

NUCLEAR DISASTER

Introduction:

The department of "International Atomic Energy Agency" defined a nuclear and radiation accident as "an event that has led to significant consequences to the people, the environment or the facility". Effects include dangerous effects to individuals, large radioactivity release into the environment, or reactor core melt. Technical measures need to be adopted to reduce the risk of accidents or to minimize the amount of radioactivity released to the environment.

When large radioactive substances are released into environment because of calamities, human error or failure is considered as nuclear accidents.

Major reason for Nuclear Disaster:

The prime reason for nuclear accident is coolant failure. Coolant is used to cool nuclear reactor generating temperature and this is always maintained at a proper level. Most of the nuclear reactors around the world are PHWR which use heavy water as coolant. The overheated heavy water heats the surrounding water which turns into steam and turns turbines for electricity.

As coolant failure persists, nuclear reactor core gets overheated. Even if control rods are made down in order to stop nuclear fission process, the problem persists in the form of overheat. The generated overheat cannot get controlled without heavy water. The overheat generated melts fuel rods and steel frame and gets down to earth in deep. There it contacts with ground water and steam is made. This steam is spread around, which is very harmful.

Apart from its disastrous potential, nuclear radiation is one of the most effective means of providing electricity to the country and ensuring

economic development. If handled carefully, nuclear energy can be a greener alternative to other forms of energy like coal and petrol. Proponents, such as the World Nuclear Association, the IAEA and Environmentalists for Nuclear Energy believe that nuclear power is a safe, sustainable energy source that reduces carbon emissions.

Consequences of nuclear disaster:

- Nuclear explosions produce both immediate and delayed destructive effects.
 - Immediate effects (blast, thermal radiation, prompt ionizing radiation) are produced and cause significant destruction within seconds or minutes of a nuclear detonation.
 - The delayed effects (radioactive fallout and other possible environmental effects) inflict damage over an extended period ranging from hours to centuries, and can cause adverse effects in locations very distant from the site of the detonation.
- Direct contact leads to radioactive sickness which may lead to death.
- Cancer is major problem in affected areas and this effect may stay longer.
- Air and water will be contaminated due to radioactive steam and groundwater mixing with radioactive substances.
- Land degradation.
- It affects eye sight.
- The ecological system gets disturbed.
- Birds and animals have affect on their reproductive systems.
- Gene disturbances and deformity in newly born.
- Nuclear disaster can produce climate issues because the high temperatures of the nuclear fireball cause large amounts of nitrogen oxides formed from the oxygen and nitrogen in the atmosphere. Each megaton of yield will produce some 5000 tons of nitrogen oxides. The rising fireball of a high kiloton or megaton range warhead will carry these nitric oxides well up into the stratosphere, where they can reach the ozone layer. A series of large atmospheric explosions could significantly deplete the ozone layer.
- Nuclear explosions can release high levels of radiation, an energy that removes electrons.
- Nuclear radiation can damage DNA.

- A nuclear disaster causes the depletion of the ozone layer which in turn leads to skin diseases. The only way to insure safety of people is to build robust nuclear reactors and efficient coolants. Prevention is better than cure.

Corrective measures:

- Fukushima disaster caused many people to become aware of KI tablets, available from your local drug store, via outlets online and sometimes distributed by utilities or local officials to people living near nuclear facilities experiencing problems. This stable form of iodine, which is used by the thyroid gland to produce necessary hormones for metabolism and fetal brain development, can protect your thyroid gland from radioactive iodine-131. But it does not protect against any other limiting isotopes likely to be released from a nuclear event.
- In case of a Nuclear Disaster - People should stay inside buildings or areas far away from the nuclear plant
- Phones should not be used unless absolutely necessary, the lines may collapse if everybody is using phones and phone lines are very necessary for emergency equipment.
- There should be a ban on consumption of agricultural products or water. For example in Japan there was a ban on consumption of products from near the nuclear plant.
- Evacuation of affected place when alarmed.
- Wearing mask is necessary.
- Staying home.
- Not drinking tap water of affected area.
- Government should supply drinking water by tanks and other suppliers.

