REVISED RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

RAI No.:	**281-8232**
SRP Section:	**14.02 – Initial Plant Test Program - Design Certification and New License Applicants**
Application Section:	**14.02**
Date of RAI Issue:	**11/02/2015**

Question No. 14.02-49

10 CFR Part 50, Appendix E, Section IV, indicates that the emergency response data system is required to include various parameters, some of which are associated with radiation monitoring including, reactor coolant radioactivity, containment radiation level, condenser air removal radiation level, effluent radiation monitor, and process radiation monitor levels.

Regulatory Guide 1.68, “Initial Test Programs for Water-Cooled Nuclear Power Plants,” provides guidance on initial tests that are acceptable to staff as part of the initial test program. Appendix A to Regulatory Guide 1.68 provides guidance on the types of tests that should be included as part of the initial test program. Section A-1.k. “Radiation Protection Systems” indicates that the initial test program should include a test to test that radiation data is being transmitted to the emergency response data system.

1. Please update FSAR Chapters 11 and 12 to specify which radiation monitors are responsible for transmitting the emergency response data system parameters required in 10 CFR Part 50, Appendix E.

2. Include a test in the applicable initial test program section 14.2 to ensure that each of these radiation monitors are accurately transmitting data to the emergency response data system and that the emergency response data system is accurately providing the correct data.

Response

KHNP has reviewed the subject question and understands the staff’s request. KHNP is in the process of upgrading the test plans presented in Section 14.2 of the DCD. This effort is focused on adding additional SSCs that are important to safety and risk significant as well as increasing the level of detail described in the DCD for test prerequisites, test methods and acceptance criteria for the various tests. It has been determined that the actions to be taken as a result of this question is within the scope of the upgrade effort. Therefore, KHNP will address the noted

items in the upgrade effort, which is scheduled to be completed by February 1, 2016. A revised response to this question that incorporates the results of the upgrade effort will be submitted to the NRC after completion.

Response – (Rev. 3)

1. The process and effluent radiation monitors discussed in DCD Section 11.5 without sampler and Containment upper operating area monitors (RE-233A, RE-234B) will send signals to ERDS as described in the attached DCD markup.

2. The Radiation Monitoring System (RMS) communicates with information processing system (IPS) to transmit these parameters to ERDS. The IPS receives these parameters via unidirectional communication and transmits these parameters to the ERDS. The communication test between the RMS and the IPS is performed at the site during initial test period. Since the manufacturers for the RMS have not been determined for the APR1400, the test method for the communication between the Radiation Monitoring Systems and IPS cannot be determined at this time. Therefore, the communication test between the RMS and the ERDS will be performed by the COL applicant. COL Item 14.2(14) has been added to ensure that the COL applicant is to perform the appropriate interface testing of the monitors with ERDS. The communication test will ensure system and data link connections, verify network signals and commands between simulator computer and RMS computer, check communication packets are transmitted or received correctly, and validate output values for RMS computer and simulator to input values, for both analog and digital values.

Impact on DCD

DCD Revision 1 incorporated changes that were to the following Subsections, Tables, and Figure that were included in the initial response to this RAI.

DCD Tier 2

Subsection 11.5.2.2.5.m, 11.5.2.3.5.h, 12.3.4.1.5.a, 14.2.13

The following DCD Rev. 1 Subsections, Tables, and Figure will be revised as a result of this revised response.

DCD Tier 2

Subsection 11.5.2.2.5.a, 11.5.2.2.5.b, 11.5.2.2.5.d, 11.5.2.2.5.f, 11.5.2.2.5.h, 11.5.2.2.5.i, 11.5.2.2.5.k, 11.5.2.2.5.l, 11.5.2.3.5.a, 11.5.2.3.5.b, 11.5.2.3.5.c, 11.5.2.3.5.d, 11.5.2.3.5.e, 11.5.2.3.5.f, 11.5.2.3.5.g, 11.5.2.3.5.h, 11.5.2.3.5.i, 11.5.2.3.5.j, 12.3.4.1.5.a, 14.2.13

Table 1.8-2, 11.5-1, 11.5-2, 12.3-6

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Report.

Table 1.8-2 (32 of 38)

Item No.	Description
COL 14.2(11)	The COL applicant is to provide a schedule for the development of plant procedures, as well as a description of how, and to what extent, the plant operating, emergency, and surveillance procedures are use-tested during the initial test program.
COL 14.2(12)	The COL applicant that references the APR1400 design certification is to identify the specific operator training to be conducted as part of the low-power testing program related to the resolution of TMI Action Plan Item I.G.1, as described in (1) NUREG-0660 – NRC Action Plans Developed as a Result of the TMI-2 Accident, Revision 1, August 1980 and (2) NUREG-0737 – Clarification of TMI Action Plan Requirements.
COL 14.2(13)	The COL applicant is to develop a sequence and schedule for the development of the plant operating and emergency procedures should allow sufficient time for trial use of these procedures during the Initial Test Program. The sequence and schedule for plant startup is to be developed by the COL applicant to allow sufficient time to systematically perform the required testing in each phase.
COL 14.2(14)	The COL applicant is to perform the appropriate interface testing of the ~~gaseous~~ PERMSS monitors with ERDS.
COL 14.2(15)	The COL applicant is to prepare the preoperational test of cooling tower and associated auxiliaries, and raw water and service water cooling systems.
COL 14.2(16)	The COL applicant is to develop the test program of personnel monitors, radiation survey instruments, and laboratory equipment used to analyze or measure radiation levels and radioactivity concentrations.
COL 14.2(17)	The COL applicant is to prepare the site-specific preoperational and startup test specification and test procedure and/or guideline for plant and offsite communication system.
COL 14.2(18)	The COL applicant is to prepare the pre-operational test of ultimate heat sink pump house.
COL 14.2(19)	The COL applicant is to prepare the testing and verification of ultimate heat sink cooling chains.
COL 14.3(1)	The COL applicant is to provide the ITAAC for the site-specific portion of the plant systems specified in Subsection 14.3.3.
COL 14.3(2)	The COL applicant is to provide a design ITAAC closure schedule for implementing the V&V design ITAAC as addressed in Subsection 14.3.2.9.
COL 14.3(3)	The COL applicant is to provide the proposed ITAAC for the facility's emergency planning not addressed in the DCD in accordance with RG 1.206.
COL 14.3(4)	The COL applicant is to provide the proposed ITAAC for the site specific facility's physical security hardware not addressed in the DCD in accordance with RG 1.206.
COL 15.0(1)	The COL applicant is to perform the radiological consequence analysis using site-specific χ/Q values, unless the χ/Q values used in the DCD envelop the site-specific short-term or long-term χ/Q values of the DCD, and to show that the resultant doses are within the guideline values of 10 CFR 50.34 for EAB and LPZ and that of 10 CFR Part 50, Appendix A, GDC 19 for the MCR and TSC.
COL 16.1(1)	The choice of units is a COL information to be resolved by COL applicant
COL15.0(2)	The COL applicant is to perform the radiological consequence analysis and demonstrate that the related dose limits specified in 10 CFR Part 50, Appendix A GDC 19 are not exceeded, if the interval value of re-opening the closed outside air intake isolation dampers is less than that specified in Subsection 15.0.3.5.

and ARMS

radiation levels and to initiate appropriate safety actions. These are to meet the requirements of 10 CFR 50, Appendix A, GDC 63.

