Enclosure 2

M170049

Revised ABWR DCD Revision 6/Draft Revision 7 Markups

1.6 GEH Topical Reports and Other Documents

Table 1.6-1 is a list of all GE topical reports and any other reports or documents which are referenced in Tier 2 and which contain information utilized for the ABWR.

Add: Table 1.6-2 is a list of technical reports which are incorporated by reference into Tier 2 for the ABWR.

Table 1.6-1 Referenced Reports (Continued)

Report No.	Title	Tier 2 Section No.
NEDC-30851P-A	W. P. Sullivan, "Technical Specification Improvement Analyses for BWR Reactor Protection System,", March 1988.	19D.6
NEDE-31096-A	"GE Licensing Topical Report ATWS Response to NRC ATWS Rule 10CFR 50.62,", February 1987.	19B.2
NEDE-31152-P	"GE Bundle Designs,", December 1988.	4.2
NEDO-31331	Gerry Burnette, "BWR Owner's Group Emergency Procedure Guidelines,", March 1987.	18A
NEDC-31336	Julie Leong, "General Electric Instrument Setpoint Methodology,", October 1986.	7.3
NEDC-31393	"ABWR Containment Horizontal Vent Confirmatory Test, Part I,", March 1987.	3B
NEDO-31439	C. VonDamm, "The Nuclear Measurement Analysis & Control Wide Range Neutron Monitoring System (NUMAC-WRNMS),", May 1987	20.3
NEDC-31858P	Louis Lee, "BWROG Report for Increasing MSIV Leakage Rate Limits and Elimination of Leakage Control System,", 1991	15.6
NEDE-31906-P	A. Chung, "Laguna Verde Unit I Reactor Internals Vibration Measurement,", January 1991.	7.4
NEDO-31960	Glen Watford, "BWR Owners' Group Long-Term Stability Solutions Licensing Methodology,", June 1991.	4.4
NEDC-32267P	"ABWR Project Application Engineering Organization and Procedures Manual,", December 1993.	17.1
NEDO-32686-A	"Utility Resolution Guide for ECCS Suction Strainer Blockage,", October 1998.	6C
NEDC-32721P-A	"Application Methodology for the General Electric Stacked Disk ECCS Suction Strainer," Rev. 2, March 2003 (using an updated head loss correlation).	6C
~~NEDO-33875~~	~~"ABWR US Certified Design Aircraft Impact Assessment, Licensing Basis Information and Design Details for Key Design Features," Rev. 0, November 2016.~~	~~19G~~
~~NEDE-33875P~~	~~"ABWR US Certified Design Aircraft Impact Assessment, Licensing Basis Information and Design Details for Key Design Features," Rev. 2, November 2016.~~	~~19G~~

Delete text above as marked.

Add after Table 1.6-1 Insert 1.6 #1 as shown on the next page.

Insert 1.6 #1:

Table 1.6-2 Reports Incorporated by Reference

Report No.	Title	Tier 2 Section No.
NEDO-33875	"ABWR US Certified Design Aircraft Impact Assessment, Licensing Basis Information and Design Details for Key Design Features," Rev. 3, February 2017, except for Appendices A and D.	19G
NEDE-33875P	"ABWR US Certified Design Aircraft Impact Assessment, Licensing Basis Information and Design Details for Key Design Features," Rev. 3, February 2017, except for Appendices A and D.	19G

3H.6 Summary of Key Structural Design Features

An assessment of the effects on the ABWR for the beyond design basis impact of a large, commercial aircraft has been performed in accordance with 10 CFR 50.150(a). A summary of the assessment can be found in Appendix 19G. Information that supports detailed design used in the AIA assessment is provided in NEDE-33875P, "Aircraft Impact Assessment, Licensing Basis Information and Design Details for Key Design Features" (Reference 19G-3). NEDE-33875P captures the strengthening measures configured as part of the design enhancements for Aircraft Impact Assessment.

This appendix describes the key structural design features of the ABWR that were identified in that assessment.

