example, when the Fukushima accident took place, everyone questioned how safe Indian reactors are. A detailed account on the compulsions, imperatives, specificities and achievements of India's nuclear programmes, addressing all apprehensions, needs to be highlighted. Nuclear accidents and dangers should not be generalised and it must be known that India has achieved more than 360 reactors years of safe operation without any major nuclear accident. The attitude towards nuclear energy in India would change and diffusion of nuclear energy would take place if the uncertainties relating to its cost-effectiveness, relative capital costs and reliability are clarified early.

52. Kalyan Ray, "Tata Centre to Set up Cancer Registries in all Nuclear Plants", *Deccan Herald*, January 10, 2012.
53. Ibid.

LESSONS LEARNT TO ENGAGE THE PUBLIC

As rightly acknowledged by S.A. Bhardwaj, Director NPCIL (Technical), "We did not realise that we keep talking about nuclear power plants and other technical things but never tried to allay fears among people about the impacts of radiation".[54] Convincing the public that nuclear power is a viable solution to meet the growing power demands of the country, and that advanced mechanisms are in place for safe operation of reactors is the key to engage the public directly. Public resentment, leading to agitation, at both Jaitapur and Kudankulam has taught the nuclear establishment and the government that a policy of ignoring or treating lightly the public's questions and criticism will not work. The Indian nuclear establishment cannot convince the public by merely pointing to its long safe nuclear operation record in justification of its present and future plans. It is important to understand that "nuclear energy must not be looked upon as an end in itself, but must serve social justice and quality of life".[55] In India, nuclear matters have been "projected as being very secretive". Evidence shows that if the political decision to include nuclear in the energy mix is taken in an open and democratic way, people tend to become more favourable to nuclear power. Moreover, "nuclear energy is not the people's main occupation. It is a 'back-of-the-mind' issue which implies that people's attitude can change".[56]

In that context, issues like how quickly the nuclear energy projects will bring benefits to the public at large and, importantly, how much compensation is offered to the people who have to shift out of the area or live in the surroundings, need to be addressed. Undoubtedly, technologies may play an important long-term role in achieving trouble-free and economical nuclear power but in the short-term, the policies and practices

54. "Nuclear Power Corp to Reach out to People, Allay Fears", http://www.smetimes.in/smetimes/news/indian-economy-news/2012/Jan/10/nuclear-power-corp-reach-out-people-allay-fears70344.html, January 10, 2012.
55. Paul Abrecht, et al., Working Committee on Church and Society, World Council of Churches, "Public Acceptance of Nuclear Power – Some Ethical Issues", *IAEA Bulletin*, vol. 19, no. 6, p. 56.
56. FORATOM for Nuclear Energy in Europe, "What People Really Think about Nuclear Energy", http://www.foratom.org/publications/item/what-people-really-think-about-nuclear-energy.html, p. 3

It is essential to recognise the importance of regular public interaction, public communication and public awareness meetings to timely educate and clear all the reservations/ misinformation, if any, in the minds of the people.

of the organisation using the technologies are likely to affect the degree of acceptance. In her letter to Prime Minister Manmohan Singh in the wake of the Kudankulam protest, Tamil Nadu Chief Minister J. Jayalalithaa observed that "the scope and magnitude of this issue is creating a fear *psychosis among the people* and villages surrounding Kudankulam. It is surprising to note that till date no responsible Minister or concerned higher authorities from the Government of India have visited the people or even attempted to assuage their misgivings."[57] How effectively and early the "fear psychosis among the people" is addressed is the key to progress of the project as *fear* and *misperception* are contagious.

Of course, transforming the public perception and convincing everyone to be positive towards nuclear energy is a herculean task. Careful attention to public concerns and a series of measures thereof would help in convincing the public to introspect. It is essential to recognise the importance of regular public interaction, public communication and public awareness meetings to timely educate and clear all the reservations/misinformation, if any, in the minds of the people.[58] With the realisation of the magnitude of public opposition, the Indian nuclear establishment is now looking to scale up its outreach programmes significantly to enhance public acceptance of nuclear power. In a massive way, the DAE is planning to multiply manifold the development work in the vicinity of all nuclear power plants as well as proposed project sites. This includes providing education, healthcare and other social services, deployment of nuclear agriculture

57. "Entire Letter Written by Jayalalithaa to PM", http://www.ndtv.com/article/india/entire-letter-written-by-jayalalithaa-to-pm-134736, September 20, 2011.
58. P.P. Chandrachoodan, "Kudankulam Nuclear Power Station, An Important Developmental Hub for Tamil Nadu – A Green House Gas and Fly-Ash Pollution Free Electricity Provider for The Industrial and Other Over All Development", http://www.npcil.nic.in/pdf/Kudankulam_Nuclear_Power_Station_An_Important_Developmental_Hub_For_Tamil_Nadu.pdf, p. 1

tools, food preservation measures and waste-to-wealth programmes in the neighbourhood of project sites.[59] Reportedly, the total outlay for the nuclear sector could be higher in the Twelfth Plan period (April 2012 to March 2017) than the Rs 46,000 crore earmarked for the current plan period ending March 2012.[60]

In its effort to engage the public, the NPCIL has undertaken many public awareness activities at the proposed Jaitapur nuclear plant site. From 2005 till April 2011, it has engaged around four lakh people—local people, representatives, groups, students, teachers, mediapersons—through meetings, visits to other nuclear plant localities, exhibitions, etc.[61] The NPCIL Bhavnagar office organised a public awareness programme at village Kukad which is about six kilometres from the proposed Mithi Virdi site in Gujarat. Around 150 people were invited from 14 surrounding villages for interaction in the local language on various issues where they claimed that "anti-nuclear people have poisoned their minds, asking them to protest".[62] A series of public awareness programmes through a slogan competition, painting competition, medical and blood donation camps, media orientation programmes, conferences and seminars at school, college and university levels have been undertaken more aggressively.[63]

