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   STATEMENT OF THE PROBLEM

   OBJECTIVES

   HYPOTHESES

   RESEARCH METHODOLOGY

   RESULTS & DISCUSSION

   FINDINGS

   RECOMMENDATIONS/SUGGESTIONS

   CONCLUSIONS

   SCOPE FOR FURTHER RESEARCH

   ACKNOWLEDGMENTS

   REFERENCES

   APPENDIX/ANNEXURE

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- Bowersox, Donald J., Closs, David J., (1996), "Logistical Management." Tata McGraw, Hill, New Delhi.
- Hunker, H.L. and A.J. Wright (1963), "Factors of Industrial Location in Ohio" Ohio State University, Nigeria.

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- Sharma T., Kwatra, G. (2008) Effectiveness of Social Advertising: A Study of Selected Campaigns, Corporate Social Responsibility, Edited by David Crowther & Nicholas Capaldi, Ashgate Research Companion to Corporate Social Responsibility, Chapter 15, pp 287-303.

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- Schemenner, R.W., Huber, J.C. and Cook, R.L. (1987), "Geographic Differences and the Location of New Manufacturing Facilities," Journal of Urban Economics, Vol. 21, No. 1, pp. 83-104.

CONFERENCE PAPERS

- Garg, Sambhav (2011): "Business Ethics" Paper presented at the Annual International Conference for the All India Management Association, New Delhi, India, 19–22 June.

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- Kumar S. (2011): "Customer Value: A Comparative Study of Rural and Urban Customers," Thesis, Kurukshetra University, Kurukshetra.

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- Garg, Bhavet (2011): Towards a New Natural Gas Policy, Political Weekly, Viewed on January 01, 2012 http://epw.in/user/viewabstract.jsp

NUCLEAR ENERGY IN INDIA: A COMPULSION FOR THE FUTURE

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ABSTRACT

India requires 80,000 MWe of power up to the year 2050, to achieve this target of power generation India is neither having Thermal power nor Hydral power to achieve this mega target. The only option India is having is of nuclear energy. Nuclear power supplies 50.8 billion KWh (2.5% of India's total electricity generation) in the year of 2007. It is a very small percentage of nuclear power generation by a nation of the size of India. Even smaller countries like South Korea are producing more then 20% of their total power generation by nuclear energy. So it is the need of the time for India to generate nuclear energy at a large scale. Presently 25 reactors at 8 sites are producing 2170 MWe of power in India. To generate more nuclear power India needs Uranium-232, from the international nuclear club. In 1998 in the NDA Government India blasted five underground nuclear bombs. The result of this was that the Uranium supply to India was crippled but the nuclear blast hampered India's efforts. India was in search of an International recognition of its nuclear power. This resulted is to Indo-US Civil Nuclear agreements on March 2, 2006 in New Delhi. It was a big achievement of India's recognition as a global nuclear power and presently India is in its way of setting of 39 Nuclear Power reactors to produce 45000 MWe electricity in the near future.

KEYWORDS

Nuclear Power, Indo-US Civilian Nuclear Deal, Nuclear Radiations.

INTRODUCTION

India's Atomic Energy programme has been a mission-oriented comprehensive programme with a long-term focus. From its inception the guiding principle of this programme has been self-reliance through the utilization of domestic mineral resources, and building up capability to face possible restrictions in international technology and the exchange of resources. The events of the last 50 years have, in fact, validated this approach. **(**Reddy S, Balachandra P, 2002)

The Department of Atomic Energy (DAE) in India is today a broad-based multidisciplinary organization incorporating basic and applied research, technology development and their translation into industrial application, as closely linked activities. As a result, India today builds its own thermal reactors and associated nuclear fuel cycle facilities and is well poised to march on to the second and third stages of its planned programme involving fast breeder and thorium utilization technologies respectively. This effort is expected to provide a significant long-term solution to India's crucial electricity needs to support its overall development.

