U.S. NUCLEAR REGULATORY COMMISSION

STANDARD REVIEW PLAN

OFFICE OF NUCLEAR REACTOR REGULATION

11.5 PROCESS AND EFFLUENT RADIOLOGICAL MONITORING INSTRUMENTATION AND SAMPLING SYSTEMS

REVIEW RESPONSIBILITIES

Primary - Effluent Treatment Systems Branch (ETSB)

Secondary - None

I. AREAS OF REVIEW

At the construction permit (CP) stage, ETSB reviews the information in the applicant's preliminary safety analysis report (PSAR) in the specific areas that follow. During the operating license (OL) stage of review, ETSB review consists of confirming the design accepted at the CP stage and evaluating the adequacy of the applicant's specifications in those areas. The ETSB review includes:

1. The design objectives and design criteria for the process and effluent radiological monitoring instrumentation and sampling systems. The review includes the identification of the process and effluent streams to be monitored by radiation detection instrumentation or sampled for separate analyses, the purpose of each instrumented monitoring or sampling function provided, and the parameters to be determined through monitoring instrumentation or sampling and analysis (e.g., gross beta-gamma concentrations, radionuclide distribution, or quantities of specific radionuclides).

2. The system description for the process and effluent radiological monitoring instrumentation and sampling systems. The review includes (a)* description of radiation detection instrumentation and related instrumentation and sampling equipment provided, including redundancy (where applicable), range, calibration, sensitivity, alarm/trip setpoints, independence, and diversity of components for normal operations, anticipated operational occurrences, and postulated accidents; (b)* location of monitors and direct readouts; (c)* location of sampling points and sampling stations; (d) calculation of

*Final Safety Analysis Report (FSAR) only.

radioactivity concentrations to be monitored or sampled for normal operations, anticipated operational occurrences, and postulated accidents; (e) measurements, analyses, or determinations to be made (e.g., gross beta-gamma concentration or measurement of specific radionuclides); (f)* types and locations of annunciations and alarms and the actions initiated by each; (g) provisions for purging sample lines, input volumes to waste collection systems, and sampling frequency; (h) expected relationships between monitoring instrumentation readouts, sampling analytical results and plant operations; (i)* descriptions or procedures for calibration, maintenance, and inspection of monitoring instrumentation; (j) layout drawings, piping and instrumentation diagrams (P&IDs), and process flow diagrams.

In addition, ETSB will coordinate other branches evaluations that interface with the overall review of the process and effluent radiological monitoring instrumentation and sampling systems as follows: Instrumentation and Control Systems Branch reviews the process and effluent radiological monitors which are required to actuate engineered safety feature (ESF) systems designed to prevent or mitigate consequences of accidents which could result in offsite exposures comparable to the guidelines of 10 CFR Part 100 as part of its primary review responsibility for SRP Section 7.6. Chemical Engineering Branch review provisions for controlling sample leakage, spillage, and radiation exposure during sampling from process waste systems as part of its primary review responsibility for SRP Section 9.3.2. The reviews for Technical Specifications and Quality Assurance are coordinated and performed by the Licensing Guidance Branch and the Quality Assurance Branch as part of their primary review responsibility for SRP Sections 16.0 and 17.0, respectively.

For those areas of review identified above as being reviewed as part of the primary review responsibility of other branches, the acceptance criteria necessary for the review and their methods of application are contained in the referenced SRP section of the corresponding primary branch.

II. ACCEPTANCE CRITERIA

ETSB acceptance criteria for the process and effluent radiological monitoring instrumentation and sampling systems are based on meeting the relevant requirements of the following regulations:

A. 10 CFR Part 20, §20.106 as it relates to radioactivity monitoring of effluents to unrestricted areas.

B. General Design Criterion 60 as it relates to the radioactive waste management systems being designed to control release of radioactive materials to the environment.

C. General Design Criteria 63 and 64 as they relate to the radioactive waste management systems being designed to monitor radiation levels and leakage.

Specific criteria necessary to meet the relevant requirements of the Commission regulations identified above are:

1. Provisions should be made for the instrumented monitoring or for the sampling and analyses of all normal and potential effluent pathways for release of radioactive materials to the environment to meet General Design Criterion 64.

