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12.5 OPERATIONAL RADIATION PROTECTION PROGRAM

REVIEW RESPONSIBILITIES

Primary - Organization responsible for the review of health physics.

Secondary - None

I. AREAS OF REVIEW

The review includes the following areas of the applicant's preliminary safety analysis report (PSAR) for a construction permit (CP) or final safety analysis report (FSAR) for an operating license (OL), design certification (DC), or combined license (COL) as they relate to the operational aspects of the radiation protection program.

The specific areas of review are as follows:

1. Organization

   A. The administrative organization of the radiation protection program, including the authority and responsibility of each position identified (CP PSAR and updates in the OL FSAR, or the COL FSAR).

   B. The experience and qualifications of the personnel responsible for conducting various aspects of the radiation protection program and for handling and monitoring radioactive material. Reference may be made to SAR Chapter 13 as appropriate (OL FSAR or COL FSAR).

USNRC STANDARD REVIEW PLAN

This Standard Review Plan, NUREG-0800, has been prepared to establish criteria that the U.S. Nuclear Regulatory Commission staff responsible for the review of applications to construct and operate nuclear power plants intends to use in evaluating whether an applicant/licensee meets the NRC's regulations. The Standard Review Plan is not a substitute for the NRC's regulations, and compliance with it is not required. However, an applicant is required to identify differences between the design features, analytical techniques, and procedural measures proposed for its facility and the SRP acceptance criteria and evaluate how the proposed alternatives to the SRP acceptance criteria provide an acceptable method of complying with the NRC regulations.

The standard review plan sections are numbered in accordance with corresponding sections in Regulatory Guide 1.70, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants (LWR Edition)." Not all sections of Regulatory Guide 1.70 have a corresponding review plan section. The SRP sections applicable to a combined license application for a new light-water reactor (LWR) are based on Regulatory Guide 1.206, "Combined License Applications for Nuclear Power Plants (LWR Edition)."

These documents are made available to the public as part of the NRC's policy to inform the nuclear industry and the general public of regulatory procedures and policies. Individual sections of NUREG-0800 will be revised periodically, as appropriate, to accommodate comments and to reflect new information and experience. Comments may be submitted electronically by email to NRR_SRP@nrc.gov.

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C. Information describing the implementation of Regulatory Guides 1.8, 8.2, 8.8, and 8.10. Information describing any proposed alternatives (CP PSAR and updates in the OL FSAR, or the COL FSAR).

D. Review of qualifications, experience, and organization related to the operational radiation protection program. This review is coordinated with the general review of staffing and qualifications in SRP Chapter 13.

E. The authority and responsibility of the management and staff for implementation and documentation of radiation program reviews required by 10 CFR 20.1101 and 10 CFR 20.2102 (CP PSAR and updates in the OL FSAR, or the COL FSAR).

2. Equipment, Instrumentation, and Facilities

A. The criteria for selecting portable and laboratory technical equipment and instrumentation for (1) performing radiation and contamination surveys, (2) in-plant airborne radioactivity monitoring and sampling, (3) area radiation monitoring, and (4) personnel monitoring (including audible alarming, electronic dosimeters) for normal operation, anticipated operational occurrences, and accident conditions (CP PSAR and updates in the OL FSAR, DC FSAR, or the COL FSAR). The review includes the quantity of each type of instrument, taking into consideration that some instruments will be unavailable during calibration, maintenance, and repair.

B. The description of instrument storage, calibration, and maintenance facilities (CP PSAR and updates in the OL FSAR, DC FSAR, or the COL FSAR).

C. The description and location of the radiation protection facilities (including locker and shower rooms, personnel decontamination area, respiratory protective equipment, “hot” machine shop and repair facilities, use of close-capture filtration devices, and other contamination control equipment and areas) and information describing how such facilities and services will allow male and female workers to receive the necessary protection against radioactive contamination (CP PSAR and updates in the OL FSAR, DC FSAR, or the COL FSAR).

D. The location of items in A(1), A(2), A(3), and A(4) above and the description of types of detectors and monitors, sensitivity, range, frequency, alarms, and recordkeeping as well as methods of calibration (OL FSAR, DC FSAR, or COL FSAR).

E. Information describing the implementation of the equipment and facilities included in Regulatory Guides 1.97, 8.4, 8.6, 8.8, 8.9, 8.15, 8.20, 8.26, and 8.28 as well as information describing any proposed alternatives (OL FSAR, DC FSAR, or COL FSAR).

3. Procedures

A. The description of physical and administrative measures for controlling access to, and work within, radiation areas, high-radiation areas, and very-high-radiation areas (OL FSAR or COL FSAR).

B. The description of procedures governing the accountability and storage of radioactive sources not fixed to, or installed in, plant systems (CP PSAR and updates in the OL FSAR, or the COL FSAR).

C. The description of procedures and methods of operation for ensuring that occupational radiation exposure (ORE) will be as low as reasonably achievable (ALARA), especially procedures used in refueling, inservice inspections, radwaste handling, spent fuel handling, loading and shipping, normal operation, routine maintenance, and sampling and calibration that are specifically related to radiation safety (OL FSAR or COL FSAR).

D. The description of methods, frequencies, and procedures for conducting radiation surveys (OL FSAR or COL FSAR).

E. The description of the bases and methods for monitoring and control of surface contamination (including loose discrete radioactive particles) for personnel and equipment, including the surveillance program to ensure that licensed materials will not be inadvertently released from the controlled area (OL FSAR or COL FSAR).

F. The description of engineering controls for limiting airborne radioactivity, as well as methods and procedures for evaluating and controlling potential airborne radioactivity concentrations, special air sampling, and issuance and use of respiratory equipment (OL FSAR or COL FSAR).

G. The description of radiation protection training and retraining programs (OL FSAR or COL FSAR).

H. Information describing the implementation of Regulatory Guides 1.8, 1.39, 8.2, 8.7, 8.8, 8.9, 8.10, 8.13, 8.15, 8.20, 8.25, 8.26, 8.27, 8.29, 8.32, 8.34, 8.35, 8.36, and 8.38, including information describing any proposed alternatives (either CP PSAR and updates in OL FSAR or COL FSAR).