The Atomic Energy Establishment was set up at Trombay, near Mumbai, in 1957 and renamed as Bhabha Atomic Research Centre (BARC) ten years later. Plans for building the first Pressurised Heavy Water Reactor (PHWR) were finalised in 1964, and this prototype - Rajasthan-1, which had Canada's Douglas Point reactor as a reference unit, was built as a collaborative venture between Atomic Energy of Canada Ltd (AECL) and Nuclear Power Corporation of India Limited (NPCIL). It started up in 1972 and was duplicated Subsequent indigenous PHWR development has been based on these units.

THE ROLE OF NUCLEAR POWER

There is a well established link between per capita electricity consumption and human development. The installed electricity generation capacity in the country is quite impressive and gross electricity generated during the year 2009-2010 was about 800,000 million units. [2] (India Development Report 2004-2005). In absolute terms, this is a large figure, but when looked at on a per capita basis, this is far below the world average. To meet our large electricity production needs, we have to tap all energy resources available to us. While coal-fired thermal power plants, apart from hydro, would remain the mainstay for our electricity production for quite some time, we would need to supplement them with sizeable additional resources to assure long-term energy-security as well as environmental protection. In this energy mix, nuclear power has an important role to play in the coming years.

The Indian uranium reserves are modest and cannot make an overly significant contribution to electricity requirements, if this uranium is used once in a nuclear reactor and then disposed of as waste. However, with a carefully planned programme, the available uranium can be used to harness the energy contained in non-fissile thorium, of which India possesses about 30 per cent of the world's reserves. The first stage of this programme involves using the indigenous uranium in Pressurised Heavy Water Reactors (PHWRs), which produce not only energy but also fissile plutonium. In the second stage, by reprocessing the spent nuclear fuel and using the recovered plutonium in Fast Breeder Reactors (FBR), the non-fissile depleted uranium and thorium can breed additional fissile nuclear fuel plutonium and uranium-233 respectively. In the third stage, thorium and uranium-233 based nuclear reactors can meet India's long-term energy requirements. Sustainable development of the country's economy requires nuclear energy, and sustainable development of nuclear energy requires closing the nuclear fuel cycle with thorium utilization. **(**Kakodkar & R.Grover, 2004)

Indian concerns and priorities are, thus, quite unique. For its long-term energy security India has no option but to deploy nuclear power according to a strategy precisely tuned to its needs and resources.

THE PRESENT AND THE FUTURE

Electricity demand in India is increasing rapidly, and the 830 billion kilowatt hours produced in 2008 was triple the 1990 output, though still represented only some 700 kWh per capita for the year. With huge transmission losses, this resulted in only 591 billion kWh consumption. Coal provides 68% of the electricity at present, but reserves are limited. Gas provides 8%, hydro 14%. The per capita electricity consumption figure is expected to double by 2020, with 6.3% annual growth, and reach 5000-6000 kWh by 2050. **(**The World Fact Book- India, 2005).

Nuclear power supplied 15.8 billion kWh (2.5%) of India's electricity in 2007 from 3.7 GWe (of 110 GWe total) capacity and after a dip in 2008-09 this will increase steadily as imported uranium becomes available and new plants come on line. In the year to March 2010, 22 billion kWh was forecast, and for the 2010-11 year 24 billion kWh is expected. For 2011-12, 32 billion kWh is now forecast. Some 300 reactor-years of operation had been achieved by mid 2009. India's fuel situation, with shortage of fossil fuels, is driving the nuclear investment for electricity, and 25% nuclear contribution is foreseen by 2050, when 1094 GWe of base-load capacity is expected to be required. Almost as much investment in the grid system as in power plants is necessary. (A.Gopalakrishnan, 2002)

In 2006 almost US$ 9 billion was committed for power projects, including 9.35 GWe of new generating capacity, taking forward projects to 43.6 GWe and US$ 51 billion. In late 2009 the government said that it was confident that 62 GWe of new capacity would be added in the 11th 5- year plan to March 2012, and best efforts were being made to add 12.5 GWe on top of this, though only 18 GWe had been achieved by the mid point of October 2009, when 152 GWe was on line. The government's 12th 5-year plan for 2012-17 was targeting the addition of 100 GWe over the period. Three quarters of this would be coal- or lignite-fired and only 3.4 GWe nuclear, including two imported 1000 MWe units at one site and two indigenous 700 MWe units at another. (S. Banerjee 2010)

