ArevaEPRDCPEm Resource

From: Tesfaye, Getachew
Sent: Tuesday, June 01, 2010 7:11 AM
To: Dehmel, Jean-Claude; McCann, Edward; Roach, Edward; Patel, Jay; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: FW: Draft RAI 391 Supplement 1 Response Ready for Submittal to NRC
Attachments: RAI 391 Supplement 1 Response Draft Response.pdf

-----Original Message-----
From: BRYAN Martin (EXT) [mailto:Martin.Bryan.ext@areva.com]
Sent: Saturday, May 29, 2010 12:00 PM
To: Tesfaye, Getachew
Cc: WILLIFORD Dennis C (AREVA NP INC); ROMINE Judy (AREVA NP INC)
Subject: Draft RAI 391 Supplement 1 Response Ready for Submittal to NRC

Getachew,

Attached is a draft response for RAI 391 Supplement 1. The revised schedule for the final response was provided yesterday. Please let me know if the staff has any questions.

Thanks

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager AREVA NP Inc.
Tel: (434) 832-3016
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-----Original Message-----
From: WILLIFORD Dennis C (AREVA NP INC)
Sent: Friday, May 28, 2010 12:55 PM
To: BRYAN Martin (EXT)
Cc: SLIVA Dana (AREVA NP INC)
Subject: Draft RAI 391 Supplement 1 Response Ready for Submittal to NRC

Marty,
Please forward to the NRC these draft responses and FSAR markups for RAI 391, Questions 11.03-17 and 11.04-16. We did not send formally earlier today as we wanted to give the NRC the opportunity to review before finalizing and sending formally.
Thanks,
Dennis

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 1483

Mail Envelope Properties (0A64B42AAA8FD4418CE1EB5240A6FED113451EBDBE)

Subject: FW: Draft RAI 391 Supplement 1 Response Ready for Submittal to NRC
Sent Date: 6/1/2010 7:11:02 AM
Received Date: 6/1/2010 7:11:17 AM
From: Tesfaye, Getachew

Created By: Getachew.Tesfaye@nrc.gov

Recipients:
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Response to

Request for Additional Information No. 391(4595, 4643, 4598), Supplement 1, Revision 1

4/28/2010

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 11.03 - Gaseous Waste Management System
SRP Section: 11.04 - Solid Waste Management System
Application Section: FSAR Ch 11

QUESTIONS for Health Physics Branch (CHPB)

Question 11.03-17:

Phase 4 RAI

Follow up to Open Item RAI 273, Question 11.03-13 (Supplement 5 Response) and Combined Health Physics and BOP staff questions

A. In the response dated March 31, 2010, the applicant provides new information and proposes the addition of Table 11.3-10 addressing the staff's request in including a failure analysis for the GWMS in FSAR Section 11.3. A review of Table 11.3-10 and information presented in FSAR Sections 11.3 and 9.5.1 indicates that the information presented in Table 11.3-10 should be revised to address the following items:

1. For the four instances of instrumentation malfunctions dealing with "inaccurate H_2/O_2 measurements," the applicant is requested to verify and state whether such inaccurate measurements would be in the conservative direction.

2. The applicant should review the listing of listed malfunctions and determine whether a failed open H_2 or O_2 injection valve malfunction should be included in the failure analysis.

3. The applicant should add in Table 11.3-10 an entry corresponding to the delay bed fire described in FSAR Section 11.3.2.4.2 in presenting a complete series of malfunction events.

B. FSAR Section 9.5.1, Appendix 9A identifies fires as an AOO event that could have radiological consequences, given Part 20 requirements for plant personnel, members of the public, and environment. The fire protection analysis for the GWMS delay beds is contained in Section 9A.3.7.5 (p.9A-31) and Table 9A-2, Col. 56, (p.9A-71and -72) for that area of the Nuclear Auxiliary Building. The analysis identifies charcoal filters as an "in situ loading" source of combustible material (based on note "h" to the table), and states that there are radiological effects, but notes that no engineering evaluations were performed. The applicant is requested to address and correct the apparent inconsistencies in Table 9A-2, Col. 56, (p.9A-71and -72), assess whether a fire (due to external sources causing charcoal to reach auto ignition temperatures) in the room housing the delay beds would have offsite radiological consequences in releasing radioactive materials, and include the results of such analysis (with either outcome, inclusion or exclusion) in an expanded discussion in FSAR Section 11.3.2.4.2 (Fire in Delay Beds). Note: The applicant is requested to review Table 9A-2 and address the several other instances where radiological effects are presumed, but qualified with entries stating that no engineering evaluations were performed. For example, see fire protection analyses for the Reactor Building, area 1; Fuel Building, areas 39, 40, 41, 42, 44, 49, and 50; Nuclear Auxiliary Building, areas 52, 54, 56, 61, and 62; Radwaste Processing Building, area 67; and Access Building, areas 89, 91, 92, 93, 94, and 97.

Response to Question 11.03-17(a):

1. U.S. EPR FSAR Tier 2, Section 11.3.2.3.15 will be revised to state that the gaseous waste processing system (GWPS) gas analyzers will have daily sensor checks, monthly functional checks, and quarterly calibrations.