I. ~~The description of quality assurance procedures, consistent with the guidance in Regulatory Guide 1.33, to implement the applicable requirements in 10 CFR 20.1101, Appendix B to 10 CFR Part 50, and Subpart H of 10 CFR Part 71 (OL FSAR or COL FSAR). This review is coordinated with the overall review of the quality assurance program in SRP Chapter 17.~~ The description of radiation protection procedures, consistent with the guidance in Regulatory guide 1.33 Appendix A, to implement the applicable requirements in 10 CFR Part 20.1101 and Subpart H of 10 CFR Part 71 (OL FSAR or COL FSAR).

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J. The description of procedures covering (1) the packaging and transportation of licensed radioactive materials pursuant to the requirements of 10 CFR 71.5 and Subpart G of 10 CFR Part 71 and (2) the transfer of low-level radioactive waste pursuant to the requirements of Subpart K of 10 CFR Part 20 (OL FSAR or COL FSAR).

4. Operational Program Description and Implementation. For a COL application, the staff reviews the radiation protection program description and the proposed implementation milestones. The staff also reviews final safety analysis report (FSAR) Table 13.x to ensure that the radiation protection program and associated milestones are included.

Review Interfaces

Other SRP sections interface with this section as follows:

1. For COL reviews of operational programs, the review of the applicant's implementation plan is performed under SRP Section 13.4, "Operational Programs."

II. ACCEPTANCE CRITERIA

Requirements

Acceptance criteria are based on meeting the relevant requirements of the following Commission regulations:

1. 10 CFR 19.12, as it relates to keeping workers informed about the storage, transfer, or use of radioactive materials or radiation and instructing them about the risk associated with ORE, necessary precautions, procedures to reduce exposures, and the purpose and function of the protective devices employed.

2. 10 CFR 20.1101, as it relates to (a) development, documentation, and implementation of a radiation protection program, (b) the use of procedures and controls to achieve doses to workers and the public that are ALARA, as defined in 10 CFR 20.1003, and (c) the review and audit of the radiation protection program content and implementation.

3. 10 CFR 20.1201, as it relates to occupational dose limits for adults.

4. 10 CFR 20.1201, 10 CFR 20.1202, 10 CFR 20.1203, and 10 CFR 20.1204, as they relate to demonstrating compliance with internal and external dose limits.

5. 10 CFR 20.1206 and 10 CFR 20.2105, as they relate to the authorization, control, and documentation of planned special exposures to adult workers.

6. 10 CFR 20.1207, as it relates to control of occupational radiation doses received by minors.

7. 10 CFR 20.1208, as it relates to control of radiation doses received by the embryo/fetus of a declared pregnant worker.

8. 10 CFR 20.1301 and 10 CFR 20.1302, as they relate to controlling radiation doses to individual members of the public and the maximum dose rate in unrestricted areas.

9. 10 CFR 20.1406, as it relates to the facility design and procedures for operation of the plant for minimizing contamination of the facility site.

10. 10 CFR 20.1501, as it relates to performance of surveys to comply with the regulations in 10 CFR Part 20.

11. 10 CFR 20.1501(c) and 10 CFR 20.1502, as they relate to requirements for providing appropriate personnel monitoring equipment to individuals who are occupationally exposed.

12. 10 CFR 20.1601, 10 CFR 20.1602, 10 CFR 20.1901, 10 CFR 20.1902, 10 CFR 20.1903, 10 CFR 20.1904, and 10 CFR 20.1905, as they relate to posting of, and control of access to, radiation areas, high-radiation areas, very-high-radiation areas, airborne radioactivity areas, and other indicators necessary to identify and quantify the presence of radioactive materials in an area.

13. 10 CFR 20.1701 and 10 CFR 20.1702, as they relate to controlling the concentrations and limiting the intake of radioactive materials in the air.

14. 10 CFR 20.1703, as it relates to the use of respiratory protective equipment to limit the intake of radioactive material.

15. 10 CFR 20.1906, as it relates to appropriate handling of packages containing certain quantities of radioactive materials.

16. 10 CFR 20.1801, as it relates to securing licensed materials against unauthorized removal from the place of storage.

17. 10 CFR 20.1802, as it relates to controlling licensed material that is not in storage.

18. 10 CFR 20.2001 and 10 CFR 20.2006, as they relate to the transfer of radioactive materials and the disposal of low-level radioactive waste.

19. 10 CFR 20.2101, 10 CFR 20.2102, 10 CFR 20.2103, 10 CFR 20.2104, 10 CFR 20.2105, 10 CFR 20.2106, 10 CFR 20.2107, and 10 CFR 20.2110, as they relate to maintaining records of individuals who are provided with personnel monitoring equipment and who are exposed to radiation, and records of the radiation protection program, including surveys.

20. 10 CFR 20.2201, as it relates to reports to the NRC required from licensees immediately after they become aware of any loss or theft of certain quantities of licensed material.

21. 10 CFR 20.2202, 10 CFR 20.2203, 10 CFR 20.2204, and 10 CFR 20.2205, as they relate to requirements for reports to the NRC concerning individual exposures that exceed regulatory limits, incidents requiring notification, levels of radiation or concentrations of radioactive materials in excess of certain values, and planned special exposures.

22. 10 CFR 20.2206 and 10 CFR 19.13, as they relate to requirements for informing workers of the results of their individual monitoring.

23. 10 CFR 50.34(f)(2)(viii) and 10 CFR 50.34(f)(2)(xxvii)[1], as they relate to monitoring of in-plant radiation and airborne radioactivity for routine and accident conditions. Refer also to NUREG-0737, items II.B.3 and III.D.3.3, for additional detail and clarification of requirements.

24. 10 CFR 50.120, as it relates to the provisions and requirements for training radiation protection technicians.

25. General Design Criterion (GDC) 64 found in Appendix A to 10 CFR Part 50, as it relates to the provision of appropriate monitoring for the reactor containment atmosphere and spaces containing components for the recirculation of loss-of-coolant-accident fluids.

26. Appendix B to 10 CFR Part 50 and Subpart H of 10 CFR Part 71, as they relate to quality assurance programs.

27. 10 CFR 71.5 and Subpart G of 10 CFR Part 71, as they relate to the control of licensed radioactive material during packaging and transportation, as well as Subpart K of 10 CFR Part 20, as it relates to the transfer of low-level radioactive materials and waste.

