ENCLOSURE 2

APP-GW-GLN-014-NS, Revision 0

"AP1000 Integrated Head Package"

Technical Report 61

Redacted version of Enclosure 1 with sensitive material relative to the physical protection of an AP1000 Nuclear Plant withheld from public disclosure pursuant to 10 CFR 2.390(d)

AP1000 DOCUMENT COVER SHEET

TDC: _____ Permanent File: _____ APY: _____

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AP1000 DOCUMENT NO.	REVISION NO.		ASSIGNED TO
APP-GW-GLN-014-NS	0	Page 1 of 1	W-A. Sterdis

ALTERNATE DOCUMENT NUMBER: WORK BREAKDOWN #:

ORIGINATING ORGANIZATION: Westinghouse Electric Company

TITLE: **AP1000 Integrated Head Package**

ATTACHMENTS:	DCP #/REV. INCORPORATED IN THIS DOCUMENT REVISION:
None	
CALCULATION/ANALYSIS REFERENCE:	APP-GW-GEE-069 Rev. 1 and APP-GW-GEE-130 Rev. 1
N/A	

ELECTRONIC FILENAME	ELECTRONIC FILE FORMAT	ELECTRONIC FILE DESCRIPTION
APP-GW-GLN-014.doc	Microsoft Word	Text

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November 2006

AP1000 Standard Combined License Technical Report

AP1000 Integrated Head Package

Public (redacted) Version with sensitive unclassified nonsafeguards information relative to the physical protection of an AP1000 nuclear plant withheld under 10 CFR 2.390(d)

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Document Number: APP-GW-GLN-014-NS **Revision Number:** 0

Title: AP1000 Integrated Head Package

Brief Description of the change (what is being changed and why):

The control rod drive mechanism (CRDM) cooling fans are no longer supported on the Integrated Head Package, but on an adjacent structure. This reduces the size and load to be picked up by the polar crane. A cable bridge is no longer used for instrumentation and power cable management. A stud hoist rail system is used to support individual stud hoist tensioners. Shielded covers are provided for the in-core instrument guide tubes to enhance radiation protection during refueling operations.

I. APPLICABILITY DETERMINATION

This evaluation is prepared to document that the change described above is a departure from Tier 2 information of the AP1000 Design Control Document (DCD) that may be included in plant specific FSARs without prior NRC approval.

A.	Does the proposed change include a change to:		
	1. Tier 1 of the AP1000 Design Control Document APP-GW-GL-700	☒ NO ☐ YES	(If YES, prepare a report for NRC review of the changes.)
	2. Tier 2* of the AP1000 Design Control Document, APP-GW-GL-700	☒ NO ☐ YES	(If YES, prepare a report for NRC review of the changes.)
	3. Technical Specification in Chapter 16 of the AP1000 Design Control Document, APP-GW-GL-700	☒ NO ☐ YES	(If YES, prepare a report for NRC review of the changes.)
B.	Does the proposed change involve:		
	1. Closure of a Combined License Information Item identified in the AP1000 Design Control Document, APP-GW-GL-700	☒ NO ☐ YES	(If YES, prepare a COL item closure report for NRC review.)
	2. Completion of an ITAAC item identified in Tier 1 of the AP1000 Design Control Document, APP-GW-GL-700	☒ NO ☐ YES	(If YES, prepare an ITAAC completion report for NRC review.)

☒ The questions above are answered no, therefore the departure from the DCD in a COL application does not require prior NRC review unless review is required by the criteria of 10 CFR Part 52 Appendix D Section VIII B.5.b. or B.5c

II. TECHNICAL DESCRIPTION AND JUSTIFICATION

Removal of CRDM Cooling Fans from Integrated Head Package – The purpose of the Integrated Head Package is to facilitate the rapid removal of the reactor vessel head during a refueling outage. With the CRDM cooling fans on the Integrated Head Package, this became a difficult task. The size and weight of the Integrated Head Package was large. It required disconnection of the CRDM cooling fan power cables. Heavy shield doors would have to be placed where the fans are disconnected from the ductwork. Because the CRDM fans were not uniformly distributed on the Integrated Head Package, it would be difficult to meet the levelness criteria while lifting it. The CRDM cooling fans and their supporting

structure interfered with the removal and insertion process of the in-core instrumentation cable assemblies. For all of these reasons, the CRDM cooling fans were removed from the Integrated Head Package and placed on a support structure adjacent to the Integrated Head Package.