(1) Structural configuration of Spent Fuel Pool (SFP) within Reactor Building precludes direct strike on SFP~~, and structural design of SFP insures integrity of SFP to maintain water~~. The spent-fuel pool is a reinforced concrete structure with a 6.4mm (minimum) thick ASTM A-240 Type 304L stainless steel liner (see DCD Section 9.1.2.1.3). The SFP walls are strengthened as described in NEDE-33875P (Reference 19G-3) to ensure the integrity of the SFP is maintained.

(2) Structural configuration of primary containment (RCCV) within Reactor Building precludes direct strike on containment, and structural design of RCCV ~~insures~~ensures that RCCV is not perforated.

(3) Shield blocks over drywell head are ~~designed~~configured to fully resist secondary impacts from concrete debris, aircraft wreckage, and falling crane components to protect integrity of drywell head. The reactor cavity shield blocks are shown in Figure 3H.1-23.

(4) Interior partition walls ~~on 1F (Figure 1.2-8) and 2F (Figure 1.2-9) will be~~are thickened and strengthened ~~with additional reinforcement~~as shown in NEDE-33875P (Reference 19G-3) to limit physical damage to interior partition walls.

(5) Reinforced Concrete Sliding Barriers with structural capacity equivalent to the surrounding wall are~~will be~~ provided for the 6 large openings on 1F (Figure 1.2-8) to limit physical damage to exterior wall.

Note the numbering of Item (6) and (7) rather than (6a) and (6b) in earlier markups.

(6) ~~Protective awnings will be provided for the 3 EDG HVAC exhausts on 2F (Figure 1.2-9) to limit physical damage to exterior wall.~~Protective awnings for the HVAC exhaust openings on 2F (Figure 1.2-9) are sized to provide structural capacity equivalent to the corresponding exterior wall to prevent unabated wreckage through these openings.

Note the numbering of Item (6) and (7) rather than (6a) and (6b) in earlier markups.

(7) Protective awnings for the HVAC intake openings on 3F (Figure 1.2-10) are sized to provide structural capacity equivalent to that provided in Table 3-2 of NEI 07-13 for exterior walls (Reference 19G-1).

(8) ~~Protective external vestibules will be provided for the 5 single entry doors on 1F (Figure 1.2-8) to limit physical damage to exterior wall.~~Deleted.

(9) Control Building Annex exterior walls ~~running in the North-South direction~~ are made of reinforced concrete and are at least ~~600~~450mm thick.

(10) ~~Service Building exterior walls running in the North-South direction in total are made of reinforced concrete and are at least 600mm thick.~~The Service Building exterior wall running in the North-South direction immediately adjacent to the Control Building is a reinforced concrete wall of 900mm minimum thickness.

(11) Turbine Building reinforced concrete exterior wall adjacent to the Control Building (south wall) from column line T6 to T9 up to elevation 22750mm is at least 900mm thick.

(12) R/B exterior walls on the East, West, and South sides are strengthened with enhanced reinforcement as described in NEDE-33875P (Reference 19G-3).

preventing opening of valves or start of pump motors on command from the control room. However, the SLC equipment is not required for safe shutdown of the reactor, since it is redundant to the RPS.

9A.5.5.9 Flammability Control System

The flammability control system equipment is located in a large enclosed area at grade level at approximately 180 degrees azimuth. The rooms have a fire barrier floor and is completely surrounded by fire barrier walls and doors. There are large access doors to the outside at the centerline of the room.

The FCS is made up of two independent redundant divisions (Divisions 2 and 3), and each division is located in the fire area division 2 and 3 respectively. Each division has two suction isolation valves (inboard and outboard) and two return isolation valves (inboard and outboard). The inboard isolation valves are motor operated (MO) valves, and the outboard isolation valves are fail close (FC) air operated (AO) solenoid valves (two solenoids per valve). They are powered from division 1 and 4. Fire in either division may cause the inboard valves (Div. 2 or 3) to fail to operate, but the outboard isolation valves are still capable to isolate because they are powered from different divisions (Div. 1 and 4). Loss of a complete division is acceptable because FCS is made up of two independent redundant divisions mounted in two separated fire areas.