To meet Criterion 64, the design of systems should meet the provisions of Regulatory Guide 1.21 (Position C and Appendix A) (Ref. 2), Regulatory Guide 1.97 (Position C and Table 1 or Table 2, as applicable) (Ref. 3), and Regulatory Guide 4.15 (Position C) (Ref. 4).

a. The gaseous and liquid process streams or effluent release points should be monitored and sampled according to Tables 1 and 2.

b. For both BWRs and PWRs, liquid wastes and confined volumes of gaseous waste should be sampled batchwise prior to release, in accordance with Regulatory Guide 1.21. Continuous gaseous effluent monitors are not required for open structures, such as PWR turbine buildings or atmospheric vents for liquid waste tanks containing treated or processed liquid waste and located outside of buildings. For liquid and gaseous effluents that cannot be practicably monitored or sampled batchwise, one of the following methods of representative sampling should be provided:

(1) A continuous proportioning sampling system with at least two sample collection tanks. The system should be designed to provide a fixed or measured flow ratio of the sample collected to the sampled stream discharge, or, alternatively

(2) A periodic automatic grab sampling system with at least two sample collection tanks. The system should be designed to collect a fixed volume of sample at a rate proportional to the measured flow in the sampled stream discharge.

(3) Radioactive materials other than noble gases in gaseous effluents. A continuous sampling system with replaceable particulate filter and radioiodine adsorber. The system should be designed to automatically take samples at a fixed or measured flow ratio of the sample throughput to the sampled stream discharge flow.

For intermittently operating effluent release points, the system should be designed to automatically take samples whenever there is flow in the effluent stream.

For all of the above samples, a periodic analysis frequency for the collected samples should be specified in the technical specifications.

2. Provisions should be made for the instrumented monitoring of, or the periodic or continuous sampling and analysis of, radioactive waste process systems. To meet Criteria 60 and 63, as they relate to radioactive waste systems and detection of excessive radiation levels and initiation of appropriate safety actions, the design of systems should meet the guidelines of Appendix 11.5-A (this SRP section), Regulatory Guide 1.21 (Position C, as applicable), Regulatory Guide 1.97 (Position C and Table 1 or Table 2, as applicable), and Regulatory Guide 4.15 (Position C).

a. Provisions should be made to assure representative sampling from radioactive process streams and tank contents. Recirculation pumps for liquid waste tanks (collection or sample test tanks) should be capable of recirculating at a rate of not less than

two tank volumes in eight hours. For gaseous liquid process stream samples, provisions should be made for purging sample lines and for reducing plateout in sample lines. Provisions for gaseous sampling from ducts and stacks should be in agreement with ANSI N13.1. (Ref. 5)

b. Where practicable, provisions should be made to collect samples from process waste streams at central sample stations to reduce leakage, spillage, and radiation exposures to operating personnel in accordance with SRP Section 9.3.2.

c. Provisions should be made to purge and drain sample streams back to the system of origin or to an appropriate waste treatment system.

3. Provisions should be made for administrative and procedural control, for necessary auxiliary or ancillary equipment, and for special features for the instrumented radiological monitoring, sampling, and analysis of process and effluent streams. To meet Criterion 63 and Criterion 64, as they relate to radioactive waste process systems and effluent discharge paths, the design of systems and the implementation of administrative and procedural controls should meet the guidelines of Appendix 11.5-A (this SRP section), Regulatory Guide 1.21 (Position C) and Regulatory Guide 4.15 (Position C).

Instrumentation, sampling, and monitoring provisions should conform to the following:

a. Sampling frequencies, required analyses, instrument alarm/trip setpoints, calibration and sensitivities, and provisions for preparing composite samples for low-level analyses should be in conformance with Regulatory Guides 1.21 and 4.15. Sampling frequencies and required analyses should be given in the plant technical specifications; these provisions will be reviewed at the OL stage.

b. Provisions should be made for the necessary instrumentation and facilities to perform gross beta-gamma and gross alpha measurements, isotopic analyses, and other routine analyses in conformance with Regulatory Guide 1.21.

c. Provisions should be made to perform routine instrument calibration, maintenance, and inspections in conformance with guidelines of Regulatory Guide 4.15. The frequencies of such actions should be given in the plant technical specifications. The provisions will be reviewed at the OL stage. Provisions should also be made to replace or decontaminate monitors without opening the process system or losing the capability to isolate the effluent stream.

d. Isolation valves, dampers, or diversion valves with automatic control features should fail in the closed or safe position. Setpoints for actuation of automatic control features initiating actuation of isolation valves, dampers, or diversion valves should be established in the plant technical specifications. Non-ESF instrumentation provisions for automatic termination or diversion of releases should conform to the design guidance contained in

Appendix 11.5-A (this SRP section). ESF instrumentation provisions for automatic termination or diversion of releases are reviewed in SRP Section 7.6 by ICSB.

