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U-603389
8E.100a
July 14, 2000

Docket No. 50-461

10 CFR 50.90

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Subject: Application for Amendment of Facility Operating License No. NPF-62 for Clinton Power Station Regarding Reactor Cavity Water Level Requirements During Refueling Operations (LA-00-009)

Dear Madam or Sir:

Pursuant to 10CFR50.90, AmerGen Energy Company, LLC (AmerGen) hereby requests amendment of the Facility Operating License, No. NPF-62, for Clinton Power Station (CPS). Specifically, AmerGen requests a change to the specified value for the minimum or reference reactor cavity water level addressed by the following Technical Specifications (TS) governing refueling operations:

TS 3.5.2, Emergency Core Cooling Systems (ECCS) – Shutdown
TS 3.9.6, Reactor Pressure Vessel (RPV) Water Level – Irradiated Fuel
TS 3.9.8, Residual Heat Removal (RHR) – High Water Level
TS 3.9.9, Residual Heat Removal (RHR) – Low Water Level

The above TS contain requirements that apply to, or are affected by, the reactor cavity water level, as measured from the top of the RPV flange, when the reactor and drywell heads are removed (or being removed) and the reactor cavity is filled (or being filled) with water up to or near the skimmer/scupper level of the upper containment pool to support refueling operations during refueling outages. TS 3.5.2 is applicable during Mode 5 (i.e., during refueling operations) except with the reactor cavity to steam dryer pool gate removed and reactor cavity water level maintained above the specified minimum level. TS 3.9.6 is applicable during movement of irradiated fuel assemblies within the RPV and requires reactor cavity water level to be maintained above the specified minimum level. TS 3.9.8 and TS 3.9.9 are applicable during Mode 5 with irradiated fuel in the RPV. Their applicability also depends on whether reactor cavity water level is above or below the specified reference/minimum level.

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It has been determined that uncertainty exists as to the exact distance between the RPV flange and the surface of the upper containment pool. Further, there is little or no margin between the normal upper containment pool (reactor cavity) water level and the TS limit of 23 feet (ft). At pool levels below the specified limit, more restrictive requirements apply and/or entry into Technical Specification Required Actions is required. A slight reduction in the required minimum/reference reactor cavity water level is justified and would provide operational flexibility without significantly affecting nuclear safety.

The changes being proposed would revise the TS limit for the minimum RPV water level from 23 ft to 22 ft, 8 inches (in) without changing the requirements that are intended to apply when reactor cavity water level is greater than or equal to the appropriate minimum required level. There are several reasons for the current requirement of maintaining a minimum reactor cavity pool depth. The first reason for maintaining a minimum water level is to ensure the radiological consequences associated with a fuel handling accident (FHA) are acceptably low (per the basis for TS 3.9.6). The second reason for the minimum water level is to ensure adequate backup decay heat removal capability (per the basis for TS 3.9.8/TS 3.9.9). The third reason for the minimum water level is to ensure that sufficient coolant inventory is provided to allow operator sufficient time to take action to terminate an inadvertent draindown (per the basis for TS 3.5.2). Changing the minimum RPV water level requirements from 23 ft above the top of the RPV flange to 22 ft, 8 in has a minimal effect on all of these concerns. The revised value for the minimum/reference water level is similar to currently specified values approved at other BWR-6 plants (Grand Gulf and Perry).

A description of the proposed change and the associated justification (including a Basis for No Significant Hazards Consideration) are provided in Attachment 2. A marked-up copy of the affected page(s) from the current TS is provided in Attachment 3. A marked-up copy of the affected page(s) from the current TS Bases is provided for information only in Attachment 4. (Following approval of this request, AmerGen will revise the CPS TS Bases in accordance with the TS Bases Control Program of TS 5.5.11.) In addition, an affidavit supporting the facts set forth in this letter and its attachments is provided in Attachment 1.

