ArevaEPRDCPEm Resource

From: WELLS Russell (AREVA) [Russell.Wells@areva.com]
Sent: Friday, May 06, 2011 7:55 PM
To: Tesfaye, Getachew
Cc: WILLIFORD Dennis (AREVA); PEDERSON Ronda (AREVA); Miernicki, Michael; BENNETT Kathy (AREVA); DELANO Karen (AREVA); HALLINGER Pat (EXTERNAL AREVA); ROMINE Judy (AREVA); RYAN Tom (AREVA)
Subject: Draft Response to U.S. EPR Design Certification Application RAI No. 449, FSARCh. 19 NEW PHASE 4 RAI,Questions 19-339 and 19-340
Attachments: RAI 449 Questions 19-339 and 19-340 Response US EPR DC - DRAFT.PDF

Getachew,

Attached is a draft response for RAI No. 449, Questions 19-339 and 19-340 as shown below in advance of the June 3, 2011 final date.

Let me know if the staff has questions or if this can be sent as a final response.

Sincerely,

Russ Wells
U.S. EPR Design Certification Licensing Manager
AREVA NP, Inc.
3315 Old Forest Road, P.O. Box 10935
Mail Stop OF-57
Lynchburg, VA 24506-0935
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Russell.Wells@Areva.com

From: WELLS Russell (RS/NB)
Sent: Friday, April 22, 2011 4:17 PM
To: 'Tesfaye, Getachew'
Cc: WILLIFORD Dennis (RS/NB); PEDERSON Ronda (EP/PE); BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 449, FSARCh. 19 NEW PHASE 4 RAI, Supplement 2

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 449 on January 24, 2011. Supplement 1 was submitted to the NRC on February 24, 2011 to revise the schedule.

To allow additional time to interact with NRC staff and to complete a new technical report related to design features to protect against the impact of a large commercial aircraft impact, the schedule for a technically correct and complete response to the 2 questions has been changed as provided below.

Question #	Response Date

RAI 449 — 19-339	June 3, 2011
RAI 449 — 19-340	June 3, 2011

Sincerely,

Russ Wells
U.S. EPR Design Certification Licensing Manager
AREVA NP, Inc.
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From: WELLS Russell (RS/NB)
Sent: Thursday, February 24, 2011 3:57 PM
To: 'Tesfaye, Getachew'
Cc: ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); SALAS Pedro (RS/NB); BRYAN Martin (External RS/NB); SALAS Pedro (RS/NB); PEDERSON Ronda (EP/PE)
Subject: Response to U.S. EPR Design Certification Application RAI No. 449, FSARCh. 19 NEW PHASE 4 RAI, Supplement 1

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete response to RAI No. 449 on January 24, 2011. To allow time for interaction between AREVA and the NRC staff, a revised schedule for submittal of the final response is provided in this e-mail.

The schedule for technically correct and complete responses to the questions has been revised and is provided below:

Question #	Response Date
RAI 449 — 19-339	April 29, 2011
RAI 449 — 19-340	April 29, 2011

Sincerely,

Russ Wells
U.S. EPR Design Certification Licensing Manager
AREVA NP, Inc.
3315 Old Forest Road, P.O. Box 10935
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From: BRYAN Martin (External RS/NB)
Sent: Monday, January 24, 2011 12:13 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); SALAS Pedro (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 449, FSARCh. 19 NEW PHASE 4 RAI

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 449 Response US EPR DC.pdf" provides a schedule since a technically correct and complete response to the 2 question (s) is not provided.

The following table indicates the respective pages in the response document, "RAI 449 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 449 — 19-339	2	2
RAI 449 — 19-340	3	3

A complete answer is not provided for the 2 questions. The schedule for a technically correct and complete response to these questions is provided below.

Question #	Response Date
RAI 449 — 19-339	February 24, 2011
RAI 449 — 19-340	February 24, 2011

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
Tel: (434) 832-3016
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From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Wednesday, December 08, 2010 9:12 AM
To: ZZ-DL-A-USEPR-DL
Cc: Xu, Jim; Hawkins, Kimberly; Ford, Tanya; Carneal, Jason; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 449 (5104), FSARCh. 19 NEW PHASE 4 RAI

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on October 10, 2010, and on December 6, 2010, you informed us that the RAI is clear and no further clarification is needed. As a result, no change is made to the draft RAI. The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs, excluding the time period of **December 24, 2010 thru January 3, 2011, to account for the holiday season** as discussed with AREVA NP Inc. For any RAIs that cannot be answered **within 45 days**, it is expected that a date for receipt of this information will be provided to the staff within the 40-day period so that the staff can assess how this information will impact the published schedule.