4. Provisions should be made for the instrumented monitoring or sampling and analysis of identified gaseous effluent paths in the event of postulated accident releases. To meet Criterion 64, as it relates to potential gaseous effluent paths, the design of systems should meet the provisions of NUREG-0718 and NUREG-0737 (Refs. 9 and 10) (Items II.F.1, Attachments 1 and 2), Appendix 11.5-A (this SRP section) (Ref. 11), and Regulatory Guide 1.97 (Position C, and Table 1 or Table 2, as applicable) (Ref. 3).

5. Provisions should be made for the instrumented monitoring or sampling and analysis of identified liquid effluent paths in the event of a postulated accident. To meet Criterion 64, as it relates to postulated accidents and identified liquid effluent paths, the design of plant liquid waste collection and processing streams should meet the guidelines referenced in SRP Sections 9.3.3 and 11.2 and, in addition, the following conditions should be met:

   a. Administrative controls and procedures in conformance with subsection II.3 of this SRP section are to be in effect to minimize inadvertent or accidental releases of radioactive liquids, and

   b. Liquid effluent radiological monitors are to be provided for the automatic termination of releases in the event that effluent setpoints, as provided in subsection II.1 of this SRP section, and as established in the plant technical specifications, are exceeded.

III. REVIEW PROCEDURES

The reviewer will select and emphasize material from this SRP section as may be appropriate for a particular case.

1. In the review of the process and effluent radiological monitoring and sampling system, ETSB will compare the listing of process and effluent monitors contained in the SAR with the principal release points identified in SRP Section 11.1 to assure that all major process stress and release pathways are being monitored during normal operation, anticipated operational occurrences, and postulated accidents. The review includes the following:

   a. The location of probes, detectors, sampling points, and sample stations, and the bases for the selection of these sampling or monitoring points are compared with the general principles for obtaining valid samples of airborne radioactive materials, the methods and materials for gaseous and particulate sampling, and guides for sampling from ducts and stacks contained in ANSI N13.1-1969, "Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities" (Ref. 5).

   b. The equipment, piping, and description of sampling methods to assure representative sampling will be compared with the guidelines given in Regulatory Guide 1.21.

c. ETSB will independently calculate, on an audit basis, the radiation levels and concentrations in process and effluent streams using the models of NUREG-0016 or NUREG-0017 to verify the expected levels (Refs. 6 and 7).

d. ETSB will compare the sampling frequencies, types of analyses required, and monitoring instrument sensitivities and ranges with those recommended in Regulatory Guides 1.21 and 1.97. At the OL stage, ETSB will compare the applicant's monitoring instrumentation specifications and performance criteria with those contained in ANSI N13.10-1974 (Ref. 8) and in Appendix 11.5-A (this SRP section).

e. In the review of the P&IDs for the liquid and gaseous waste treatment systems, ETSB will verify that release points for radioactive material have provisions for automatic termination of releases in the event they exceed a predetermined level. Instrumentation provisions for automatic termination of releases will be compared with the design guidance contained in Appendix 11.5-A (this SRP section).

f. ETSB will review the location of the monitors shown on the P&IDs and the location of readouts, annunicators, and alarms discussed in SAR Chapter 7 to assure that the operator will be advised of system performance and effluent releases consistent with the release limits specified in the plant technical specifications.

g. ETSB will compare the proposed calibration methods and frequency of calibration with the guidelines in Regulatory Guide 1.21 (FSAR) and Regulatory Guide 4.15.

h. ETSB will assure that provisions are included in the design for replacing or decontaminating detectors without opening the boundary of the process system or without losing the capability to isolate the system or divert the effluent to a standby treatment system (as appropriate).

i. ETSB will review special features, applicable topical reports, and data referenced in the SAR on a case-by-case basis.