A report in 2007 said that India needed to spend US$ 120-150 billion on power infrastructure over the next five years, including transmission and distribution (T&D). It said that T&D losses were some 30-40%, worth more than $6 billion per year. A 2010 estimate shows big differences among states, with some very high, and a national average of 27% T&D loss, well above the target 15% set in 2001 when the average figure was 34%. The target since about 2004 has been for nuclear power to provide 20 GWe by 2020, but in 2007 the Prime Minister of India referred to this as "modest" and capable of being "doubled with the opening up of international cooperation." However, it is evident that even the 20 GWe target will require substantial uranium imports. Late in 2008 NPCIL projected 22 GWe on line by 2015, and the government was talking about having 50 GWe of nuclear power operating by 2050. Then in June 2009 NPCIL said it aimed for 60 GWe nuclear by 2032, including 40 GWe of PWR capacity and 7 GWe of new PHWR capacity, all fuelled by imported uranium. This target was reiterated late in 2010. (CMIE, Energy, 2005).

The table given below summarizes the present status of and future plans for nuclear power in India. The designs of new reactors have progressively evolved to incorporate advanced features to further improve safety, reliability and economics. The country has successfully developed technologies for in-service inspection, maintenance and refurbishment of older plants. As India gains experience and masters various aspects of nuclear technology, the performance of its nuclear plants continues to improve. The average capacity factor of Indian plants in 1995-96 was 60 per cent and it has risen to 82.5 per cent during 2000-2001. So far they have produced more than 165 billion units of electricity. (CMIE, Energy, 2005).

NUCLEAR POWER PLANTS: PRESENT STATUS (2010) AND FUTURE PLANS

Plants under operation 25 reactors at 8 sites --	6,730 MWe
Future plans 2x220 PHWR 4x500 PFBR 10x500PHWR 6x1000LWR	13,440
Total	20,170

Source: Annual Report, Department of Atomic Energy, GoI. 2010

Two 500 MWe PHWRs, fully designed and developed in India, are under construction at Tarapur. In parallel, to further accelerate the growth of nuclear power, plans are being considered to build a few light water reactor based plants as an additionally, with foreign collaboration. The deal with the Russian Federation for setting up two 1,000 MWe units at Kundankulam is a step in this direction. (Ghosh S., 2009). Pre-project activities for setting up these units have commenced and DAE expects to start construction later this year. The two programmes of light water reactor and the indigenous self-reliant three-stage PHWRs, run as parallel programmes. The Nuclear Power Corporation of India Limited (NPCIL) has gained considerable experience and confidence in plant life management, after many complex repair and rehabilitation jobs. Its nuclear power reactor maintenance capability is now on par with that of advanced countries. The intricate job of *en masse* replacement of coolant channel assemblies in the RAPS-2 reactor was successfully completed by employing indigenously developed technology well ahead of schedule and with minimum consumption of man-rem. The technology for tackling the Over Pressure Relief Device (OPRD) problem of the RAPS- 1 leak was evolved and demonstrated and the repair work carried out successfully. From RAPS-2 onwards, improved coolant channel material and modified channel design have been adopted for longer life of the coolant channel.

FBR (Fast Breeder Reactors) technology is critical to developing stage two of India's nuclear power programme. Without developing the wide-scale use of FBR technology, India will find it difficult to go beyond 10,000 MWe nuclear capacities based on known indigenous Uranium resources. Use of FBR technology would enable indigenous Uranium resources to support a 20,000 MWe nuclear power programme by the year 2020. Such a FBR programme is critical to developing the Thorium-based third stage of India's nuclear power programme. The Bhabha Atomic Research Centre (BARC) is also engaged in R&D activities to develop an Advanced Heavy Water Reactor of 300 MWe capacity that would provide industrial scale experience necessary for the Thorium-based Stage Three of India's nuclear power programme. (Annual Report,GoI, 2006-07).