SRP Acceptance Criteria

Specific SRP acceptance criteria acceptable to meet the relevant requirements of the NRC's regulations identified above are as follows for the review described in this SRP section. The SRP is not a substitute for the NRC's regulations, and compliance with it is not required. However, an applicant is required to identify differences between the design features, analytical techniques, and procedural measures proposed for its facility and the SRP acceptance criteria and evaluate how the proposed alternatives to the SRP acceptance criteria provide acceptable methods of compliance with the NRC regulations.

The following regulatory guides, NUREGs, and industry standards provide information, recommendations, and guidance and in general describe a basis acceptable to the staff to implement the requirements of 10 CFR Part 19, 10 CFR Part 20, and 10 CFR Part 50:

1. Regulatory Guide 1.8, as it relates to compliance with the Commission's regulations regarding qualification of nuclear power plant personnel

[1]For Part 50 applicants not listed in 10 CFR 50.34(f), the provisions of 50.34(f) will be made a requirement during the licensing process.

2. Regulatory Guide 1.33, as it relates to compliance with the Commission's quality assurance regulatory requirements during nuclear power plant operations.

3. Revision 3 of Regulatory Guide 1.97, as it relates to compliance with the Commission's regulations to provide instrumentation to monitor plant variables and systems during and following an accident.

4. Regulatory Guide 8.2, as it relates to general information on radiation monitoring programs for administrative personnel.

5. Regulatory Guide 8.4, as it relates to standards for direct-reading and indirect-reading pocket dosimeters used for personnel dose or dose rate measurements.

6. Regulatory Guide 8.6, as it relates to testing the operating characteristics of Geiger-Mueller counters before making calibrations and measurements.

7. Regulatory Guide 8.7, as it relates to the specification of records necessary to describe the ORE of individuals and to the conditions under which the exposure may occur.

8. Regulatory Guide 8.8, as it relates to meeting the requirements of 10 CFR 20.1101(b) and the definition of ALARA in 10 CFR 20.1003 by providing radiation protection information pertaining to actions taken during the design, construction, operation, and decommissioning to ensure that ORE remains ALARA.

9. Regulatory Guide 8.9, as it relates to appropriate concepts, models, equations, and assumptions to be used in determining the extent of an individual's intake of radioactive materials and resulting committed organ dose.

10. Regulatory Guide 8.10, as it relates to meeting the requirements of 10 CFR 20.1101(b) and the definition of ALARA in 10 CFR 20.1003 concerning commitment by the applicant's management and vigilance by the radiation protection manager and the radiation protection staff to maintain ORE ALARA.

11. Regulatory Guide 8.13, as it relates to the description of the instruction to be provided concerning biological risks to embryos or fetuses resulting from prenatal ORE.

12. Regulatory Guide 8.15, as it relates to elements of acceptable respiratory protection programs.

13. Regulatory Guide 8.20, as it relates to the development and implementation of a bioassay program for any licensee handling or processing of iodine-125 or iodine-131.

14. Regulatory Guide 8.25, as it relates to monitoring the levels of airborne radioactivity within the facility.

15. Regulatory Guide 8.26, as it relates to bases used by the NRC staff in evaluating the need for license provisions on bioassay programs for workers subject to internal radiation exposure from the inhalation or ingestion of licensed materials.

16. Regulatory Guide 8.27, as it relates to a radiation protection training and retraining program consistent with the ALARA objective and acceptable to the NRC staff for meeting the training requirement of 10 CFR Part 19.

17. Regulatory Guide 8.28, as it relates to the appropriate use of audible alarm dosimeters and the conditions under which they should not be relied on to perform their intended function.

18. Regulatory Guide 8.29, as it relates to providing appropriate instruction on the risks associated with ORE to individuals who might be exposed that are acceptable to the NRC staff for meeting the training requirement of 10 CFR Part 19.

19. Regulatory Guide 8.32, as it relates to monitoring individuals for exposure to tritium.

20. Regulatory Guide 8.34, as it relates to criteria acceptable to the NRC staff that licensees may use to determine when monitoring is required, as well as methods acceptable to the NRC staff for calculating occupational doses when intake is known.

21. Regulatory Guide 8.35, as it relates to guidance on the conditions and prerequisites for permitting planned special exposures, as allowed by 10 CFR Part 20, and the associated specific monitoring and reporting requirements.

22. Regulatory Guide 8.36, as it relates to determination of the total radiation dose to the embryo/fetus as the sum of the deep-dose equivalent to, and dose to the embryo/fetus from, intakes of the declared pregnant worker.

23. Regulatory Guide 8.38, as it relates to guidance on acceptable methods to control access to high- and very-high-radiation areas in nuclear power plants that follows the requirements specified in 10 CFR Part 20.

24. NUREG-0041, as it relates to the provision of technical information to licensees on the appropriate application of respiratory protective devices for protection against airborne radioactive materials, including selection and maintenance of equipment and personnel training.

25. NUREG-0731, as it relates to appropriate staffing levels and technical expertise considered essential within a utility to support nuclear power plant operation properly.

26. NUREG-1736, as it relates to the requirements for a radiation protection program (including program review and audit) and compliance with 10 CFR Part 20.

27. American National Standards Institute (ANSI)/American Nuclear Society (ANS) 3.1-1978, reaffirmed 1999, as it relates to criteria for selection, qualifications, responsibilities, and training of personnel in operating and support organizations, as appropriate for the safe and efficient operation of nuclear power plants.

28. ANSI N13.6-1999, as it relates to guidance to the employer for the systematic generation and retention of records relating to ORE.

29. ANSI/Health Physics Society (HPS) N13.11-2001, as it relates to the performance criteria for personal radiation dosimeters that require processing.

30. ANSI/HPS N13.14-1994, as it relates to personnel monitoring.

31. ANSI/HPS N13.30-1996, as it relates to detection and dosimetry of internally deposited radionuclides.

32. ANSI/HPS N13.42-1997, as it relates to monitoring radiation dose from internally deposited radionuclides.

33. ANSI Institute for Electrical and Electronics Engineers (IEEE) 309-1991, as it relates to guidance on specification of test conditions - such as associated electronic circuitry, environment, and counting rate - to ensure that operating characteristics can be appropriately evaluated

34. ANSI N42.20-2003, as it relates to the accuracy and overall performance of personnel radiation monitors

35. ANSI N42.17A-1989, as it relates to the accuracy and overall performance of portable survey instruments

36. ANSI N323A-1997, as it relates to the calibration and maintenance of portable radiation survey instruments

37. Memorandum from Larry W. Camper to David B. Matthews and Elmo E. Collins, dated October 10, 2006, and NUREG/CR-3587, as they relate to operating programs that facilitate decommissioning.