Cable Bridge – The cable/support/management function was not correctly described in the DCD. There is no cable bridge for the Integrated Head Package. In its place is a cable support structure with removable cable guides. The CRDM power and digital rod position indication cables are disconnected from the connector plates, retracted, and temporarily stored below the operating deck so they do not interfere with refueling operations.

Lifting of the Integrated Head Package – The Integrated Head Package is not lifted with the reactor vessel stud tensioners, studs, nuts, and washers. These items are removed from the reactor vessel head before the Integrated Head Package is lifted by the polar crane to the in-containment storage stand during refueling.

There is a clarification of the lifting system (tripod) for the Integrated Head Package. This apparatus lifts the reactor vessel head and Integrated Head Package as a unit. The lifting system attaches to the control rod drive mechanism seismic support structure. The lift legs transfer the head load during a head lift from the head attachment lugs through the control rod drive mechanism seismic support structure to the lift rig. The lifting system consists of lift legs, sling block, clevises, and sling rods, required interfacing with the polar crane hook.

Stud Hoist Rail – A stud hoist rail has been added to Figure 3.9-7. The stud hoist rail is used to support individual stud hoist tensioners used during refueling operations.

In-core Instrumentation Guide Tube Covers – Shielded covers are provided for the 42 in-core instrument guide tubes to enhance radiation protection during refueling operations.

III. REFERENCES

1. APP-GW-GL-700, AP1000 Design Control Document, Revision 15.
2. NUREG 1793, U.S. Nuclear Regulatory Commission "Final Safety Evaluation Report for AP1000 Design," September 2004.

IV. DCD MARK-UP

The following mark-ups of AP1000 DCD Revision 15 Tier 2 (Reference 1) identify how COL application FSARs should be prepared to incorporate the subject change.

Revise subsection 3.9.7 as follows:

3.9.7 Integrated Head Package

The integrated head package (IHP) combines several components in one assembly to simplify refueling the reactor. Figure 3.9-7 illustrates the integrated head package. The integrated head package includes a lifting rig, seismic restraints for control rod drive mechanisms, support for reactor head vent piping, power cables, cables and conduit for in-core instrumentation, cable supports ~~(including messenger tray and cable bridge)~~, and cooling shroud assembly~~, and cooling system~~.

The integrated head package provides the ability to rapidly disconnect cables, including the CRDM power cables, digital rod position indication cables, and in-core instrumentation cables from the components~~, including the control rod drive mechanism and~~ The integrated head package also provides the ability to rapidly disconnect the reactor head vent system.

The integrated head package ~~It also~~provides the ability to move these components as an assembly to permit their lifting and removal ~~of~~ with the reactor vessel head. In addition, the integrated head package provides support for the vessel head ~~multi~~-stud tensioner/detensioner during refueling.

The lifting rig function is discussed in subsection 9.1.5. The control rod drive mechanisms are discussed in subsection 3.9.4. The control rod drive mechanism support and cooling function is discussed in Section 4.6. The reactor vessel head vent function is discussed in subsection 5.4.12. The function and requirements of the in-core instrumentation are discussed in Chapter 7.

Revise the fifth and tenth paragraphs of subsection 3.9.7.1 as follows:

3.9.7.1 Design Bases

Those components that function as part of the lifting rig are required to be capable of lifting and carrying the total assembled load of the package. This includes the vessel head, control rod drive mechanisms, control rod drive mechanism seismic supports, cooling shroud, instrumentation support, cooling ducts ~~and fans~~, ~~stud tensioners, vessel studs, nuts, washers,~~ instrumentation support structure, and insulation. The lifting rig components are required to meet the guidance for special lifting rigs, in NUREG-0612, (Reference 10). The lifting rig components are nonsafety-related, AP1000 equipment Class E.