POWER PLANTS IN INDIA

India ranked sixth in the world's elite nuclear club, with its 20th nuclear-powered reactor at Kaiga in Karnataka and another nuclear power plant is proposed to be setup in CHUTKA Mandla District in the state of Madhya Pradesh. About 39 new sites have been proposed to be set up in India generating in future 45000 MWe of electricity.

POWER PLANTS IN INDIA

Name	Location	Type	Rating, MWe	Status
Tarapur Atomic Power Station	Tarapur, Maharashtra	BWR	160	Operational Oct. 1969
		BWR	160	Operational Oct.1969
		PHWR	540	Operational Aug. 2006
		PHWR	540	Operational Sept. 2005
Rajasthan Atomic Power Station	Rawatbhata, Rajasthan	PHWR	90	Operational Dec.1973
		PHWR	187	Operational April 1981
		PHWR	202	Operational June 2000
		PHWR	202	Operational Dec. 2000
		PHWR	202	Operational Dec., 2009
		PHWR	202	Operational March, 2010
Madras Atomic Power Station	Kalpakkam, Tamilnadu	PHWR	170	Operational Jan. 1984
		PHWR	220	Operational March 1986
Narora Atomic Power Station	Narora, Uttar Pradesh	PHWR	220	Operational Jan. 1991
		PHWR	220	Operational July 1992
Kakrapar Atomic Power Station	Kakrapar, Gujarat	PHWR	220	Operational May 1993
		PHWR	220	Operational Sept.1995
		PHWR	700	under construction
		PHWR	700	under construction
Kaiga Atomic Power Station	Kaiga, Karnataka	PHWR	220	Operational Nov. 2000
		PHWR	220	Operational March 2000
		PHWR	220	Operational May 2007
		PHWR	220	Operational Jan.2011
Koodankulam Nuclear Power Plant	Kudankulam, Tamilnadu	VVER	1000	Under construction, online February 2011
		VVER	1000	Under construction, online August 2011
Prototype Fast Breeder Reactor	Kalpakkam, Tamilnadu	FBR	500	Under construction
Total Capacity			**6,730 MWe**	

Source: Annual Report, Department of Atomic Energy, Govt. of India. 2010

In 1998 a new party named Bharitya Janta Party came to power in India to the general election. Mr. A.B. Bajpai became the Prime Minister of India. BJP is a highest party and May 1998 India blasted five atomic device underground at Pokhran in the desert of Rajsthan. The whole world became anti-India regarding the nuclear fuel supplies. The nuclear club which was supplying nuclear fuel to India almost stopped the nuclear fuel to India. The World opinion was that India must signed NPT and then only the nuclear fuel will be supplied to India.

India was totally against this treaty because of some political reasons and the China factor. India and China has fought a fairest battle in 1962 and the china became a nuclear power. India is still subspecies of Chinese and military and atomic activities, so India has even today not signed the NPT after this incident India's nuclear programme was adversely effected and most of the nuclear plant were running below their instilled capacity.

After a year of these atomic blasts in 2001 India secretly started talking to U.S. for the supply of nuclear fuel and has a comprehensive nuclear agreement with U.S. These talks resulted in 2005, in India-US civilian nuclear agreement.

INDO-U.S. CIVILIAN NUCLEAR AGREEMENT

The Indo-U.S. civilian nuclear agreement, also known as the Indo-U.S. nuclear deal, refers to a bilateral accord on civil nuclear cooperation between the United States of America and the Republic of India. The framework for this agreement was a July 18, 2005 joint statement by Indian Prime Minister Dr. Manmohan Singh and then U.S. President George W. Bush, under which India agreed to separate its civil and military nuclear facilities and place all its civil nuclear facilities under International Atomic Energy Agency (IAEA) safeguards and, in exchange, the United States agreed to work toward full civil nuclear cooperation with India.