Approval of this amendment request is needed to support refueling activities in the next refueling outage (RF-7), scheduled to begin October 15, 2000. Due to the uncertainties associated with the exact distance between the RPV flange and the normal upper containment pool level, CPS plans to measure and confirm the exact distance at the beginning of RF-7. If the measured distance or depth is less than 23 ft (given that it is not possible to raise the upper pool level beyond the skimmer/scupper level that establishes the maximum depth or distance from the RPV flange), the Required Actions of the affected Technical Specifications would have to be met. These actions include immediately suspending the handling of irradiated fuel. Thus, refueling operations would have to be halted until the TS pool level limit could be met, which would only be achievable by revising the TS limit. This amendment request provides the means for revising the limit on the basis that a small change in the pool level limit has a minimal impact on nuclear safety. Approving this amendment request would therefore eliminate the possibility of an emergency TS change, should the measured distance be less than 23 ft.

Based on the above, AmerGen respectfully requests NRC review and approval of this amendment prior to the beginning of RF-7. This application for amendment of the CPS Operating License was reviewed by the site Facility Review Group and the AmerGen Nuclear Review Board.

Sincerely yours,

Michael T. Coyle
Vice President

JLP/blf

Attachments

cc: NRC Clinton Licensing Project Manager
Regional Administrator, USNRC Region III
NRC Resident Office, V-690
Illinois Department of Nuclear Safety

AFFIRMATION

Michael T. Coyle, being first duly sworn, deposes and says: That he is Vice President for Clinton Power Station; that this application for amendment of Facility Operating License NPF-62 has been prepared under his supervision and direction; that he knows the contents thereof; and that the letter and the statements made and the facts contained therein are true and correct to the best of his knowledge and belief.

Date: This 14TH day of July 2000.

Signed: Michael T Coyle
Michael T. Coyle
Vice President

STATE OF ILLINOIS }
DE WITT COUNTY } SS.

"OFFICIAL SEAL"
Thomas B. Elwood
Notary Public, State of Illinois
My Commission Expires 11/29/2001

Subscribed and sworn to before me this 14th day of July 2000.

Thomas B. Elwood
(Notary Public)

BACKGROUND

The proposed change to the specified value for the minimum/reference water level in the upper containment pool [relative to the reactor pressure vessel (RPV) flange] affects the following Clinton Power Station (CPS) Technical Specifications (TS):

TS 3.5.2, "Emergency Core Cooling Systems (ECCS) – Shutdown"
TS 3.9.6, "Reactor Pressure Vessel (RPV) Water Level – Irradiated Fuel"
TS 3.9.8, "Residual Heat Removal (RHR) – High Water Level"
TS 3.9.9, "Residual Heat Removal (RHR) – Low Water Level"

The basis for each of these Technical Specifications and how it is affected by reactor cavity pool level or depth is discussed below.

TS 3.5.2

TS 3.5.2 specifies Operability requirements for the ECCS during shutdown conditions. The Applicability of TS 3.5.2 is dependent on the reactor cavity water level. Specifically, TS 3.5.2 requires two ECCS injection/spray subsystems to be operable during Modes 4 and 5 **except** when the reactor cavity water level is ≥ 23 feet (ft) over the top of the RPV flange with the reactor cavity to steam dryer pool gate removed. As noted in the Bases for TS 3.5.2, ECCS operability requirements exist for Modes 4 and 5 primarily to ensure adequate coolant inventory and sufficient heat removal capability in case of an inadvertent draindown of the vessel. These requirements are relaxed (such that no ECCS are required to be operable) if the reactor cavity is filled to greater than 23 feet above the RPV flange and the reactor cavity to steam dryer pool gate is removed. Such conditions ensure there is sufficient coolant inventory to allow operator action to be taken to terminate inventory loss prior to fuel uncovery in the event of an inadvertent draindown.

TS 3.9.6

The Limiting Condition for Operation (LCO) for TS 3.9.6 currently states that RPV water level shall be ≥ 23 ft above the top of the RPV flange during the movement of irradiated fuel assemblies. Accordingly, associated TS Surveillance Requirement (SR) 3.9.6.1 requires periodically verifying that RPV water level is ≥ 23 ft above the top of the RPV flange.