9A.5.5.10 Emergency Core Cooling System

Detailed cable routing is not provided in the DCD. In general divisional power, instrumentation and control cabling is routed within its own divisional area. In the event that cabling needs to be routed outside its assigned divisional area it must be protected from fire with a 3-hour fire rating and if necessary a 5-psid rating. Any divisional power, instrumentation and control cabling routed in any of the rooms described below must be assessed under 10 CFR 50.150. ~~Since cable routing is not defined at this stage in the design; any power, instrumentation or control cabling necessary for core cooling that is routed in any of the below fire areas must have a 3-hour fire rated insulation jacket.~~

Add: For performing the aircraft impact assessment, fire damage is identified by fire area and by division for each elevation. All core cooling equipment is assumed lost within a division if there is any fire damage within a divisional fire area. The exception to this is where it has been determined from the Fire Hazards Analysis that a fire area does not contain any equipment necessary for core cooling. Such fire areas and their associated rooms are identified in the table below (note the special exceptions for F4301). Divisional equipment (including cabling and HVAC ducts) may not be added in or routed through these areas without an assessment under 10 CFR 50.150. See Section 19G.4.3 and Reference 19G-3.

Replace the table with Insert #1 for Section 9A.5.5.10 (further below).

Fire Area	Room No.	Comment
F1510	195	Northeast Stairwell
F1520	192	Northeast Elevator
F1530	193	Southwest Stairwell
F1540	194	Southwest Elevator
F3210	329	West Stairwell
F3211	328	West Elevator
F3310	316	East Stairwell
F3311	317	East Elevator
F4203	611, 685	HVAC for Main Steam Tunnel
F4301	433, 530,	Instrumentation penetrations and lines associated with reactor water level, reactor pressure, and drywell pressure will be wrapped with secure, 3-hour fire rated insulation jacket.
F4301	430, 435, 438, 531, 615, 616, 617, 639, 657, 658, 674, 711, 716, 720, 722, 723, 734, 741, 742	Instrumentation lines associated with reactor water level, reactor pressure, and drywell pressure will be wrapped with secure, 3-hour fire rated insulation jacket.
F4303	434	Fire buffer zone between divisions 1 and 3 at elevation 1F and 2F
F4304	437	Fire buffer zone between divisions 2 and 3 at elevation 1F
F4305	535, 631	Fire buffer zone between divisions 2 and 3 at elevation 2F and 3F
F4306	635	Fire buffer zone between divisions 2 and 3 at elevation 3F and 3.5F
F4307	637	Fire buffer zone between divisions 2 and 3 at elevation 3F and 3.5F

Fire Area	Room No.	Comment
F6100	659	Containment Atmospheric Monitoring System Rack A
F6102	614, 644	Fire buffer zone between divisions 1 and 2 at elevation 3F
F7202	744	Fire buffer zone between divisions 1 and 2 at elevation 4F
F7203	743	Fire buffer zone between divisions 1 and 2 at elevation 4F

9A.5.5.11 Standby Gas Treatment System

The Standby Gas Treatment System consists of two totally independent and redundant divisional trains (Div. II and Div.III). Each divisional train has a filter train (consisting of the demister, an electronic process heater, prefilter, pre-HEPA filter, charcoal adsorber, a post-HEPA filter and space heaters), an exhaust fan and cooling fan. The two divisional trains occupy two separate rooms separated by a 3-hour fire barrier. Each divisional train exhaust is connected to the R/A exhaust duct and they are isolated by fire dampers.

9A.5.5.12 Fine Motion Control Rod Drive Motors

The power distribution for the FMCRD motors has been redesigned such that they are all powered from Division I, with a non-Class 1E backup power source. Therefore, a special case analysis is not required.

9A.5.5.13 Reactor Building Operating Deck Radiation Monitors

Radiation monitoring within this area is facilitated by two independent systems. The area radiation monitoring system and the process radiation monitoring system.

The area radiation monitoring (ARM) system is non-safety related and uses two radiation channels in the fuel storage and handling areas. It has no system actuation function, but is used for monitoring of background radiation and radiation resulting from accidental fuel drops. The sensors are mounted on the walls within the fire zone area. These detectors are designed to annunciate local and control room alarms for both high and low radiation conditions. The low condition is an indication of an inoperative radiation monitor. Loss of these detectors, due to fire, does not impact plant safety.