On March 2, 2006 in New Delhi, George W. Bush and Dr. Manmohan Singh signed a Civil Nuclear Cooperation Agreement, following an initiation during the July 2005 summit in Washington between the two leaders over civilian nuclear cooperation. **(**Planning Commission (GoI), 2005).

Heavily endorsed by the White House, the agreement is thought to be a major victory to George W. Bush's foreign policy initiative and was described by many lawmakers as a cornerstone of the new strategic partnership between the two countries. The agreement is widely considered to help India fulfill its soaring energy demands and boost U.S. and India into a strategic partnership. The Pentagon speculates this will help ease global demand for crude oil and natural gas. On August 3, 2007, both the countries released the full text of the 123 agreement. Nicholas Burns, the chief negotiator of the India-United States nuclear deal, said the U.S. has the right to terminate the deal if India tests a nuclear weapon and that no part of the agreement recognizes India as a nuclear weapons state.

IMPACTS OF INDO-US NUCLEAR DEAL ON HEALTH CARE

Investment in Research & Development health care has resulted in the setting up of a Radiation Medicine Centre (RMC) as part of BARC in Mumbai, which has become the nucleus for the growth of nuclear medicine in the country. Similarly, Tata Memorial Centre (TMC), a fully autonomous institute aided by the DAE, provides comprehensive treatment for cancer and allied diseases and is one of the best internationally. It carries out a vast number of patient investigations every year (about 800,000 pathological investigations in 1999-2000). To cater to the requirements of the eastern region of the country, a regional radiation medicine centre has been set up at Kolkata as a part of the Variable Energy Cyclotron Centre (VECC). The facilities include those for in vitro studies like RIA and IRMA, gamma cameras for diagnostic and 4MeV LINAC for therapy. Radio-pharmaceuticals and other preparations for these and several other medical centers in the country are regularly supplied by BRIT, which runs a comprehensive programme for this purpose based on the R&D generated at BARC. **(**Rosenthal, Elisabeth and William Broad, 2011).

AGRICULTURE AND FOOD

Application of radiation to agriculture has resulted in the release of 22 improved varieties of seeds, which are contributing directly to the increase of GDP in the country. Of these mutant varieties, blackgram (urad) accounts for 95 per cent of the cultivation of this pulse in the State of Maharashtra.(IEA, 2003). At an all-India level, four BARC blackgram varieties account for over 49 per cent of the total national breeder seed indent of all the blackgram varieties taken together. Groundnut variety TAG-24 is very popular and accounts for 11 per cent of the national breeder seed indent. (Key World Energy Statistics 2005,). At a conservative estimate, these varieties constitute a GDP of over Rs.10,000 millions per year. Research done in BARC and other centers in the world, has clearly demonstrated the advantages of food preservation by irradiation, and the Government of India has cleared several items for radiation processing. Setting up of such plants is expected to reduce the percentage of food that is lost due to various causes and provide the means for improving food hygiene and facilitate export. One spice irradiator is already operating at BRIT in Navi Mumbai, to treat items requiring high doses. A Proton irradiator at Lasalgaon, near Nasik, is being set up by BARC and will be completed in the year 2001 to treat items requiring low doses. Efforts are being made to encourage other agencies to set up such plants in the private sector.(Annual Report, GoI, 2006).

INDUSTRY

Applications of radiation technology for industry span a wide range, including radiography, water hydrology, gamma scanning of process equipment, use of tracers to study sediment transport at ports and harbours, flow measurements, pigging of buried pipelines and water hydrology in general. All these applications are in use and have made significant contributions to Indian industry. For example, the country's expertise in gamma scanning has been used by almost all the major petrochemical companies for troubleshooting in process equipment and this has resulted in minimizing downtime and production loss costs, which could be of the order of several crores per day for such big units. BARC has handled about 20 such scannings every year for the past five years. Radiotracers have been utilized to study sediment transport at almost all the major ports and harbours. Such studies have provided guidance for desilting operations, increasing the time intervals between desilting campaigns and thus saving costs. On a conservative estimate, savings to the nation due to isotope application related services like gamma scanning, blockage and leakage detection, RTD studies and sediment transport studies amount to over Rs.20,000 millions per year. (Belson, Ken and Hiroko Tabuchi 2011).

