

HSE CONTROL OF NUCLEAR POWER GENERATION

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INTRODUCTION

Nuclear power is the best solution to fill the gap between demand and supply of electrical power and, nuclear power plant is the source of power generation from the heat energy produced by the nuclear fission of certain heavy elements, such as radioactive isotopes of uranium and plutonium.

Health safety and environment (hse) control is essential to ensure safe and steady p operation of nuclear plant. Special measures and procedures to be carried out for the protection of workers of the plant and the general public from there radiations. Continuous surveillance of the plant is necessary to make sure that no one receives an unnecessary or hazardous exposure to radiation except the permissible level.

STAGES OF CONTROL:

a) **Operational control:**

Under the designed conditions safe and steady operation of the power plant is essential, for which different controls and instrumentations are provided. These are used for start up, for achieving the desired power level, smooth operation and for the shutdown of the reactor as and when required. The control of nuclear reactor is possible by changing the quality of fissionable fuel moderator, reflector or the neutron absorber. Each one of them or a combination of them are being used for reactor control. Special instruments are used to measure the neutrons in the reactor core, which is proportional to the power level of a reactor.

b) **Radiation control:**

For controlling external radiation shielding is provided around the reactor for radiation control to protect the people and equipment from exposure to harmful radiations coming out of the nuclear power reactors. When very intensive radiation is received by the living body, it can be damaged to the point of severe illness or death. Shielding are therefore provided to prevent the radiation from reaching the human body. Usually the dense materials such as lead, concrete or water are used for shielding. There are two main effects of radiation on human beings:

1. **Somatic effects :**

Somatic effects relate to injuries to cells, which are concerned with the maintenance of the body functions, such as cells in the blood and bone marrow etc.

2. **Genetic effects**

It relates to the injuries to cells and tissues which are more radiosensitive and are responsible for the propagation of genetic characteristics to the subsequent generations.

c) **Hazards control**

Hazards arising from the use of radiation sources can be divided into two sections:

- a. External hazards are to be minimized by reducing all external radiations levels to bare minimum. This can be accomplished by a number of methods, including the following:
 - Maintain the maximum possible distance between the radiation source and the worker.
 - Using proper shielding between the source and the worker
 - Conducting regular area and personal monitoring checks to ensure minimum radiation exposures.
- b. Internal hazards to be controlled by the following additional measures:
 - Ensuring that good house keeping habits are maintained in all areas where open sources are handled.
 - Conducting all operations with open sources in enclosures such as fume cupboard and glove boxes.
 - Conducting periodic survey aimed at ensuring that the degree of air, surface, effluent and personnel contamination is well within acceptable limits.

Hazard of health and safety demand control of radiation dose to operation and maintenance personnel, freedom from contamination by radionuclides in control and maintenance areas and the elimination of any risk of nuclear excursion due to the accumulation of critical quantities of plutonium or enriched uranium.

Environmental pollution:

In spite of protective measures such as cooling towers etc. Every reactor has some effect on environment as it will occupy some space, use cooling water and reject heat,

radiation, waste etc. To the environment. Strict regulations therefore are enforced allowing minimum possible impact on the environment. The impact evaluation on environments may be divided into five groups:

- i. Radiological and radioactive
- ii. Heat dissipation
- iii. Chemicals and other waste
- iv. Disturbance of site and nature etc.
- v. Effects due to noise, and site construction etc.

Conclusion:

The principal objective of HSE programmes associated with nuclear power plant are to assist plant management:

1. In reducing the number and severity of accidents;
2. To detect at an early stage significant perturbations in reactor operation, which, if not corrected, may lead to reactor accidents;
3. To be alert to increase in levels of radiation background; and
4. To take immediate remedial measures which assure appropriate correction before rather than after accidents have had the time to develop.

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