The requirement for maintaining RPV/pool level ≥ 23 ft above the top of the RPV flange during refueling is based on maintaining a sufficient pool depth to retain iodine fission product activity in the water in the event of a fuel handling accident. Thus, the water level in the RPV is an initial condition design parameter in the analysis of a fuel handling accident in containment postulated pursuant to Regulatory Guide 1.25. A minimum water level of 23 ft above damaged fuel allows a decontamination factor of 100 to be used in the accident analysis for iodine. This relates to the assumption that 99% of the total iodine released from the fuel

pellet to cladding gap of all the dropped fuel assembly rods is retained by the refueling cavity water. (The fuel pellet to cladding gap is assumed to contain 10% of the total fuel rod iodine inventory (Ref. RG 1.25).) Sufficient iodine activity must be retained to limit offsite doses from the accident to < 25% of 10 CFR 100 limits, as provided by the guidance of NUREG-0800, "Standard Review Plan," Section 15.7.4.

The worst case assumptions for the fuel handling accident include the dropping of the irradiated fuel assembly being handled directly onto the reactor core. Under such a scenario, the point of impact between the dropped assembly and the fuel in the reactor core is well below 23 feet from the upper pool level since there is an additional distance or depth of approximately 30 feet between the flange and the top of the core. As noted in the Bases for TS 3.9.6, however, the possibility exists of the dropped assembly striking the RPV flange and releasing fission products. Therefore, the minimum depth for water coverage to ensure acceptable radiological consequences is specified relative to the RPV flange.

<u>TS 3.9.8 and TS 3.9.9</u>

TS 3.9.8 and TS 3.9.9 dictate the number of RHR shutdown cooling subsystems required to be operable (and in operation) during Mode 5. The number required is dependent on the reactor cavity/upper containment pool water level. Specifically, TS 3.9.8 requires one RHR shutdown cooling subsystem to be operable and in operation in Mode 5 with irradiated fuel in the RPV and RPV water level ≥ 23 ft above the top of the RPV flange. TS 3.9.9 requires two RHR shutdown cooling subsystems to be operable, with one RHR shutdown cooling subsystem in operation, in Mode 5 with irradiated fuel in the RPV and RPV water level < 23 ft above the top of the RPV flange.

The purpose of the RHR system in Mode 5 is to remove decay heat and sensible heat from the reactor coolant, as required by General Design Criterion (GDC) 34. Each of the two shutdown cooling loops of the RHR system can provide the required decay heat removal. Each loop consists of one motor driven pump, a heat exchanger, and associated piping and valves. Both loops have a common suction from the same recirculation loop. Each pump discharges the reactor coolant, after it has been cooled by circulation through the respective heat exchanger, to the reactor via separate feedwater lines or to the upper containment pool via a common single flow distribution sparger, or to the reactor via the low pressure coolant injection path. The RHR heat exchangers transfer heat to the shutdown service water system. The RHR shutdown cooling mode is manually controlled.

In addition to the RHR subsystems, the volume of water above the RPV flange provides a heat sink for decay heat removal. Therefore, with reactor cavity/upper pool level ≥ 23 feet, only one RHR subsystem is required because the associated volume of water above the RPV flange provides backup decay heat removal capability.

DESCRIPTION AND REASON FOR CHANGE

Clinton Power Station (CPS) proposes to change TS 3.5.2, TS 3.9.6, TS 3.9.8 and TS 3.9.9 to reduce the specified minimum/reference reactor pressure vessel (RPV) water level from 23 feet (ft) to 22 ft, 8 inches (in) as shown on the marked-up copy of the affected TS pages provided in Attachment 3.

The above TS typically apply during refueling operations and contain requirements that are dependent on reactor cavity water depth, i.e., the distance between the upper containment pool water level and the top of the RPV flange. It has been determined that more operating flexibility is needed during refueling operations because of discrepancies and uncertainties associated with the exact distance between the RPV flange and the upper containment pool water level. The currently identified margin between this distance and the TS water level limit is estimated to be approximately one-quarter inch. Such a small operating margin is overly restrictive in that a very small change in upper containment pool water level during applicable conditions could possibly cause an undetected or unwanted change in Modes, thus determining whether TS 3.9.8 or TS 3.9.9 applies, or in the case of TS 3.5.2, whether two Operable ECCS injection/spray subsystem are required. Also, as in the case of TS 3.9.6, a drop in water level by only this small amount could cause entry into Condition A of this TS, for which the Required Action is to immediately suspend the movement of irradiated fuel assemblies within the RPV. Entry into this Required Action, as well as the change in Modes that may result from such a small change in level, is unnecessary in light of the insignificant impact of such a small change in level on the basis for these TS requirements.