Thanks,

Getachew Tesfaye
Sr. Project Manager
NRO/DNRL/NARP
(301) 415-3361

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 2939

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Subject: Draft Response to U.S. EPR Design Certification Application RAI No. 449, FSARCh. 19 NEW PHASE 4 RAI,Questions 19-339 and 19-340
Sent Date: 5/6/2011 7:54:51 PM
Received Date: 5/6/2011 7:55:00 PM
From: WELLS Russell (AREVA)

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RAI 449 Questions 19-339 and 19-340 Response US EPR DC - DRAFT.PDF	343376	

Options
Priority: Standard
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Response to

Request for Additional Information No. 449 (5104),
Questions 19-339 through 19-340

12/8/2010

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 19 - Probabilistic Risk Assessment and Severe Accident Evaluation
Application Section: 19.2.7

QUESTIONS for Structural Engineering Branch 2 (ESBWR/ABWR Projects) (SEB2)

Question 19-339:

OPEN ITEM

AIRCRAFT IMPACT ASSESSMENT

U.S. EPR FSAR, Tier 2, Revision 2, Section 19.2.7.4 identifies design features credited for meeting the acceptance criteria of 10 CFR 50.150(a)(1). The descriptions of the design features are typically provided in other sections of FSAR. Cross-references to respective sections of the FSAR with regards to the description of the credited design features should be provided in Section 19.2.7.4 to assist the staff review. The applicant is requested to include in FSAR Section 19.2.7.4 references to other FSAR sections where the design features credited for meeting the acceptance criteria of 10 CFR 50.150(a)(1) are described. The applicant is also requested to describe in the FSAR how each of the identified design features is used to meet the acceptance criteria of 10 CFR 50.150(a)(1).

Response to Question 19-339:

U.S. EPR FSAR Tier 2, Section 19.2.7.4 will be revised to include an additional description and cross references to the respective U.S. EPR FSAR sections that describe the design features credited for conformance with 10 CFR 50.150. In addition, U.S. EPR FSAR Tier 2, Section 19.2.7.4 will be revised to describe how each of the identified design features meets the acceptance criteria of 10 CFR 50.150.

New Technical Report ANP-10317, “Design Requirements for the U.S. EPR Aircraft Hazard Protection Structures,” documents design requirements that are credited for conformance with 10 CFR 50.150. U.S. EPR FSAR Tier 2, Section 19.2.8 will be revised to add a reference to Technical Report ANP-10317. This report will also be added to the list of reports referenced in U.S. EPR FSAR Tier 2, Table 1.6-1.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 19.2.7.4, Section 19.2.8, and Table 1.6-1 will be revised as described in the response and indicated on the enclosed markup.

Question 19-340:

OPEN ITEM

AIRCRAFT IMPACT ASSESSMENT

FSAR, Tier 2, Revision 2, Section 19.2.7.5, under physical damage, indicates that analyses were performed for the containment, safeguard and fuel buildings, and consideration of physical separation and redundant trains. However, it is not clear how these analyses address the protection of all design features as provided in FSAR, Tier 2, Revision 2,Section 19.2.7.4 such as: ECCS, decay heat removal systems, emergency feedwater tanks and emergency core cooling water. The applicant is requested to clarify the above issue and revise the FSAR section as needed.

Response to Question 19-340:

U.S. EPR FSAR Tier 2, Section 19.2.7.5 states that:

> "Finite Element Analyses indicate that interior areas of the Safeguard Building, Fuel Building, or Containment Building are not susceptible to damage due to physical perforation of aircraft components into the structures."

Therefore, components housed in these structures, such as the emergency core cooling system (ECCS) components, decay heat removal systems, emergency feedwater (EFW) tanks, and emergency core cooling water, are not susceptible to damage resulting from physical perforation of aircraft components into the structures.

