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Title: ALARA in BNFL - The role of inspection internal to a major nuclear operator

Abstract: The paper describes and discusses the development and functioning of multi-tiered inspection arrangements in BNFL(UK) which are in place to provide assurance that legal and policy requirements relating to actual and potential occupational and public exposures arising from its fuel cycle activities are implemented throughout the organisation.

Introduction

The BNFL approach to adoption of the ALARA principle to its design, commissioning, operation and decommissioning activities as endorsed by the regulator, (Nuclear Installations Inspectorate), is set out in Corporate level documentation as part of its Safety Management System. Guidance material on ALARA methodology takes account of advice from ICRP and NRPB and draws on international experience in the nuclear industry. Guidance covers awareness, training and communication, allocation of responsibilities, co-operation, place of cost-benefit analysis, visibility of optioneering during design and checklists for enabling ALARA decision-making during project work and as part of work planning and post-job review.

This paper sets out the role of the Corporate Independent Inspector in helping the company apply the ALARA principle.

Background

Formed from the UK Atomic Energy Authority in 1971, BNFL is a world player in the provision of nuclear fuel services. Its activities span reactor design, fuel manufacture, reactor operation, irradiated fuel transport, reprocessing and decommissioning of nuclear facilities. It employs 23,000 people in 16 countries and has 12% of the world nuclear market.

Application of the ALARA principle is important to BNFL not only for legal compliance but in the context of maintaining public acceptance of its operations and for industrial relations reasons. The public do not expect to be exposed at or near dose limits. The workforce need to be assured that the company is doing all it can, as a caring employer, to restrict exposure and thus protect worker health.

Taking the above into account and applying the concept of tolerability of risk, the Company self-imposes dose targets for the public (critical group exposure levels) and dose targets for occupational exposure at corporate, site and plant level which are more restrictive than the law demands. These targets provide a strong driver to reduce doses even below the point where application of standard £/man Sievert valuations could justify exposures. The setting of such target levels effectively reduces the scope for further reductions by formal application of cost-benefit analysis. However, ALARA is seen as a continuous striving to avoid unnecessary exposure and at the working level “reasonableness” is applied to steps to further reduce exposures not involving excessive cost or other dis-benefit.

Inspection, audit and review

BNFL has a safety management system modelled on the UK Health & Safety Executive’s “Successful Health & Safety Management” Ref. 1. This sets out the key inter-linking elements of a safety management system as

- Policy
- Organisation
- Planning and Implementation
- Measuring Performance
- Reviewing performance and
- Auditing

Responsibility for safety is placed firmly on facility and line management. Inspection, audit and review arrangements are in place to assist line management discharge their responsibilities and to continuously improve. Requirements for inspection, audit and review are set out at Corporate and site level. Processes and how they bear on ALARA include:

- Behavioural Safety Observations – e.g. peer check that dosimeters are being worn, barrier procedures adhered to
- General supervision by line management – e.g. ensuring compliance with Local Rules (required by the UK Ionising Radiations Regulations)
- Pro-active monitoring by management and safety advisers – e.g. follow a particular activity, confirm that steps necessary to achieve exposures which are ALARA are being followed
- Audit – e.g. at site level, compliance with site procedure on dose control
- Review- e.g. Safety Committees keep exposures, survey schedules and dosimetry arrangements under review, annual management review sets ALARA targets and inputs radiological protection items into safety improvement plan
- Inspection – e.g. topic inspections on an aspect of radiological control (company or site wide), plant or project specific team inspections

Role of Independent Inspector – general

BNFL appointed a team of Corporate Independent Inspectors in late 2000 as part of the BNFL response to a major review of control and supervision at the Sellafield Site in 1999 by the regulator (Nuclear Installations Inspectorate of the UK Health & Safety Executive). It is the role of these inspectors to inspect on the BNFL UK sites for compliance with EH&S legislation and Company Policy and provide assurance to the BNFL Board through the Director of EHS&Q. All aspects of the safety management system and its interpretation and application are open to inspection. Their reporting line is independent of site and facility management. The team of inspectors includes expertise in many relevant fields including radiological protection. Successful inspection leading to sustained improvement relies on acceptance of the inspection regime by those inspected and respect for the knowledge and experience of the inspectors.

Role of Independent Inspector - ALARA

Key activities and attributes of inspection of ALARA

Pre-inspection

- Understand concept of ALARA in context of radiological protection legislation
- Familiarity with safety management system, company policies and standards and regulatory approach to ALARA
- Understand roles, responsibilities, activities and "observables" relating to ALARA within the organisation inspected. This includes an awareness of "contra-indications" ie evidence that systems are not functioning as they should which management should be aware of and need to take steps to correct. (See Appendix 2)

During inspection

- Unrestricted access to people and plant to observe activities, question practitioners at all levels, places and times
- Be sensitive to the ALARA culture (See Appendix 1)
- Coach at all levels to enable local management to be self-regulating

Post-inspection

- Ability to recognise weakness/vulnerability, form balanced judgement about extent of ALARA application/shortfalls/improvement areas
- Identify practical ways to address shortfalls (policies, knowledge, understanding, procedures, behaviours, plant and equipment)
- Identify most appropriate roles/level for taking corrective action