The ~~messenger tray~~ cable support provides seismic support and maintains separation for instrumentation and power cables ~~when it is in the normal position spanning the space over the cavity from operating deck to the integrated head package~~.

Revise subsection 3.9.7.2 as follows:

3.9.7.2 Design Description

The integrated head package combines several separate components in one assembly to simplify refueling of the reactor. The purpose of the integrated head package is to reduce the outage time and personnel radiation exposure by combining operations associated with movement of the reactor vessel head during the refueling outage. In addition, the integrated head concept reduces the laydown space required in the containment. With the integrated head package, disconnections from and connections to the control rod drive mechanisms and rod position indicators (RPI) and other components within the cooling shroud assembly are not made at the individual component.

The integrated head package consists of the following main elements:

- Cooling Sshroud assembly ~~and cooling system~~
- Lifting system
- Mechanism seismic support structure
- ~~Messenger tray and c~~Cable support structure
- Cables
- In-core instrumentation support structure

Brief descriptions of the principal elements of the integrated head package are provided in the following paragraphs.

Cooling Sshroud assembly ~~and cooling system~~ - The cooling shroud assembly is a carbon steel structure that includes an outer shroud and an inner air baffle and encloses the control rod drive mechanisms above the reactor vessel head. During normal operation, it provides for the flow of cooling air to the control rod drive mechanism coil stacks. The rod position indicators are also cooled by this air flow. The ~~air cooling fans and the~~ duct work and air baffle are integral with, and supported by, the shroud assembly. The air cooling fans are supported on a separate platform. Structurally, the shroud is integrated with the head lifting system and the mechanism seismic support structure. The shroud also provides shielding at the vessel flange region.

The shroud structure is bolted to attachment lugs on the reactor vessel head~~, which also serve as the lifting attachment to the reactor vessel head. The shroud transfers the head load during a head lift to the control rod drive mechanism seismic support and into the lift rig.~~

Cabling, conduit and their supports and attachment hardware for the control rod drive mechanisms, control rod drive mechanism coil, ~~cooling fans,~~ and in-core instrumentation ~~is~~are routed around the ~~messenger tray~~cable support attached to the shroud.

Lifting system - This apparatus lifts the reactor vessel head and integrated head package as a unit. The lifting system attaches to the control rod drive mechanism seismic support structure. The lift legs transfer the head

load during a head lift from the head attachment lugs through the control rod drive mechanism seismic support structure to the lift rig. The lifting system ~~It~~ consists of lift legs, sling block, clevises, and sling rods required to interface with the polar crane hook.

Mechanism seismic support structure - This structure provides seismic restraint for the mechanisms. It is located near the top of the control rod drive mechanism rod travel housings. The spike on the top of the control rod drive mechanism rod travel housing interfaces with this support. This support interfaces with the cooling shroud assembly to transfer seismic loads from the mechanisms to the reactor vessel head. In addition to this function, the mechanism seismic support structure acts as a spreader for the lift system and transfers the reactor vessel head loads to the lift system. The in-core instrument support structure is also supported from the mechanism seismic support structure.

~~**Messenger tray and c**~~**Cable support structure** - The ~~messenger tray~~ cable support is located at an elevation above the top of the rod travel housings. It provides permanent support and routing for the control rod drive mechanism power cables, and rod position indication cables, ~~and in-core instrumentation cables~~ which remain with the integrated head package and are normally not disturbed. These cables terminate at ~~the~~ connector plates, which constitutes the interface with the mating cables. Cable disconnects are made at the connector plates.