The specific deviation of the measurement (high, low, or no indication) depends on the type of sensor, the signal processing, and the degree of inadequate sample conditioning. In currently operating plants, hydrogen and oxygen sensor failures are rare, random events (see INPO CE 01032345 (6/12/2006) for an example).

For accurate measurements, the gas temperature must remain above the dew point. Condensation in the sample cell will likely damage the hydrogen and oxygen sensors. Personnel in the main control room (MCR) are alerted of the failure of a gas sensor, and the flammable gas supplies are automatically isolated.

Temperatures outside of the range acceptable to the sensor may cause erratic measurements. Temperature sensors in the measuring gas driers indicate sample temperature.

For the measuring cabinets upstream of the recombiner, the control logic notes the deviation between the two sets of hydrogen/oxygen measurements. If the deviation exceeds a certain value, personnel in the MCR are alerted. The sensors are able to distinguish between a concentration of zero volume percent and an invalid measurement.

2. U.S. EPR FSAR Tier 2, Table 11.3-10 will be revised to include entries that describe the fail-open malfunction of the hydrogen and oxygen injection valves. Oxygen and hydrogen gases are supplied to the GWPS from the respective gas supply system through the hydrogen and oxygen gas supply valves. Normally, control logic exists that prevents the simultaneous addition of hydrogen and oxygen in the GWPS, but if the oxygen or hydrogen gas supply valve malfunctions, parallel addition of hydrogen and oxygen could occur. Incomplete conversion of hydrogen and oxygen to water would result, and an explosive mixture could form in the GWPS. The operator would note an increase in the concentration of oxygen upstream of the recombiner and would manually close the faulty valve from the MCR. The operator would switch operation to the redundant gas supply valve.
3. U.S. EPR FSAR Tier 2, Table 11.3-10 will be revised to include an entry corresponding to the delay bed fire described in U.S. EPR FSAR Tier 2, Section 11.3.2.4.2. If higher than normal temperatures or flammable gas concentrations in the delay section caused a fire in the delay beds, the activated carbon could be damaged and the holdup of radioactive gases may decrease. The delay section may be isolated to prevent the release of radioactive gases and may be blanketed with nitrogen via the nitrogen gas supply system to extinguish a fire.

Response to Question 11.03-17(b):

The potential for radiological release from a fire in a given fire area will be evaluated by the COL applicant. The entries in U.S. EPR FSAR Tier 2, Table 9A-2, “Radiological Effects” are based on the fire hazards analysis (FHA) created during design certification. The FHA indicates that a determination of radioactive source locations in a given fire area and an assessment of the potential for a radiological release as a result of a fire in the area will be performed by the COL applicant. If the assessment indicates the potential for a fire to cause radiological consequences, then the COL applicant will provide fire protection in-depth features to mitigate the consequences of this fire.

U.S. EPR FSAR Tier 2, Table 9A-2 will be revised to clarify this entry. The following note will be added to “Radiological Effects” in U.S. EPR FSAR Tier 2, Table 9A-2:

> "Radiological Effects: This indicates the potential presence of radiological sources in a fire area. Possible radiological effects from a fire and the need for additional in-depth fire protection features to mitigate the consequences of a fire will be evaluated by the COL applicant as a part of the final FHA (refer to Section 9.5.1.3)."

The existing applicable COL item in U.S. EPR FSAR Tier 2, Section 9.5.1.3, and identified as U.S. EPR FSAR Tier 2, Table 1.8-2, Item 9.5-17, states:

> "A COL applicant that references the U.S. EPR design certification will evaluate the differences between the as-designed and as-built plant configuration to confirm the Fire Protection Analysis remains bounding. This evaluation will be performed prior to fuel loading and will consider the final plant cable routing, fire barrier ratings, combustible loading, ignition sources, purchased equipment, equipment arrangement and includes a review against the assumptions and requirements contained in the Fire Protection Analysis. The applicant will describe how this as-built evaluation will be performed and documented, and how the NRC will be made aware of deviations from the FSAR, if any."

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 11.3.2.3.15, Table 9A-2, and Table 11.3-10 will be revised as described in the response and indicated on the enclosed markup.

Question 11.04-16:

Phase 4 RAI

Follow-up to Open Item 273, Supplement 1, Question 11.4-08 and RAI 273, Question 11.04-11

a. In the response dated Nov. 6, 2009, the applicant provides information addressing the staff's questions about the long-term LLW storage capacity of the Radwaste Processing Building. The response describes a storage scheme for Class B and C LLW, with a storage capacity for 7.5 years. This assumes that Class A wastes would be shipped for disposal and would not require any long-term storage. A review of the response indicates that the new information introduces inconsistencies given the information already presented in FSAR Section 11.4.1 and Table 11.4-1. Specifically, the applicant is requested to address the following issues and revise the response and FSAR accordingly. The issues are:

   1. In deriving the storage capacity, the response assumes that 73 drums (55-gallon or 7.3 ft^3) of Class B and C wastes will be generated yearly. This number of drums equates to a waste volume of about 544 ft^3 per year (7.3 ft^3/drum x 73 drums). This estimate is inconsistent with the corresponding volume of 360 ft^3/year presented in FSAR Table 11.4-1. While the estimate presented in the response is believed to be a maximum value, the waste volume of Table 11.4-1 implies rather an annual average estimate. This inconsistency in yearly waste generation rates needs to be clarified in the proposed revision to FSAR Section 11.4.1.2.1 and Table 11.4-1.