2. ETSB reviews the technical specifications proposed by the applicant for process and effluent radiological monitoring and sampling at the OL stage. The reviewer determines that the content and intent of the technical specifications prepared by the applicant are in agreement with the requirements developed as a result of the staff's review. The review will include the evaluation or development of appropriate limiting conditions for operation and their bases consistent with the plant design.

IV. EVALUATION FINDINGS

ETSB verifies that sufficient information has been provided and that the review supports conclusions of the following type, to be included in the staff's safety evaluation report:

The staff concludes that the process and effluent radiological monitoring instrumentation and sampling systems are acceptable and meet the relevant requirements of 10 CFR Part 20, §20.106, and General Design Criteria 60, 63, and 64. This conclusion is based on the following:

The process and effluent radiological monitoring and sampling systems include the instrumentation for monitoring and sampling radioactivity, contaminated liquid, gaseous, and solid waste process and effluent streams. Our review included the provisions proposed to sample and monitor all station effluents in accordance with General Design Criterion 64, the provisions proposed to provide automatic termination of effluent releases and assure control over discharges in accordance with General Design Criterion 60, the provisions proposed for sampling and monitoring plant waste process streams for process control in accordance with General Design Criterion 63, the provisions for conducting sampling and analytical programs in accordance with the guidelines in Regulatory Guides 1.21 and 4.15, and the provisions for sampling and monitoring process and effluent streams during postulated accidents in accordance with the guidelines in Regulatory Guide 1.97. The review included piping and instrument diagrams and process flow diagrams for the liquid, gaseous, and solid radwaste systems, and for ventilation systems, and the location of monitoring points relative to effluent release points as shown on the site plot diagrams.

Based on our review, we have determined that the applicant's designs, design criteria, and design bases for the process and effluent radiological monitoring instrumentation and sampling systems meet the guidelines of Appendix 11.5-A (this SRP section) and industry standards.

V. IMPLEMENTATION

The following is intended to provide guidance to applicants and licensees regarding the NRC staff's plans for using this SRP section.

Except in those cases in which the applicant proposes an acceptable alternative method for complying with specified portions of the Commission's regulations, the method described herein will be used by the staff in its evaluation of conformance with Commission regulations.

Implementation schedules for conformance to parts of the method discussed herein are contained in the referenced Appendix 11.5-A (this SRP section), regulatory guides, and NUREGs.

TABLE 1

Provisions for Monitoring and Sampling Gaseous Streams

No.	Process Systems	Reactor Type	Monitor Provisions In Process Cont[i]	Monitor Provisions In Effluent ACF[j]	Monitor Provisions In Effluent Cont[i]	Sample Provisions In Process Grab[k]	Sample Provisions In Effluent Grab[k]	Sample Provisions In Effluent Cont[l]
1.	Waste Gas Holdup System[a]	P&B	NG	NG	(NG)		(NG,H3)	(I)
2.	Condenser Evacuation System[b]	P&B	NG	(NG)[n]	(NG)	I	(NG,H3)	(I)
3.	Vent & Stack Release Pt. System[c]	P&B	-	-	NG		H3	(I)
4.	Containment Purge Systems[d]	P&B	NG	NG[m]	(NG)	I	(NG,I,H3)	I
5.	Aux. Bldg. Ventilation System	P&B	—	—	(NG)	I	(NG,H3)	(I)
6.	Fuel Storage Area Vent. Syst.[e]	P&B	(NG)	NG[m]	(NG)	I	(NG,H3)	(I)
7.	Radwaste Area Vent. Systems	P&B	—	—	(NG)	I	(NG,H3)	(I)
8.	Turb. Gland Seal Cond. Vent System	P&B	—	—	(NG)	I	(NG,H3)	(I)
9.	Mech. Vacuum Pump Exhaust (Hogging) System	P&B	—	—	(NG)	I	(NG,H3)	(I)
10.	Evaporator Vent Systems	P&B	—	—	(NG)	I	(NG,H3)	(I)
11.	Pre-treatment Liquid Radwaste Tank Vent Gas Systems	P&B	—	—	(NG)	(I)	(NG,H3)	(I)
12.	Flash Tank and Steam Generator Blowdown Vent Systems	P	—	—	(NG)	I	(NG,H3)	(I)
13.	Turbine Bldg. Vent Systems	B	—	—	(NG)	I	(NG,H3)	(I)
14.	Pressurizer & Boron Recovery Vent Systems	P	—	—	(NG)	I	(NG,H3)	(I)

