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ENVIRONMENTAL IMPACTS OF THE NUCLEAR POWER STATIONS ON HEALTH OF PEOPLE OF INDIA

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ABSTRACT

This paper deals with the comparative assessment of the environmental & health impacts of nuclear power stations in India.

Nuclear energy is the 5th largest source of electricity for India which contributes about 3% of the total electricity generation in the country. But a lot of challenges are associated with use of nuclear energy and development of nuclear reactors such as:

1. Cancers in populations surrounding nuclear reactors.
2 Efforts to deal with nuclear waste.
3. Pollution of nearby rivers, bonds, lakes etc. due to dumbing of nuclear associated waste.
4. Exposure to harmful radiations released from Nuclear plants villages.
5. Displacement of people of nearby villages close to nuclear Power stations.
6. High-level radioactive waste associated health problems.

India is not deterred, though, owing to its large-scale requirements for diversified energy Sources. However, the country has, tightening it's safeguards to ensure better nuclear security practices.

Introduction:

As of November 2020, India has 22 nuclear reactors in operation in 8 nuclear power plants, with a total installed capacity of 7,380 MW. Nuclear power produced a total of 43 TWh in 2020-21, contributing 3.11% of Total Power generation in India. 10 more reactors are under construction with a combined generation capacity of 8,000 mw. In October 2010, India drew up a plan to reach a nuclear power capacity of 63GW in 2032.

However, following the 2011 Fukushima nuclear disaster there have been numerous anti-nuclear protests at proposed nuclear power plant sites. There have been mass protests against the Jaitafur Nuclear Power Project in Maharashtra & the Kudankulam Nuclear power Plant in Tamil Nadu & a proposed large nuclear power plant near Hawbipur was refused permission by Govt. of West Bengal.

A Public Interest Litigation (PIL) has also been filed against the Govt's civil nuclear programme at The Supreme Court.

Study of Ionizing Radiation due to Nuclear Power Plants & Cancer risk by NCI (National Cancer Institute) –

Ionizing radiation consists of subatomic particles & electromagnetic waves. At high doses, ionizing radiation can cause immediate damage to a person’s body, including radiation sickness & death.

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At lower doses, ionizing radiation can cause health effects such as cardiovascular diseases & contracts, as well as cancer.

How are people exposed to ionizing radiation after a nuclear power plant accident? Nuclear power plants use energy released by the decay of the certain radioactive isotopes to produce electricity. If the fuel & surrounding containment structures are severely damaged, radioactive materials & ionizing radiation may be released, potentially posing a health risk for people.

The radioactive isotopes released in nuclear power plant accidents include iodine- 131 (I-131), Cesium-134 (Cs-134), Cs-137.

Human exposure to I-131 released from nuclear power plant accidents comes contaminated water, mainly from consuming com milk, or foods.

Exposure to radioactive-iodine may increase the risk of thyroid cancer for many years, especially for children & adolescents Exposure to Cs-134 & Cs-137) can be external to the body or internal. External on contaminated exposure comes from walking soil. Internal exposure can come from breathing particles.

Environmental effects of 1000-MWe generating plant

Type	Coal-fired	LWBR	HTGR	LMFBR
THERMAL Btu/s[a] to be dissipated	1.49 x 10^6	1.93 x 10^6	1.43 x 10^6	1.31 x 10^6
EFFLUENT Radioactivity (10^3 CI/a	-	2253	2	2
AIR POLLUTION (t/a)				
SO_2	45000	1500[b]	1200[b]	-
NO_x	26000	900	700	-
CO	750	25	20	-
Particulates	3500	120	95	-
HC	260	9	7	-
WASTES ($10^3 ft^3$/a)[c]				
Radioactive	-	12	10	8
Ashes	200	7[b]	5[b]	-
LAND				
Acres mined	200	13	9	0.05
Plant sites (acres)	300-400	←	70-140	→

a 1 Btu= 1054 X 10^3 J

b The emissions charged to the reactors are computed from the electric energy used in enrichment

c 1 ft^3 = 2832 X 10-2 m^3

The United Nations Environment Programme has been concerned with studies on the environmental impacts of all sources of energy At its fourth session (1976), the Governing Council of UNEP requested the preparation of in-depth studies on the environmental impacts of fossil fuels, nuclear energy and renewable sources of energy. These studies, which are carried out in co-operation with UN bodies concerned and other organizations, will provide a

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comprehensive comparative assessment of these impacts with the main goal of identifying a priority list of inadequacies in knowledge for further research and development

This paper was presented at the 1977 International Conference on Nuclear Power and Its Fuel Cycle, Salzburg, Austria.