   2. In deriving the storage capacity, the response assumes that 73 drums of Class B and C wastes will be generated yearly. However, the assumed storage scheme ignores that some wastes will be stored in HICs instead of 55-gallon drums, as is noted in FSAR Table 11.4-1. The storage of waste in HICs is expected to have an impact on the assumed storage capacity described for the Drum Store Room since HICs require more storage space for the same waste volume. This inconsistency in the use of different types of waste containers and implications on storage capacities needs to be clarified in the proposed revision to FSAR Section 11.4.1.2.1 and Table 11.4-1.

   3. In deriving the storage capacity, the response is based on the waste streams and volumes presented in FSAR Table 11.4-1. The response assumes that the waste streams listed in Table 11.4-1 would be stored in 73 drums (55-gallon or 7.3 ft3) of Class B and C wastes and that Class A wastes would be promptly shipped for disposal and not require any long-term storage. However, a review of the waste streams listed in Table 11.4-1 indicates that spent charcoal and dessicant media and HEPA and charcoal filters are not listed as wet and solid and as dry active wastes. Spent charcoal and dessicant media would be generated from the waste gas processing system if they were to become water-saturated or chemically poisoned, and spent HEPA and charcoal filters are expected to be replaced and disposed of periodically. The omission of spent charcoal and dessicant media and HEPA and charcoal filters, as potentially significant additional waste streams, should be addressed in FSAR Section 11.4.2 and Table 11.4-1. If the GWMS systems offers the means for in situ regeneration of charcoal in delay beds, this provision should be described in both FSAR Sections 11.3 and 11.4.

b. A review of FSAR Sections 1.8.1 and 11.4 indicates that the listing of COL information items is incomplete. Regulatory Guide 1.206 (Section C.III.4) addresses COL information that a COL applicant is required to address because of plant and site-specific conditions that cannot be described at the design certification stage. In this context, the staff has determined that the following COL information items should be added to the FSAR. The COL information items are:

   1. The COL applicant will include plant and site-specific information describing how design features and implementation of operating procedures for the SWMS will address the requirements of 10 CFR Part 20.1406(b) and guidance of SRP Section 11.4, Regulatory Guides 4.21 and 1.143, IE Bulletin 80-10, industry standards, and NEI 08-08 when the SWMS is augmented with the installation and operation of mobile skid-mounted processing systems connected to permanently installed SWMS processing equipment.

   2. The COL applicant will address plant-specific commitments to address the long-term storage of LLRW beyond the provisions described in the U.S. EPR design certification when such storage capacity is exhausted and describe how additional onsite LLRW storage or alternate LLRW storage will be integrated in plant operations. In addressing the need for additional storage, the commitment will address the requirements of 10 CFR Part 20, Appendix B (Table 2, Col. 1 and 2); dose limits of 10 CFR 20.1301, 20.1302, and 20.1301(e) in unrestricted areas; Part 20.1406(b) in minimizing the contamination of plant facilities and environs; and design objectives of Sections II.A, II.B, II.C, and II.D of Appendix I to 10 CFR Part 50. The design and operations of additional onsite storage capacity will be integrated in the plant-specific process control program and consider the guidance of SRP Section 11.4 and Appendix 11.4-A, Regulatory Guides 1.206, 4.21 and 1.143, IE Bulletin 80-10, industry standards, and NEI 08-08.

Response to Question 11.04-16:

a) The issues regarding long-term low level radioactive waste (LLRW) storage capacity in the Radioactive Waste Building (RWB) are addressed in the Response to RAI 273, Supplemental 6, Question 11.04-15, which was submitted to the NRC on May 19, 2010.

b) The following COL items will be added to U.S. EPR FSAR Tier 2, Sections 11.4.1.2.5 and 11.4.1.2.1 to address plant and site-specific conditions that cannot be addressed as a part of design certification:

   - A COL applicant that references the U.S. EPR design certification and that chooses to install and operate mobile skid-mounted processing systems connected to permanently installed solid waste management system (SWMS) processing equipment will include plant and site-specific information describing how design features and implementation of operating procedures for the SWMS will address the requirements of 10 CFR Part 20.1406(b) and guidance of SRP Section 11.4, Regulatory Guides 4.21 and 1.143, IE Bulletin 80-10, industry standards, and NEI 08-08.

   - A COL applicant that references the U.S. EPR design certification will address plant-specific commitments to address the long-term storage of LLRW beyond the provisions described in the U.S. EPR design certification when such storage capacity is exhausted and describe how additional onsite LLRW storage or alternate LLRW storage will be integrated in plant operations. To address the need for additional storage, the

commitment will address the requirements of 10 CFR Part 20, Appendix B (Table 2, Column 1 and 2); dose limits of 10 CFR 20.1301, 20.1302, and 20.1301(e) in unrestricted areas; Part 20.1406(b) in minimizing the contamination of plant facilities and environs; and design objectives of Sections II.A, II.B, II.C, and II.D of Appendix I to 10 CFR Part 50. The design and operations of additional onsite storage capacity will be integrated in the plant-specific process control program and consider the guidance of SRP Section 11.4 and Appendix 11.4-A, Regulatory Guides 1.206, 4.21 and 1.143, IE Bulletin 80-10, industry standards, and NEI 08-08.