Cables - The integrated head package cables include those portions of the control rod drive mechanism power cables, in-core instrumentation, and rod position indication instrumentation cables extending from the connector plates, ~~through the messenger tray and cooling shroud assembly~~ to the user devices. These cables remain with the integrated head package and are normally not disturbed. The individual cables length are sized to provide an orderly arrangement ~~in the messenger tray and inside the cooling shroud~~. For a refueling or other operation requiring movement of the integrated head package, the cables that span the space over the cavity from the operating deck to the integrated head package ~~connected to the cables on the messenger tray~~ are disconnected at ~~a~~ the connector plates. The cables are then moved away from the integrated head package.

Revise Table 8.3.1-1 (Sheet 4 of 5), "Onsite Standby Diesel Generator ZOS MG 02A Nominal Loads," and Table 8.3.1-2 (Sheet 4 of 4), "Onsite Standby Diesel Generator ZOS MG 02B Nominal Loads," as shown on the following pages.

Table 8.3.1-1 (Sheet 4 of 5)

ONSITE STANDBY DIESEL GENERATOR ZOS MG 02A NOMINAL LOADS

Manual Loads (Note 2)				
Item No.	**Time Seq. (sec)**	**Event or Load Description**	**Rating (hp/kW)**	**Operating Load (kW)**
47.		Class 1E Div. A Battery Charger 1 (Note 13)	78 kVA	26
48.	--	Class 1E Div. C Battery Charger 1 (Note 13)	78 kVA	26
49.	--	Class 1E Div. C Battery Charger 2	78 kVA	15
50.	--	Supplemental Air Filtration System Fan A	15 hp	15
51.	--	Supplemental Air Filtration System Electric Heater A	20 kW	20
52.	--	Backup Group 4A Pressurizer Heaters	246 kW	246
53.	--	CRDM Fan 01A	40 hp	33
54.	--	CRDM Fan 01C~~B~~	40 hp	33
55.	--	Spent Fuel Cooling Pump A	250 hp	200
56.	--	Make-Up Pump A	600 hp	498
57.	--	Non-1E Regulating XFMR EDS1-DT-1	75 kVA	25
58.	--	Non-1E Regulating XFMR EDS3-DT-1	75 kVA	25
59.	--	Instrument Air Compressor A (Note 14)	200 hp	166
60.	--	Main Control Room AHU Supply Fan A (Note 11)	40 hp	34
61.	--	Main Control Room AHU Return Fan A (Note 11)	25 hp	21
62.	--	Div A/C Class 1E Electrical Room AHU Supply Fan A (Note 11)	40 hp	34
63.	--	Div A/C Class 1E Electrical Room Return Fan A (Note 11)	25 hp	21

Table 8.3.1-2 (Sheet 4 of 4)

ONSITE STANDBY DIESEL GENERATOR ZOS MG 02B NOMINAL LOADS

Manual Loads (Note 2)				
Item No.	**Time Seq. (sec)**	**Event or Load Description**	**Rating (hp/kW)**	**Operating Load (kW)**
53.	--	Class 1E Div. B Battery Charger 1	78 kVA	26
54.	--	Class 1E Div. B Battery Charger 2	78 kVA	15
55.	--	Class 1E Div. D Battery Charger 1	78 kVA	26
56.	--	Supplemental Air Filtration System Fan B	15 hp	15
57.	--	Supplemental Air Filtration System Electric Heater B	20 kW	20
58.	--	Backup Group 4B Pressurizer Heaters	246 kW	246
59.	--	CRDM Fan 01B~~C~~	40 hp	33
60.	--	CRDM Fan 01D	40 hp	33
6~~0~~1.	--	Spent Fuel Cooling Pump B	250 hp	200
6~~1~~2.	--	Make-Up Pump B	600 hp	498
6~~2~~3.	--	Non-1E Regulating XFMR EDS2-DT-1	75 kVA	25
6~~3~~4.	--	Annex Bldg Equipment Room Return/Exhaust Fan B	20 hp	17
64~~5~~.	--	Annex Bldg Equipment Room AHU MS02B Fan	50 hp	42
6~~5~~6.	--	Annex Bldg Swgr Rm AHU MS 05B Fan	50 hp	42
6~~6~~7.	--	Annex Bldg Swgr Rm Ret/Exhaust Fan 06B	25 hp	21
		Total Manually Sequenced Loads (kW)		**122~~6~~59**

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Revise Figure 3.9-7, "Integrated Head Package," as shown on the following page, to reflect its current configuration with CRDM cooling fans on an adjacent structure.