The 22 ft, 8 in proposed value would allow additional operational flexibility without significantly affecting nuclear safety, as it would incorporate margin into the TS limit to accommodate small level changes without incurring an unnecessary Mode change or entry into an unwarranted Required Action statement. The new proposed value (22 ft, 8 in) for the minimum/reference water level is similar to currently specified values at other BWR-6 plants (Grand Gulf and Perry).

Approval of this amendment request is needed to support refueling activities in the next scheduled refueling outage (RF-7), scheduled to begin October 15, 2000. Due to the uncertainties associated with the exact distance between the RPV flange and the normal upper containment pool level, CPS plans to re-verify the exact distance at the beginning of RF-7. If the measured distance or depth is less than 23 ft (given that it is not possible to increase the depth or distance from the RPV flange to the upper containment pool skimmer/scupper level), the Required Actions of the affected Technical Specifications would have to be met. These actions include, as noted above, immediately suspending the handling of irradiated fuel. Thus, refueling operations would have to be halted until the TS pool level limit could be met, which would only be achievable by revising the TS limit. Approving this amendment request would therefore eliminate the possibility of an emergency TS change, should the measured distance be less than 23 ft.

JUSTIFICATION FOR PROPOSED CHANGE

As described previously, there are several reasons for the current requirement of maintaining a minimum reactor cavity pool depth. The first reason for maintaining a minimum water level is to ensure the radiological consequences associated with a fuel handling accident (FHA) are acceptably low (per the basis for TS 3.9.6). The second reason for the minimum water level is to ensure adequate backup decay heat removal capability (per the basis for TS 3.9.8/TS 3.9.9). The third reason for the minimum water level is to ensure that sufficient coolant inventory is provided to allow operator sufficient time to take action to terminate an inadvertent draindown (per the basis for TS 3.5.2). Changing the minimum RPV water level requirements from 23 ft above the top of the RPV flange to 22 ft, 8 in has a minimal effect on all of these concerns.

Impact on Fuel Handling Accident

In evaluating the impact of the proposed change on the fuel handling accident, three different events should be considered:

- Dropping of an irradiated fuel assembly onto the reactor core in the containment building,
- Dropping of an irradiated fuel assembly onto spent fuel in the spent fuel racks in the fuel building, and
- Dropping of an irradiated fuel assembly onto the RPV flange.

The accident that produces the largest number of failed irradiated fuel rods is the drop of an irradiated fuel assembly onto the reactor core when the reactor vessel head is removed (Reference USAR 15.7.4.1.1). Since this event takes place only in the containment and the release associated with this event must be transferred from the containment building atmosphere to secondary containment before it is released to the environment (via the Standby Gas Treatment System), the accident that produces the most severe radiological release is a drop of channeled fuel onto unchanneled spent fuel in the fuel storage racks in the fuel building i.e., directly within the secondary containment. Lowering the minimum water level of the upper containment pool by 4 inches has no effect on the consequences of this most limiting fuel handling accident. (As further explained below, lowering of the minimum upper containment pool level by a small amount per the proposed change would have no significant impact on the fuel handling accident in the containment, and therefore the fuel handling accident in the fuel building would continue to be the most limiting event.)

For a fuel handling accident in the upper containment (i.e., over the reactor core), the Bases for TS 3.9.6 note that while the worst case assumptions include the dropping of a handled irradiated fuel assembly onto the reactor core, the possibility exists of the dropped assembly striking the RPV flange and releasing fission products. Therefore, as stated in the Bases, the minimum depth for water coverage to ensure acceptable radiological consequences is specified from the RPV flange. This basis, however, is very conservative, if the design basis fuel handling accident for the containment (wherein the handled irradiated fuel assembly is dropped directly onto the reactor core) is compared to the event where the handled irradiated fuel assembly is dropped such that it strikes the RPV flange.