However, there are certain aspects of the functioning of the nuclear establishment and government policies that need a relook. Most urgent is the transparency in functioning. First, keeping civilian nuclear energy under the official Secrets Act is unnecessary. A recent study by the Washington-based Nuclear Threat Initiative and the London based Economist Intelligence Unit reveals that "low level of transparency of countries like India most directly affects the scores in the global norms category. … If India were as

59. "Nuke Players to Step up Outreach Programme to Win People Back", *Business Line*, November 9, 2011.
60. Ibid.
61. NPCIL, "Details of Public Awareness Activities , Implemented by NPCIL for Proposed NPPs at Jaitapur Site (as on April 2011)", http://www.npcil.nic.in/main/Details_of_Public_meeting.pdf
62. P.M. Shah, NPCIL, "Report on Public Awareness Program at Village Kukad for Representatives of Villages Surrounding Mithi Virdi Site", http://www.npcil.nic.in/pdf/news_19dec2011_01.pdf, p. 2.
63. Information on detail programmes undertaken by NPCIL can be found at http://www.npcil.nic.in/main/PublicAwareness.aspx

transparent as the United Kingdom, its rank in the global norms category would move from 26th to sixth overall".[64] Second, the courses of action on issues relating to the internal and organisational incidents that are reported in the media need further clarification. For example, the reported "act of mischief" and deliberate contamination of the drinking water cooler with tritium at the Kaiga atomic power station in November 2009[65] – the incident seems to have gone unpunished. Another such allegation is the death of 197 Indian nuclear scientists from 1995 to 2011. The Shiv Sena member Dr Deepak Sawant, on July 29, 2011, demanded in the Maharashtra Legislative Council a probe into the spate of suicides among scientists at the Bhabha Atomic Research Centre (BARC). He claimed that 197 scientists working at BARC centres in the country had ended their lives in the last 15 years. Of these, 57 suicides were from BARC in Mumbai.[66] Though these alleged media reports may not have any substance, a negative public perception on nuclear energy as a whole gets shaped on the basis of such allegations, which the nuclear establishment must keep an eye on.

ASSESSMENT: CHALLENGING OPPORTUNITY FOR INDIA

The Indian nuclear establishment is now facing a dual challenge in respect of maintaining its international image as a "responsible nation" while committing to nuclear business deals, and in its effort to garner greater public acceptance of nuclear projects at home. Amidst the global anti-nuclear lobby which has spilled over to India as well, the nuclear establishment now seems to have embarked on a policy of transparency and a trust initiative to reach out to people by providing them with the factual position on India's capabilities, and the safety and economical performance of its plants. Undoubtedly, the ongoing projects would move slowly owing to protest snags but this has brought both challenges and opportunities to step up efforts to feed the awakened public the correct information. In a way, "Fukushima has had a mostly positive effect on the nuclear industry" as it has made the most advanced safety systems an

64. "India's Nuclear Among Less Secure in World: Report", *Hindustan Times*, January 12, 2012.
65. "No Breakthrough yet in Kaiga Case", *The Times of India*, December 17, 2009.
66. "Shiv Sena Wants Probe into BARC Suicides", *The Times of India*, July 30, 2011.

essential requirement and virtually eliminated the supply of older generation reactors.[67] This has also encouraged a look into tougher safety rules and legal frameworks for nuclear safety globally.

Measures to raise public confidence in institutions are also needed and this can be done only by ensuring good governance in the country.

In the days ahead, though challenging, India would find opportunities in matters of the cost of uranium and global cooperation. The price of uranium has fallen to $52 a pound after the Fukushima crisis in 2011, and in the near future, it will not escalate.[68] Japan which was initially reluctant to cooperate with India, has come forward and offered all cooperation. Recently, Australia has also changed its stand. On the domestic front, as the people are increasingly questioning the nuclear energy option and related issues, probably this is the right moment to provide them with authentic information instead of spurious arguments.

The media must be taken on board in the nuclear information management drive. The benefits accrued over the years from the nuclear energy programme need vigorous propagation. For example, few know that the cost of solar energy at present is about Rs 20/kWh and the cost of wind energy is Rs 10/kWh which is suitable only for about 20 to 25 percent of the time (when the wind blows). On the other hand, nuclear power stations sell energy at Rs 1/kWh at Tarapur, and Rs 3/kWh at Kaiga. Power from Kudankulam will cost below Rs 3/kWh.[69]

Measures to raise public confidence in institutions are also needed and this can be done only by ensuring good governance in the country. While citizens have the right to raise their concerns and their genuine concerns need to be addressed by the authorities adequately, the public needs to rise to the occasion, understanding the fact that the world does not have

67. Alexander Yakovenko, "Fukushima has Made the Nuclear Industry Safer", http://rbth.ru/articles/2011/11/29/fukushima_has_made_the_nuclear_industry_safer_13841.html, November 29, 2011.
68. The price of uranium dipped 16 per cent in 2009 after decreasing 41 per cent in 2008 and peaking at $136 in 2007.
69. M.R. Srinivasan, "Why Kudankulam Plant is Safe, and Good for us", *DNA* (Mumbai), October 7, 2011.

any easy energy choices. On the other hand, the government must go the extra mile to convert the anti-nuclear challenge into an opportunity to wipe out the public stigma, keeping in mind that technological controversies comprise a dynamic social process and a cultural feature of today's world is that risk perception is quite decoupled from real risk. But to claim that nuclear energy has abysmally no future owing to sporadic nuclear accidents is a colossal failure of the collective imagination to understand how much real risk is involved and what benefits can be accrued.