The process radiation monitoring (PRM) channels that are utilized in this area are safety related, and are used to perform isolation functions. The Geiger Mueller detectors are mounted in the reactor building ventilation system exhaust duct (Rm 643). They are safety related, and receive

Section 9A.5.5.10 Insert #1:

Fire Area	Room No.	Comment
F1510	195	Northeast Stairwell
F1520	192	Northeast Elevator
F1530	193	Southwest Stairwell
F1540	194	Southwest Elevator
F3101	341	RSS not required as MCR is available for all strikes
F3210	329	West Stairwell
F3211	328	West Elevator
F3300	315, 331, 336, 413, 517, 638, 654	FMCRD Equipment and non-1E power supplies
F3310	316	East Stairwell
F3311	317	East Elevator
F3400	345, 380, 444, 543	Division 4
F4203	611, 685	HVAC for Main Steam Tunnel
F4301	430, 433, 435, 438, 530, 531, 615, 616, 617, 639, 657, 658, 674, 711, 716, 720, 721, 722, 723, 733, 734, 741, 742	Instrumentation penetrations and instrument lines associated with reactor water level and pressure and drywell pressure are required to be wrapped with secure, 3-hour fire barrier material and, if necessary, 5-psid rated.
F4303	434, 537	Fire buffer zone created between divisions 1 and 3 at elevation 1F and 2F
F4304	437	Fire buffer zone created between divisions 2 and 3 at elevation 1F
F4305	535, 631	Fire buffer zone created in crossover corridor between divisions 2 and 3 at elevation 2F and 3F
F4306	635	Fire buffer zone created in crossover corridor between divisions 2 and 3 at elevation 3F and 3.5F
F4307	637	Fire buffer zone created in crossover corridor between divisions 2 and 3 at elevation 3F and 3.5F
F6100	659	Containment Atmospheric Monitoring System Rack A
F6102	614, 644	Fire buffer zone created in crossover corridor between divisions 1 and 2 at elevation 3F
F6200	640, 680	Non-1E power supplies for FMCRD
F7202	744	Fire buffer zone created in crossover corridor between divisions 1 and 2 at elevation 4F
F7203	743	Fire Buffer zone created in crossover corridor between divisions 1 and 2 at elevation 4F
F7300	715	RIP and ASD equipment

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19G Aircraft Impact Assessment

19G.1 Introduction and Background

A design-specific assessment of the effects on the ABWR of the beyond design basis impact of a large, commercial aircraft has been performed in accordance with 10 CFR 50.150(a) to identify and incorporate into the design those design features and functional capabilities to show that, with reduced use of operator actions: (i) The reactor core remains cooled, or the containment remains intact: and (ii) spent fuel cooling or spent fuel pool integrity is maintained. The specific assumptions regarding the aircraft impact were based on guidance provided by the NRC (RG 1.217) and the Nuclear Energy Institute (NEI 07-13, Rev. 8) (References 19G-2 and 19G-1), including the loading function derived from the aircraft impact characteristics for use in assessments of aircraft impact effects. These guidelines were fully followed with no exceptions taken.

This appendix describes those design features and functional capabilities identified in the assessment, and discusses how the identified design features and functional capabilities show that, with reduced use of operator actions, the reactor core remains cooled or the containment remains intact, and spent fuel cooling or spent fuel pool integrity is maintained. In the following discussion the identified design features are designated as "key design features." Detailed information is provided in Reference 19G-3.

19G.2 Scope of the Assessment

The evaluation of plant damage caused by the impact of a large, commercial aircraft is a complex analysis problem involving phenomena associated with structural impact, shock-induced vibration, and fire effects. The analysis of the aircraft impact considers structural damage, taking into account:

- "An assessment of the effects of aircraft fuselage and wing structure;
- "An assessment of the effects of shock-induced vibration on systems, structures, and components;
- "An assessment of the penetration of hardened aircraft components, such as jet engine rotors and landing gear.

The results of the assessment predict that the Spent Fuel Pool and the RCCV (Reinforced Concrete Containment Vessel) are not perforated; therefore, further assessment of the damage to RCCV internal systems, structures, and components caused by 1) burning aviation fuel and 2) secondary impacts is not required. The Control Building (C/B) is protected by intervening structures.