The specific SRP acceptance criteria are described below.

1. Organization

Acceptance will be based on a determination that the organization described, and the duties, qualifications, and training of the individuals responsible for ensuring that ORE will be ALARA; (1) are in accordance with 10 CFR 20.1101(b) and the definition of ALARA in 10 CFR 20.1103; Regulatory Guides 1.8, 8.2, 8.8, and 8.10; and 10 CFR 19.12; and (2) are such that doses resulting from licensed activities fall within the limits of 10 CFR 20.1201, 10 CFR 20.1202, 10 CFR 20.1203, 10 CFR 20.1204, 10 CFR 20.1301, 10 CFR 20.1302, 10 CFR 50.120, NUREG-0731, and NUREG-1736. Alternatives will be evaluated on the basis of a comparison with the referenced regulatory guides.

2. Equipment, Instrumentation, and Facilities

Acceptance will be based on a determination of the following:

A. Sufficient sampling and analysis capabilities for reactor coolant and containment samples are available during normal and accident conditions, consistent with 10 CFR 50.34(f)(2)(viii).

B. The radiochemistry laboratory is equipped to perform the routine analyses required for personnel protection, surveys, and related radiation protection functions, in accordance with 10 CFR 20.1501.

C. The counting room (low background) has the necessary instrumentation to perform routine counting on all plant radioactivity samples (e.g., water, air, swipes) in conformance with 10 CFR 20.1501 and with GDC 64 in Appendix A to 10 CFR Part 50. Counting room equipment normally includes the following:

i. Radionuclide spectrometry equipment (such as a multichannel gamma pulse height analyzer).

ii. Low-background alpha-beta proportional counter and gamma and alpha-beta scintillation counters.

iii. End-window Geiger-Mueller type counter.

D. Instruments for measuring radiation or radioactivity in accordance with 10 CFR 20.1501 normally include the following:

i. Portable low- and high-range ion chamber rate meters (see Revision 3 of Regulatory Guide 1.97 for ranges).

ii. Portable Geiger-Mueller counters.

iii. Portable alpha scintillation or proportional counter rate meters.

iv. Portable neutron dose equivalent rate meters.

v. Fixed and portable air samplers for use with particulate filters and iodine collection devices (such as charcoal cartridges or equivalent filters) and airborne radioactivity monitors.

vi. High-range instruments, in accordance with Revision 3 of Regulatory Guide 1.97.

vii. Fixed area monitors with local and remote readouts and alarm functions.

viii. Small item contamination (i.e., box) counters.

E. Personnel monitoring instruments in accordance with 10 CFR 20.1501 and 10 CFR 20.1502 include the following:

i. Personnel contamination monitors (e.g., friskers, hand-and-foot monitors, standup portal monitors).

ii. Self-reading low and intermediate pocket dosimeters, including audible alarm dosimeters (for early evaluation of individual doses). Performance and other requirements conform to Regulatory Guides 8.4 and 8.28 or to appropriate proposed alternatives.

iii. Remote and local reading alarm dosimeters (coupled with direct or electronic surveillance equipment) for monitoring workers in high-dose/high-dose-rate environments.

iv. Personal dosimeters (e.g., film badges, thermoluminescent dosimeters (TLD), ocularly stimulated dosimeters) of sufficient range and sensitivity that are processed and evaluated by a processor accredited by the National Voluntary Laboratory Accreditation Program (NVLAP), as appropriate, in conformance with 10 CFR 20.1501(c).

v. Provisions for bioassays (in vivo and in vitro as appropriate) and facilities capable of detecting intakes of expected radionuclides (e.g., mixed fission and activation products, tritium, and alpha-emitting nuclides) to meet the requirements of 10 CFR 20.1204 and Regulatory Guides 8.9, 8.20, 8.26, and 8.32 or to satisfy appropriate proposed alternatives.

F. Utility-issued personnel protection equipment include the following:

i. Anticontamination clothing.

ii. Plastic suits for contamination control in wet work environments.

iii. Head covers, shoe covers, gloves, face shields, and safety-related items (including provisions for personnel cooling in high-temperature work environments).

iv. Pressure demand (e.g., full-facepiece) air line respirators.

v. Pressure demand self-contained breathing apparatus.

vi. Air purifying respirators (e.g., full-face negative pressure, powered air purifying).

vii. Respiratory protection equipment and facilities that meet the requirements of 10 CFR 20.1703.

viii. Work efficiency equipment (e.g., ice vests, air-supplied suits, or other heat stress coping equipment).

G. At a minimum, the following radiation protection support facilities or areas will be provided:

i. Portable instrument calibration and storage area. The latter should be easily accessible.

ii. Personnel decontamination area with necessary monitoring equipment. This facility should be located and designed to expedite rapid cleanup of male and female personnel and should not be used as a multiple-purpose area.

iii. Facility and equipment to clean, sanitize, repair, and decontaminate personnel protective equipment, monitoring instruments, respirators, and associated equipment.

iv. A change room for donning protective clothing (i.e., anticontamination suits) and storage of personal items.

v. Control points for entrance into, or exit from, controlled access areas of the plant, condition signs, labels, and signals, in accordance with 10 CFR 20.1601, 10 CFR 20.1602, 10 CFR 20.1901, 10 CFR 20.1902, 10 CFR 20.1903, 10 CFR 20.1904, and 10 CFR 20.1905.

vi. Storage and control capability for licensed materials in unrestricted areas, in accordance with 10 CFR 20.1801 and 10 CFR 20.1906.

vii. One or more radiation protection stations, which may be used as locations for storage and issuance of portable radiation survey equipment, respiratory protective equipment, personnel monitoring equipment, and contamination control supplies. The equipment should be readily accessible, and the stations should be equipped to facilitate communication throughout the plant.

viii. Training facilities for conducting general employee training, health physics technician hands-on practical factors exercises, and prework ALARA mockup training.

ix. Radiation work control stations (and/or remote surveillance facilities) for overseeing work in high-radiation and very-high-radiation areas.

