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How to ensure safety of a nuclear installation (Perspective of different Stakeholders)

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### How to Ensure Safety of a Nuclear Installation (Operator)

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#### **OPERATOR CARRIES ON FULL RESPONSIBILITY FOR THE SAFETY OF NUCLEAR POWER PLANT**

- How it could and should be practically implemented, and
- What are the Operator safety objectives (how safe is safe enough)?

Operator is working in the environment defined by the national Safety Culture which is characterized by:

- nuclear risk and importance of quality is acknowledged and understood by persons connected to safety decision and they act in responsible way;
- Presence of full-powered RB and off site rescue organization for emergency;
- Permanent updating of safety regulation assigning the responsibilities of Operator;
- National scientific, industrial and educational infrastructure;
- International co-operation, etc.

# **Basis to Meet the Operator Responsibility**

Operator should plan, develop and implement Integrated Management System which give opportunity:

1.To have effective organizational structure with well-defined distribution of responsibilities and authorities corresponding to the responsibilities;
2.To implement staffing system with clear defined requirements to the personnel competence in accordance with gradual approach to safety and well-developed program of personnel training for qualification upgrading and psychological preparation to act in accident and unexpected condition;
3.To perform permanent analysis of deviation from normal operation

conditions, to develop and implement of corrective and compensatory measures for safety upgrading;

4.To monitor environment and infrastructure in vicinity of the NPP site and implement measures to maintain NPP safety in response of external challengers;

5.To collect information on operational experience, and on scientific achievements, provided by of IAEA, WANO, other Operators, analysis of the collected information, and further development and implementation of measures to safety upgrade.

# **Basis to Meet the Operator Responsibility**

#### **Questioning attitude:**

- Is the design safe?
- Are the safety limits and conditions well defined and understood by personnel?
- Is the quality of the NPP as a whole adequate?
- Are the operating and maintenance personnel properly qualified?
- Is information on operating experience of other Operators assessed and lessons learned implemented?
- Is the requirements of the RB understood?
- Is the safety culture of the Operator at acceptable level?

## **Operator Indications of Strong Safety Culture**

- Responsible persons acknowledge and understand the quality and the magnitude of nuclear risk, and act in responsible way;
- The commitment to safety is manifested clearly and openly, Operator personnel understand the importance of prioritizing the safety before economy or other interests and take the actions correspondingly;
- Permanent updating of operation and maintenance procedures;
- Relationship with the RB is on acceptable level;
- Process of self assessment is implemented at all level of Operator management hierarchy.

## What Are the Safety Objectives?

Nuclear safety is directed on maintenance of radiological safety of NPP personnel, members of society and prevention the radiological contamination of the environment.

Technical safety objective is directed on prevention of the releases of radioactive materials from the NPP to the environment. To achieve this goal it should be assured in all circumstances, including unexpected:

- shutdown of the reactor;
- heat transfer from the nuclear fuel; and
- confinement of radioactive materials.

NPP should be provided with designed protection systems to assure safe shut-down, fuel cooling, confinement of radioactive materials, monitoring of NPP conditions and mitigation of possible radiological consequences and also with additional safety features to overcome accident condition in the case of unexpected events (multiple failure).

## Means to Reach the Safety Objectives:

#### **Operator should guarantee:**

- high quality of design, construction and operation by comprehensive quality management program;
- implementation of defense —in- depth principle, including multiple-barrier protection, redundant systems working with diverse principles as far as practically possible;
- testing and analyzing the NPP and its systems using best estimate and probabilistic approaches to verify NPP behavior in normal, transient and accident conditions to make sure that plant meets the safety objectives;
- probabilistic analysis to assess internal reliabilities, revealing possible weaknesses and use PSA results towards balanced systems;
- utilizing automated systems in normal and accident conditions; etc.

Operator should understand the crucial role of operators and shift supervisors in accident and unexpected situations, develop and implement the training programs for increase of their qualification and psychological readiness to act in unexpected and accident conditions.

# Means to Reach the Safety Objectives:

#### **Operator should:**

- assess and be prepared for extreme natural phenomena (storms, earthquakes, tsunamis, etc.) that could load the NPP with exceeding design values;
- provide NPP for unexpected situations with special diagnostic systems, electric power supply, spent fuel heat removal, water supply, ultimate heat sink, pressure relief-valves of primary system and environmental radiation monitoring system, etc.;
- develop procedures for unexpected situations and diagnostic, including symptom oriented;
- manage ageing of the plant, including changing over personnel and transfer collected knowledge and experience to new generation of personnel;
- create and support well developed communication system for immediate notification of emergency response organizations, local and state authorities, etc.

### **Operator Goals:** "Safety as High as Reasonably Achievable"

Antti Vuorinen, Director General, Emeritus, STUK (Finland) in his message to Japan NUS (August, 2011) proposed to implement SAHARA principle for nuclear safety: "Safety As High As Reasonably Achievable". It was his latest message, it was his testament to us:

- in addition to the well-proven solutions even the latest achievements of science and technology should be utilized, where applicable;
- learning incidents and accident is the way for improving nuclear safety and it should be followed by careful consideration about back-fitting of the NPP, procedures, operator training etc.;
- PSA & cost benefit analyses should be implemented to take decision on safety improvements;
- uncertainties of accident with a very low probability and possibility for severe consequences are too big for an analytic decision. The pragmatic approach is preferable. All practicable measures to prevent major radioactive leakages from NPP must be taken.

# Safety Upgrading is a Permanent Process – Stoppage Leads to Losses in Safety

**Operator** -1: "We have excellent behaviors, we solved all safety issues. We could not have the problems our colleagues faced" - it is a very bad position, it is complacency.

Within such attitude to safety you open the door for big problems.

**Operator** – **2.** "We have excellent behaviors, but we perform permanent monitoring of our NPP conditions and assess information of other Operators, IAEA and WANO publication, last scientific data and planning, and implement additional measures for safety upgrading in accordance with lessons learned of our experience and experience of others».

It is a good attitude to safety, it is strong Safety Culture.