International Nuclear Event Scale:

Some Nuclear and Radiation accidents over the history:

- i. **1952** - AECL Chalk River Laboratories, Chalk River, Ontario, Canada: Partial meltdown, about 10,000 Curies released.
- ii. **September 1957** - a plutonium fire occurred at the Rocky Flats Plant, which resulted in the contamination of Building 71 and the release of plutonium into the atmosphere, causing US \$818,600 in damage.
- iii. **September 1957** - Mayak nuclear waste storage tank explosion at Chelyabinsk, Two hundred plus fatalities, believed to be a

- conservative estimate; 270,000 people were exposed to dangerous radiation levels. Over thirty small communities had been removed from Soviet maps between 1958 and 1991.
- iv. **October 1957** - Windscale fire, UK, Fire ignites plutonium piles and contaminates surrounding dairy farms. An estimated 33 cancer deaths.
 - v. **1959, 1964, 1969** - Santa Susana Field Laboratory, Los Angeles, California, Partial meltdowns.
 - vi. **July 1961** - Soviet submarine K-19 accident, Eight fatalities and more than 30 people were over-exposed to radiation.
 - vii. **1962** - Radiation accident in Mexico City, four fatalities.
 - viii. **January 1969** - Lucens reactor in Switzerland undergoes partial core meltdown leading to massive radioactive contamination of a cavern.
 - ix. **July 1979** - Church Rock Uranium Mill Spill in New Mexico, USA, when United Nuclear Corporation's uranium mill tailings disposal pond breached its dam.
 - x. **March 1984** - Radiation accident in Morocco, eight fatalities
 - xi. **August 1985** - Soviet submarine K-431 accident. Ten fatalities and 49 other people suffered radiation injuries.
 - xii. **September 1987** - Goiania accident. Four fatalities and 249 other people received serious radiation contamination.
 - xiii. **December 1990** - Radiotherapy accident in Zaragoza. Eleven fatalities and 27 other patients were injured.
 - xiv. **April 1993** - accident at the Tomsk-7 Reprocessing Complex, when a tank exploded while being cleaned with nitric acid. The explosion released a cloud of radioactive gas.
 - xv. **1996** - Radiotherapy accident in Costa Rica. Thirteen fatalities and 114 other patients received an overdose of radiation
 - xvi. **September 1999** - Criticality accident at Tokai nuclear fuel plant (Japan)
 - xvii. **February 2000** - Three deaths and ten injuries resulted in Samut Prakarn when a radiation-therapy unit was dismantled.
 - xviii. **April 2010** - Mayapuri radiological accident, India, one fatality.
 - xix. **March 2011** - Fukushima I nuclear accidents, Japan (current event).
 - xx. **March 2011** - Fukushima Daichi Power Station - radioactive discharge

Nuclear Plants in India 2010:

- Narora, UP - 440 MW
- Rawatbhata, Raj - 2,580 MW
- Kakrapar, Gujarat - 1,840 MW
- Tarapur, Mah - 1,400 MW
- Kaiga, Karnataka - 880 MW
- Kalpakkam, TN - 940 MW

Post Indo-US Nuclear Deal Existing Plants Proposed Plants:

- Narora, UP - 440 MW
- Rawatbhata, Raj - 2,580 MW
- Bargi, MP 1,400 MW
- Kakrapar, Gujarat - 1,840 MW
- Mithi Virdi, Gujarat 8,000 MW
- Tarapur, Mah - 1,400 MW
- Kaiga, Karnataka - 880 MW
- Kalpakkam, TN - 940 MW
- Jaitapur, Mah - 9,900 MW
- Haripur, WB 10,000 MW
- Kovvada, AP 8,000 MW
- Koodankulam , TN 9,200 MW
- Kumhariya, Haryana 2,800 MW

Impact of Nuclear Accidents in India Can you imagine the massive loss of Human Lives, Forests, Agriculture, Existing Plants Proposed Plants Animals, and Economic Activities for 1000's of years!

Major nuclear accidents:

- i. **Three Mile Island accident:** This island is situated at Pennsylvania in United States of America. This disaster occurred due to coolant failure on March 28, 1979. Human error was also associated with it. This is major nuclear accident in history of USA. However, there are no direct casualties in this accident.
- ii. **Chernobyl accident:** This accident is also due to coolant failure occurred in former Soviet Union on April 26, 1986. Present, it is in Ukraine. It is abandoned city which was once a potential habitation for 14,000 people. The radioactive steam spread over large parts of Russia which made 3, 36,000 people migrate.