The results of the assessment predict that for the Reactor Building (R/B) in certain locations perforation is predicted; therefore, realistic assessments of the damage to internal systems,

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structures and components caused by 1) burning aviation fuel and 2) secondary impacts are performed.

19G.3 Assessment Methodology

Methods described in NEI-07-13, Rev. 8 were followed to assess the effects on the structural integrity of the RCCV and Spent Fuel Pool, and to assess the physical, fire and vibration effects of the aircraft impact on the core cooling capability of the existing and enhanced design.

19G.4 Results of Assessment

The following key design features and functional capabilities ensure that the ABWR design can maintain core cooling and spent fuel integrity following a strike of a large commercial aircraft.

19G.4.1 Primary Containment

The RCCV, as described in Sections 3.8 and 3H.1, is a key design feature that would protect the safety systems located inside primary containment from the impact of a large commercial aircraft. The assessment concludes that a strike upon the primary containment would not result in the perforation of the primary containment, and would not cause direct damage to the systems within the primary containment or expose them to jet fuel.

The assessment also finds that safety-related components inside primary containment, including the reactor pressure vessel and associated ECCS piping are unaffected by shock-induced vibrations resulting from the impact of a large commercial aircraft.

19G.4.2 Site Arrangement and Plant Structural Design

The design and arrangement of major structures associated with the ABWR design as described in Section 1.2 and Figure 1.2-1 are key design features. Key structural design features for aircraft impact are listed in Section 3H.6. Specifically, the assessment credited the arrangement and design of the following building features to limit the location and effects of potential aircraft strikes on the R/B, RCCV and C/B in the following locations:

(1) The location and design of the C/B structure as described in Sections 3.8.4 and 3H.2 are key design features that protect portions of the north wall of the R/B below Elevation 22000 from the impact of a large commercial aircraft. The C/B location on site is reflected on Figure 1.2-1, Site Plan. The C/B location, fixed with respect to other major structures, is defined in NEDE-33875P (Reference 19G-3) to ensure that credit of the C/B as an intervening structure is maintained.

(2) The location and design of the Turbine Building structure and layout as described in Tier 1 Section 2.15.11 and Tier 2 Figures 1.2-24 through 1.2-31 are key design features that protect the entire north wall of the C/B and portions of the north wall of the R/B from the impact of a large commercial aircraft. The Turbine Building location on site is reflected on Figure 1.2-1, Site Plan. The Turbine Building location,

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fixed with respect to other major structures, is defined in NEDE-33875P (Reference 19G-3) to ensure that credit of the Turbine Building as an intervening structure is maintained.

(3) The location and design of the R/B structure as described in Sections 3.8.4 and 3H.1 are key design features that protect portions of the primary containment and the entire south wall of the C/B from the impact of a large commercial aircraft. This includes the protection provided by exterior walls, interior walls, intervening structures and barriers on the large openings in the reactor building exterior walls. A detailed structural analysis using the NEI 07-13 Rev. 8 methodology was utilized to determine the design of selected internal walls as shown in Figures 1.2-10 thru 1.2-12 and external barriers as shown in Figures 1.2-8 and 1.2-9 that, in combination with the external wall, protects the critical penetrations. That analysis was also used to determine the key design features for the reactor cavity shield blocks for protecting the drywell head from secondary impacts as identified in Section 3H.1.3~~3H.1.4~~ and Figure 3H.1-23. The R/B location on site is reflected on Figure 1.2-1, Site Plan. The R/B location, fixed with respect to other major structures, is defined in NEDE-33875P (Reference 19G-3) to ensure that credit of the R/B as an intervening structure is maintained.

(4) The location and design of the Spent Fuel Pool and its supporting structure as described in Section 9.1 and Figure 1.2-12 are key design features in protecting the spent fuel pool from the impact of a large commercial aircraft.

(5) The physical separation of the Class 1E emergency diesel generators is a key design feature that prevents the loss of all electrical power to core cooling systems by protecting them from physical damage, fire damage and smoke effects.