H. Special shields and equipment include the following:

i. Lead blankets
ii. Remote tools and handling equipment
iii. Portable ventilation equipment

Acceptance will also be based on implementation of the guidance of Regulatory Guide 8.8 or the provision of acceptable alternatives.

3. Procedures

Plans and procedures will be acceptable if they meet the criteria in 10 CFR 20.1101, 10 CFR 20.1601, and 10 CFR 20.1602 or Standard Technical Specification for access control; Regulatory Guides 1.33, 1.8, 8.8, 8.10, 8.15, and 8.38; or proposed appropriate alternatives. There should be provision for a special control procedure to ensure that measures are implemented such that personnel cannot gain unauthorized or inadvertent access to a very-high-radiation area. The radiation work permit program should include data on radiation levels in the area, allowable working time, protective clothing and respiratory protective equipment, special tools, portable shielding, and special personnel monitoring devices. The description of operation, maintenance, repair, surveillance, and

refueling procedures and methods used by the applicant should be reviewed to ensure that ORE will be ALARA and in accordance with Regulatory Guide 8.8.

For major dose accumulating functions, a postoperation review should evaluate the effectiveness of the work permit program in ensuring that ORE will be ALARA in future similar activities. Quality assurance criteria and inspections should be provided for the radiation procedures identified in Regulatory Guide 1.33, in accordance with Appendix B to 10 CFR Part 50. Quality assurance of procedures applicable to packaging and transportation of radioactive materials are in accordance with Subpart H of 10 CFR Part 71. There should be (1) provisions for supervision and control of the handling or movement of material within and from radiation or controlled access areas and (2) procedures for controlling the speed of radioactive materials.

There should also be provisions for personnel monitoring procedures, bioassays, and keeping records of and reporting personnel doses. In addition, 10 CFR 20.1501, 10 CFR 20.1502, 10 CFR 20.2101, 10 CFR 20.2102, 10 CFR 20.2103. 10 CFR 20.2104, 10 CFR 20.2105, 10 CFR 20.2106, 10 CFR 20.2107, 10 CFR 20.2110, 10 CFR 20.2201, 10 CFR 20.2203, 10 CFR 20.2204, 10 CFR 20.2205, and 10 CFR 20.2306 provide the criteria for radiation surveys, personnel monitoring, bioassays, recordkeeping, and reporting. Guidance regarding these areas appears in Regulatory Guides 8.2 and 8.25 (surveys and personnel monitoring); Regulatory Guides 8.9, 8.20, 8.26, and 8.32 (bioassays); Regulatory Guides 8.2 and 8.7 (recordkeeping and reporting); Regulatory Guide 8.8 (decontamination, inspection, radiation protection program, and operations); Regulatory Guide 8.13 (training on radiation risks to fetuses); Regulatory Guide 8.27 (radiation protection training); Regulatory Guide 8.29 (training on radiation risks); Regulatory Guide 8.34 (monitoring criteria and calculation of occupational doses); Regulatory Guide 8.35 (planned special exposures); Regulatory Guide 8.36 (doses to the embryo/fetus); and NUREG-0736.

The acceptability of the radiation protection program will also be based on provisions for indoctrination and personnel training and retraining programs. Guidance appears in Regulatory Guides 1.8, 8.8, 8.10, 8.15, and 8.27. In addition, 10 CFR 19.12 requires instruction of personnel on radiation protection. An annual review of the radiation protection program should include updating procedures, equipment, and facilities where improvements are warranted. Different parts of the radiation protection program can be reviewed each year, on a rotating basis, such that the entire program is reviewed at least once every 3 years. The program should include regular audits to determine where ORE is occurring and to review methods for reducing these exposures.

Using the methods listed in 10 CFR 50.34(f)(2)(xxvii) and additional guidance from Section III.D.3.3 of NUREG-0718, applicants for construction permits should provide preliminary design information concerning monitoring in-plant radiation dose rates and airborne radioactivity for a broad range of routine and emergency conditions. The monitors should meet the criteria of Revision 3 of Regulatory Guide 1.97.

Using the methods listed in 10 CFR 50.34(f)(2)(xxvii) and additional guidance from Section III.D.3.3 of NUREG-0737, applicants for operating licenses (OLs) and COLs should describe the equipment, training, and procedures to measure accurately the radioiodine concentration and external radiation dose rate levels in areas within the plant where plant personnel may be present during an accident.

Using the methods listed in 10 CFR 50.34(f)(2)(viii) and additional guidance from Section II.B.3 of NUREG-0737, applicants for OLs and COLs should describe the equipment, training, and procedures to obtain and analyze samples of reactor coolant and containment during an accident without resulting in excessive radiation doses to plant personnel.

Utility management structure and technical lessons will be acceptable if they meet the criteria in Regulatory Guide 8.8 and NUREG-0731.

4. Operational Programs. For COL reviews, the description of the operational program and proposed implementation milestone for the Radiation protection program is reviewed in accordance with 10 CFR 20.1101. Its implementation is required by a license condition.

   Acceptance will be based on a determination that the 10 CFR Part 52 COL applicant has described the intended implementation of the radiation protection program. A phased-in implementation should include appropriate milestones in the construction of the facility. Staffing levels, equipment, facilities, and procedures necessary to ensure radiation safety of the workers and public for each phase of implementation should be identified. At a minimum, the program implementation at the following milestones must be addressed:

   A. Before receipt of licensed radioactive sources

   B. Before receipt of special nuclear material (i.e., reactor fuel) subject to the monitoring requirements of 10 CFR 70.24

   C. Before loading fuel in the reactor vessel

   D. Before the first shipment of radioactive material from the facility site

Technical Rationale

The technical rationale for application of these acceptance criteria to the areas of review addressed by this SRP section is discussed in the following paragraphs:

1. Compliance with 10 CFR 19.12 requires keeping workers informed about radiation levels, instructing them about health problems associated with exposure to radiation, teaching them precautions to minimize exposure to radiation, instructing them to report violations of Commission regulations, and instructing them in the appropriate response to warnings of an unusual occurrence.

   This SRP section relates to review and approval of the radiation protection program that must be implemented at all nuclear power plants. It covers administration of the program, problem identification and resolution, qualifications of radiation protection personnel, equipment and facilities that support the radiation protection program, and operating and administrative procedures that must be in place. The requirements imposed by 10 CFR 19.12 for instructions provided to individuals who receive occupational exposures are one aspect of the overall radiation protection program at a nuclear plant site.