In addition, these new COL items will be added to the list of COL items in U.S. EPR FSAR Tier 2, Table 1.8-2. The acronym LLRW will be added to U.S. EPR FSAR Tier 2, Table 1.1-1.

FSAR Impact:

U.S. EPR FSAR Tier 2, Table 1.1-1, Table 1.8-2, Section 11.4.1.2.5, and Section 11.4.1.2.1 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

Table 1.1-1—U.S. EPR FSAR Acronyms and Descriptions
Sheet 10 of 20

Acronym	Description
LAN	Local Area Network
LBB	Leak-Before-Break
LBD	Licensing Basis Documentation
LBLOCA	Large Break Loss of Coolant Accident
LBOP TR	Loss of Balance of Plant
LC	Load Center
LCO	Limiting Conditions for Operation
LCS	Local Control Stations
LHSI	Low Head Safety Injection
LL	Low Load Line
LLCV	Low Load Control Valve
LLRT	Local Leakage Rate Test
LLRW	Low Level Radioactive Waste ← 11.04-16
LMP	Level Monitoring Probe
LNEP	Loss of Non-Emergency Power
LNFF	Loss of Normal Feedwater Flow
LOCA	Loss of Coolant Accident
LOCF	Loss of Coolant Flow
LOCV	Loss of Condenser Vacuum
LOEL	Loss of External Load
LOOP	Loss of Offsite Power
LOOP PL	Loss of Offsite Power with a Low Pressure End State
LOOP SS	Loss of Offsite Power with Seal LOCA
LOOP TR	Loss of Offsite Power with a High Pressure End State
LP	Low Pressure
LPD	Linear Power Density
LPMS	Loose Parts Monitoring System
LPSD	Low Power Shutdown
LPZ	Low Population Zone
LRF	Large Release Frequency
LSP	Lower Support Plate
LSSS	Limiting Safety System Setting
LTL	Lower Tolerance Limit

Table 1.8-2—U.S. EPR Combined License Information Items
Sheet 38 of 50

Item No.	Description	Section	~~Action Required by COL Applicant~~	~~Action Required by COL Holder~~
11.4-2	A COL applicant that references the U.S. EPR design certification and that chooses to install and operate mobile skid-mounted processing systems connected to permanently installed solid waste management system (SWMS) processing equipment will include plant and site-specific information describing how design features and implementation of operating procedures for the SWMS will address the requirements of 10 CFR Part 20.1406(b) and guidance of SRP Section 11.4, Regulatory Guides 4.21 and 1.143, IE Bulletin 80-10, industry standards, and NEI 08-08.	11.4.1	11.04-16	
11.4-3	A COL applicant that references the U.S. EPR design certification will address plant-specific commitments to address the long-term storage of LLRW beyond the provisions described in the U.S. EPR design certification when such storage capacity is exhausted and describe how additional onsite LLRW storage or alternate LLRW storage will be integrated in plant operations. To address the need for additional storage, the commitment will address the requirements of 10 CFR Part 20, Appendix B (Table 2, Column 1 and 2); dose limits of 10 CFR 20.1301, 20.1302, and 20.1301(e) in unrestricted areas; Part 20.1406(b) in minimizing the contamination of plant facilities and environs; and design objectives of Sections II.A, II.B, II.C, and II.D of Appendix I to 10 CFR Part 50. The design and operations of additional onsite storage capacity will be integrated in the plant-specific process control program and consider the guidance of SRP Section 11.4 and Appendix 11.4-A, Regulatory Guides 1.206, 4.21 and 1.143, IE Bulletin 80-10, industry standards, and NEI 08-08.	11.4.1		

Table 9A-2—Fire Area Parameters
Sheet 2 of 40

Column	1	2	3	4
Portable Fire Extinguishers (Note 8)	Yes	Yes	Yes	Yes
Suppression Effects	None	None	None	None
Plant Drains	Yes	Yes	Yes	Yes
Radiological Effects (Note 15)	Yes	None	None	None
HVAC (Note 9)	f	e~~, i~~	e	e
Emergency Lighting (Note 10)	aa	aa	None	aa
Communication (Note 11)	Yes	Yes	Yes	Yes
Engineering Evaluations	None	None	None	None

11.03-17

Table 9A-2—Fire Area Parameters
Sheet 4 of 40

Column	6	7	8	9
Portable Fire Extinguishers (Note 8)	Yes	Yes	Yes	Yes
Suppression Effects 11.03-17	None	None	None	None
Plant Drains	Yes	Yes	Yes	Yes
Radiological Effects (Note 15)	None	None	None	None
HVAC (Note 9)	e	e~~, i~~	e	e
Emergency Lighting (Note 10)	aa	aa	aa	aa
Communication (Note 11)	Yes	Yes	Yes	Yes
Engineering Evaluations	None	None	None	None