SOCIAL BENEFITS

Over 6,000 technicians have been trained in the use of radiography and they have found employment in India and abroad, where the certification provided by BARC is well recognized. BARC has also developed many applications using electron beam machines, for radiation processing of products such as cross-linking of polyethylene insulation, heat shrinkables, and vulcanization of natural rubber. BARC has developed desalination technologies based on multi-stage flash (MSF) evaporation, reverse osmosis (RO) and low temperature vacuum evaporation. A425 cu.m/day MSF desalination plant is in operation at Trombay. Plants based on BARC's RO technology have been set up in rural areas for purification of brackish water. Currently, BARC is setting up a 6,300 cu.m/day capacity desalination plant using MSF-RO technology at Kalpakkam using nuclear heat from the Madras Atomic Power Station. (National Academies of Science, 2006).

BASIC RESEARCH

The DAE places high importance on basic research. All disciplines in nuclear sciences and several science disciplines where nuclear techniques play a role, are covered by this programme, which is broad-based enough to enable use of the DAE facilities by scientists from other organizations as well as provide support to nuclear science activities there. Apart from the four R&D centers BARC, Mumbai; CAT, Indore; VECC, Kolkata; and IGCAR, Kalpakam; there are aided institutions such as Tata Institute of Fundamental Research, Saha Institute of Nuclear Physics, Institute of Physics, Harish-Chandra Research Institute, Institute of Mathematical Sciences, Cancer Research Institute and Institute of Plasma Research, which are engaged in basic research activities spanning a broad range of disciplines. The DAE also offers several opportunities to scientists from other institutions in India and abroad to interact and collaborate on research activities of mutual interest.

The Board of Research in Nuclear Sciences enables such support to Indian scientists, while those from abroad are supported through several bilateral cooperative arrangements or through schemes sponsored by international organizations like the International Atomic Energy Agency in Vienna, the Third World Academy of Sciences in Trieste and others. In conclusion, it may be stated that the DAE is manned by trained scientists and engineers, who are relentlessly working towards fulfilling the mandate given to them by the nation, by developing technologies having direct and widespread societal benefits. Nuclear power plants are working well; application of radiation technology to health care is benefiting a large number of patients on a regular basis; improved crop varieties are helping to increase the agricultural output; and radio-isotopes and tracer techniques are helping industry in many ways. It has been able to reach this level because of the broad R&D base that has been nurtured over the years. India is happy to share its experience with scientists from the third world countries and collaborate in areas of mutual interest.

NUCLEAR ACCIDENT IN JAPAN AND IT'S IMPACT ON INDIA'S NUCLEAR ENERGY PROGRAMME

Almost ten months into the nuclear crisis in Japan, efforts to contain radioactive emissions are still underway. Officials there have indicated that it will take years to fully cool the facility’s nuclear fuel, a process that is currently releasing radioactive material into the environment. (Washington Post, 2011).

Reports from Japan bring almost daily evidence of continued radioactive releases. Eleven types of vegetables have been found to contain radioactivity and have been deemed unfit for consumption. Tokyo’s drinking water has been deemed unsafe for children based on its levels of radioactivity.

The full impact of the Japanese nuclear crisis remains to be seen, but the health risks posed by radioactive contamination are well documented. In 2006, the National Academies of Science issued a definitive report on radiation exposure that concluded that even low levels of radiation can cause human health problems, including cancer, heart disease, or immune disorders. (Sato, Shigeru, 2011). Children are especially susceptible to the impact of foodborne exposure to radioactive materials, making safeguards of food and water particularly critical. While government officials have thus far downplayed the significance of radioactivity from the Japanese nuclear crisis, the science shows that the radioactive materials will have an impact somewhere, and that impact could last for decades.