Meeting the requirements of 10 CFR 19.12 offers a level of assurance that radiation doses to individuals who work in restricted areas will be limited to the lowest practicable levels because 10 CFR 19.12 requires that the workers themselves be stakeholders in maintaining low levels of radiation doses.

2. The referenced sections of 10 CFR Part 20 relate to the administration of the radiation protection program to be used in the operation of a nuclear power plant.

   The referenced sections of 10 CFR Part 20 specify in detail the administrative procedures to which this SRP applies, including problem identification and resolution; maintenance of radiation doses ALARA; use of engineering controls and monitoring to control radiation exposures; doses in unrestricted areas; performance of surveys; posting of radiation areas; receipt, control, storage, transfer, and disposal of radioactive material; and maintaining records of and reporting radiation exposures.

   Meeting the requirements of the referenced sections of 10 CFR Part 20 will provide a level of assurance that exposure to radioactivity will be controlled such that individual workers and members of the public will only receive radiation doses that fall within the limits specified in 10 CFR Part 20 and are ALARA.

3. The NRC regulations 10 CFR 50.34(f)(2)(viii) and 10 CFR 50.34(f)(2)(xxvii) relate to the capability to promptly obtain and analyze reactor coolant and containment atmospheres during accident conditions (without resulting in excessive radiation doses to individuals) and to monitor in-plant radiation and airborne radioactivity for routine and accident conditions.

   This SRP section relates to review and approval of the radiation protection program that must be implemented at all nuclear power plants. It covers administration of the program, qualifications of radiation protection personnel, equipment and facilities that support the radiation protection program, and operating and administrative procedures that must be in place. The requirements imposed by 10 CFR 50.34(f)(2)(viii) and 10 CFR 50.34(f)(2)(xxvii) are an integral part of the areas covered by this SRP section.

   Meeting the requirements of 10 CFR 50.34(f)(2)(viii) and 10 CFR 50.34(f)(2)(xxvii) will provide a level of assurance that actions needed to monitor conditions in the plant during a postulated accident can be performed such that individual workers will not receive radiation doses that exceed the limits specified in 10 CFR Part 20.

4. Compliance with GDC 64 in Appendix A to 10 CFR Part 50 requires that means be provided to monitor the atmosphere in areas in which components are located that potentially contain radioactive fluids and gases that may be released during normal operation, anticipated operational occurrences, and accidents.

   SRP section 12.5 covers the administrative controls that encompass the radiation protection program. GDC 64 applies to SRP section 12.5 because one part of the program is monitoring and surveillance of radiation areas during normal operation, during anticipated operational occurrences, and following accidental releases of radioactive materials.

Meeting the requirements of GDC 64 will provide a level of assurance that releases of radioactive materials to the environment will be detected and that resultant exposures will be ALARA and will not exceed the limits specified in 10 CFR Part 20.

5. 10 CFR Part 71 contains requirements for packaging and transporting licensed radioactive materials. These requirements apply to the transportation of radioactive wastes as well as the transportation of activated, or contaminated, components or equipment transferred during the operation and maintenance of the plant. Additional requirements in Appendix G to 10 CFR Part 20 apply to the transfer of radioactive wastes for land disposal.

   The scope of 10 CFR Part 20 and SRP section 12.5 includes the transfer of radioactive materials. Although the programmatic requirements in 10 CFR Part 71 extend beyond monitoring and radiation surveys, they are provided to ensure that the transportation of licensed radioactive materials off site does not result in unnecessary or inadvertent exposures to members of the public and that an uncontrolled release of such material does not occur.

   Meeting the requirements of 10 CFR 71.5, in addition to the requirements in Appendix G to 10 CFR Part 20, will provide a level of assurance that releases of radioactive materials to the environment will not result from transportation or waste disposal activities and that doses to members of the public will not exceed the limits specified in 10 CFR Part 20.

6. Appendix B to 10 CFR Part 50 establishes quality assurance requirements for the operation of a nuclear power plant. Guidance is provided by Regulatory Guide 1.33.

   The procedures implemented to ensure the quality of the radiation protection program safety-related activities identified in Regulatory Guide 1.33, as well as the required periodic review of the content and implementation of the radiation protection program, are integral to SRP section 12.5.

   A quality assurance program satisfies the quality assurance requirements in 10 CFR 71.101 if it meets the requirements of Appendix B to 10 CFR Part 50 and is established, maintained, and executed to address the transportation of radioactive materials.

III. REVIEW PROCEDURES

The reviewer will select material from the procedures described below, as may be appropriate for a particular case.

These review procedures are based on the identified SRP acceptance criteria. For deviations from these acceptance criteria, the staff should review the applicant's evaluation of how the proposed alternatives provide an acceptable method of complying with the relevant NRC requirements identified in Subsection II.

1. The organizational position, functional responsibilities, experience, and qualifications of personnel responsible for the radiation protection program. The plant organization, functional responsibilities, and qualifications of personnel are the primary responsibility of the quality and maintenance section and the operator licensing and human performance

section, and they are reviewed under SRP Chapter 13. The reviewer evaluates the radiation protection organization, function, and personnel qualifications in accordance with Regulatory Guides 1.8 and 8.8.

2. The equipment necessary to measure radioactivity as well as radiation fields and exposures—including the number, type, range, sensitivity, calibration method and frequency, availability, and planned used of portable, fixed, laboratory, and personnel monitoring instrumentation—for all units on the site.

3. The health physics facilities and associated protective equipment for controlling ORE and contamination.

4. Description of the methods for ensuring development of the training, retraining, and indoctrination program and the radiation protection instruction manuals.

5. The procedures to receive, store, transfer, and dispose of radioactive material; to control exposures; to control and minimize contamination; to facilitate decommissioning; to provide adequate radiation monitoring; and to conduct program reviews and quality assurance. The review of the quality assurance program is the primary responsibility of the quality and maintenance section and the operator licensing and human performance section, and they are reviewed under SRP Chapter 17.

6. Operational Programs. The reviewer verifies that the radiation protection program is fully described in accordance with 10 CFR 20.1101. The reviewer verifies that the program and implementation milestones are included in FSAR Table 13.x. The implementation milestones are identified in the SRP acceptance criteria, above. The reviewer ensures the program and associated implementation milestones are included within the license condition on operational programs and implementation.

