Highlights of Presentation on "Perspectives of Nuclear Safety Management"

Shri A.K. Balasubrahmanian, Chairman, AERB gave a talk on *"Perspectives of Nuclear Safety Management"*. The presentation provided an overview of the evolution and current framework of safety in the conventional industry and nuclear sector. It highlighted how safety has progressed from conventional, reactive approaches to proactive, system-based frameworks where safety is intrinsically embedded in design, processes, and organizational culture. The evolution of engineering and fire safety practices was cited as an example of how safety has matured into a structured, scientific, and data-driven discipline. As a key example, development of engineering codes and standards, particularly the ASME Boiler and Pressure Vessel Code (BPVC), which marked the shift from empirical practices to codified design requirements, forming the backbone of safety in high-risk industries.

The talk introduced core principles of nuclear safety, including nuclear fuel integrity, fundamental safety functions—Control, Cooling, and Containment—and the conmcept of multiple physical barriers to prevent the release of radioactivity. The principle of Defence-in-Depth and other important design considerations was emphasized as central to ensuring safety under both normal and accident conditions.

The role of safety assessment methodologies, including Deterministic Safety Analysis (DSA) and Probabilistic Safety Analysis (PSA) was highlighted, in evaluating plant response to postulated initiating events and ensuring fulfilment of safety functions across different plant states, thereby reinforcing reliability, quality, and safety.

In Indian context, the Atomic Energy Regulatory Board (AERB) has a robust regulatory framework, developed in alignment with technological advancements, national regulations, regulatory experience, and international benchmarks, including IAEA Safety Standards. AERB develops regulatory documents and exercises comprehensive oversight across all stages of nuclear power plants—from design to operation—ensuring adherence to safety requirements.

The presentation emphasized that nuclear safety rests on two interdependent pillars: a strong technical foundation and the human and organizational dimension, including leadership, management systems, competence development, and safety culture. The evolution of quality practices—from Quality Control (QC) to Quality Assurance (QA), Quality Management Systems (QMS), Integrated Management Systems (IMS), and leadership-driven systems—was highlighted as a key enabler of safety. Strong leadership was identified as critical in fostering safety culture, ensuring accountability, and prioritizing safety in decision-making.

In conclusion, nuclear safety management requires the integrated application of robust technical systems, effective regulatory oversight, strong leadership, and competent human performance to ensure safe, reliable, and sustainable operation with no adverse impact on the public or the environment.

“Safety Everywhere, Safety Always.”