TABLE 2

Provisions for Monitoring and Sampling Liquid Streams

No.	Process Systems	Reactor Type	Monitor Provisions In Process Cont[i]	Monitor Provisions In Effluent ACF[j]	Monitor Provisions In Effluent Cont[i]	Sample Provisions In Process Grab[k]	Sample Provisions In Effluent Grab[k]	Sample Provisions In Effluent Cont[l]
1.	Liquid Radwaste (Batch) Effluent System	P&B	(R)	R	R	S&A	S&A,H3	—
2.	Liquid Radwaste (Continuous) Effluent System	P&B	R	R	R	—	S&A,H3	S&A
3.	Service Water System	P&B	—	—	(R)	—	S&A,H3	S&A
4.	Component Cooling Water System[f]	P&B	(R)	(R[m])	(R)	S&A	S&A,H3	(S&A)
5.	Spent Fuel Pool Treat. Syst.[g]	P&B	(R)	(R)	(R)	S&A	(S&A,H3)	(S&A)
6.	Equip. & Floor Drain Collection and Treatment Systems[h]	P&B	—	(R)	(R)	—	(S&A,H3)	(S&A)
7.	Phase Separator Decant & Holding Basin Systems	P&B	—	(R)	(R)	—	(S&A,H3)	(S&A)
8.	Chemical & Regeneration Solution Waste Systems	P&B	—	(R)	(R)	—	(S&A,H3)	(S&A)
9.	Laboratory & Sample System Waste Systems	P&B	—	(R)	(R)	S&A	(S&A,H3)	(S&A)
10.	Laundry & Decontamination Waste Systems	P&B	—	(R)	(R)	—	(S&A,H3)	(S&A)
11.	Resin Slurry, Solidification & Baling Drain Systems	P&B	(R)	—	(R)	—	(S&A,H3)	(S&A)
12.	Radwaste Liquid Tanks (outside the buildings)	P&B	—	—	(R)	S&A	(S&A,H3)	(S&A)
13.	Storm & Underdrain Water Syst.	P&B	—	—	—	—	(S&A,H3)	—
14.	Tanks and Sumps inside Reactor Building	P&B	—	(R)	(R)	—	(S&A,H3)	(S&A)
15.	Boron Recovery System Liquid Effluent	P	—	(R)	(R)	—	(S&A,H3)	(S&A)
16.	Steam Generator Blowdown (Batch) Liquid Effluent System	P	(R)	R	R	S&A	(S&A,H3)	(S&A)
17.	Steam Generator Blowdown (Continuous) Liquid Effluent System	P	(R)	R	R	—	(S&A,H3)	(S&A)

TABLE 2 (Continued)

No.	Process Systems	Reactor Type	Monitor Provisions In Process Cont[i]	Monitor Provisions In Effluent ACF[j]	Monitor Provisions In Effluent Cont[i]	Sample Provisions In Process Grab[k]	Sample Provisions In Effluent Grab[k]	Sample Provisions In Effluent Cont[l]
18.	Secondary Coolant Treat. Waste & Turbine Bldg. Drain Systems	P	—	(R)	(R)	—	(S&A,H3)	(S&A)
19.	Ultrasonic Resin Cleanup Waste Systems	B	—	(R)	(R)	—	(S&A,H3)	(S&A)
20.	Non-Contaminated Waste Water & PWR Turbine Building Clean Drain System	P&B	—	—	—	—	(S&A,H3)	(S&A)

Notes for Table 1 and Table 2

a - for example, offgas storage tank systems, cover gas decay systems, chilled charcoal adsorption systems, offgas cryogenic units, and delay pipes.

b - for example, main condenser steam jet air ejector systems and mechanical vacuum pump systems.

c - for example, free standing stacks, roof vents, building vents, exhausters, process vents, ventilation vents.

d - for example, containment relief systems, containment normal purge, containment low volume purge, containment leak testing systems, drywell purge, cleanup purges.

e - includes spent fuel pool and refueling pool ventilation systems, if separate from the fuel storage area ventilation system.

f - also called closed cooling water systems and component cooling loop systems.

g - includes refueling pool cleanup systems.

h - includes suppression tanks, reactor drain tanks, equipment and drain sumps collecting leakage, drainage, sampling, and condensate.

i - continuous radiation monitor.

j - automatic control feature. For example, the continuous liquid effluent radiation monitor (see note m, below) should be equipped to alarm at a setpoint established in the technical specifications and should automatically terminate effluents in the discharge line by closing an isolation valve (see II.3.d).

k - sample point should be available to obtain grab samples for laboratory analyses as indicated by notations.

l - continuous sampler (see II.1.b).

m - the automatic control feature may be alternatively provided by a process continuous radiation monitor, located at a point upstream of the systems' effluent continuous radiation monitor.

n - for BWRs only.