Table 9A-2—Fire Area Parameters
Sheet 6 of 40

Column	11	12	13	14
Portable Fire Extinguishers (Note 8)	Yes	Yes	Yes	Yes
Suppression Effects 11.03-17	None	None	None	None
Plant Drains	Yes	Yes	Yes	Yes
Radiological Effects (Note 15)	None	None	None	None
HVAC (Note 9)	e	e	e~~, i~~	e~~, i~~
Emergency Lighting (Note 10)	None	aa	aa	aa
Communication (Note 11)	Yes	Yes	Yes	Yes
Engineering Evaluations	None	None	None	None

Table 9A-2—Fire Area Parameters
Sheet 8 of 40

Column	16	17	18	19
Portable Fire Extinguishers (Note 8)	Yes	Yes	Yes	Yes
Suppression Effects	None	None	None	None
Plant Drains	Yes	Yes	Yes	Yes
Radiological Effects (Note 15)	None	None	None	None
HVAC (Note 9)	e	e~~, i~~	e	e
Emergency Lighting (Note 10)	cc, dd	aa	aa	aa
Communication (Note 11)	Yes	Yes	Yes	Yes
Engineering Evaluations	None	None	None	None

11.03-17

Table 9A-2—Fire Area Parameters
Sheet 10 of 40

Column	21	22	23	24
Portable Fire Extinguishers (Note 8)	Yes	Yes	Yes	Yes
Suppression Effects 11.03-17	None	None	None	None
Plant Drains	Yes	Yes	Yes	Yes
Radiological Effects (Note 15)	None	None	None	None
HVAC (Note 9)	e	e	e~~, i~~	e~~, i~~
Emergency Lighting (Note 10)	None	aa	aa	aa
Communication (Note 11)	Yes	Yes	Yes	Yes
Engineering Evaluations	None	None	None	None

Table 9A-2—Fire Area Parameters
Sheet 12 of 40

Column	26	27	28	29
Portable Fire Extinguishers (Note 8)	Yes	Yes	Yes	Yes
Suppression Effects 11.03-17	None	None	None	None
Plant Drains	Yes	Yes	Yes	Yes
Radiological Effects (Note 15)	None	None	None	None
HVAC (Note 9)	e	e~~, i~~	e	e
Emergency Lighting (Note 10)	cc, dd	aa	aa	aa
Communication (Note 11)	Yes	Yes	Yes	Yes
Engineering Evaluations	None	None	None	None

Table 9A-2—Fire Area Parameters
Sheet 14 of 40

Column	31	32	33	34
Portable Fire Extinguishers (Note 8)	Yes	Yes	Yes	Yes
Suppression Effects 11.03-17	None	None	None	None
Plant Drains	Yes	Yes	Yes	Yes
Radiological Effects (Note 15)	None	None	None	None
HVAC (Note 9)	e	e	e~~,i~~	e
Emergency Lighting (Note 10)	None	aa	aa	aa
Communication (Note 11)	Yes	Yes	Yes	Yes
Engineering Evaluations	None	None	None	None

Table 9A-2—Fire Area Parameters
Sheet 16 of 40

Column	36	37	38	39
Suppression Effects	None	None	None	None
Plant Drains	Yes	Yes	Yes	Yes
Radiological Effects (Note 15)	None	None	Yes	Yes
HVAC (Note 9)	e	e	b~~, i~~	b~~, i~~
Emergency Lighting (Note 10)	aa	aa	aa	aa
Communication (Note 11)	Yes	Yes	Yes	Yes
Engineering Evaluations	None	None	None	None

11.03-17

Table 9A-2—Fire Area Parameters
Sheet 18 of 40

Column	41	42	43	44
Portable Fire Extinguishers (Note 8)	Yes	Yes	Yes	Yes
Suppression Effects	None	None	None	None
Plant Drains	Yes	Yes	Yes	Yes
Radiological Effects (Note 15)	Yes	Yes	None	Yes
HVAC (Note 9)	b	b	b	b
Emergency Lighting (Note 10)	None	aa	None	aa
Communication (Note 11)	Yes	Yes	Yes	Yes
Engineering Evaluations	None	None	None	None

11.03-17

Table 9A-2—Fire Area Parameters
Sheet 20 of 40

Column	46	47	48	49
Suppression Effects 11.03-17	None	None	None	None
Plant Drains	Yes	Yes	Yes	Yes
Radiological Effects (Note 15)	None	None	None	Yes
HVAC (Note 9)	b	b	b	b
Emergency Lighting (Note 10)	None	None	aa	aa
Communication (Note 11)	Yes	Yes	Yes	Yes
Engineering Evaluations	None	None	None	None

Table 9A-2—Fire Area Parameters
Sheet 22 of 40

Column	51	52	53	54
Suppression Effects 11.03-17	None	None	None	None
Plant Drains	Yes	Yes	Yes	Yes
Radiological Effects (Note 15)	None	Yes	None	Yes
HVAC (Note 9)	b	c~~, i~~	c	c
Emergency Lighting (Note 10)	aa	aa	None	aa
Communication (Note 11)	Yes	Yes	Yes	Yes
Engineering Evaluations	None	None	None	None

Table 9A-2—Fire Area Parameters
Sheet 24 of 40

Column	56	57	58	59
Portable Fire Extinguishers (Note 8)	Yes	Yes	Yes	Yes
Suppression Effects	None	None	None	None
Plant Drains	Yes	Yes	Yes	Yes
Radiological Effects (Note 15)	Yes	None	None	None
HVAC (Note 9)	c	c	c	c
Emergency Lighting (Note 10)	aa	None	None	None
Communication (Note 11)	Yes	Yes	Yes	Yes
Engineering Evaluations	None	None	None	None