U.S. EPR FSAR Tier 2, Section 19.2.7.4 and Section 19.2.7.5 will be revised to clarify that the systems and components listed in U.S. EPR FSAR Tier 2, Section 19.2.7.4 are housed in the Safeguard, Fuel, and Containment Buildings.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 19.2.7.4 and Section 19.2.7.5 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

Table 1.6-1—Reports Referenced
Sheet 3 of 4

RAI 449, Q. 19-339
RAI 456, Q. 19-342

Report No. (See Notes 1, 2, and 3)	Title	Date Submitted to NRC	FSAR Section Number(s)
ANP-10317	Design Requirements for the U.S. EPR Aircraft Hazard Protection Structures	5/11	19.2.7.4
ANP-10318P	Pipe Rupture External Loading Effects on U.S. EPR Essential Structures, Systems, and Components Technical Report	3/11	3.6.2
BAW-10132-A	Analytical Methods Description – Reactor Coolant System Hydrodynamic Loadings During a Loss-of-Coolant Accident	7/20/79	App. 3C
BAW-10133P-A BAW-10133-A Revision 1, Addendum 1 and 2	Mark-C Fuel Assembly LOCA-Seismic Analysis	10/30/00	4.2
BAW-10147P-A BAW-10147-A Revision 1	Fuel Rod Bowing in Babcock & Wilcox Fuel Designs	6/28/83	4.2, 4.4
BAW-10156-A Revision 1	LYNXT, Core Transient Thermal-Hydraulic Program	8/18/93	4
BAW-10163P-A BAW-10163-A	Core Operating Limit Methodology for Westinghouse Designed PWRs	6/2/89	4.3 and 16
BAW-10164P-A BAW-10164NP-A Revision 6	RELAP5/MOD2-B&W - An Advanced Computer Program for Light Water Reactor LOCA and Non-LOCA Transient Analysis	11/20/07	3.9.1, 6.2, and 8.4
BAW-10168P-A BAW-10168-A Revision 3	BWNT Loss-of-Coolant Accident Model for Recirculating Steam Generator Plants	1/31/97	6.2
BAW-10169P-A BAW-10169-A	B&W Safety Analysis Methodology for Recirculating Steam Generator Plants	11/28/89	6.2
BAW-10172P-A BAW-10172NP-A	Mark-BW Mechanical Design Report	12/19/89 (Note 4)	4.2
BAW-10183P-A BAW-10183-A	Fuel Rod Gas Pressure Criterion (FRGPC)	7/24/95	4.2 and 4.4
BAW-10186P-A BAW-10186NP-A Revision 2	Extended Burnup Evaluation	1/30/04	4.2 and 4.4

mitigation design alternatives from previous industry studies and from U.S. EPR PRA insights was performed against broad acceptance criteria. None of the SAMDA candidates met the criteria; therefore, the overall conclusion is that no additional plant modifications are cost beneficial to implement due to the robust design of the U.S. EPR with respect to prevention and mitigation of severe accidents.

19.2.7 Beyond Design Basis Large Commercial Aircraft Impact Assessment

19.2.7.1 Introduction

The U.S. EPR design has been evaluated to demonstrate that it has inherent protection to avoid or mitigate, to the extent practical and with reduced reliance on operator actions, the effects of a large commercial aircraft impact.

19.2.7.2 Assessment Scope

The scope of the assessment was to demonstrate—using realistic analyses— that the U.S. EPR design has design features and functional capabilities such that with reduced reliance on operator actions:

- The reactor core remains cooled, OR the containment remains intact.
- Spent fuel cooling, OR spent fuel pool integrity is maintained.

19.2.7.3 Methodology

RAI 456, Q. 19-345

The methodology used to demonstrate compliance with 10 CFR 50.150 is NEI 07-13, Revision 7, “Methodology for Performing Aircraft Impact Assessments for New Plant Designs,” dated May 2009 (Reference 18), applying the aircraft impact loading function provided by the NRC (Reference 19). The methodology of NEI 07-13, Revision 7 was followed with no exceptions.

The methodology is subdivided into two major evaluations:

- Containment and Spent Fuel Pool Evaluation.

  Two distinct types of structural failure modes were evaluated for the containment structure and spent fuel pool: local failure (i.e., scabbing and perforation) caused by aircraft fuselage or engine impact and global structural failure (i.e., plastic collapse) caused by impact of the complete aircraft.

- Heat Removal Evaluation.

  The evaluation considered physical, shock, and fire effects of a large commercial aircraft impact that can cause damage to systems needed to maintain cooling of fuel in the vessel and the spent fuel pool.

19.2.7.4 Design Features Credited for Conformance with 10 CFR 50.150

RAI 449, Q.19-339 & 19-340 RAI 456, Q. 19-342, 19-344, & 19-347

The U.S. EPR design incorporates system redundancy, diversity, and independence. The key features incorporated to mitigate the effects of potential impact of aircrafts that are credited for compliance with 10 CFR 50.150 are as follows:

1. The use of individual hardened and isolated shield structures specific to the Containment, Fuel Building, and Safeguard Building 2/3.

