

Nuclear power for energy production and hazardous waste regulations in India

There is a huge gap in energy/power production, supply and demand in India. A large section of the country's population suffers from power-cut throughout the day or no power supply at all. Major portion of the energy production in India is being fulfilled by thermal and hydro power-plants currently, which is not sufficient for the total energy demand of the country. It is therefore important to consider an alternative source of energy production, which should also be economically feasible for the Indian people as well as environment-friendly. Wind and solar energy are the most environmentally sustainable sources of power generation which have been harnessed successfully in several countries, but they require high initial investment. Nuclear power would be an alternative to fulfil the energy demands of the country. India has been successful in making nuclear agreement recently with nuclear fuel-producing countries to get uninterrupted supply of nuclear fuel (i.e. uranium) to solve power shortage in the country.

Before installing any nuclear power-generation plants in India, it is important to implement stringent regulations for the health and safety of the people and for protection of the environment, soil and water from the nuclear and hazardous waste produced in the power plants. Although some initiatives have been taken for radioactive waste disposal in India¹, the current hazardous and nuclear waste storage/disposal regulations are still too soft and are not being implemented properly in the country. There are several examples of improper handling of hazardous waste by industries in India and elsewhere, which ultimately pollutes the surface water and groundwater continuously. In one of the early incidents in USA, Hanford's site operations released significant amount of radioactive materials in the subsurface system and the Columbia River, which threatened the health of the residents as well as the ecosystems². A recent incident where an old equipment with radioactive elements (gamma irradiator with cobalt-60) was sold by the Chemistry Department of

Delhi University to the scrap market in Delhi, left several people seriously ill and killed at least one of them, is a glaring example of improper handling of radioactive waste in the country. The lack of hazardous waste-handling regulations resulted in the worst ever industrial disaster in India about 25 years ago at the Union Carbide factory in Bhopal. More than 20,000 people were killed due to leakage from methyl isocyanate (MIC) storage tank and millions were infected because of inhaling MIC and other toxic substances^{3,4}. The soft hazardous waste-handling regulations of India are incapable of initiating any remediation steps to the contaminated area even 25 years after the accident. Due to negligence, it is likely that contaminants would have been transported through the subsurface systems and may have reached the groundwater, which is a sign of another disaster for the heavily populated area of Central India, where people use groundwater near the contaminated zone for their drinking water supply. There are significant evidences from nano- and micro-size particle mobilization studies that the particles in the unsaturated zone can get attached with the contaminants and be transported much faster than anticipated due to the presence of liquid-gas interfaces in the infiltration/rainfall events^{5,6}. It is therefore necessary to make an effort to remediate the contaminated site before it is too late.

It is a positive step of the Indian Government to initiate nuclear power generation to fulfil the gap in the production and demand of energy needs for the development of the country. However, we must be cautious to implement a proper regulation for liability and storage of nuclear/hazardous waste from the nuclear power industries. Radionuclide from nuclear waste has the potential to enter the food chain and severely affect the health of the ecosystems. Even the best safety standards cannot completely exclude the possibilities of nuclear accidents. Thus, the need for a legal regime to compensate for damage and loss arising from nuclear accidents in India becomes evident. The Nuclear Liability Bill, whose amended

version was recently discussed in the Indian parliament has many loopholes. The Bill essentially seeks to legally channel the liability for accidents to the operators, gives the operators limited right of recourse against the suppliers in the event of an accident, and also sets aside ordinary Tort Law so as to disallow fault-based claims by victims against the operator or supplier. If the reactor has intrinsic flaws in its design, engineering, construction, materials of construction, etc., then even the most well-equipped and well-trained operator cannot prevent an accident. The reason and intent behind the Bill is not only to deter the operators from being negligent with such perilous operations, but to ensure that justice is delivered as soon as possible in the event of an accident. The Bhopal tragedy happened due to faulty design and operations, but the owners refused to take responsibility for the same. Therefore, it is essential that the suppliers also be held responsible by the operator for 'patent' or 'latent' defects in the equipment. This must be incorporated in the Nuclear Liability Bill.

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