For the design basis fuel handling accident in the containment, the reactor core itself is at a much greater depth than 23 ft relative to the required upper pool surface level. Thus, the point of fuel impact and fission product release for this event is at a much greater depth in the pool even though a pool depth of only 23 ft is credited for radiological scrubbing. (The total distance from the upper pool surface to the top of the reactor core is on the order of 53 ft.) For this reason, the proposed change has no impact on the analysis for the design basis fuel handling accident in the containment.

For the event involving a dropped irradiated fuel assembly striking the RPV flange, no specific analysis is provided in the USAR for this event as it is considered to be bounded by the design basis fuel handling accident for the containment (which in turn is bounded by the fuel handling accident in the fuel building). As noted in the TS Bases, a dropped assembly could be damaged and release fission products upon striking the RPV flange. While the actual pool depth to the point of fission product release for this event could be less than 23 ft, the quantity of fission products released would be much less than what is assumed for the design basis event. In particular, the dropped assembly would strike the flange with less impact energy than it would have if it fell directly onto the reactor core since the flange is at a higher elevation than the core. In addition, the dropped assembly would not be expected to *also* damage a significant amount of fuel in the core since much of the assembly's impact energy would be dissipated after striking the RPV flange. Therefore, compared to the design basis fuel handling accident for the containment, this event is not limiting from a radiological dose standpoint, and the impact of a slightly reduced minimum pool depth (from 23 ft to 22 ft, 8 in) would not be significant.

Impact on Backup Decay Heat Removal Capability

The effects of the change on the backup decay heat removal capability of the residual heat removal (RHR) system requirements during Mode 5 with irradiated fuel in the reactor pressure vessel are also minimal. As noted previously, the Technical Specifications allow reduced RHR shutdown cooling requirements with the reactor cavity filled to the upper pool skimmer/scupper level, due to the decay heat removal capability afforded by this volume of water. For the purpose of assessing plant risk during shutdown conditions (including refueling operations), heat-up rates and time to boiling are calculated for the reactor vessel as a function of reactor/reactor cavity water level and length of time since plant shutdown. Reducing the minimum water level requirements by 4 inches to 22 ft, 8 in, represents a very small reduction (~1.5%) of the original volume above the RPV flange. Plant experience shows that with the reactor cavity water level at 23 feet above the RPV flange, the reactor heat-up rate at 4 days after plant shutdown is less than 10°F per hour. (The rate assumes no refueling has been performed. Refueling, i.e., movement of spent fuel to the spent fuel storage pool in the fuel building, reduces the decay heat load to the reactor cavity pool volume.) For these conditions, at such a heatup rate, the resultant time to boiling is on the order of 15 hours. A 1.5% reduction in initial pool volume would reduce the boiling time by less than 15 minutes. This supports the conclusion that the proposed, slight reduction in the minimum/reference reactor cavity/upper pool level constitutes an insignificant reduction in the backup decay heat removal capability of the reactor cavity water volume.

Impact on Reactor Coolant Inventory

With respect to reactor draindown event response, the effects of the change on reactor coolant inventory are similar to those discussed regarding decay heat removal. As stated in the Bases for TS 3.5.2, no ECCS subsystems are required to be operable in Mode 5 with the reactor cavity to steam dryer pool gate removed and water level maintained greater than the minimum specified distance above the RPV flange. Maintaining this level provides sufficient coolant inventory to allow operator action to terminate the inventory loss prior to fuel uncovery in case of an inadvertent draindown. As stated previously, the change in the available reactor cavity water volume associated with this request is small. Therefore, the change in the required reference/minimum water level has a negligible effect on the ability to mitigate a draindown event.