Revise Figure 1.2-9, "Nuclear Island General Arrangement Plan at Elevation 117'6" with Equipment," to eliminate CRDM cooling fans on the Integrated Head Package. This figure is at the end of this document.

Revise Figure 12.3-1, "Radiation Zones, Normal Operations/Shutdown Nuclear Island, Elevation 135'-3" (Sheet 8 of 16)," as shown at the end of this document.

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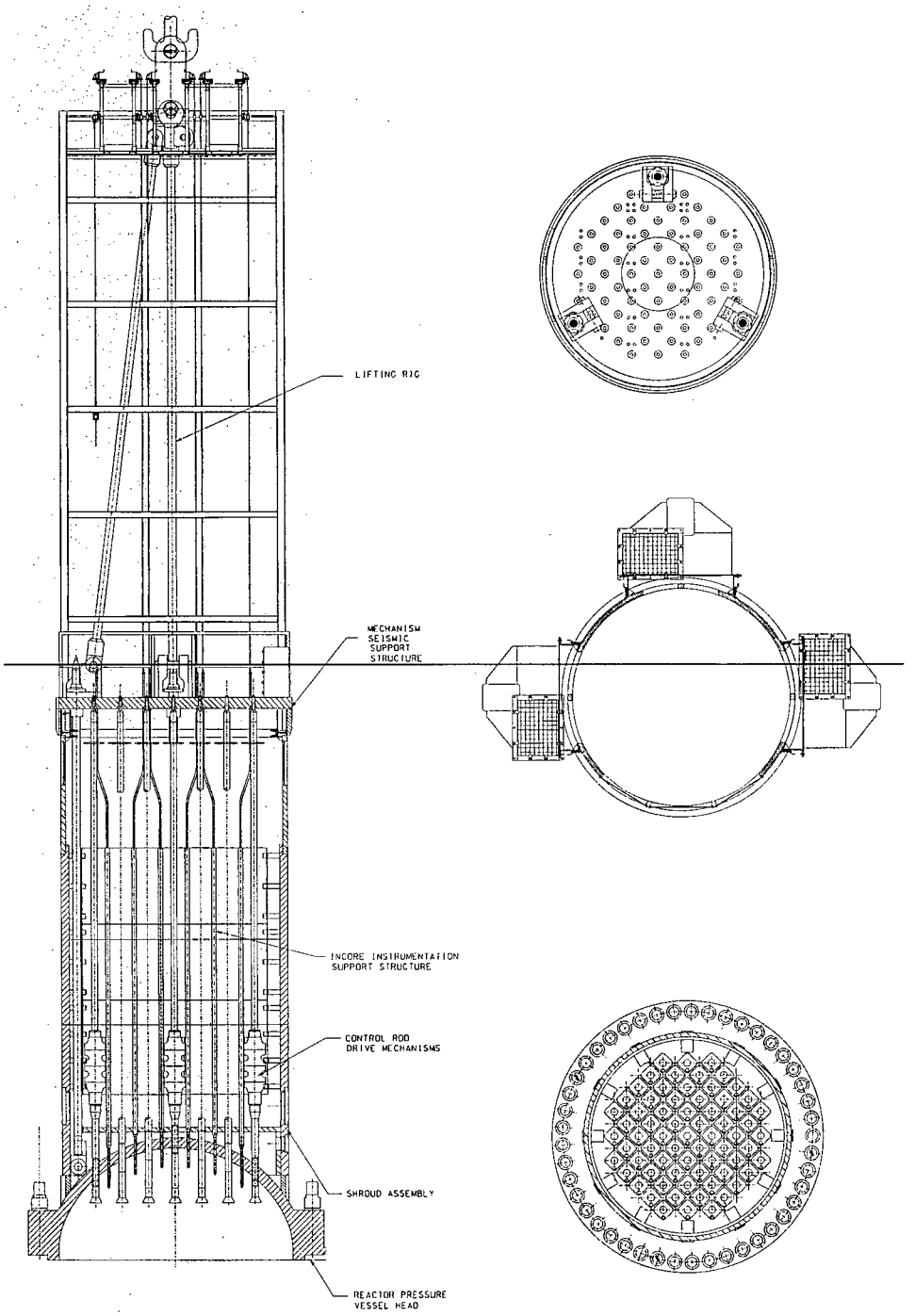