11.03-17

Table 9A-2—Fire Area Parameters
Sheet 26 of 40

Column	61	62	63	64
Suppression Effects 11.03-17	None	None	None	None
Plant Drains	Yes	Yes	Yes	Yes
Radiological Effects (Note 15)	Yes	Yes	None	None
HVAC (Note 9)	c	c	c	c
Emergency Lighting (Note 10)	aa	aa	aa	None
Communication (Note 11)	Yes	Yes	Yes	Yes
Engineering Evaluations	None	None	None	None

Table 9A-2—Fire Area Parameters
Sheet 28 of 40

Column	66	67	68	69
Portable Fire Extinguishers (Note 8)	Yes	Yes	Yes	Yes
Suppression Effects 11.03-17	None	None	None	None
Plant Drains	Yes	Yes	Yes	Yes
Radiological Effects (Note 15)	None	Yes	None	None
HVAC (Note 9)	c	c	c	c
Emergency Lighting (Note 10)	None	aa	aa	aa
Communication (Note 11)	Yes	Yes	Yes	Yes
Engineering Evaluations	None	None	None	None

Table 9A-2—Fire Area Parameters
Sheet 30 of 40

Column	71	72	73	74
Suppression Effects 11.03-17	None	None	None	None
Plant Drains	Yes	Yes	Yes	Yes
Radiological Effects (Note 15)	None	None	None	None
HVAC (Note 9)	c	c	h	h
Emergency Lighting (Note 10)	aa	None	bb	bb
Communication (Note 11)	Yes	Yes	Yes	Yes
Engineering Evaluations	None	None	None	None

Table 9A-2—Fire Area Parameters
Sheet 32 of 40

Column	76	77	78	79
Suppression Effects 11.03-17	None	None	None	None
Plant Drains	Yes	Yes	Yes	Yes
Radiological Effects (Note 15)	None	None	None	None
HVAC (Note 9)	h	h	h	h
Emergency Lighting (Note 10)	bb	bb	aa	bb
Communication (Note 11)	Yes	Yes	Yes	Yes
Engineering Evaluations	None	None	None	None

Table 9A-2—Fire Area Parameters
Sheet 34 of 40

Column	81	82	83	84
Suppression Effects 11.03-17	None	None	None	None
Plant Drains	Yes	Yes	Yes	Yes
Radiological Effects (Note 15)	None	None	None	None
HVAC (Note 9)	h	h	h	h
Emergency Lighting (Note 10)	aa	bb	bb	aa
Communication (Note 11)	Yes	Yes	Yes	Yes
Engineering Evaluations	None	None	None	None

Table 9A-2—Fire Area Parameters
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Column	86	87	88	89
Suppression Effects 11.03-17	None	None	None	None
Plant Drains	None	None	None	Yes
Radiological Effects (Note 15)	None	None	None	Yes
HVAC (Note 9)	l	l	l	j~~,i~~
Emergency Lighting (Note 10)	aa	aa	aa	aa
Communication (Note 11)	Yes	Yes	Yes	Yes
Engineering Evaluations	None	None	None	None

Table 9A-2—Fire Area Parameters
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Column	91	92	93	94
Portable Fire Extinguishers (Note 8)	Yes	Yes	Yes	Yes
Suppression Effects	None	None	None	None
Plant Drains	Yes	Yes	Yes	Yes
Radiological Effects (Note 15)	Yes	Yes	Yes	Yes
HVAC (Note 9)	j	j	j	j
Emergency Lighting (Note 10)	aa	aa	None	aa
Communication (Note 11)	Yes	Yes	Yes	Yes
Engineering Evaluations	None	None	None	None

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Table 9A-2—Fire Area Parameters
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Column	96	97	98	99
Suppression Effects 11.03-17	None	None	None	None
Plant Drains	Yes	Yes	Yes	Yes
Radiological Effects (Note 15)	None	Yes	None	None
HVAC (Note 9)	j	j	j	j
Emergency Lighting (Note 10)	aa	aa	aa	aa
Communication (Note 11)	Yes	Yes	Yes	Yes
Engineering Evaluations	None	None	None	None

Notes:

1. In-situ loading:
   a. Miscellaneous Cable Insulation.
   b. Miscellaneous Plastic and Rubber.
   c. Miscellaneous Wire and Plastic Components (Panels).
   d. Lubricants and Hydraulic Fluids.
   e. Electrical Cabinets.
   f. Flammable Gases (Hydrogen).
   g. Electrical Cable Insulation (Cable Trays).
   h. Charcoal (Filters).
   i. Air Compressors.
   j. HVAC Subsystem Components.

- Extra Hazard (EH Group-2).

13. Automatic Fire Detection:

The type of detection provided, and the extent of detection coverage where partial detection is in Section 9A.3.

14. Automatic Fixed Fire Suppression and Manual Fixed Fire Suppression:

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The type of fire suppression provided, and the extent of fire suppression coverage where partia indicated, is contained in Section 9A.3.