   Implementation of this program will be inspected in accordance with NRC Inspection Manual Chapter IMC-2504, “Construction Inspection Program - Non-ITAAC Inspections.”

On the basis of the review, the reviewer may request additional information or ask the applicant to modify the submittal to meet the acceptance criteria described in Subsection II.

IV. EVALUATION FINDINGS

The reviewer verifies that the applicant has provided sufficient information and that the review and calculations (if applicable) support conclusions of the following type to be included in the staff's safety evaluation report. The reviewer also states the bases for those conclusions.

In accordance with the provisions of Section 12.5 of Regulatory Guide 1.70 (or equivalent section in RG 1.206 for a COL FSAR under 10 CFR Part 52) and the radiation protection aspects of 10 CFR 50.34 (or 10 CFR 52.79), the staff’s review should verify that the SAR and amendments include sufficient information to arrive at conclusions of the following type, which must be included in the staff’s safety evaluation report. The report will include a summary of the applicant’s submittal, the staff’s basis for review and acceptance criteria, and the findings of the review:

The staff concludes that the operational radiation protection program is acceptable and meets the requirements of 10 CFR 19.12 and 10 CFR 19.13; 10 CFR Part 20; and GDC 64 in Appendix A to 10 CFR Part 50. This conclusion is based on the following findings.

The Radiation protection program objectives are to provide reasonable assurance that the limits of 10 CFR 20.1201, 10 CFR 20.1202, 10 CFR 20.1203, 10 CFR 20.1204, 10 CFR 20.1207, and 10 CFR 20.1208 will not be exceeded; to reduce unavoidable exposures further; and to ensure that individual occupational radiation exposures are maintained as far below regulatory limits as is reasonably achievable and that total person-rem doses are ALARA, in accordance with 10 CFR 20.1101(b) and the definition of ALARA in 10 CFR 20.1003 and Regulatory Guides 8.8 and 8.10.

The duties of the plant [radiation protection manager] include [list duties]. The radiation protection organizations, qualifications, personnel training, program objectives, and implementation methods are in accordance with the guidelines in Regulatory Guides 1.8, 8.2, 8.8, 8.10, and 8.13 and with 10 CFR 19.12 and NUREG-0731 and therefore are acceptable.

The radiation protection features at [plant name] include a [radiochemistry laboratory, personnel decontamination and emergency treatment areas, an access control point, counting room, calibration room, respirator testing facility, office, laundry, and other relevant features]. These facilities are sufficient to maintain occupational radiation exposures ALARA and are consistent with the guidelines in 10 CFR 50.34(f)(2)(xxvii) and Section III.D.3.3 of NUREG-0737, which provides additional detail and clarification of requirements, and with the provisions of Regulatory Guide 8.8.
Equipment to be used for radiation protection purposes includes portable radiation survey instruments, personnel monitoring equipment, fixed and portable area and airborne radioactivity monitors, laboratory equipment, air samplers, respiratory protective equipment, and protective clothing. The number and types of equipment to be used are adequate, meet the criteria of Revision 3 of Regulatory Guide 1.97, and provide reasonable assurance that the applicant will be able to maintain occupational exposures ALARA.

All permanent and temporary plant personnel will be assigned [beta-gamma thermoluminescent dosimeter badges or film badges to be worn in restricted areas at all times.] A processor accredited under NVLAP will process these badges as appropriate. All personnel assigned [dosimeter or film badges] also must wear [direct or indirect] reading dosimeters when entering radiologically controlled areas. The readings from these dosimeters will be used to keep a running total of an individual's dose before TLD or film badge processing. Plant visitors wear self-reading dosimeters or are escorted by an individual wearing such personnel dosimetry devices. Appropriate caution signs, labels, and signals will be provided in accordance with 10 CFR 20.1601, 10 CFR 20.1602, 10 CFR 20.1901, 10 CFR 20.1902, 10 CFR 20.1903, 10 CFR 20.1904, and 10 CFR 20.1905. Neutron film badges, neutron dosimeters, and alarm dosimeters will also be provided for personnel when necessary. Whole body counts of all plant personnel will be conducted on a scheduled basis, and other

bioassays will be provided when deemed necessary by the [radiation protection manager], in accordance with 10 CFR 20.1201, 10 CFR 20.1202, 10 CFR 20.1203, 10 CFR 20.1204, 10 CFR 20.1207, and 10 CFR 20.1208. Records of surveys, personnel monitoring, and bioassays will be maintained in accordance with 10 CFR 20.1501, 10 CFR 20.1502, 10 CFR 20.1601, 10 CFR 20.1602, 10 CFR 20.2101, 10 CFR 20.2102, 10 CFR 20.2103, 10 CFR 20.2104, 10 CFR 20.1205, 10 CFR 20.2106, 10 CFR 20.2107, 10 CFR 20.2201, 10 CFR 20.2203, and 10 CFR 20.2306 as well as Regulatory Guide 8.7. All radiation exposure information will be processed and recorded in accordance with 10 CFR Part 20.

The staff reviewed the description of maintenance, repair, surveillance, and refueling procedures and methods used by the applicant to ensure that all plant radiation protection procedures, practices, and criteria have been considered and that occupational radiation exposures will be ALARA and in accordance with Regulatory Guide 8.8. Procedures will also be developed to ensure that plant or visitor personnel to the site do not exceed exposure limits, to administer and control conditions of radiation work permits, to post radiation areas, to establish radiation access control zones, to control all radioactive material entering or leaving the plant site, and to train plant and visitor personnel in radiation protection policies and procedures and meet the quality assurance guidance of Regulatory Guide 1.33 with respect to the requirements of 10 CFR 20.1101, Appendix B to 10 CFR Part 50, and 10 CFR 71.101.

Storage and control of licensed materials in unrestricted areas will be maintained in accordance with 10 CFR 20.1601, 10 CFR 20.1602, 10 CFR 20.1801, 10 CFR 20.1802, 10 CFR 20.1901, and 10 CFR 20.1902.
Facilities and procedures are adequate to provide reasonable assurance that the plant will be operated in a manner that will minimize, to the extent practicable, contamination of the facility and the environment, in accordance with 10 CFR 20.1406.

The utility management structure and technical resources meet the criteria in NUREG-0731 and are acceptable.