(6) The location and design of the Service Building structure as described in Section 3H.6 and Figures 1.2-20 through 1.2-22 are key design features that protect the east wall of the C/B from the impact of a large commercial aircraft. The Service Building location on site is reflected on Figure 1.2-1, Site Plan. The Service Building location, fixed with respect to other major structures, is defined in NEDE-33875P (Reference 19G-3) to ensure that credit of the Service Building as an intervening structure is maintained.

(7) The location and design of the Control Building Annex structure as described in Section 3H.6 and Figures 1.2-20 through 1.2-22 are key design features that protect the west wall of the C/B from the impact of a large commercial aircraft. The Control Building Annex location on site is reflected on Figure 1.2-1, Site Plan. The Control Building Annex location, fixed with respect to other major structures, is defined in NEDE-33875P (Reference 19G-3) to ensure that credit of the Control Building Annex as an intervening structure is maintained.

Section 19G.4.2: Replace with: (9) The R/B HVAC ducting locations ensure routing maintains separation divisionally through protection or physical separation so that AIA strikes do not result in a loss of all divisions of core cooling.

(8) The seismic gap between the Reactor Building and Control Building described in DCD Section 3.8.5.1 is a key design feature in protecting the Control Building from shock effects from strikes on the Reactor Building.

~~(9) The locations of the R/B HVAC system ducting are also key design features that prevent loss of core cooling systems by protecting HVAC SSC from physical damage, fire damage and smoke effects through physical separation.~~

(10) During normal operating conditions, the R/B crane will be parked at the Reactor Building North wall when not in use.

(11) Any permanent structure that penetrates the C/B roof is sized to preclude a strike from the east and west directions.

19G.4.3 Fire Barriers and Fire Protection Features

The design and location of 3-hour fire barriers and 3-hour, 5-psid fire barriers are key design features for the protection of core cooling equipment within these buildings from the impact of a large commercial aircraft. The assessment credited the design and location of fire barriers (including doors, dampers and other penetrations) as shown on Reactor Building Fire Protection drawings 9A.4-1 through 9A.4-8 and described in Sections 9.5.1 and 9A.4 for the R/B to limit the effects of internal fires created by the impact of a large commercial aircraft. All credited watertight doors have a 5 psid, 3-hour fire rating. All doors, dampers and other penetrations at the perimeter of a fire area will be designed to meet the rating of the designated fire barrier (3-hour or 3-hour, 5-psid). Additionally, all credited penetration seals in 3-hour fire barriers will also be rated for 3-hour, 5-psid and fire dampers with a 3-hour 5-psid rating will be quick actuating (Blast) type.

Replace with Insert 19G.4.3 #1 on next page.

~~Divisional power, instrumentation or control cabling routed through another space must be assessed under 10 CFR 50.150 (see Section 9A.5.5.10).~~

Steel Roof Trusses supporting the Reactor Building roof (el. 49700mm) are fireproofed and encased with a 3 hr, 5 psid fire retardant material/system that will not be dislodged by the postulated aircraft impact overpressure (see Section 9A.2.4).

19G.4.4 Core Cooling Features

The design and physical separation of the emergency core cooling systems described in Section 6.3 are key design features for assuring core cooling. The following support systems are also designated as key design features for ensuring ECCS is available. All support systems were assessed for physical, fire and shock damage.

(1) The Class 1E Onsite AC power system described in DCD Section 8.3.1 is a key design feature. The Class 1E Onsite DC power system described in DCD Section 8.3.2 is a key design feature.

Insert 19G.4.3 #1:

Section 9A.5.5.10 establishes fire hazards requirements that are key design features for aircraft impact assessment. Locating divisional core cooling equipment in certain fire areas and their associated rooms must be assessed under 10 CFR 50.150, as described in Section 9A.5.5.10. Divisional power, instrumentation or control cabling or HVAC ducting routed through certain fire areas must be assessed under 10 CFR 50.150 as described in Section 9A.5.5.10.

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(2) The instrumentation system described in DCD Sections 7.2, 7.3.2.1, 7.3.2.4, 7.3.2.6, 7.3.2.7, and 7.3.2.8 is a key design feature.