15. This indicates the potential presence of radiological sources in a fire area. Possible radiological the need for additional in-depth fire protection features to mitigate the consequences of a fire v COL applicant as a part of the final FHA (refer to Section 9.5.1.3).

annunciate both locally and in the main control room. The interlocks actuate when the hydrogen concentration exceeds four percent by volume, or when the oxygen concentration exceeds two percent by volume. The hydrogen and oxygen gas analyzers will have daily sensor checks, monthly functional checks, and quarterly calibrations.

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No additional sources of hydrogen or oxygen enter between the upstream and downstream measurement cabinets and the catalyst in the recombiner combines the hydrogen and oxygen gases present into water vapor. Consequently, only one measurement cabinet is required downstream of the recombiner. The hydrogen and oxygen sensors in that cabinet have only indication and warning functions.

11.3.2.3.16 Condensate Collecting Tank

The condensate collecting tank collects the liquid formed by condensation in the pre-drier. This tank drains to the NI drain and vent system primary effluent tank in the Fuel Building. The condensate collecting tank is a cylindrical, stainless steel pressure vessel.

11.3.2.3.17 Sealing Liquid Coolers

The sealing liquid coolers reduce the temperature of the circulating sealing liquid before it returns to the waste gas compressors. The sealing liquid must be cooled to avoid evaporation in the subatmospheric pressure conditions prevailing at the waste gas compressor intake. If not controlled, sealing liquid evaporation can reduce the integrity of the waste gas compressor seals and lead to a reduced operating life for the waste gas compressors. The sealing liquid coolers are stainless steel shell and tube heat exchangers. The operational chilled water system provides cooling liquid flow to the tube bundle in the sealing liquid coolers.

11.3.2.3.18 Containment Isolation Valves

Containment isolation valves isolate the gaseous waste processing system from the pressurizer relief tank and the reactor coolant drain tank. These valves are located on the gaseous waste processing supply and return piping at the respective penetrations from the Fuel Building into the Reactor Building. The valves are normally open to allow purge gas flow through the tanks, but are automatically closed by a containment isolation signal to prevent the potential release of radioactive material from the Reactor Building. The containment isolation valves and the intervening piping at each penetration are safety related.

11.3.2.3.19 Bypass Valves

The recombiner and gas cooler may be isolated and bypassed in response to certain abnormal operating conditions. Under these conditions, two normally open air-

Table 11.3-10—Equipment Malfunction Analysis
Sheet 3 of 4

Equipment Item	Malfunction	Result(s)	Mitigating or Alternate Action(s)
Recombiner	Failure or temperature control.	Incomplete recombination of hydrogen and oxygen to water.	Malfunctioning heating element(s) switched off and replaced if necessary.
Gas cooler	Chilled water loss to cooler.	Inaccurate H_2/O_2 measurement. High humidity of waste gas.	Chilled water supply restored.
	Corrosion of tubes in cooler.	Leakage of water into process stream.	Plug tubes or replace cooler if there is considerable leakage.
Pre drier	Chilled water loss to drier.	Possible carryover of moisture to delay section.	Chilled water supply restored. Delay section is isolated if necessary.
	Corrosion of tubes in drier.	Leakage of water into process stream.	Plug tubes or replace cooler if there is considerable leakage. Delay section is isolated if necessary.
Gas drier	Chilled water loss to drier.	Inaccurate H_2/O_2 measurement.	Chilled water supply restored.
	Corrosion of tubes in drier.	Leakage of water into process stream.	Plug tubes or replace cooler if there is considerable leakage.
Sealing liquid coolers	Chilled water loss to cooler.	Inadequate cooling of sealing liquid to waste gas compressor.	Operator switches to alternate waste gas compressor train.
	Corrosion of tubes in drier.	Leakage of water into process stream.	Operator switches to alternate waste gas compressor train.
Nitrogen gas supply valve	Nitrogen gas supply valve fails open.	Pressure in purging section of GWPS increases.	Operator manually closes nitrogen gas supply valve. The recombiner if necessary.
Oxygen gas supply valves	Oxygen gas supply valve open during hydrogen injection.	Parallel addition of hydrogen and oxygen. Incomplete recombination and possible formation of explosive mixture.	Operator closes faulty supply valve and switches control to redundant valve.

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Table 11.3-10—Equipment Malfunction Analysis
Sheet 4 of 4

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Equipment Item	Malfunction	Result(s)	Mitigating or Alternate Action(s)
Hydrogen gas supply valves	Hydrogen gas supply valve open during hydrogen injection.	Parallel addition of hydrogen and oxygen. Incomplete recombination and possible formation of explosive mixture.	Operator closes faulty supply valve and switches control to redundant valve.
Instruments	Fails to indicate.	Indication lost.	Essential instruments are redundant or provided with one-out-of-two voting. Other instruments are replaceable.
Gaseous Waste Processing System Pressure Boundary	Failure of GWPS pressure boundary.	Waste gas released to equipment compartment/ environment.	In-leakage is detectable by oxygen and flow sensors. Most ruptures can be isolated by operator or automatic actions. Doses are within design guidance of BTP 11-5.
Fire in the delay beds	Higher than normal temperature/oxygen concentration in delay section causes fire in the delay beds.	Damage to activated carbon and reduced holdup of radioactive species.	Fire in the delay beds is precluded by the system design (see Section 11.3.2.4.2). However, if fire were to occur, the delay section could be isolated to prevent the release of waste gas and blanketed with nitrogen via the nitrogen gas supply system.

