

**GENERIC FSAR TEMPLATE
GUIDANCE FOR ENSURING
THAT OCCUPATIONAL
RADIATION EXPOSURES
ARE AS LOW AS IS
REASONABLY ACHIEVABLE
(ALARA)**

August 2007

Nuclear Energy Institute

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November 2007

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EXECUTIVE SUMMARY

NEI 07-08, Generic FSAR Template Guidance for Ensuring That Occupational Radiation Exposures Are As Low As Is Reasonably Achievable (ALARA), Revision 0, provides a generic program description for use in developing construction and operating license (COL) applications. This generic template guidance is for use only in conjunction with the companion template NEI 07-03, “Generic FSAR Template Guidance for Radiation Protection Program Description.” The document reflects contemporary NRC guidance, including Regulatory Guide 1.206 (Draft Guide DG-1145), “COL Applications for Nuclear Power Plants (LWR Edition),” and industry-NRC discussions regarding the applicable standard review plan section. A main objective of this program description is to assist in expediting NRC review and issuance of the combined license.

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GENERIC FSAR TEMPLATE GUIDANCE FOR ENSURING THAT OCCUPATIONAL RADIATION EXPOSURES ARE AS LOW AS IS REASONABLY ACHIEVABLE (ALARA), REVISION 0

12.1 ENSURING THAT OCCUPATIONAL RADIATION EXPOSURES ARE ALARA

12.1.1 OPERATIONAL POLICIES

Company and station policies are to keep all radiation exposure of personnel within limits defined by 10 CFR 20, Standards for Protection Against Radiation. Administrative procedures and practices related to maintaining radiation exposure of personnel as low as is reasonable achievable (ALARA) are described in this section.

The ALARA policy is consistent with Regulatory Guide 8.8, Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations Will Be As Low As is Reasonably Achievable and Regulatory Guide 8.10, Operating Philosophy for Maintaining Occupational Radiation Exposures As Low As is Reasonably Achievable in establishing, organizing, and operating an effective ALARA program.

To varying extents, all station personnel are responsible for ALARA. Each supervisor is responsible for enforcing ALARA requirements. Individual workers are responsible for complying with ALARA requirements, which are presented during initial plant training and reinforced through annual retraining. The extent of ALARA training provided for each person is at least commensurate with the worker's job responsibilities and plant areas frequented. The radiation protection training program is maintained and implemented by the training department.

To ensure that personnel comply with established radiological policies, procedures and practices, radiation protection management personnel are charged with the responsibility to promptly advise higher management of any unsafe practices which exceed their authority to correct. They have the authority to halt any operation which in their judgment is unsafe. Radiation protection technicians are responsible for notifying the operations shift supervision or radiation protection management immediately in order to stop work on any operation deemed to be radiologically unsafe.

12.1.2 REGULATORY COMPLIANCE

As further discussed in FSAR Section 12.5, the station's ALARA policies and practices are consistent with 10 CFR 20. Compliance with Regulatory Guides 1.8, 8.2, 8.7, 8.8, 8.9, 8.10, 8.13, 8.15, 8.27, 8.28, 8.29, 8.34, 8.35, 8.36, 8.38, and the applicable portions of NUREG-1736 is discussed in FSAR Section 12.5, Radiation Protection. Compliance with Regulatory Guide 1.8 is further discussed in FSAR Section 13.2, Training.

12.1.3 OPERATIONAL CONSIDERATIONS

The ALARA program is based on mature programs at other commercial nuclear facilities. As such, it inherently incorporates lessons-learned from decades of operating experience. Industry

operating experience is regularly reviewed, and applicable lessons-learned are incorporated into plans, procedures, and policies as warranted.

Organizational Structure

Organizational structure is discussed in FSAR Section 13.1 and/or FSAR Section 17.5.

Radiation Protection Plan

The station has a radiation protection program and an ALARA program which contain the operational ALARA philosophy. These programs, made available to plant personnel, define management's commitment to ALARA and designate those individuals who have the responsibility and authority to implement the ALARA program. FSAR Section 12.5 provides further radiation protection details, including a description of the radiation work permit (RWP) system.

Training

ALARA training is described in FSAR Sections 12.5 and 13.2.

Procedures

Procedures are developed and maintained in accordance with FSAR Sections 13.5 and 17.5. During initial preparation, procedures for operations, maintenance, refueling, inservice inspections, and radwaste system are reviewed for compliance with ALARA guidelines outlined in the radiation protection plan.