Figure 3.9-7

Integrated Head Package

CURRENT FIGURE

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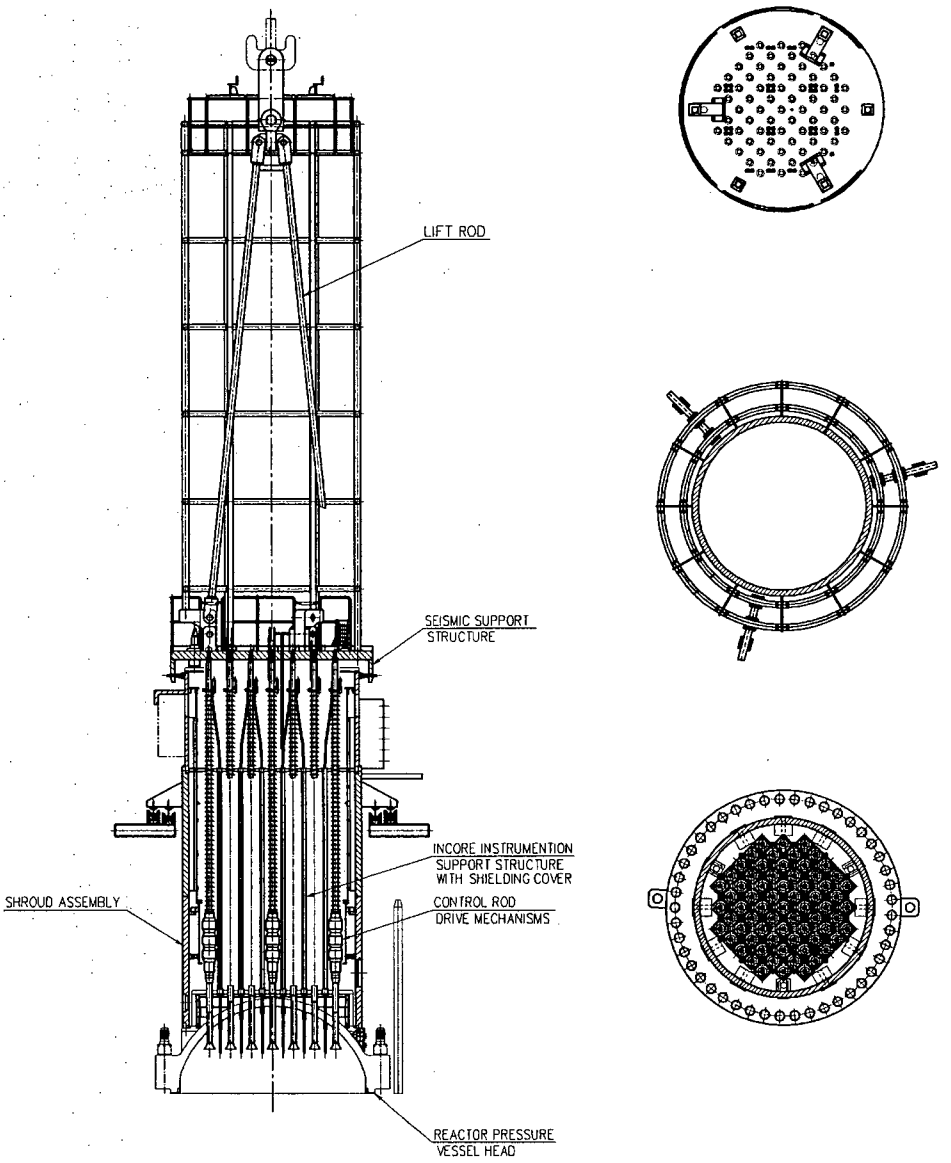