P - Typical system names applicable to pressurized water reactors.

B - Typical system names applicable to boiling water reactors.

NG - Noble gas radioactivity.

I - Iodine radioactivity, radioactivity of other radionuclides in particulate form, and alpha emitters.

H3 - Tritium

R - Gross radioactivity (beta radiation, gamma radiation, or total beta plus gamma)

S&A- Sampling and analysis of radionuclides, to include gross radioactivity, identification and concentration of principal radionuclides and concentration of alpha emitters.

( )- Provisions indicated within parentheses are required only for systems not monitored, sampled, or analyzed (as indicated) prior to release by downstream provisions.

VI. REFERENCES

1. 10 CFR Part 20, §20.106, "Radioactivity in Effluents to Unrestricted Areas," and 10 CFR Part 50, Appendix A, General Design Criterion 60, "Control of Releases of Radioactive Material to the Environment"; Criterion 63, "Monitoring Fuel and Waste Storage"; and Criterion 64, "Monitoring Radioactivity Releases."

2. Regulatory Guide 1.21, "Measuring and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants."

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

4. Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Programs (Normal Operation) - Effluent Streams and the Environment."

5. ANSI N13.1-1969, "Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities," American National Standards Institute (1969).

6. NUREG-0016, "Calculation of Releases of Radioactive Materials in Gaseous and Liquid Effluents from Boiling Water Reactors" (BWR-GALE Code).

7. NUREG-0017, "Calculation of Releases of Radioactive Materials in Gaseous and Liquid Effluents From Pressurized Water Reactors" (PWR-GALE Code).

8. ANSI N13.10-1974, "Specification and Performance of On-Site Instrumentation for Continuously Monitoring Radioactivity in Effluents" (1974).

9. NUREG-0737, "Clarification of TMI Action Plan Requirements" (1980).

10. NUREG-0718, "Licensing Requirements for Pending Applications for Construction Permits and Manufacturing Licenses."

11. Standard Review Plan Appendix 11.5-A, "Design Guidance for Radiological Effluent Monitors."

12. Regulatory Guide 1.143, "Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants."

APPENDIX 11.5-A DESIGN GUIDANCE FOR RADIOLOGICAL EFFLUENT MONITORS PROVIDING SIGNALS FOR INITIATING TERMINATION OF FLOW OR OTHER MODIFICATION OF EFFLUENT STREAM PROPERTIES

A. Background

The primary design function of a radiological effluent monitor is the detection and measurement of radioactive materials released in gaseous or liquid effluent streams of light-water-cooled nuclear power reactors. An additional design function of some monitors is that of providing a signal to automatically terminate or otherwise modify the effluent stream. Examples are the termination of exhaust air flow by closure of containment ventilation or purge isolation valves and diversion of building ventilation exhaust streams from an untreated discharge path to an alternative treatment system, such as a standby gas treatment system for a BWR plant.

Depending on plant design and onsite meteorology, such an action may be necessary to mitigate the consequences of a design basis accident (DBA). The need for such mitigation is determined by calculating offsite doses that would result from the DBA. In other plant designs, radiological effluent monitors are used to actuate systems to modify or terminate releases for other purposes, e.g., to terminate releases due to anticipated operational occurrences to assure that offsite doses are maintained within the limits specified in the plant technical specifications.

The design and quality assurance criteria applied to the design, procurement, installation, testing, and operation of radiological effluent monitors installed in light-water-cooled nuclear power reactors should provide assurance that the monitors will perform all of their design functions.

If the DBA analysis noted above shows that the actuation of an engineered safety feature (ESF) system is required to mitigate the consequences of a DBA, and that a signal from a radiological effluent monitor is necessary to actuate the ESF system, then the monitor should be designed and qualified to the design and quality assurance criteria applicable to the ESF system. Conversely, if an automatically functioning device or system is used to reduce radioactive releases to assure maintaining offsite doses within the limits of the plant technical specifications (i.e., not for the purpose of mitigating the consequences of a DBA), then a monitor providing the actuation signal should be designed and qualified to criteria consistent with those of the actuated system.