On the basis of the information presented in the [CP PSAR, OL FSAR, DC FSAR, or COL FSAR] by the applicant, the staff concludes that the applicant intends to implement a radiation protection program that will maintain in-plant radiation exposures as far below the applicable limits of 10 CFR Part 20 as is reasonably achievable and will maintain radiation exposures ALARA.

The applicant described the radiation protection program in conformance with 10 CFR 20.1101. The program and its implementation milestones are included within the license condition on operational program implementation.

V. IMPLEMENTATION

The staff will use this SRP section in performing safety evaluations of DC applications and license applications submitted by applicants pursuant to 10 CFR Part 50 or 10 CFR Part 52. Except when the applicant proposes an acceptable alternative method for complying with

specified portions of the Commission's regulations, the staff will use the method described herein to evaluate conformance with Commission regulations.

The provisions of this SRP section apply to reviews of applications submitted six months or more after the date of issuance of this SRP section, unless superseded by a later revision.

The referenced regulatory guides and NUREGs include implementation schedules for conformance to parts of the method discussed herein.

VI. REFERENCES

1. 10 CFR Part 19, "Notices Instructions, and Reports to Workers: Inspections and Investigations."

2. 10 CFR Part 20, "Standards for Protection Against Radiation."

3. 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities."

4. 10 CFR Part 52, "Early Site Permits; Standard Design Certifications; and Combined Licenses for Nuclear Power Plants."

5. 10 CFR Part 71, "Packaging and Transportation of Radioactive Material."

6. Regulatory Guide 1.8, "Qualification and Training of Personnel for Nuclear Power Plants."

7. Regulatory Guide 1.33, "Quality Assurance Program Requirements (Operations)."

8. Regulatory Guide 1.97, Revision 3, "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident."

9. Regulatory Guide 8.2, "Guide for Administrative Practices in Radiation Monitoring."

10. Regulatory Guide 8.4, "Direct-Reading and Indirect-Reading Pocket Dosimeters."

11. Regulatory Guide 8.6, "Standard Test Procedures for G-M Counters."

12. Regulatory Guide 8.7, "Instructions for Recording and Reporting Occupational Radiation Exposure Data."

13. Regulatory Guide 8.8, "Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations Will Be as Low as Is Reasonably Achievable."

14. Regulatory Guide 8.9, "Acceptable Concepts, Models, Equations, and Assumptions for a Bioassay Program."

15. Regulatory Guide 8.10, "Operational Philosophy for Maintaining Occupational Radiation Exposures as Low as Is Reasonably Achievable."

16. Regulatory Guide 8.13, “Instruction Concerning Prenatal Radiation Exposure.”

17. Regulatory Guide 8.15, “Acceptable Programs for Respiratory Protection.”

18. Regulatory Guide 8.20, “Applications of Bioassay for I-125 and I-131.”

19. Regulatory Guide 8.25, “Air Sampling in the Workplace.”

20. Regulatory Guide 8.26, “Applications of Bioassay for Fission and Activation Products.”

21. Regulatory Guide 8.27, “Radiation Protection Training for Personnel at Light-Water-Cooled Nuclear Power Plants.”

22. Regulatory Guide 8.28, “Audible Alarm Dosimeters.”

23. Regulatory Guide 8.29, “Instruction Concerning Risks from Occupational Radiation Exposure.”

24. Regulatory Guide 8.32, “Criteria for Establishing a Tritium Bioassay Program.”

25. Regulatory Guide 8.34, “Monitoring Criteria and Methods To Calculate Occupational Radiation Doses.”

26. Regulatory Guide 8.35, “Planned Special Exposures.”

27. Regulatory Guide 8.36, “Radiation Doses to Embryo/Fetus.”

28. Regulatory Guide 8.38, “Control of Access to High and Very High Radiation Areas of Nuclear Power Plants.”

29. NUREG-0041, “Manual of Respiratory Protection Against Airborne Radioactive Materials.”

30. NUREG-0731, “Guidelines for Utility Management and Technical Resources.”

31. NUREG-0737, “Clarification of TMI Action Plan Requirements.”

32. NUREG-1736, “Consolidated Guidance: 10 CFR Part 20—Standards For Protection Against Radiation.”

33. ANSI/ANS 3.1-1993 R99, “Selection, Qualification, and Training of Personnel for Nuclear Power Plants.”

34. ANSI/HPS N13.6, “Practice for Occupational Radiation Exposure Records Systems.”

35. ANSI/HPS N13.11-2001, “Personnel Dosimetry Performance—Criteria for Testing.”

36. ANSI/HPS N13.14-1994, “Internal Dosimetry Programs for Tritium Exposure—Minimum Requirements.”

37. ANSI/HPS N13.30-1996, “Performance Criteria for Radiobioassay.”

38. ANSI/HPS N13.42-1997, “Internal Dosimetry for Mixed Fission Activation Products.”

39. ANSI IEEE 309-1991, “Test Procedure for Geiger-Mueller Counters.”

40. ANSI N42.20-2003, “Performance Criteria for Active Personnel Radiation Monitors.”

41. ANSI N42.28-2002, “American National Standard for Calibration of Germanium Detectors for In Situ Gamma Ray Measurements.”

42. ANSI N42.17A-1989, “Performance Specifications for Health Physics Instrumentation—Portable Instrumentation for Use in Normal Environmental Conditions.”

43. ANSI N323A-1997, “American National Standard Radiation Protection Instrumentation Test and Calibration, Portable Survey Instruments.”

44. Memorandum from Larry W. Camper to David B. Matthews and Elmo E. Collins, “List of Decommissioning Lessons Learned in Support of the Development of a Standard Review Plan for New Reactor Licensing,” October 10, 2006 (ADAMS Accession No. ML0619201830).

45. NRC Inspection Manual Chapter IMC-2504, “Construction Inspection Program - Non-ITAAC Inspections,” issued April 25, 2006.

PAPERWORK REDUCTION ACT STATEMENT

The information collections contained in the Standard Review Plan are covered by the requirements of 10 CFR Part 50 and 10 CFR Part 52, and were approved by the Office of Management and Budget, approval number 3150-0011 and 3150-0151.

PUBLIC PROTECTION NOTIFICATION

The NRC may not conduct or sponsor, and a person is not required to respond to, a request for information or an information collection requirement unless the requesting document displays a currently valid OMB control number.