RADIATION IMPACTS ON HEALTH

Japan’s nuclear disaster has released several kinds of ionizing radiation. This radiation can create or break chemical bonds in cells, causing chemical changes that damage the DNA in living organisms, leading to cell death and cancer. Once inside a living organism, radioactive materials continue to radiate—and cause the body harm – until they are excreted or naturally decay, which can take a lifetime. (Washington Post). Officials have identified two main radioactive materials being emitted in Japan, iodine and cesium — both of which are extremely dangerous to human health. There is also concern about two other highly dangerous radioactive materials, strontium and plutonium, which may have been released as well. (Barclay, Eliza, 2011).

CONTAMINATION OF FOOD AND WATER

A major avenue for exposure to radioactive contamination comes through food and water. Decades after the Chernobyl accident, the United Kingdom still maintains restrictions on large sectors of the country’s sheep production because radioactive cesium—dispersed through wind and rain—still contaminates grazing lands. (Patel, Tara, 2011).

Additionally, thousands of square miles of land experienced radioactive iodine contamination from Chernobyl, ending up in the grazing paddocks of animal herds, and then in the milk and animal products that humans consumed. After Chernobyl, there were 6000 cases of thyroid cancer reported from 1991 to 2005 in Belarus, Ukraine, and four affected regions of Russia, many of which were attributed to consumption of radioactive milk after the accident. Radiation contamination remains a fact of life for parts of Europe following Chernobyl, especially for wild foods like mushrooms, berries, and game that have not been effectively treated for contamination. (Broder, John, 2011). In Germany, the government continues to pay hunters compensation for lost revenue from wild boar meat found to have high levels of cesium, and the problem is expected to continue for decades.

It remains unknown where or to what degree the radioactive material emitted from Japan’s nuclear facilities will cause similar problems. But already in Japan, tests have found eleven types of vegetables to contain levels of radioactive iodine exceeding national standards by as much as a factor of seven as well as milk. A soil sample taken 40 kilometers from the nuclear reactors showed levels of radioactive cesium 1630 times higher than normal. This is especially disconcerting because of cesium’s long half-life and its unique chemical composition that allows it to move freely through the environment.(Rubin, Rita and Dan Vergano, 2011).

India has suffered adversely due to Japan's nuclear reactors disaster. The friendly countries to India as Canada, France and some of the European countries and Russia who were supplying nuclear fuel to atomic reactors in India were not sure of the safety measure in Indian nuclear reactors. They were sending many quarries to Govt. of India about the safety measure and cooling system of the nuclear plants in India.

The Govt. of India sent them satisfactory reply that when in 2004 the Tsunami struck the Kalpakkam Nuclear Power Plant near Chennai. The power plant was submerged by four feet of water and the plant was automatically shut-down. The cooling system of the plant was intact .There were no radiations or any other dangers to the people and the environment. This strong reply by India has satisfied some of the donor countries of nuclear fuel but some of the countries like Australia are still not satisfied and have stopped supplying nuclear fuel to India after the Japanese disaster.

India has no option but the only option is to have nuclear power plants for India's long term need to develop alternative energy sources. India is having large amount of Thorium. It is estimated that about 300,000 MWe of electricity generation capacity for about 300 years. Now it is necessary to diversify the energy resources for long term energy requirement and energy independence before saturation effects that may throttle other technologies like constraints in transport and infrastructure; and also to limit green house gases such as carbon dioxide from thermal stations.

Keeping abreast with nuclear power technology among the developed and developing countries, especially in Asia. The nuclear power industry is almost totally indigenous for the entire nuclear fuel cycle. Thus, installation of nuclear power plants can give a fillip to other Indian industries.

It is worth noting in this context that countries such as China, which have larger resources of coal than India, are developing nuclear power at a rapid pace. Japan, South Korea and South East Asia are also increasing their nuclear power capacities in a big way. Even Indonesia with good oil reserves, Thailand, Malaysia and Vietnam etc. are going for nuclear power in a big way then why only India should be dragged to limit its nuclear power progremme?

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