ALARA Program Review and Improvement

Periodic reviews are performed as required by 10 CFR 20.1101, the ALARA Committee and plant management, and are used to monitor workgroup trends as a means of controlling and reducing personnel exposure. All employees are encouraged to submit suggestions on methods of reducing personnel exposure and improving the ALARA program. Operating procedures are revised to incorporate ALARA lessons-learned.

Plant Modifications

Proposed plant modifications are screened for potential adverse radiological impacts. The initial screening review is typically performed by engineering personnel. Written procedures direct further review by radiological protection personnel and management as warranted by level of potential impact.

Work Practices

Radiation protection training, the radiation protection plan, the RWP system, and procedure reviews all help to ensure that radiation exposure of personnel is maintained ALARA. In addition, ALARA work practices are incorporated as shown in the following examples:

- Personnel required to be monitored for radiation exposure in accordance with 10 CFR 20.1502 are assigned TLDs to establish exposure history.
- Direct-reading dosimeters are used so that the worker can determine accumulated exposure at any time during a job.
- Dose rate meters are used as needed to identify elevated dose rates.
- Pre-job briefs are used to review radiological surveys and to plan work before personnel enter a radiation area. The amount of detail included in pre-job briefings is specified by procedures designed to maintain exposures ALARA.
- Post-job debriefs are used to accumulate lessons learned, so that personnel exposure may be reduced on future jobs. The requirement for post-job briefings is specified by procedures.
- For work involving high radiation areas, high collective dose based on administrative controls, high levels of removable contamination relative to site posting criteria for contamination areas, or known or suspected airborne radioactivity areas:
 1. Work is preplanned to minimize personnel exposure as defined in ALARA program procedures
 2. Radiation protection personnel provide coverage as required by radiation protection procedures.

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- On complex jobs in high radiation areas, dry-run training may be utilized. In some cases, mockups are used to familiarize workers with the operations that they are to perform. These techniques are beneficial to improving worker efficiency and minimizing the amount of time spent in the radiation field.
- On jobs where general area radiation levels are greater than 1.5 rem/hour or when individual exposure greater than 500 mrem per entry is expected, stay times are considered as further protection against unnecessary exposure.
- As practical, entry and exit points for work areas are established in areas with low radiation levels. This is done to minimize dose accumulated while changing protective clothing and respiratory equipment. Access points are also established to minimize the spread of removable contamination from the job site.
- As much as practicable, jobs are performed outside radiation areas. This includes activities such as reading instruction manuals or maintenance procedures, adjusting tools or jigs, repairing valve internals, and prefabricating components.
- Individuals working in radiologically controlled areas are trained to be aware of the varying intensities of radiation fields within the general vicinity of their job locations, and instructed to remain in the areas of lower radiation levels as much as possible, consistent with performing their assigned tasks.
- For high radiation area jobs, maps, postings, and/or detailed instructions are provided to clearly delineate the source of radiation or to alert personnel concerning the location of elevated dose rates. Provided with this information and adhering to good radiological

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work practices, workers will be cognizant of their immediate radiological environment, thus maintaining exposures ALARA.

- Protective clothing and respiratory equipment prescribed by radiation protection personnel are commensurate with the radiological hazards involved, and such requirements cannot be decreased by any other personnel. Consideration is given to the discomfort of workers to minimize the effect of protective efforts on efficiency and the time spent in a radiation area.
- Contamination containments (glove bags, plastic bottles, tents, etc.) and special ventilation systems (e.g., HEPA units) are used where practicable when personnel are working on highly contaminated equipment.
- On some jobs, special tools or jigs are used when their use permits the job to be performed more efficiently or prevents errors, thus reducing the time spent in a radiation area.
- In some cases, special tools are used to increase the distance from the source to the worker, thereby reducing the exposure received.
- On certain jobs, consideration is given to use of remote monitoring of personnel with various combinations of audio, visual and dose information to reduce exposure of personnel. Direct communications (e.g., radios) may be used to further enhance radiation protection.
- Some systems and components which are subject to crud buildup are equipped with flush connections to reduce hot-spot buildup. Prior to performing maintenance work on these systems or components, consideration is given to flushing and/or chemically decontaminating the system or piece of equipment in order to reduce the crud levels, thereby reducing personnel exposure.
- Permanent shielding is used, where practicable, to reduce radiation exposure at the work site and in designated "waiting areas" to personnel during periods when they are not actively involved in the work.
- On some jobs, temporary shielding is used, such as lead sheets draped or strapped over a pipe or concrete blocks stacked around a piece of equipment. Temporary shielding is used only if the estimated total exposure, which includes exposure received during installation and removal, is reduced. Experience with such operations is used in developing guidelines in this area.