(3) The Makeup Water Condensate System described in DCD Section 9.2.9, the Fire Water Storage System described in DCD Section 9.5.1 and the Suppression Pool described in DCD Section 6.2.1 are key design features for providing adequate cooling water to maintain fuel cooling.

(4) The Reactor Service Water System described in DCD Section 9.2.15 and the Reactor Building Cooling Water System described in DCD Section 9.2.11 are key design features for providing the necessary cooling water for ECCS system operation.

(5) The Ultimate Heat Sink described conceptually in DCD Section 9.2.5 is a key design feature for cooling the Reactor Service Water System. The AC Independent Water System (ACIWA) described in DCD Section 5.4.7 is a key design feature for maintaining cooling of the fuel in the event the UHS is lost.

(6) The Reactor Safety Relief Valves described in DCD Section 6.2 are a key design feature.

(7) The Containment Overpressure Protection System (COPS) described in DCD Section 6.2.5 is a key design feature.

(8) The design and physical location of the CRD Hydraulic Control Units (HCU) and the CRD ~~mechanisms~~ System mechanisms described in DCD Section 4.6.1 are key design features for ensuring that a reactor scram is available.

(9) Cabling and ventilation routing is designed divisionally.

(10) The MCR HVAC mechanical and electrical cross connects described in DCD Section 9.4.1.1.4 are key design features.

The ABWR design for aircraft impact is in full compliance with the guidance of NEI 07-13 Rev 8, "Methodology for Performing Aircraft Assessments for New Plant Designs." In the event of a threatened aircraft impact while the reactor is critical and operating normally at power, the guidelines in NEI 07-13 Rev 8 allow the assumption that the operators will have advance warning to take manual action to shutdown the reactor prior to impact unless the hydraulic control units (HCUs) are in the physical damage footprint. For the ABWR design, the HCUs are located below grade, outside of the physical and shock damage footprints. As a result, such advance warning to shutdown the reactor can be credited.

During shutdown conditions, core cooling is maintained by injecting water into the Reactor Vessel using the available RHR or HPCF train. For some strike locations only one division of RHR/HPCF equipment is available. If this train were to be out of service for maintenance, shutdown cooling would be lost. Administrative controls will be established by the COL applicant to ensure that RHR Train A and either RHR or HPCF for Trains B and C are not out of service for maintenance until the cavity is flooded and the SFP gates are opened. This will ensure an adequate water reservoir to provide cooling of the fuel in the vessel for at least 24 hours. Subsequent installation of the SFP gates may be performed with less than the previously described ECC system injection capability as long as the amount of water in the reactor/reactor cavity is sufficient to provide 24 hours of cooling for the fuel remaining in the reactor. The minimum system availability requirements are covered by Technical Specifications.

19G.5 Conclusions of Assessment

This assessment based upon NEI 07-13 Rev 8, concludes that the ABWR can continue to provide adequate protection of the public health and safety in the event of an impact of a large, commercial aircraft, as defined by the NRC. The aircraft impact would not inhibit the ABWR's core cooling capability and spent fuel pool integrity based on best estimate calculations. There are no AIA scenarios that would result in leakage from the spent fuel pool below the required minimum water level. The pool liner is not perforated and all piping attachments are configured such that they will not allow drain down below the minimum water level described in Section 9.1.3.3. The assessment resulted in the identification of the key design features and functional capabilities described in Section 19.G.4, changes to which are required to be controlled in accordance with 10 CFR 50.150(c).

19G.6 References

Change to: Rev. 3, February 2017

19G-1 NEI 07-13, Rev 8.

19G-2 Regulatory Guide 1.217, Guidance for the Assessment of Beyond-Design-Basis Aircraft Impacts, Rev. 0, August 2011.

19G-3 NEDE-33875P, ABWR US Certified Design Aircraft Impact Assessment, Licensing Basis Information and Design Details for Key Design Features, ~~Rev. 2, November 2016~~; NEDO-33875 (Public Version), ABWR US Certified Design Aircraft Impact Assessment, Licensing Basis Information and Design Details for Key Design Features, ~~Rev. 0, November 2016~~.

Change to: Rev. 3, February 2017.