Figure 3.9-7

Integrated Head Package

REVISED FIGURE

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V. REGULATORY IMPACT

A. FSER IMPACT

The Integrated Head Package is described in subsection 3.9.4 of the NRC Final Safety Evaluation Report (FSER) (Reference 2). The changes detailed in this document do not impact the FSER.

B. SCREENING QUESTIONS (Check correct response and provide justification for that determination under each response)

1. Does the proposed change involve a change to an SSC that adversely affects a DCD described design function? ☐ YES ☒ NO

   The proposed IHP change does not involve a change to an SSC that adversely affects a DCD described design function.

2. Does the proposed change involve a change to a procedure that adversely affects how DCD described SSC design functions are performed or controlled? ☐ YES ☒ NO

   The proposed IHP change does not involve a change to a procedure that adversely affects how DCD described SSC design functions are performed or controlled.

3. Does the proposed activity involve revising or replacing a DCD described evaluation methodology that is used in establishing the design bases or used in the safety analyses? ☐ YES ☒ NO

   The proposed IHP activity does not involve revising or replacing a DCD described evaluation methodology that is used in establishing the design bases or used in the safety analyses.

4. Does the proposed activity involve a test or experiment not described in the DCD, where an SSC is utilized or controlled in a manner that is outside the reference bounds of the design for that SSC or is inconsistent with analyses or descriptions in the DCD? ☐ YES ☒ NO

   The proposed IHP activity does not involve a test or experiment not described in the DCD, where an SSC is utilized or controlled in a manner that is outside the reference bounds of the design for that SSC or is inconsistent with analyses or descriptions in the DCD.

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C. EVALUATION OF DEPARTURE FROM TIER 2 INFORMATION (Check correct response and provide justification for that determination under each response)

10 CFR Part 52, Appendix D, Section VIII. B.5.a. provides that an applicant for a combined licensee who references the AP1000 design certification may depart from Tier 2 information, without prior NRC approval, if it does not require a license amendment under paragraph B.5.b. The questions below address the criteria of B.5.b.

1. Does the proposed departure result in more than a minimal increase in the frequency of occurrence of an accident previously evaluated in the plant-specific DCD? ☐ YES ☒ NO
   Since there is no change to the design function or operation of the Integrated Head Package there are no new accident initiators and no effect on the frequency of evaluated accidents.
2. Does the proposed departure result in more than a minimal increase in the likelihood of occurrence of a malfunction of a structure, system, or component (SSC) important to safety and previously evaluated in the plant-specific DCD? ☐ YES ☒ NO
   Since there is no change to the design function or operation of the Integrated Head Package there is no new effect on malfunctions of structures, systems or components.
3. Does the proposed departure Result in more than a minimal increase in the consequences of an accident previously evaluated in the plant-specific DCD? ☐ YES ☒ NO
   The changes have no effect on the operation, performance, and pressure boundary integrity of the containment vessel. Therefore, there is no increase in the calculated release of radioactive material during postulated accident conditions.
4. Does the proposed departure result in more than a minimal increase in the consequences of a malfunction of an SSC important to safety previously evaluated in the plant-specific DCD? ☐ YES ☒ NO
   The changes have no effect on the design functions or reliability of the Integrated Head Package. Therefore there is no increase in the calculated release of radioactive material due to a malfunction of an SSC.
5. Does the proposed departure create a possibility for an accident of a different type than any evaluated previously in the plant-specific DCD? ☐ YES ☒ NO
   The changes have no effect on the operation, performance and pressure boundary integrity of the Integrated Head Package or containment vessel. The changes do not introduce any additional failure modes to the Integrated Head Package. Therefore, there is no possibility of an accident of a different type than any evaluated previously in the plant-specific DCD.
6. Does the proposed departure create a possibility for a malfunction of an SSC important to safety with a different result than any evaluated previously in the plant-specific DCD? ☐ YES ☒ NO
   The changes have no effect on the design functions of the Integrated Head Package. Therefore, there are no additional failure modes or the possibility for a malfunction of an SSC important to safety with a different result than evaluated previously.
7. Does the proposed departure result in a design basis limit for a fission product barrier as described in the plant-specific DCD being exceeded or altered? ☐ YES ☒ NO
   There is no change to the design function of the Integrated Head Package. Therefore, the proposed departure result does not result in a design basis limit for a fission product barrier as described in the plant-specific DCD being exceeded or altered