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11.4.1.2.1 Capacity

The facilities in the Radioactive Waste Processing Building have the capacity to store ~~several years~~a minimum of 7.5 years' volume of solid waste (excluding dry active waste) resulting from plant operation. The solid wastes can be stored in one of two onsite storage areas in the Radioactive Waste Processing Building (see Figure 12.3-52). One area is a tubular shaft store for the higher activity drums and the other is a drum store for low activity drums. The storage area has a capacity of approximately 200 drums in the tubular shaft storage and approximately 350 drums in the drum store. When off-site disposal options for Class B and C wastes are not available, the U.S. EPR solid waste processing system provides the flexibility necessary to treat potential Class B and C waste types such that the final container for these wastes are 55-gallon waste drums. The normal container for some of these waste types is high-integrity container (HIC), however the solid waste management system is able to store these wastes in drums if necessary. Assuming the maximum annual shipping volume of solid waste in Table 11.4-1 (with the exception of dry active waste) is stored in 55-gallon drums and must be placed in the drum storage area or tubular shaft storage area, there would be 72.9 drums annually that would need to be stored. This results in a drum storage capacity of approximately 7.5 years.

Storage and offsite shipping of solid radioactive waste maintains exposure ALARA to personnel onsite or offsite under normal conditions or extreme environmental conditions, such as tornados, floods, or seismic events. The solid waste management system is designed with sufficient waste accumulation capacity and redundancy to allow temporary storage of the maximum generated waste during normal plant operation and AOOs.

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The estimated annual volume of solid waste generated in the plant and shipped offsite is provided in Table 11.4-1—Estimated Solid Waste Annual Activity and Volume.

A COL applicant that references the U.S. EPR design certification will address plant-specific commitments to address the long-term storage of LLRW beyond the provisions described in the U.S. EPR design certification when such storage capacity is exhausted and describe how additional onsite LLRW storage or alternate LLRW storage will be integrated in plant operations. To address the need for additional storage, the commitment will address the requirements of 10 CFR Part 20, Appendix B (Table 2, Column 1 and 2); dose limits of 10 CFR 20.1301, 20.1302, and 20.1301(e) in unrestricted areas; Part 20.1406(b) in minimizing the contamination of plant facilities and environs; and design objectives of Sections II.A, II.B, II.C, and II.D of Appendix I to 10 CFR Part 50. The design and operations of additional onsite storage capacity will be integrated in the plant-specific process control program and consider the guidance of SRP Section 11.4 and Appendix 11.4-A, Regulatory Guides 1.206, 4.21 and 1.143, IE Bulletin 80-10, industry standards, and NEI 08-08.

Process monitors installed on the drum drying system detect in-process radiation levels to keep the operator informed of the process radiation levels, in accordance with GDC 61. In addition, area radiation monitors throughout the Radioactive Waste Processing Building detect excessive radiation levels and alert the operators to this condition, in accordance with GDC 63. Area radiation monitoring is addressed in detail in Section 12.3.4. The dried, filled solid waste drums are stored for a sufficient time to allow the short lived radionuclides to decay before shipping offsite in accordance with NUREG-0800, BTP 11-3 (Reference 1) and 10 CFR 61.55 and 61.56.

11.04-16

11.4.1.2.5 Mobile Systems

A COL applicant that references the U.S. EPR design certification and that chooses to install and operate mobile skid-mounted processing systems connected to permanently installed solid waste management system (SWMS) processing equipment will include plant and site-specific information describing how design features and implementation of operating procedures for the SWMS will address the requirements of 10 CFR Part 20.1406(b) and guidance of SRP Section 11.4, Regulatory Guides 4.21 and 1.143, IE Bulletin 80-10, industry standards, and NEI 08-08.

~~The Radioactive Waste Processing Building is sized to provide space and support services for optional site-specific mobile or vendor-supplied processing equipment. Flexible hose or pipe used with site-specific mobile or vendor-supplied solid waste processing systems is subject to the hydrostatic test requirements in accordance with NUREG-0800, BTP 11-3 (Reference 1) and RG 1.143. However, such an optional mobile or vendor-supplied system is a site-specific design feature that is outside the scope of the design certification.~~

11.4.2 System Description

11.4.2.1 Solid Waste Processing and Storage System (Dry Solid Waste)

The solid waste processing and storage system handles the waste generated in the different controlled areas of the plant independent from the plant operating conditions. Solid radioactive wastes consist of paper, plastic, cloth, wood, metal parts, worn-out items, concrete, glass, electrical parts, HEPA filters, iodine filter media, ~~spent charcoal from the gaseous waste management system,~~ and other potentially contaminated discarded materials generated throughout the controlled area. These wastes are collected, segregated, and treated according to their properties. The wastes are placed in different containers to simplify handling, storage, and transport of the waste in the plant. Typical waste containers used are plastic bags, drums, or bins, which are transferred and placed in interim storage areas of the Radioactive Waste Processing Building. Solid waste treatment facilities include the sorting box for sorting waste. This sorting box contains a shredder and a compactor for in-drum compaction of compressible waste.