11.5.2.2.4 Calibration

Calibration procedure is described in Subsection 11.5.1.2.l.

11.5.2.2.5 Gaseous PERMSS monitor component description

Gaseous PERMSS are classifies as non-safety-related except Containment air monitors and MCR air intake monitors, which are Safety Class 3. Setpoints for safety-related monitors are described in Subsection 12.3.4.1.6.

Table 11.5-1 lists the measuring range, safety class, seismic category, quality class, electrical class, and other associated design information for each monitor.

a. High-energy line break area effluent monitors (RE-006 and 007)

The sample line inlet of RE-006 is located at High-energy line break area HVAC effluent. The monitor has particulate and iodine sampler and sends the radiation signal to RMS computer to analyze the radiation data. There is no indication, alarm, and automatic actuation generated from RE-006.

The monitors transmit the radiation signals to the licensing entity via emergency response data system (ERDS) link

The sample line inlet of RE-007 is located at High-energy line break area exhaust ACU inlet. The monitor is used to detect particulate, iodine, and noble gas activities. The monitor has measuring range specified in Table 11.5-1 and provides indication and alarm to the MCR, RSR, and local RMS skid. There is no automatic action initiated by RE-007.

These monitors are located in Auxiliary Building as shown in Figure 11.5-2E.

b. Auxiliary Building controlled area I, II HVAC normal/emergency exhaust ACU inlet monitors (RE-013, 014, 017, and 018)

The sample line inlet of RE-013 is located at Auxiliary Building controlled area I HVAC normal exhaust ACU inlet. The monitor is used to detect particulate, iodine, and noble gas activities. The monitor has measuring range specified in Table 11.5-1 and provides indication and alarm to the MCR, RSR, and local RMS

The monitor transmits the radiation signals to the licensing entity via emergency response data system (ERDS) link

skid. There is no automatic action initiated by RE-013. The monitor is located in Auxiliary building as shown in Figure 11.5-2F.

The monitor transmits the radiation signals to the licensing entity via emergency response data system (ERDS) link

The sample line inlet of RE-014 is located at Auxiliary building controlled area II HVAC normal exhaust ACU inlet. The monitor is used to detect particulate, iodine, and noble gas activities. The monitor has measuring range specified in Table 11.5-1 and provides indication and alarm to the MCR, RSR, and local RMS skid. There is no automatic action initiated by RE-014. The monitor is located in Auxiliary Building as shown in Figure 11.5-2G.

The monitor transmits the radiation signals to the licensing entity via emergency response data system (ERDS) link

The sample line inlet of RE-017 is located at Auxiliary building controlled area I HVAC emergency exhaust ACU inlet. The monitor is used to detect particulate, iodine, and noble gas activities. The monitor has measuring range specified in Table 11.5-1 and provides indication and alarm to the MCR, RSR, and local RMS skid. There is no automatic action initiated by RE-017. The monitor is located in Auxiliary Building as shown in Figure 11.5-2H.

The monitor transmits the radiation signals to the licensing entity via emergency response data system (ERDS) link

The sample line inlet of RE-018 is located at Auxiliary building controlled area II HVAC emergency exhaust ACU inlet. The monitor is used to detect particulate, iodine, and noble gas activities. The monitor has measuring range specified in Table 11.5-1 and provides indication and alarm to the MCR, RSR, and local RMS skid. There is no automatic action initiated by RE-018. The monitor is located in Auxiliary Building as shown in Figure 11.5-2H.

These monitors are designed to provide alarm to operator not to exceed the dose limits in 10 CFR 50, Appendix I and the effluent concentration limits in 10 CFR 20, Appendix B.

c. Auxiliary building controlled area HVAC normal/emergency exhaust ACU effluent monitors (RE-015, 016, 019, and 020)

The sample line inlet of RE-015 is located at Auxiliary building controlled area I HVAC normal exhaust ACU effluent. The sample line inlet of RE-016 is located at Auxiliary building controlled area II HVAC normal exhaust ACU effluent. The sample line inlet of RE-019 is located at Auxiliary building controlled area I HVAC emergency exhaust ACU effluent. The sample line inlet of RE-020 is located at Auxiliary building controlled area II HVAC emergency exhaust ACU effluent.

These monitors have particulate and iodine sampler and send the radiation signal to RMS computer to analyze the radiation data to ensure that the radioactive effluent discharged to the environment does not exceed the dose limit given in 10 CFR 50, Appendix I ALARA condition and the effluent concentration limit in 10 CFR 20, Appendix B. There is no individual separate indication, alarm, and automatic action initiated by these monitors other than one combined common alarm generated by the RMS computer to alert the operator. When the common alarm is generated, the operator uses the RMS computer log to determine the details of the alarm.

The monitors are located in Auxiliary building as shown in Figure 11.5-2G (RE-015), Figure 11.5-2M (RE-016), Figure 11.5-2I (RE-019), and Figure 11.5-2J (RE-020).

d. Containment purge effluent monitors (RE-037N01 and 037N02)

These monitors detect particulate, iodine, and noble gas activities from the containment before they are released to the environment. The sample lines of these offline monitor is provided with heat tracing to prevent condensation and are purged before sampling to provide reasonable assurance that samples are representative. The monitors have measuring range specified in Table 11.5-1 and provide indication and alarm to the MCR, RSR, and local RMS skid. High radiation signal initiated by these monitors stops the high volume purge exhaust ACUs or low volume purge exhaust ACU automatically.

The monitors transmit the radiation signals to the licensing entity via emergency response data system (ERDS) link

These monitors are designed to provide alarm to operator not to exceed the dose limits in 10 CFR 50, Appendix I and the effluent concentration limits in 10 CFR 20, Appendix B.