   The hardened and isolated shield structures, as described in ANP-10317, "Design Requirements for the U.S. EPR Aircraft Hazard Protection Structures¨ (Reference 24) and Sections 1.2.3.1.2, 3.8.4, Appendix 3B, and Appendix 3E.1.7, are a key design feature credited for compliance with 10 CFR 50.150. The use of hardened and isolated shield structures provides protection for the Containment, Fuel Building, and Safeguard Building 2/3 structures and the following credited SSCs that are housed in these structures:

   - Containment vessel (Section 3.8.2).
   - RCS (Section 5.0).
   - Emergency core cooling water source, IRWST (Section 6.3).
   - Main steam system (MSS) from the SGs to the Safeguard Building annulus penetration (Trains 1, 2, 3, and 4) (Section 10.3).
   - Main feedwater system (MFWS) from the SGs to the Safeguard Building annulus penetration (Trains 1, 2, 3, and 4) (Section 10.4.7).
   - SFP (Section 9.1).
   - Fuel pool cooling and purification system (Section 9.1.3).
   - MCR (Section 6.4).
   - MCR HVAC (Section 9.4.1).
   - Safety injection/RHRS (Trains 2 and 3) (Section 6.3).
   - EFW system (Trains 2 and 3) (Section 10.4.9).
   - CCWS (Trains 2 and 3) (Section 9.2.2).
   - ESWS (interior portions) (Trains 2 and 3) (Section 9.2.1).
   - Uninterruptible electrical power supply systems (Trains 2 and 3) (Section 8.3.2).
   - Safety chilled water system (SCWS) (Trains 2 and 3) (Section 9.2.8).

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& 19-347

- Electrical division of Safeguard Building ventilation system (Trains 2 and 3) (Section 9.4.6).
- Fuel Building ventilation system (Section 9.4.2).
- Annulus Ventilation System (Section 6.2.3.2.2).
- EBS (Section 6.8).
- I&C for the systems and components in this list (Section 7.0).

The structural isolation of the shield structures provides protection against shock-induced vibration from the impact of a large commercial aircraft so that the SSCs housed in these structures are not damaged.

2. The use of a hardened building exterior for Safeguard Buildings 1 and 4.

   The hardened building exterior, as described in Reference 24 and Sections 1.2.3.1.2, 3.8.4, and Appendix 3B, is a key design feature credited for compliance with 10 CFR 50.150. The hardened building exterior provides protection for the following SSCs housed in Safeguard Buildings 1 and 4 from physical damage resulting from the impact of a large commercial aircraft:

   - Safety Injection/RHRS (Trains 1 and 4) (Section 6.3).
   - EFW system (Trains 1 and 4) (Section 10.4.9).
   - CCWS (Trains 1 and 4) (Section 9.2.2).
   - ESWS (interior portions) (Trains 1 and 4) (Section 9.2.1).
   - SCWS (Trains 1 and 4) (Section 9.2.8).
   - Uninterruptible electrical power supply systems (Trains 1 and 4) (Section 8.3.2).
   - MSS from the Safeguard Building annulus penetration to the MSIV (Trains 1, 2, 3, and 4) (Section 10.3).
   - MFWS from the Safeguard Building annulus penetration to the MFW isolation valve (MFWIV) (Trains 1, 2, 3, and 4) (Section 10.4.7).
   - Electrical division of Safeguard Building ventilation system (Trains 1 and 4) (Section 9.4.6).
   - I&C located in Safeguard Buildings 1 and 4 for the systems and components in this list (Section 7.0).

3. Screening by the site arrangement and plant structural design.

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The site arrangement and structural design of major structures are key design features credited for compliance with 10 CFR 50.150. The arrangement and design of the major structures limits the location and effects of potential aircraft strikes on these structures. The characteristics of the structures credited for compliance with 10 CFR 50.150 are described in Reference 24 and supplemented by information in the U.S. EPR FSAR. The assessment credits the arrangement and design of the following building features to limit the location and effects of potential aircraft strikes on the U.S. EPR structures:

- The location and design of concrete barriers at selected locations along the exterior of the U.S. EPR structures described in Reference 24 or in Appendix 3B provides protection of the interior of these structures.

- The location and design of the Emergency Power Generating Building structures and layout described in Section 3.8 and Reference 24 provides protection of portions of Safeguard Building 2/3 and Safeguard Building 4.

