

# Improvements in the Management of Safety in Research Reactor Operation through Appropriate Application of Selected Power Reactor Good Practices

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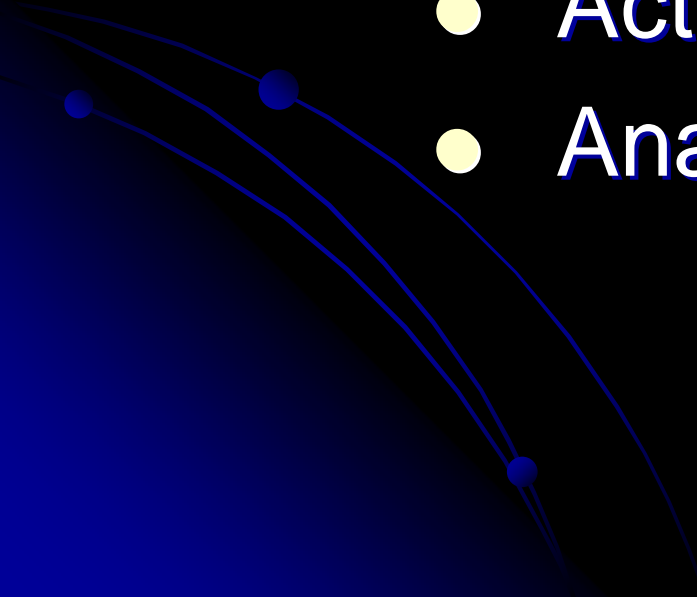
# International Nuclear Safety Advisory Group (INSAG) Definitions

- The safety management system comprises those arrangements made by the organization for the management of safety in order to promote a strong safety culture and achieve good safety performance.
- Safety Culture is that assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, nuclear plant safety issues receive the attention warranted by their significance.

# Traditional Safety Management System

- Policy Manual
- Safety Analysis Report
- Operational Limits and Conditions
- Operating and Emergency Procedures
- Surveillance and Preventative Maintenance Programme
- Radiation Protection Programme
- Training Programme

# Assessing Potential Enhancements

- Observation
  - Apparent Problem
  - Actual Problem
  - Analysis
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# Observation #1 – Frequent Failure to Perform Required Instrument Checks

- Apparent Problem: Operator error
- Actual Problem: Procedures do not include all requirements to perform the checks
- Analysis:
  - Initial assessment, poor human performance
  - Procedures did not state the requirement
  - Root cause, inconsistency in procedures

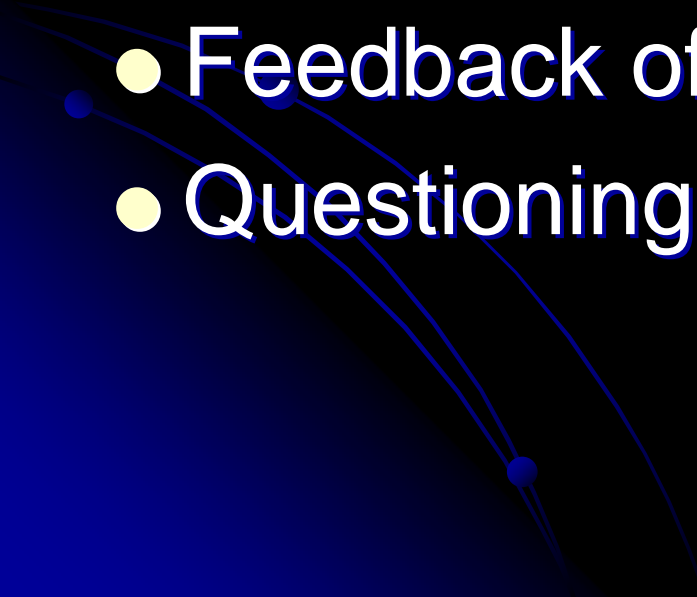
# Observation #3 – Routine Scrams Resulting from Ruptured Valve Diaphragm

- Apparent Problem: Poor diaphragm material on the market
- Actual Problem: Valve was over-torqued during re-assembly
- Analysis:
  - Skill-of-the-trade knowledge was assumed
  - No maintenance procedure addressing torque
  - Root cause, insufficient training or procedures

# Observation #5 – Lab Cleaned by Custodian Frequently Left Contaminated

- Apparent Problem: Lab users messy and careless
- Actual Problem: Custodian lacks a strong safety culture
- Analysis:
  - Labs cleaned by others rarely contaminated
  - Others ask lab users for advice in handling materials, hints for improved performance, and results of smear data (feedback)

# Areas of Desired Improvements


- Procedure content and consistency
  - Training for repairman
  - Procedure to support skill-of-the-craft
  - Feedback of performance information
  - Questioning attitude
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# Programmes to Consider

- Standardized Writers' Guide
- Expanded Training
- Quality Assurance Oversight
- Design Change Control and Configuration Management Process
- Work Control Process
- Corrective Action Programme

# Standardized Writers' Guide

- Capture best practices
  - Consistency
    - Format and content
    - Interface between documents
  - Completeness
    - Acceptance range for recorded data
    - Data trending
    - Human factors
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# Expanded Training

- Reactor Operators & Radiation Protection
- Mechanical, Electrical & Instrumentation
- Rigging, Crane or Fork Lift Operator
- Succession Planning
- Systematic Approach to Training
- ALARA, dose and waste reduction
- Lessons learned and good practices

# Quality Assurance Oversight

- Assure independent review exists in the organization
- Control of design, drawings, facility modifications, procedures, procurement, per design basis and safety analysis
- Disposition of non-conforming items and corrective actions
- Internal auditors or inspectors

# Design Change Control and Configuration Management Process

- Replacement parts and new technologies
- Facility upgrades and new experiments
- Revised design basis and revised Safety Analysis Report
- Updated documents; facility drawings, procedures, surveillance, maintenance, training material

# Work Control Process

- Plan, coordinate, monitor, communicate
- Integrate design change analysis with engineering, construction, operations, radiation protection
- Plan-of-the-day coordination meetings
- Pre-job briefings, hold points, tag-outs, foreign material exclusion, pre-start testing, startup testing, nuclear and non-nuclear hazard potential

# Corrective Action Programme

- Identify, prioritize, track resolution
- Worker and management involvement
- Root cause analysis
- Performance trending
- Computer tracking, software available
- Ownership in problem resolution leads to improved safety culture

# Consideration when Importing Lessons Learned

- Analyze performance vs. enhancements
- Prioritize initiatives
- Replicate successful experiences of others
  - Consider size of operation and staff
  - Scaling programme to research reactor size
  - Resources available
- Incorporate safety culture enhancements.