The monitors are located in Auxiliary building as shown in Figure 11.5-2O.

e. Containment air monitors (RE-039A and 040B)

Two monitors with air particulate, gas, and iodine channels are provided to monitor the radiation level in the containment. The wet parts of the detectors maintain pressure boundary integrity during normal conditions. The containment air monitors continuously measure, indicate, alarm, and record the radioactivity of particulate, iodine, and noble gas in a sample of air extracted from the containment.

The monitors transmit the radiation signals to the licensing entity via emergency response data system (ERDS) link

exhaust ACU and isolates the isolation dampers installed upstream of the normal supply AHU and downstream of the normal exhaust ACU in the fuel handling area.

The monitor is designed to provide alarm to operator not to exceed the dose limits in 10 CFR 50, Appendix I and the effluent concentration limits in 10 CFR 20, Appendix B.

The monitor is located in Auxiliary building as shown in Figure 11.5-2F.

g. Condenser vacuum pump vent effluent monitor (RE-063)

The sample line inlet of RE-063 is located at the condenser vacuum pump vent effluent. RE-063 has particulate and iodine sampler and detects noble gas activities. The monitor sends the radiation signal to RMS computer to analyze the radiation data. The sample lines of these offline monitor is provided with heat tracing to prevent condensation and are purged before sampling to provide reasonable assurance that samples are representative.

The monitor has measuring range specified in Table 11.5-1 and provides indication and alarm to the MCR, RSR, and local RMS skid.

High radiation signal from the monitor automatically stops the condenser overboard pump and diverts condensate flow to the condensate overflow storage sump by the modulating condenser overflow valve. The deaerator vent gas diverts from atmosphere to condenser by closing atmosphere valve and opening condenser valve simultaneously. Then, the condenser exhaust atmosphere valve closes and the containment isolation valve opens simultaneously. Also, the exhausted gases from condenser vacuum pump discharge are diverted to the reactor containment building drain sump by the booster fan start simultaneously.

The monitor transmits the radiation signal to the licensing entity via ERDS link.

The monitor is designed to provide alarm to operator not to exceed the dose limits in 10 CFR 50, Appendix I and the effluent concentration limits in 10 CFR 20, Appendix B.

The monitor is located in Turbine Generator Building as shown in Figure 11.5-2Z.

h. MCR air intake monitors (RE-071A, 072B, 073A, and 074B)

Two monitors per division (a total of four monitors) are provided with gas channels to monitor each of the intakes. The sample line inlet of two monitors are located in the air intake duct of each safety division as close to the intake point as practicable. The monitors detect noble gas activities.

The monitor has measuring range specified in Table 11.5-1 and provides indication and alarm to the MCR, RSR, and local RMS skid. Upon detection of high radiation, control room emergency ventilation actuation signal (CREVAS) is generated. The AHU inlet isolation dampers, which are open for normal operation, automatically close and the outside air is routed through the control room emergency makeup ACU.

The monitors transmit the radiation signals to the licensing entity via emergency response data system (ERDS) link

The monitors are located in Auxiliary Building as shown in Figure 11.5-2P (RE-073A, 074B) and Figure 11.5-2Q (RE-071A, 072B).

The monitors comply with 10 CFR Part 50.55a(h)(3) by meeting the following requirements of IEEE Std. 603-1991 (Reference 33) :

1) Single-failure criterion

Two monitors per division (a total of four monitors) are provided to meet the single-failure criterion. This arrangement is to accommodate the divisionalized air intake before merging into a common plenum which can be separated when needed. This configuration allows independence of the redundant monitor channels and precludes either a detectable or non-detectable failure impairing proper functioning of its intended safety function.

2) Completion of protective action

The four redundant radiation monitor signals are brought into the balance of plant -engineered safety features actuation system (BOP-ESFAS) coincidence logic, where the one-out-of-two logic is run twice downstream to a high radiation bistable trip circuit for each signal. The output of the coincidence logic is the CREVAS. For each redundant actuation division of HVAC equipment, the actuated equipment is grouped in two; one that cannot be manually overridden until the protective action is completed, when the radiation level subsides and falls below a preset level. The other group includes equipment that could be manually overridden depending upon the

degradation of these monitors would not occur due to physical proximity or functional interaction. This is in accordance with IEEE Std. 384 (Reference 38), NRC RG 1.189 (Reference 39), and NRC RG 1.151 (Reference 40). The effect of a single failure of a non-safety portion affecting or downgrading the safety function of the safety MCR intake radiation monitors is precluded and prevented based on basic features in the design, manufacturing, inspection, installation, and testing discussed above in detail.

i. Gaseous radwaste system exhaust monitor (RE-080)

The sample line inlet of RE-080 is located at waste gas exhaust line in the gaseous radwaste system. The monitor detects noble gas activities.

The monitor transmits the radiation signals to the licensing entity via emergency response data system (ERDS) link

The monitor has measuring range specified in Table 11.5-1 and provides indication and alarm to the MCR, RSR, and local RMS skid. Upon detection of high radiation, the waste gas exhaust line in the gaseous radwaste system is isolated with an automatic closure of isolation valve.

The monitor is designed to provide alarm to operator not to exceed the dose limits in 10 CFR 50, Appendix I and the effluent concentration limits in 10 CFR 20, Appendix B.

The monitor is located in Compound Building as shown in Figure 11.5-2V.

j. Compound building HVAC effluent monitor (RE-082)

The sample line inlet of RE-082 is located at the compound building HVAC effluent duct. The monitor has particulate and iodine sampler and sends the radiation signal to RMS computer to analyze the radiation data to ensure that the radioactive effluent discharged to the environment does not exceed the dose limit given in 10 CFR 50, Appendix I ALARA condition and the effluent concentration limit in 10 CFR 20, Appendix B. There is no individual separate indication, alarm, and automatic action initiated by this monitor other than one combined common alarm generated by the RMS computer to alert the operator. When the common alarm is generated, the operator uses the RMS computer log to determine the details of the alarm.

The monitor is located in Compound Building as shown in Figure 11.5-2W.

k. Compound building exhaust ACU inlet monitor (RE-083)

The sample line inlet of RE-083 is located at the compound building exhaust ACU duct at the inlet. The monitor detects particulate, iodine, and noble gas activities.