- The location and design of the Essential Service Water Building structures and layout described in Section 3.8 and Reference 24 provides protection of portions of Safeguard Building 1, Safeguard Building 2/3, and Safeguard Building 4.

- The location and design of the Nuclear Auxiliary Building structure and layout described in Section 1.2.3 and Reference 24 provides protection of portions of Safeguard Building 4 and the Fuel Building.

- The location and design of the concrete sliding door in the Radioactive Waste Processing Building at Elevation 0 feet described in Section 1.2.3 and Reference 24 provides protection of portions of the Fuel Building.

4. Physically separate and redundant trains.

Physically separate and redundant trains, as described in Section 1.2.3.1 are a key design feature credited for compliance with 10 CFR 50.150. This design feature results in one or more divisions of systems credited in Chapter 15 analyses remaining functional after the impact from a large commercial aircraft to maintain core and SFP cooling capability. The following U.S. EPR safety-related and support systems credited in Chapter 15 are physically separated and redundant:

- Safety Injection/RHRS (Section 6.3).

- EFW System (Section 10.4.9).

- CCWS (Section 9.2.2).

- ESWS (Exterior and buried portions) (Section 9.2.1).

- Ultimate heat sink (Section 9.2.5).

- Uninterruptible electrical power supply systems (Section 8.3.2).

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– Emergency power supply system (EPSS) and EDG (Section 8.3.1).

In the event of an aircraft impact threat while the reactor is at power operation, NEI 07-13 (Reference 18) allows the assumption that the operators will have advance warning to take manual action to shutdown the reactor prior to impact. Because the systems necessary to scram the reactor are housed in the hardened and isolated Shield Building structures, there is no potential for impact damage that would prevent a scram. Following shutdown, one or more trains of the safety-related and support systems in this section are available to maintain core cooling and SFP cooling.

For an aircraft impact that occurs during shutdown with the reactor head removed and the reactor pit not flooded, the same safety-related and support systems in this section are used and one or more trains of these systems remain available to maintain core cooling.

5. Fire barriers and fire protection features.

Selected fire barriers, fire dampers, fire doors, and penetration seals are three-hour rated to prevent fire damage in one division from spreading to an adjacent division. Selected structural elements and blast dampers are 5 psid rated to prevent explosion effects from spreading to adjacent areas. The credited fire barriers, fire dampers, fire doors, penetration seals, structural elements, and blast dampers are identified on the fire zone layout figures in Appendix 9A.

~~The U.S. EPR design incorporates system redundancy, diversity, and independence. Two key features incorporated to mitigate the effects of potential impact of aircrafts are:~~

- ~~The use of a hardened shield building structure.~~
- ~~The site arrangement of major structures.~~

~~The following U.S. EPR design features are credited for compliance with 10 CFR 50.150:~~

- ~~Hardened Shield Building over Containment.~~
- ~~Hardened Shield Building over Fuel Building.~~
- ~~Hardened Shield Building over Control Room.~~
- ~~Hardened Shield Building over ECCS Components.~~
- ~~Hardened Decay Heat Removal Systems.~~
- ~~Hardened and Internalized Emergency Feedwater Tanks.~~
- ~~Hardened and Internalized Emergency Core Cooling Water.~~

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- ~~Physically Separate and Redundant Trains.~~

~~These features are described in Section 2.0 of ANP-10296, "U.S. EPR Design Features That Enhance Security Technical Report" (Reference 20).~~

19.2.7.5 Evaluation of U.S. EPR Performance

The U.S. EPR design was evaluated to establish a damage footprint for physical, fire, and vibration damage.

- Physical Damage.

RAI 456, Q. 19-347

Finite element analyses indicate that interior areas of the four Safeguards~~s~~ Buildings, Fuel Building, ~~or~~and the Containment Building are not susceptible to damage due to physical perforation of aircraft components into the structures. The containment vessel, emergency core cooling water, spent fuel pool, fuel pool makeup systems, main control room, safety injection/residual heat removal systems, emergency feedwater systems, component cooling water systems, essential service water systems (interior portions), and uninterruptible electrical power supply systems are housed in the Safeguard, Fuel, or Containment Buildings and are not susceptible to damage resulting from physical perforation of aircraft components into the structures. The physically separate and redundant train design of the U.S. EPR provides for survival of supporting functions such as emergency power and ultimate heat sink capability.

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- Fire Damage.