This appendix does not establish, nor does it change in any manner, the design and quality assurance criteria established elsewhere for ESF or ESF-related systems or monitors.

The design guidance set forth in this Appendix provides reasonable assurance that monitors used to provide initiation signals for actuation of systems to control the release of radioactive materials in effluents, but not required to mitigate the consequences of a DBA, are designed, constructed, installed, tested, and maintained on a level commensurate with their intended function.

This Appendix sets forth minimum requirements and is not intended to prohibit the implementation of equivalent design codes, standards, or quality assurance measures other than those indicated herein.

B. Definitions

Radiological Effluent Monitor: A device which removes a representative sample from the effluent stream, detects and quantitatively measures the radioactive materials present in the sample, discharges the sampled medium back to the effluent stream, and transmits the measurement data to a central point.

Monitoring System: A system consisting of one or more remote monitors, a centrally located cabinet or console where data from the monitors is received, recorded, and displayed, and the necessary interconnecting cables, power supplies, pumps, motors, alarms, recorders, display panels, relays, and other auxiliary components.

C. Design Guidance

Design and quality assurance criteria for radiological effluent monitors should be consistent with the design and quality assurance criteria applicable to the systems which are actuated by a signal from the monitors.

Monitors providing signals for the actuation of engineered safety feature (ESF) systems should be designed and qualified to the design and quality assurance criteria applicable to ESF systems. Criteria for ESF-related monitors are found in the appropriate Standard Review Plans under Section 7. This position does not affect or modify existing criteria for ESF-related systems.

Monitors providing signals for the actuation of non-ESF systems should be designed and qualified to the design and quality assurance criteria applicable to the actuated system or to the criteria shown in Table I, below.

D. Implementation

The purpose of this section is to provide information to applicants and licensees regarding the staff's plans for utilizing this Appendix.

Except in those cases in which the applicant proposes an alternate method for complying with specified portions of the Commission's regulations, the criteria described herein will be used in the evaluation of applications docketed after July 1, 1979, as follows:

(1) Preliminary Design Approval (PDA) application reviews and Preliminary Duplicate Design Approval (PDDA) application reviews.

(2) Final Design Approval, Type 2 (FDA-2), application reviews and Final Duplicate Design Approval, Type 2 (PDDA-2), application reviews. Final Design Approval, Type 1 (FDA-1), or Final Duplicate Design Approval, Type 1 (FDA-1) applications docketed after July 1, 1979, should conform to the criteria of the corresponding PDA or PDDA applications, respectively.

(3) Manufacturing License (ML) application reviews.

(4) Construction Permit (CP) application reviews, except that portions of CP applications docketed after July 1, 1979, which reference standard designs (i.e., PDAs, FDA-1s, FDA-2s, PDDAs, FDDA-1s, FDDA-2s, or MLs) and replicate plant applications docketed after July 1, 1979, should conform to the criteria of the referenced design.

(5) Operating License (OL) applications should conform to the criteria of the corresponding CP applications.

These criteria do not apply to operating plants.

If an applicant wishes to use this guidance in developing submittals for applications docketed on or before July 1, 1979, the pertinent portions of the application will be evaluated on the basis of this Standard Review Plan section.

TABLE I

DESIGN GUIDANCE FOR RADIOLOGICAL EFFLUENT MONITORS
(INSTRUMENTATION INSTALLED IN LIGHT WATER COOLED NUCLEAR POWER PLANTS)

Category	Design Criteria	Quality Assurance Criteria
Effluent Radiological Monitoring Instrumentation providing a signal for the actuation of a system used to reduce releases of radioactive materials in effluents within limits specified in plant technical specifications. (Not required to initiate actuation for an ESF system).	Review: Reviewed Under Standard Review Plan Section 11.5 Reviewed by: Effluent Treatment Systems Branch (ETSB) Criteria: Manufacturer's Standard per ANSI N13.10-1974	Review: Reviewed under Standard Review Plan Section 11.5 Reviewed by: Effluent Treatment Systems Branch (ETSB) Criteria: Quality Assurance set forth in Regulatory Guide 1.143, Section IV. (Ref. 12)