The monitor has measuring range specified in Table 11.5-1 and provides indication and alarm to the MCR, RSR, and local RMS skid. Upon detection of high radiation, the gaseous radwaste exhaust line in the gaseous radwaste system is isolated with an automatic closure of isolation valve. High radiation also diverts normal ventilation to emergency ventilation by starting the carbon adsorber exhaust ACUs and stopping the HEPA filter exhaust ACUs automatically.

The monitor transmits the radiation signals to the licensing entity via emergency response data system (ERDS) link

The monitor is designed to provide alarm to operator not to exceed the dose limits in 10 CFR 50, Appendix I and the effluent concentration limits in 10 CFR 20, Appendix B.

The monitor is located in Compound Building as shown in Figure 11.5-2W.

l. Compound building hot machine shop monitor (RE-084)

The sample line inlet of RE-084 is located at the compound building hot machine shop ACU outlet duct. The monitor detects particulate, iodine, and noble gas activities.

The monitor has measuring range specified in Table 11.5-1 and provides indication and alarm to the MCR, RSR, and local RMS skid. There is no automatic action initiated by the monitor.

The monitor transmits the radiation signals to the licensing entity via emergency response data system (ERDS) link

The monitor is located in Compound Building as shown in Figure 11.5-2U.

m. Main steam line effluent and N-16 radiation monitors (RE-217, 218, 219, and 220)

Main steam line effluent monitors detect the radioactive effluent discharge to the environment through main steam safety valve (MSSV), main steam atmospheric dump valve (MSADV), and auxiliary feedwater pump turbine exhaust. The monitor performs the function required by NRC RG 1.97. The monitor also serves to quickly detect gaseous N-16 that exists in a leak from the primary to the secondary steam line. Depending on the gaseous PERMSS supplier, the two

The sample line inlets of RE-111 and 112 are located at the component cooling water supply header. These offline monitors have a gamma scintillation detector.

The monitors have measuring range specified in Table 11.5-2 and provide indication and alarm to the MCR, RSR, and local RMS skid. Activity detected above a predetermined setpoint is indicative of a leak into the component cooling water system from the RCS and/or the other systems containing radioactive fluids. There is no automatic action initiated by RE-111 and RE-112.

The monitors transmit the radiation signals to the licensing entity via emergency response data system (ERDS) link

The monitors are located in Auxiliary Building as shown in Figure 11.5-2C (RE-111) and Figure 11.5-2B (RE-112).

b. Liquid radwaste system effluent monitors (RE-183 and 184)

The sample line inlet of RE-183 and 184 are located at liquid radwaste system effluent discharge. These offline monitors have a gamma scintillation detector. The monitors have measuring range specified in Table 11.5-2 and provide indication and alarm to the MCR, RSR, and local RMS skid.

The monitors are located in Compound Building as shown in Figure 11.5-2R.

The monitors transmit the radiation signals to the licensing entity via emergency response data system (ERDS) link

In the event that radioactivity in excess of a preset limit is detected in the waste liquid discharge flow, the liquid radwaste system effluent monitors terminate the discharge.

These monitors are designed to provide alarm to operator not to exceed the dose limits in 10 CFR 50, Appendix I and the effluent concentration limits in 10 CFR 20, Appendix B.

The LWMS is designed with two radiation monitors on the treated effluent discharge line. A radiation level in any portion of the flow that exceeds the predetermined setpoint turns off the monitor tank pump, and closes the effluent discharge valve. The status of the pumps and the position of the valve are indicated in the MCR and RSR for verification. The LWMS is designed with no release bypass.

In the event of failure of one or both radiation monitors, a failure (inoperable) signal will generate an alarm in the MCR. The discharge of the treated effluent

will be terminated by an operator action until the radiation monitor(s) is/are repaired or replaced.

A set of inspections, tests, analyses, and acceptance criteria is included in the Tier 1 Table 2.7.6.1-2, sub-item 6, to inspect, test, and verify the installation of the as-built two radiation monitors and isolation valve on the sole LWMS discharge line. A report is to be prepared to confirm the installation, functionality, operability testing, and calibration of the two radiation monitors and isolation valve.

c. Steam generator blowdown and downcomer monitors (RE-104, 185, and 186)

The sample line inlet of RE-104 is located at the discharge of the steam generator blowdown system. The sample line inlet of RE-185 and RE-186 is located at individual steam generator downcomer sample line in the process sampling system. These offline monitors have a gamma scintillation detector.

The monitors have measuring range specified in Table 11.5-2 and provide indication and alarm to the MCR, RSR, and local RMS skid.

Samples are cooled down through secondary sample cooler rack, which is part of the secondary sampling system, before being transferred to a local unit.

High radioactivity detected by these monitors indicates primary-to-secondary leakage. RE-104, RE-185, and 186, and/or grab samples from the primary sampling (PX) system are used to determine which steam generator is the source of the leak. Both of the blowdown line isolation valves and the secondary continuous sample line isolation valves are automatically closed when high radiation is detected.

The monitors transmit the radiation signals to the licensing entity via emergency response data system (ERDS) link

The monitors are located in Auxiliary Building as shown in Figure 11.5-2E (RE-104) and in Compound Building as shown in Figure 11.5-2S (RE-185 and 186).

d. Condensate polishing area sump water monitor (RE-164)

The sample line inlet of RE-164 is located at the discharge of condensate polishing area sump pump.

This offline monitor has a gamma scintillation detector. The monitor has measuring range specified in Table 11.5-2 and provides indication and alarm to the MCR, RSR, and local RMS skid.

The monitor transmits the radiation signals to the licensing entity via emergency response data system (ERDS) link

Upon detection of a high-radiation signal, the operating condensate polishing area sump pump is stopped automatically. The discharge valve to the waste water treatment facility (WWTF) is closed, and the discharge valve to the liquid waste management system (LWMS) is opened simultaneously. Then, the sump pump is manually started. The flow is then diverted to the LWMS.

The monitor is designed to provide alarm to operator not to exceed the dose limits in 10 CFR 50, Appendix I and the effluent concentration limits in 10 CFR 20, Appendix B.

However, the pump discharge line arrangement and the detailed location of sample lines for these monitors cannot be determined because the flow diagrams for these sumps will be provided by COL applicant.

The monitor is located in Turbine Generator Building as shown in Figure 11.5-2Y.

Condenser pit sump water monitor (RE-165) and RE-167

The sample line inlet of ~~RE-165~~ is located at the discharge of condenser pit sump pump RE-165 and RE-167

The monitor provides indication and alarm to the MCR, RSR, and local RMS skid.