- Engage responsible management, include "what's in it for them" and secure commitment to respond to improvement areas
- Persist in encouraging management on improvement activity/use escalation process until improvement is sustained

Outcomes of ALARA Inspection

At Corporate level

- Corporate assurance that the ALARA principle is being applied in accordance with company policy and actual and potential exposures are being controlled to ALARA
- Assurance that Company policy on ALARA is practicable and sustainable

At site/facility level

- Increased confidence in approach and application of ALARA principle
- More robust demonstration of ALARA application to provide stronger defence against external regulator challenge on ALARA

Summary

- Corporate Independent Inspection has a part to play in encouraging wider application of ALARA across a broad spectrum of decision-making in the company and strengthens the site's position in the eyes of the external regulator
- Corporate Independent Inspection provides assurance to the licensee that legal requirements in respect of controlling exposures to ALARA are being met
- Corporate Independent Inspectors have no authority but exercise influence in proportion to the respect in which they are held in by those they inspect, (deriving from experience, technical competence and persuasiveness), and to management support for the inspection process generally

Reference

1. Successful Health and Safety management. HSG 65, UK Health and Safety Executive, HMSO Books, ISBN 0 7176 1276 7

APPENDIX 1 – Key questions for inspectors to test ALARA application

- At what stages of plant life/during an operating campaign/during a project /during a work activity are there opportunities for considering a range of options which have a bearing on dose uptake?
- Are these opportunities recognised, anticipated and acted upon in time by those with decision-making authority
- Do those with these responsibilities have access to and use relevant sources of advice/OEF information to enable "ALARA decision-making"?
- Are the considerations leading to the decisions documented for visibility and learning?
- What internal controls are in place to assure ALARA is being applied –are these suitable, sufficient, effective and subject to review?
- Do behaviours demonstrate that the ALARA concept is embedded i.e. an ALARA culture – if not, what are the gaps and what more is needed to grow one?

APPENDIX 2 – ALARA application – responsibilities, activities and observables by role

	Designers/ commissioners	**Senior plant manager**	**Middle manager**	**First line supervisor/ Radiation Protection Supervisor**	**Operator/ craftsman**	**Safety adviser/Radiation Protection Adviser**
Responsibilities	Provide plant which designs out hazards and enables operational and decommissioning ALARA (engineering controls e.g. shielding, containment, ventilation, layout, installed monitoring systems)	Intelligent customer for design. Accountable for all operational plant related health and safety including compliance with site procedures covering radiation exposure control.	Operate plants within standards. Select and manage suitable Radiation Protection Supervisors (Ionising Radiation Regulations) and Duly Authorised Persons (Nuclear Site Licence).	Plan and supervise work in a way which minimises exposures. Train operators to behave in a way which minimises their exposures and those of others affected by their behaviours. Provide clear instructions.	Operate and maintain plant safely. Report abnormalities.	Advise management based on thorough knowledge of law and policies and sound judgement.
Activities	Apply design standards and principles. Respond to input from future operator and RPA. Commissioning tests proving design intent.	Provide resources to enable ALARA. Approve and review safety case and modifications which take account of ALARA.	Set local ALARA review levels with advice from RPA. Apply ALARA principles to projects, modifications and method statements.	Manage doses within targets. Identify and implement local dose reduction measures. ALARA considerations built into work safety plans.	Comply with all local rules and instructions. Peer checking.	Design and operational input from concepts through to commissioning operation and decommissioning. Identify dosimetry arrangements. Train RPSs. Promote understanding and application of ALARA.
Observables/ positive indications	Risk criteria met. Dose assessments demonstrate compliance with standards. Optioneering, key	Act on RPA advice. Plant mods consider and apply ALARA explicitly.	Challenging local ALARA review levels set. Investigations taking place when internal levels exceeded.	Hierarchy of controls applied. Trained operators. Local rule enforcement and observance. Pre-job briefs and post-job reviews apply ALARA principles	Abnormal condition reporting including PPE defects. Behaviours minimise own exposure.	Sources of dose quantified. Advice on ALARA application generally and specifically documented.

	Designers/ commissioners	Senior plant manager	Middle manager	First line supervisor/ Radiation Protection Supervisor	Operator/ craftsman	Safety adviser/Radiation Protection Adviser
	decisions and ALARA studies documented, recommendations implemented.			and promote learning and improvement.		
Contra-indications	Operational input to design and commissioning inadequate or not acted upon. Operational flexibility designed-out, unnecessary operational constraints which limit choices available to plant management. Capability of design to cope with additional demands unclear.	Lack of support to plant manager seeking funding to reduce doses. Nothing in Safety improvement plan to drive ALARA. Lack of conservative decision-making including emergency situations.	No awareness of factors likely to change exposures. No review of RPS competence and role performance. No support to First Line Supervisor delay to job while unnecessary sources are removed or shielded i.e. focus on production imperative.	Wide range of doses within working group. Non-compliances tolerated. Work allocated to persons not suitably qualified experienced and trained. Lack of suitable RPE/PPE. Events in which individuals receive unplanned exposures or become contaminated.	Unnecessary exposure due to factors within personal control. Non-compliance with local rules.	Unaware of WANO RP standards. Key decisions taken by designers and operators without RPA input. Managers have poor understanding and awareness of how to apply ALARA principles.