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8. Does the proposed departure result in a departure from a method of evaluation described in the plant-specific DCD used in establishing the design bases or in the safety analyses? ☐ YES ☒ NO
The methods of evaluation for the Integrated Head Package described in the plant-specific DCD are not altered by the proposed departure.

☒ The answers to the evaluation questions above are "NO" and the proposed departure from Tier 2 does not require prior NRC review to be included in plant specific FSARs as provided in 10 CFR Part 52, Appendix D, Section VIII. B.5.b

☐ One or more of the answers to the evaluation questions above are "YES" and the proposed change requires NRC review.

D. IMPACT ON RESOLUTION OF A SEVERE ACCIDENT ISSUE

10 CFR Part 52, Appendix D, Section VIII. B.5.a. provides that an applicant for a combined licensee who references the AP1000 design certification may depart from Tier 2 information, without prior NRC approval, if it does not require a license amendment under paragraph B.5.c. The questions below address the criteria of B.5.c.

1. Does the proposed activity result in an impact to features that mitigate severe accidents. If the answer is Yes answer Questions 2 and 3 below. ☐ YES ☒ NO

2. Is there is a substantial increase in the probability of a severe accident such that a particular severe accident previously reviewed and determined to be not credible could become credible? ☐ YES ☐ NO ☒ N/A
The changes have no effect on the operation and performance of the Integrated Head Package. There is no change in the probability of a severe accident.

3. Is there is a substantial increase in the consequences to the public of a particular severe accident previously reviewed? ☐ YES ☐ NO ☒ N/A

The changes have no effect on the operation and performance of the Integrated Head Package. There is no effect on the calculation of the release of radioactive material during a severe accident.

☒ The answers to the evaluation questions above are "NO" or are not applicable and the proposed departure from Tier 2 does not require prior NRC review to be included in plant specific FSARs as provided in 10 CFR Part 52, Appendix D, Section VIII. B.5.c

☐ One or more of the answers to the evaluation questions above are "YES" and the proposed change requires NRC review.

E. SECURITY ASSESSMENT

1. Does the proposed change have an adverse impact on the security assessment of the AP1000. ☐ YES ☒ NO

The changes to the Integrated Head Package will not alter barriers or alarms that control access to protected areas of the plant. The changes to the Integrated Head Package will not alter requirements for security personnel.

CURRENT FIGURE

Withhold from public disclosure
under 10 CFR 2.390 (d)

Figure 1.2-9

**Nuclear Island General Arrangement
Plan at Elevation 117′-6″ with Equipment**

REVISED FIGURE

Withhold from public disclosure
under 10 CFR 2.390 (d)

Figure 1.2-9

**Nuclear Island General Arrangement
Plan at Elevation 117′-6″ with Equipment**

CURRENT FIGURE

Withhold from public disclosure
under 10 CFR 2.390 (d)

Figure 12.3-1 (Sheet 8 of 16)

Radiation Zones, Normal Operations/Shutdown
Nuclear Island, Elevation 135′-3″

REVISED FIGURE

Withhold from public disclosure
under 10 CFR 2.390 (d)

Figure 12.3-1 (Sheet 8 of 16)

Radiation Zones, Normal Operations/Shutdown
Nuclear Island, Elevation 135′-3″