The analyses indicate that perforation and entry of aircraft fuel are prevented or controlled, and areas within the protected perimeter are not ~~are prevented; therefore, no interior areas are~~ susceptible to damage because of accelerant-fed fires. The fire damage footprint includes effects from exterior fires that may damage areas within the air intake and exhaust ducts up to the first three hour and 5 psid fire-rated ~~doors~~barrier.

RAI 456, Q. 19-346

- Vibration Damage.

An analysis was performed of the linear distance from the impact point to each elevation of each structure. This resulted in specific zones at each elevation to account for the damage footprint for the most sensitive equipment. Analyses were performed based on shock induced vibration from an exterior wall strike and a strike on the adjacent Containment Shield Structure.

The damage footprint was used to assess containment integrity, RCS heat removal capability, SFP integrity, and SFP heat removal capability.

19.2.7.5.1 Containment Integrity

The Containment Structure is considered to be acceptable if the containment is maintained intact after both the local and global impact analyses. The assessment concluded that the hardened and isolated containment shield structure was not perforated, and no significant structural damage occurred because of either local or global impacts. The Containment Building, inside the Containment Shield Structure, was not impacted by the aircraft or any associated debris. Therefore, the containment performance, including ultimate pressure capacity, is unaffected. Under these conditions, no physical damage or fire damage inside containment needs to be considered.

19.2.7.5.2 RCS Heat Removal Capability

The reactor coolant system heat removal is considered sufficient if the heat removal capability analyses performed conclude that sufficient heat removal equipment is available consistent with the PRA success criteria. The analyses performed demonstrated the ability of the U.S. EPR design, after the impact by a large commercial aircraft, to maintain functionality of one or more divisions of systems credited in U.S. EPR FSAR Tier 2, Chapter 15 with providing reactor core cooling under accident conditions. The U.S. EPR design has features such as hardened and isolated shield structures, a strategic site arrangement and plant structural design, fire barriers, and the physically separate and redundant trains. These features contribute to the success of one or more divisions of systems credited in Chapter 15 to maintain functionality to provide reactor core cooling after the impact of a large commercial aircraft. In addition, an aircraft impact does not create any new events that have not been analyzed in Chapter 15. NEI 07-13 does not require postulating a Chapter 15 event concurrent with an aircraft impact that does not perforate the structures containing RCS piping. Therefore, the RCS heat removal capability evaluation demonstrates additional margin in the U.S. EPR design.

RAI 456, Q. 19-342

RAI 456, Q. 19-343

19.2.7.5.3 SFP Integrity

The SFP integrity is considered to be maintained if the fuel pool liner does not have a leakage path below the minimum water level, the fuel is protected and there would be no unacceptable releases of radionuclides to the environment. Analyses demonstrate that no physical damage to the interior of the Fuel Building results from the aircraft crash. The prevention of aircraft perforation of the ~~exterior wall of the~~ hardened and isolated shield structure surrounding the Fuel Building ensures that the SFP is not perforated and that SFP integrity is maintained.

RAI 456, Q. 19-342

19.2.7.5.4 SFP Heat Removal Capability

RAI 456, Q. 19-342

With the SFP integrity maintained, SFP cooling is provided consistent with the PRA. The availability of the make-up systems is assured due to the integrity of the hardened and isolated shield structure surrounding the Fuel Building. The shield structure provides physical and fire damage protection against an aircraft impact. The isolation of this structure provides continued functionality of the SFP makeup and protection

RAI 456, Q. 19-342

against shock induced vibrations.Fuel Building exterior walls. The fire protection system provides the capability to fill the Spent Fuel Pool.

19.2.7.6 Conclusions

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The U.S. EPR has inherent protection to avoid or mitigate,, to the extent practical and with reduced reliance on operator actions, the effects of an aircraft impact. Although the regulations require meeting only two of the acceptance criteria, the assessment summarized above confirms the U.S. EPR design meets the four acceptance criteria in 10 CFR 50.150(a)(1) by following the methodology described in NEI-07-13 (Reference 18). The assessment confirmed that the U.S. EPR design meets the four acceptance criteria. The reactor remains cooled, AND the containment remains intact,; ANDand spent fuel cooling is maintained, ANDand spent fuel pool integrity isare maintained. Accordingly, the U.S. EPR design features and functional capabilities provide for adequate protection of public health and safety in the event of an impact of a large commercial aircraft as required by 10 CFR 1050.150. In fact, by exceeding the minimum acceptance criteria, the U.S. EPR design maintains significant margin beyond the minimum requirements specified in 10 CFR 50.150.

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