Upon detection of a high-radiation signal, the operating sump pumps are stopped automatically. The discharge valve to the WWTF is closed, and the discharge valve to condensate polishing area sump is opened simultaneously. Then, the sump pump is manually started. The flow is then diverted to the LWMS.

The monitors transmit the radiation signals to the licensing entity via emergency response data system (ERDS) link

The monitor is designed to provide alarm to operator not to exceed the dose limits in 10 CFR 50, Appendix I and the effluent concentration limits in 10 CFR 20, Appendix B.

The ~~monitor type, measuring range, and installed location of the RE-165 are~~ to be determined by the COL applicant (COL 11.5(9)).

The installed locations of RE-165 and RE-167 are

f. Condensate receiver tank monitor (RE-103)

The sample line inlet of RE-103 is located at the outlet of the condensate receiver tank in the auxiliary steam system.

This offline monitor has a gamma scintillation detector and monitors a leak in the boric acid concentrator and gas stripper. The monitor has measuring range specified in Table 11.5-2 and provides indication and alarm to the MCR, RSR, and local RMS skid. Detection of high activity automatically diverts the condensate flow to the equipment waste tank in the LWMS by closing condensate return pump discharge isolation valve to the gland seal water collection tank underground common tunnel and opening the condensate return pump discharge isolation valve to the LWMS. The sample pump on the condensate receiver tank discharge sample line stops upon the detection of high radiation signal.

The monitor transmits the radiation signals to the licensing entity via emergency response data system (ERDS) link

The monitor is designed to provide alarm to operator not to exceed the dose limits in 10 CFR 50, Appendix I and the effluent concentration limits in 10 CFR 20, Appendix B.

The monitor is located in Auxiliary Building as shown in Figure 11.5-2D.

g. Fire pump and water/wastewater treatment building monitor (RE-190)

The sample line inlet of RE-190 is located at the outlet of the chemical wastewater treatment ponds. This offline monitor has a gamma scintillation detector. The monitor has measuring range specified in Table 11.5-2 and provides indication and alarm to the MCR, RSR, and local RMS skid.

The monitor transmits the radiation signals to the licensing entity via emergency response data system (ERDS) link

Upon receipt of a high radiation signal, the chemical wastewater pumps stop. Contaminated wastewater in the chemical wastewater ponds is administratively controlled.

The monitor is designed to provide alarm to operator not to exceed the dose limits in 10 CFR 50, Appendix I and the effluent concentration limits in 10 CFR 20, Appendix B.

The monitor is located in Wastewater treatment facility as shown in Figure 11.5-2AA.

h. CVCS letdown monitor and CVCS gas stripper effluent monitor (RE-204 and 265)

The CVCS letdown line process radiation monitor (RE-204) provides continuous recording in the MCR of reactor coolant gross gamma radiation and specific

fission product gamma activity, thus providing a measure of fuel cladding integrity. A high-radiation alarm is annunciated in the MCR. Local and remote samples in the CVCS provide the primary means for determining RCS activity. The process radiation monitor serves only as a trending device to alert the operator of possible fuel cladding failure.

The sample line inlet of the RE-204 is located at the purification filter outlet to purification ion exchanger of CVCS.

and 265

The monitors (RE-204) transmit the radiation signals to the licensing entity via emergency response data system (ERDS) link.

The gas stripper effluent radiation monitor (RE-265) provides continuous recording in the MCR of the gross gamma activity leaving the gas stripper and entering the holdup tank. A high radiation alarm indicates improper operation of upstream purification equipment. Normally, however, an increasing activity trend allows the operator to take corrective measures (replace ion exchanger resin or filter cartridges) before significant activity increases in the holdup tank. The radiation monitor consists of a logarithmic ratemeter that processes pulses from a shielded scintillation detector.

The sample line inlet of RE-265 is located at the holdup tank inlet of CVCS.

These monitors have measuring range specified in Table 11.5-2. There is no automatic action initiated by RE-204 and RE-265.

The monitors are located in Auxiliary Building as shown in Figure 11.5-2D (RE-204) and Figure 11.5-2E (RE-265).

i. Essential service water pump discharge header monitors (RE-113 and 114)

Two monitors for essential service water discharge header are installed. The sample line inlet of RE-113 and RE-114 is located at the downstream of the component cooling water heat exchangers in the essential service water system.

These offline monitors have a gamma scintillation detector. The monitors have measuring range specified in Table 11.5-2 and provide indication and alarm to the MCR, RSR, and local RMS skid. There is no automatic action initiated by RE-

The monitors transmit the radiation signals to the licensing entity via emergency response data system (ERDS) link

113 and RE-114. Activity detected above background is indicative of a leak into the essential service water system from the component cooling water system.

The monitors are located in CCW HX Building as shown in Figure 11.5-2X.

i. CCW heat exchanger building sump monitor (RE-166)

RE-166 and RE-168

and RE-168

CCW heat exchanger building sump.

The sample line inlet of ~~RE-166~~ is located at the discharge of ~~condenser pit sump pump~~.

The monitors transmit the radiation signals to the licensing entity via emergency response data system (ERDS) link

The monitor provides indication and alarm to the MCR, RSR, and local RMS skid.

Upon detection of a high-radiation signal, the discharge valve of the CCW heat exchange building sump pump to non-radioactive liquid release is closed and the discharge valve to the LWMS is opened simultaneously. The flow is then diverted to the LWMS.

The monitor is designed to provide alarm to operator not to exceed the dose limits in 10 CFR 50, Appendix I and the effluent concentration limits in 10 CFR 20, Appendix B.

The ~~monitor type, measuring range, and installed location of the RE-166 are~~ to be determined by the COL applicant (COL 11.5(9)).

The installed locations of RE-166 and RE-168 are

11.5.2.4 Design Features for Minimization of Contamination

The APR1400 is designed with specific features to meet the requirements of 10 CFR 20.1406 (Reference 30) and Regulatory Guide 4.21 (Reference 31). The basic principles of RG 4.21, and the methods of control suggested in the regulations, are specifically delineated in four design objectives and two operational objectives described in Subsection 12.4.2 of this DCD. The following evaluation summarizes the primary features to address the design and operational objectives for the RMS.

The RMS has been evaluated for leak identification from the SSCs that contain radioactive or potentially radioactive materials, the areas and pathways where probable leak may occur, and methods of control incorporated in the design of the system. The leak identification evaluation indicated that the RMS is designed to facilitate the identification of leaks, provide prompt assessment and evaluation, and initiate responses to isolate and mitigate leaked areas. Thus unintended contamination of the facility and the environment is

However, the pump discharge line arrangement and the detailed location of sample lines for these monitors cannot be determined because the flow diagrams for these sumps will be provided by COL applicant.

