Nuclear Safety: What Is It All About

Sudhinder Thakur

The nuclear power reactors handle radioactive substances. They produce power on 24X7 hour basis (base load generation) at stable, predictable and competitive prices with very much lower emissions than fossil fuels and thereby calling it as low carbon electricity source. But as reactors use nuclear substances, nuclear radiations are associated by nuclear power. The stress on nuclear safety, therefore, is to ensure that the workers, public and environment are not exposed to any risks from nuclear radiation.

Radiation is a way of life and it is present all around us, everybody is exposed to it. On average, every individual receives 2400 micro sievert (units for the sake of simplicity) of radiation in a year from natural sources. Additionally, one gets 50 units for each chest X ray examination if conducted or 200 units for an 8 hour round air trip. The maximum limits imposed for an astronaut per mission is 250,000 units. Similarly the maximum limit imposed on nuclear occupational workers is 250,000 units, as one time, for an emergency operation. The normal limits are 20,000 units per year which can go to 30,000 units within all overall ceiling of 100,000 units in five years. But these are occupational related exposures. The exposures to public from nuclear operations need to be kept to as low as possible and a limit of 1000 units per year is applicable. While this level of exposure is at least one thousandth of the level at which some temporary effects of radiation are observed, these are in way to be construed as license to the operators. The entire gamut of nuclear safety is thus directed to keep the exposures to as low as possible.

> The limits for operation of nuclear plants are least one thousandth of the level at which some temporary harmful effects of radiation are observed.

Considering the commitment, nuclear safety is accorded highest priority in all aspects from siting, design, construction, commissioning, operation and eventual decommissioning of nuclear installations. The global nuclear community realizing that “accident anywhere is accident anywhere” has over the years evolved very stringent codes and guides for safe operation of the nuclear installations and works in a collaborative mode, unparalleled by any other industry, for safely enhancement. While the exposures to the occupational workers are documented and constitute an important parameter for performance indicator, the exposures to member of public in the vicinity of the power station are also established for all installations. The actual exposures for each of installation range from two to twenty units, depending upon the number of facilities at a site, as against regulatory requirement of 1000 units. This is accomplished through well established principles of defence in depth, provision of multiple barriers to release of radioactivity, well documented procedures of operation and above all qualified and licensed operators. The aim is to separate installation from the environment from the reactor; whatever

> The actual annual exposure to the public is 2 to 20 uSv as against 1000 uSv specified by AERB

happens inside the reactor, should not impact outside and the other way around as well.

An accident can happen however well designed and operated the installation is. The nuclear facilities have documented and rehearsed procedures to cater to situations beyond design basis. These are in terms of handling of off site emergencies and provisions of evacuation in extreme cases. The March 11 accident at Fukushima was has been very serious, continues to be a concern even after two months, involved not one but four reactors. It has been an economic disaster both in terms of written off reactors, clean up costs and resettlement of the evacuees, but no one well either amongst occupational workers or the public has been exposed to harmful levels of radiation. This is huge cost, but nuclear safety is paramount and has not been compromised.

The nuclear industry lays great stress on safety; the public perception of the technology is one fraught with dangers, otherwise why so much safety and the overlap in the media between March 11 Tsunami in Japan and reactors at Fukushima has further accentuated the gap. Clearly there is a need and scope for greater communication.

No one has been exposed to harmful levels of radiation at Fukushima

(The author was Executive Director, NPCIL and views expressed are his own)