Emergency Response Preparedness Emergency:

Emergency response preparedness is an essential aspect of nuclear safety & security. Acc. to IAEA, emergency response preparedness refers to effective national & global response arrangements and capabilities to minimise the impacts from nuclear & radiological incidents & emergencies.

Emergency response within nuclear facilities operates through the three phases: early & intermediate (response) & late recovery.

In the India atomic energy sector, Integrated Command Control & Response (ICCR) exercises focus on testing command & control functions, response mechanisms of communication. Additionally, given the proximity of population centres to nuclear facilities, field exercises & public interactions are an important requirement of emergency management in India.

Safety & Security in the Nuclear Power sector

There are 23 nuclear power & reactors in operation today across India, with an additional 11 under construction. For nuclear energy to take its place as a major low-carbon energy source, states must address issues of cost, policy & safety.

Nuclear energy projects must incorporate designs with inherent & passive safety features. Nuclear safeguards are of importance for public acceptance and long term sustainability of nuclear power. Nuclear facilities also require nuclear security features to prevent clandestine diversion of fissile and fertile materials for non-peaceful use.

Bhopal Gas Tragedy: It was a chemical accident on the night of 2-3 December 1984, more than 40 tons of methyl isocyanate gas leaked from a pesticide plant in Bhopal, India, immediately. Killing at least 3800 people & causing significant morbidity & premature death for many thousands more. Investigations later established that substandard operating and safety procedures at the understaffed plant had led to the catastrophe. Impacts of Uranium Mining: These can be classified into impact on land it water & occupational health hazards.

Radon produced by the radioactive decay of 226 Ra found in the ores has been considered a major factor in the increasing the cancer incidence among uranium miners. The environmental effects of tailings piles include: wind erosion to unrestricted areas, river pollution from files located near river banks, or from water level rising during flood Conditions to the base of the piles casing leaching of radium from the material & percolation of water through files into groundwater.

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Conclusion:

To reduce the harmful impact of nuclear Power reactors, newer reactors in India are equipped with built-in safety measures that are designed to minimize risks. For e.g. new light water & heavy" water reactors at nuclear plants such as Tarapur nuclear power plants in Maharashtra, Kudankulam Nuclear Power plant in Tamil Nadu have double containment to reduce in safety.

All nuclear reactor designs must satisfy three fundamental safety functions in the event of a significant abnormal event: stop the fission chain reaction, ensure adequate cooling of the nuclear fuel and prevent the release of radioactivity into the biosphere.

In India, all nuclear facilities are sited, designed, constructed, commissioned and operated in accordance with strict quality and safety standards. The Atomic Energy Regulatory Board (AERB) frames the policies and lays down safety standards and requirements. The safety of the reactors and their operations is ensured by:

1. "Defence –in-Depth" philosophy at design level.
2. Radiation exposures "As law as Reasonably Achievable (ALARA)" at operations level.
3. Management of Radioactive waste.
4. Preparedness for nuclear emergency.

For radiation protection purposes, AERB has prescribed an effective individual dose (whole body) limit for a radiation worker as 20mSv/year averaged over five consecutive years, calculated on a sliding scale of 5 years.

Gaseous wastes from reactor buildings are filtered using pre-filters and high efficiency particulate air filters and released after monitoring through a stack.

The radioactive solid wastes are disposed off on site in brick- lined underground trenches re-enforced cement concrete (RCC) vaults or tile holes. AERB has prescribed limits on the annual volume and activity of discharge, daily discharges and activity concentration.

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