Table 11.5-1 (1 of 3)

Gaseous Process and Effluent Radiation Monitors

Location	Tag No.	Class[1]			Range (μCi/cc)[2]					Function and Remarks [4]
		S	SE	E	Particulate Gross β	I-131 γ	Gas Gross β	Liquid Gross γ	Area	Display & Alarm at MCR/RSR/Local
High-energy line break area HVAC effluent (offline)	RE-006	N	III	N	Sampler	Sampler	N/A	N/A	N/A	Analysis No/No/No
High-energy line break area exhaust ACU inlet (offline)	RE-007	N	III	N	1.0×10^{-11} to 1.0×10^{-5}	1.0×10^{-11} to 1.0×10^{-5}	1.0×10^{-6} to 1.0×10^{3}	N/A	N/A	Yes/Yes/Yes ERDS[5]
Auxiliary building controlled area (I, II) HVAC normal/emergency exhaust ACU inlet (offline)	RE-013 RE-014 RE-017 RE-018	N	II	N	1.0×10^{-11} to 1.0×10^{2}	1.0×10^{-11} to 1.0×10^{2}	1.0×10^{-6} to 1.0×10^{3}	N/A	N/A	Yes/Yes/Yes ERDS[5]
Auxiliary building controlled area (I, II) HVAC normal/emergency exhaust ACU effluent (offline)	RE-015 RE-016 RE-019 RE-020	N	II	N	Sampler	Sampler	N/A	N/A	N/A	Analysis No/No/No
Containment purge effluent (offline)	RE-037N01 RE-037N02	N	II	N	1.0×10^{-11} to 1.0×10^{2}	1.0×10^{-11} to 1.0×10^{2}	1.0×10^{-6} to 1.0×10^{5}	N/A	N/A	containment building purge stop Yes/Yes/Yes ERDS[5]

Table 11.5-1 (2 of 3)

Location	Tag No.	Class[1]			Range (μCi/cc)[2]					Function and Remarks [4]
		S	SE	E	Particulate Gross β	I-131 γ	Gas Gross β	Liquid Gross γ	Area	Display & Alarm at MCR/RSR/Local
Containment air (offline)	RE-039A RE-040B	3	I	A B	1.0×10^{-9} to 1.0×10^{-3}	1.0×10^{-9} to 1.0×10^{-3}	1.0×10^{-6} to 1.0×10^{1}	N/A	N/A	Leak detection Yes/Yes/Yes
Fuel handling area HVAC effluent (offline)	RE-043	N	II	N	1.0×10^{-11} to 1.0×10^{-5}	1.0×10^{-11} to 1.0×10^{-5}	1.0×10^{-6} to 1.0×10^{3}	N/A	N/A	Isolation interlock diversion interlock Yes/Yes/Yes
Condenser vacuum pump vent effluent (offline)	RE-063	N	III	N	Sampler	Sampler	1.0×10^{-6} to 1.0×10^{-1}	N/A	N/A	Isolation interlock diversion interlock analysis Yes/Yes/Yes
MCR air intake (inline)	RE-071A RE-072B RE-073A RE-074B	3	I	A B A B	N/A	N/A	1.0×10^{-6} to 1.0×10^{-1}	N/A	N/A	CREVAS Yes/Yes/Yes
Gaseous radwaste system exhaust (offline)	RE-080	N	III	N	N/A	N/A	1.0×10^{-3} to 1.0×10^{2}	N/A	N/A	Isolation interlock Yes/Yes/Yes
Compound building HVAC effluent (offline)	RE-082	N	III	N	Sampler	Sampler	N/A	N/A	N/A	Analysis No/No/No
Main steam line	RE-217 RE-218 RE-219 RE-220	N	II	N	N/A	N/A	N/A	N/A	2.7×10^{-9} to 2.7×10^{-3} (Note 3)	Leak detection Primary to secondary Yes/Yes/Yes

ERDS[5]

ERDS[5]

ERDS[5]

ERDS[5]

ERDS[5]

ERDS[5]

Table 11.5-1 (3 of 3)

Location	Tag No.	Class(1)			Range (μCi/cc)(2)					Function and Remarks (4)
		S	SE	E	Particulate Gross β	I-131 γ	Gas Gross β	Liquid Gross γ	Area	Display & Alarm at MCR/RSR/Local
Compound building exhaust ACU inlet (offline)	RE-083	N	III	N	1.0×10^{-11} to 1.0×10^{-5}	1.0×10^{-11} to 1.0×10^{-5}	1.0×10^{-6} to 1.0×10^{2}	N/A	N/A	Isolation interlock, diversion interlock from normal to emergency ventilation Yes/Yes/Yes
Compound building hot machine shop	RE-084	N	III	N	1.0×10^{-11} to 1.0×10^{-5}	1.0×10^{-11} to 1.0×10^{-5}	1.0×10^{-6} to 1.0×10^{-1}	N/A	N/A	Yes/Yes/Yes

ERDS(5)

ERDS(5)

(1) S = Safety Class per ANSI/ANS 51.1 (Reference 32): 1 = SC-1, 2 = SC-2, 3 = SC-3, N = NNS
SE = Seismic Category: I, II, III
E = Electrical Class: A, B, C, D=Class 1E Separation Division, N = Non-Class 1E

(2) Detector type and calibration nuclide for each measurement:
Particulate Gross β = β scintillator with Cs-137
Gas Gross β = β scintillator with Kr-85
Liquid Gross γ = γ scintillator with Cs-137
Iodine γ = γ scintillator with Ba-133

(3) Detector type for area radiation monitor is GM tube or ionization chamber.

(4) The detector with the isolation function isolates the effluent discharge function when the discharge reaches a preset setpoint value, thus terminating the discharge. The detector with the diversion interlock function diverts the effluent discharge to a safe hold-up storage or further processing for decontamination when a setpoint is reached. Certain detectors could have both isolation and diversion interlock function depending on the application.

(5) The monitor transmits the radiation signals to the licensing entity via the emergency response data system (ERDS) link. As described in APR1400 DCD Tier 2 Section 13.3, the ERDS is a real-time electronic data transmission system to the NRC operations center that provides a set of parameters from the onsite computer system in the event of an emergency. The ERDS transmits information to allow the NRC to provide advice and support to the licensee, state, and local authorities, and other federal officials. The ERDS satisfies the requirements in 10 CFR Part 50, Appendix E.

Table 11.5-2 (1 of 2)

Liquid Process and Effluent Radiation Monitors

Location	Tag No.	Class [1]			Range (μCi/cc) [2]					Function and Remarks [3]
		S	SE	E	Particulate Gross β	I-131 γ	Gas Gross β	Liquid Gross γ	Area	Display & Alarm at MCR/RSR/Local
CVCS letdown	CV-RE-204	N	II	N	N/A	N/A	N/A	1.0×10^{-4} to 1.0×10^{2}	N/A	Yes/No/No
CVCS gas stripper effluent	CV-RE-265	N	II	N	N/A	N/A	N/A	1.0×10^{-4} to 1.0×10^{1}	N/A	Yes/No/No
Condensate receiver tank	RE-103	N	III	N	N/A	N/A	N/A	1.0×10^{-6} to 1.0×10^{-1}	N/A	Diversion interlock Yes/Yes/Yes
Steam Generator blowdown	RE-104	N	II	N	N/A	N/A	N/A	1.0×10^{-6} to 1.0×10^{-1}	N/A	Leak detection isolation interlock Yes/Yes/Yes
Steam Generator 1 and 2 downcomer	RE-185 RE-186	N	III							
CCW supply header	RE-111 RE-112	N	II	N	N/A	N/A	N/A	1.0×10^{-6} to 1.0×10^{-1}	N/A	Leak detection isolation of inlet/outlet valve of heat exchanger Yes/Yes/Yes
Essential service water (ESW) pump discharge headers	RE-113 RE-114	N	II	N	N/A	N/A	N/A	1.0×10^{-6} to 1.0×10^{-1}	N/A	leak detection Yes/Yes/Yes

ERDS[6]

ERDS[6]

ERDS[6]

ERDS[6]

ERDS[6]

ERDS[6]

Table 11.5-2 (2 of 2)

Location	Tag No.	Class(1)			Range (μCi/cc) (2)					Function and Remarks (3)
		S	SE	E	Particulate Gross β	I-131 γ	Gas Gross β	Liquid Gross γ	Area	Display & Alarm at MCR/RSR/Local
CPP area sump water	RE-164	N	III	N	N/A	N/A	N/A	1.0×10^{-6} to 1.0×10^{-1}	N/A	Pump stop signal Yes/Yes/Yes
Liquid radwaste system effluent	RE-183 RE-184	N	III	N	N/A	N/A	N/A	1.0×10^{-6} to 1.0×10^{-1}	N/A	Isolation interlock(5) Yes/Yes/Yes
Fire pump and water/wastewater treatment building	RE-190	N	III	N	N/A	N/A	N/A	1.0×10^{-7} to 1.0×10^{-1}	N/A	Pump stop signal Yes/Yes/Yes
Condenser pit sump water	RE-165	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	Yes/Yes/Yes, pump stop signal
CCW heat exchanger building sump	RE-166	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	Yes/Yes/Yes, pump stop signal

ERDS(6)

ERDS(6)

ERDS(6)

ERDS(6)

ERDS(6)

RE-167

RE-168

N/A

1.0×10^{-6} to 1.0×10^{-1}

N/A

(1) S = Safety Class per ANSI/ANS 51.1 (Reference 32): 1 = SC-1, 2 = SC-2, 3 = SC-3, N = NNS
SE = Seismic Category: I, II, III
E = Electrical Class: A, B, C, D = Class 1E Separation Division, N = Non-Class 1E

(2) Detector type and calibration nuclide for each measurement:
Particulate Gross β = β scintillator with Cs-137
Gas Gross β = β scintillator with Kr-85
Liquid Gross γ = γ scintillator with Cs-137
Iodine γ = γ scintillator with Ba-133

(3) The detector with the isolation function isolates the effluent discharge function when the discharge reaches a preset setpoint value, thus terminating the discharge. The detector with the diversion interlock function diverts the effluent discharge to a safe hold-up storage or further processing for decontamination when a setpoint is reached. Certain detectors could have both isolation and diversion interlock function depending on the application.

(4) The COL applicant is to determine the safety class ~~and measuring range~~ (COL 11.5(9)) .

(5) The liquid effluent radiation monitors shall be inspected, calibrated, and tested in accordance with the methodology and criteria specified in the ODCM. The COL applicant may follow NEI 07-09A (Reference 21) as guidance for the preparation of the ODCM (COL 11.5(4)).

(6) The monitor transmits the radiation signals to the licensing entity via the emergency response data system (ERDS) link. As described in APR1400 DCD Tier 2 Section 13.3, the ERDS is a real-time electronic data transmission system to the NRC operations center that provides a set of parameters from the onsite computer system in the event of an emergency. The ERDS transmits information to allow the NRC to provide advice and support to the licensee, state, and local authorities, and other federal officials. The ERDS satisfies the requirements in 10 CFR Part 50, Appendix E.

Table 12.3-6 (1 of 2)

Area Radiation Monitors

Description	Tag No.	Class[1]			Range					Function and Remarks
		S	SE	E	Airborne Particulate	Iodine	Gas	Liquid	Area[2] (mSv/hr)	Display & Alarm at MCR/RSR/Local
Post-accident primary sample room	RE-205	N	III	N	N/A	N/A	N/A	N/A	10^{-3}~10^{2}	Yes/Yes/Yes
Normal primary sample room	RE-285	N	III	N	N/A	N/A	N/A	N/A	10^{-3}~10^{2}	Yes/Yes/Yes
Main steam and FW containment piping penetration area	RE-237 RE-238	N	II	N	N/A	N/A	N/A	N/A	10^{0}~10^{5}	Yes/Yes/Yes
Containment operating area	RE-231A RE-232B	3	I	A B	N/A	N/A	N/A	N/A	10^{-3} ~ 10^{2}	Yes/Yes/Yes CPIAS
Containment upper operating area	RE-233A RE-234B	3	I	A B	N/A	N/A	N/A	N/A	10^{1} ~ 10^{8}	Yes/Yes/Yes CPIAS
In-core instrument	RE-235	N	II	N	N/A	N/A	N/A	N/A	10^{-3} ~ 10^{2}	Yes/Yes/Yes
Containment personnel access hatch area	RE-236	N	II	N	N/A	N/A	N/A	N/A	10^{-3} ~ 10^{2}	Yes/Yes/Yes
Spent fuel pool area	RE-241A RE-242B	3	I	A B	N/A	N/A	N/A	N/A	10^{-3} ~ 10^{2}	Yes/Yes/Yes FHEVAS
New fuel storage area	RE-245	N	II	N	N/A	N/A	N/A	N/A	10^{-3} ~ 10^{2}	Yes/Yes/Yes

ERDS[3]

Table 12.3-6 (2 of 2)

Description	Tag No.	Class[1]			Range					Function and Remarks
		S	SE	E	Airborne Particulate	Iodine	Gas	Liquid	Area[2] (mSv/hr)	Display & Alarm at MCR/RSR/Local
Hot machine shop	C-RE-293	N	III	N	N/A	N/A	N/A	N/A	$10^{-3} \sim 10^{2}$	Yes/Yes/Yes
Radiochemistry lab	RE-257	N	III	N	N/A	N/A	N/A	N/A	$10^{-3} \sim 10^{2}$	Yes/Yes/Yes
~~Instrument~~ calibration facility	~~C-RE-286~~	~~N~~	~~III~~	~~N~~	~~N/A~~	~~N/A~~	~~N/A~~	~~N/A~~	~~$10^{-3} \sim 10^{2}$~~	~~Yes/Yes/Yes~~
Main control room area	RE-275	N	II	N	N/A	N/A	N/A	N/A	$10^{-3} \sim 10^{2}$	Yes/Yes/Yes
TSC area	RE-279	N	III	N	N/A	N/A	N/A	N/A	$10^{-3} \sim 10^{2}$	Yes/Yes/Yes
Truck bay area	C-RE-288 C-RE-289	N	III	N	N/A	N/A	N/A	N/A	$10^{-3} \sim 10^{2}$	Yes/Yes/Yes
Waste drum storage area	C-RE-292	N	III	N	N/A	N/A	N/A	N/A	$10^{-3} \sim 10^{2}$	Yes/Yes/Yes
Compound building dry active waste storage area	C-RE-284	N	III	N	N/A	N/A	N/A	N/A	$10^{-3} \sim 10^{2}$	Yes/Yes/Yes

(1) S: safety Class per ANSI/ANS-51.1; 1=SC-1, 2=SC-2, 3=SC-3, N=NNS
SE: seismic Category I, II, III
E: Electrical Class A, B, C, D=Class 1E Separation Division, N=Non-Class 1E
Refer to Section 3.2 for the definition.

(2) Detector type for area radiation monitor is GM tube or ionization chamber

(3) The monitor transmits the radiation signals to the licensing entity via the emergency response data system (ERDS) link. As described in APR1400 DCD Tier 2 Section 13.3, the ERDS is a real-time electronic data transmission system to the NRC operations center that provides a set of parameters from the onsite computer system in the event of an emergency. The ERDS transmits information to allow the NRC to provide advice and support to the licensee, state, and local authorities, and other federal officials. The ERDS satisfies the requirements in 10 CFR Part 50, Appendix E.

12.3.4.1.5 ARMS

The ARMS monitors presented in Table 12.3-6 are categorized into subsystems used for process monitoring functions or other monitoring applications. The location and flow diagrams of the monitors are shown in Figure 11.5-1.

The ARMS monitors are as follows:

a. Safety-related area monitors (RE-231A, 232B, 241A, 242B, 233A, and 234B)

Containment operating area monitors (RE-231A, 231B) and spent fuel pool area monitors (RE-241A, 241B) are installed as safety-related area monitors for actuating engineered safety features. These monitors perform additional safety functions that generate containment purge isolation and fuel area emergency ventilation actuating signals. The fuel area normal ventilation system is isolated, and the emergency ventilation system is initiated by the fuel area emergency ventilation actuating signal. Containment purge isolation actuating signal (CPIAS) isolates the containment purge system. These monitors are accident monitoring instrumentation (AMI), type C, and also listed on Table 7.5-1.

The containment upper operating area monitors (RE-233A, 234B) consist of physically independent and electrically separated detectors located inside the containment away from the influence of the reactor coolant system to measure high-range gamma radiation. This monitor gives operators a seismically and environmentally qualified indication of containment airborne activity. These monitors conform with the requirements of 10 CFR 50.34(f)(2)(xvii) and the criteria in Attachment 3 to Item II.F.1 of NUREG-0737 and NRC RG 1.97.

One of the spent fuel pool area monitors is located on a wall and the other near the SFP bridge area.

The containment operating area monitors (RE-231A and 232B) are located near El. 160’ directly above the refueling pool. The containment upper operating area monitors (RE-233A and 234B) are azimuthally 180° apart and located just below the containment polar crane rail support girder (near El. 230’). Thus, the two monitors have a wide open, unobstructed view of the entire containment free air volume. The location of RE-231A, RE-232B, RE- 233A, and RE-234B is shown in Figure 11.5-2A.

The monitors (RE-233A, RE-234B) transmit the radiation signals to the licensing entity via emergency response data system (ERDS) link.

COL 14.2(9) The COL applicant is responsible for retaining preoperational and startup test procedures and test results as part of the plant's historical records in accordance with 10 CFR 50.36, "Technical Specification," 10 CFR 50.71, "Maintenance of Records, Making of Reports," 10 CFR 50, Appendix B, Criterion XVII, "Test Records," and RG 1.28, "Quality Assurance Program Criteria (Design and Construction)."

The preoperational and startup testing procedures and test results are to be retained for the life of the plant be the COL applicant.

COL 14.2(10) The COL applicant is to describe its program for reviewing available information on reactor operating and testing experiences and discusses how it used this information in developing the initial test program. The description is to include the sources and types of information reviewed, the conclusions or findings, and the effect of the review on the initial test program.

COL 14.2(11) The COL applicant is to provide a schedule for the development of plant procedures, as well as a description of how, and to what extent, the plant operating, emergency, and surveillance procedures are use-tested during the initial test program.

COL 14.2(12) The COL applicant that references the APR1400 design certification is to identify the specific operator training to be conducted as part of the low-power testing program related to the resolution of TMI Action Plan Item I.G.1, as described in (1) NUREG-0660 – NRC Action Plans Developed as a Result of the TMI-2 Accident, Revision 1, August 1980 and (2) NUREG-0737 – Clarification of TMI Action Plan Requirements.

COL 14.2(13) The COL applicant is to develop a sequence and schedule for the development of the plant operating and emergency procedures should allow sufficient time for trial use of these procedures during the Initial Test Program. The sequence and schedule for plant startup is to be developed by the COL applicant to allow sufficient time to systematically perform the required testing in each phase.

COL 14.2(14) The COL applicant is to perform the appropriate interface testing of the ~~gaseous~~ PERMSS monitors with ERDS.

and ARMS