BASIS FOR NO SIGNIFICANT HAZARDS CONSIDERATION

In accordance with 10 CFR 50.92, a proposed change to the operating license involves no significant hazards consideration if operation of the facility in accordance with the proposed change would not: (1) involve a significant increase in the probability or consequences of any accident previously evaluated, (2) create the possibility of a new or different kind of accident from any accident previously evaluated, or (3) involve a significant reduction in a margin of safety. The proposed change has been evaluated against each of the three criteria and it has been determined that the change does not involve a significant hazards consideration because:

(1) The proposed change does not involve a significant increase in the probability or consequences of any accident previously evaluated.

The proposed change to the Technical Specifications involves the minimum or reference reactor cavity water level requirement (relative to the reactor pressure vessel [RPV] flange) during refueling operations. Reactor cavity water level can affect the consequences of events that may be postulated to occur during shutdown conditions (including fuel handling operations), namely a fuel handling accident, loss of normal decay heat removal capability, or inadvertent reactor draindown. Such events, however, are caused by equipment failures or human errors. The proposed change has no impact on such failures or errors, particularly their probability of occurrence. Therefore, the proposed change will not significantly increase the probability of a fuel handling accident, loss of decay heat removal, or inadvertent reactor draindown.

With regard to impact on the consequences of postulated events/accidents, the effect of the change on the consequences of a fuel handling accident is minimal. The accident producing the largest number of failed irradiated fuel rods is the drop of an irradiated fuel assembly onto the reactor core when the reactor vessel head is removed (Reference USAR 15.7.4.1.1). Since this event takes place only in the containment and the release associated with this event must be transferred from the containment atmosphere to the secondary containment, the accident which produces the most severe radiological release is a drop of channeled fuel onto unchanneled spent fuel in the fuel storage racks in the fuel building i.e. directly within the secondary containment. The proposed

change has no impact on a fuel handling accident in the fuel building. A drop of a fuel bundle on the RPV flange may involve a release of fission products from the dropped fuel bundle, but such a release would be less severe as it would involve much less fuel damage (notwithstanding potentially less pool depth), compared to the drop of a fuel bundle onto the reactor core. It has therefore been determined that lowering the minimum water level from 23 feet (ft) to 22 ft, 8 inches has no significant effect on the consequences of a fuel handling accident.

With respect to a loss of normal decay heat removal capability, or an inadvertent reactor draindown, the change reduces slightly the volume of water required for decay heat removal capability and reactor coolant inventory to mitigate a draindown event. Since the volume change has an insignificant effect on the reactor/pool volume's total available decay heat removal capability (as a backup in the event of a loss of normal decay heat removal capability) and has a negligible effect on the operator's ability to mitigate a draindown event, lowering the minimum specified water level from 23 feet to 22 ft, 8 inches will not increase the consequences of such events.

Based on the above, the proposed change does not involve a significant increase in the probability or consequences of an accident.

(2) The proposed change would not create the possibility of a new or different kind of accident from any accident previously evaluated.

The proposed change to the Technical Specifications involves a slight change to the minimum required/reference reactor cavity water level during refueling operations. No new modes of operation or the utilization of equipment are involved. No new accident initiators are introduced as a result of allowing a lower minimum/reference water level. Therefore, this change does not involve a new or different kind of accident from any accident previously evaluated.

(3) The proposed change does not involve a significant reduction in the margin of safety.

The margin of safety involved with this change involves the consequences that could result from the release of radioactive material from damaged fuel following a fuel handling accident, loss of decay heat removal, or inadvertent reactor draindown. The consequences of a dropped fuel bundle in the upper containment pool are insignificantly affected by allowing a slightly lower reactor cavity water level, as such an event would remain bounded by a dropped fuel bundle in the fuel building. Allowing a slightly lower required minimum reactor cavity water level during refueling operations would also have an insignificant effect on the volume of water available for decay heat removal capability, or to mitigate a draindown event. Therefore, the changes will not result in a significant reduction in the margin of safety.

Based upon the above analysis, the proposed change will not increase the probability or consequences of any accident previously evaluated, create the possibility of a new or different kind of accident from any accident previously evaluated, or involve a significant reduction in the margin of safety. Therefore, the proposed change meets the requirements of 10 CFR 50.92(c) and involves no significant hazard consideration.

Environmental Impact Consideration

The proposed license amendment was evaluated against the criteria of 10 CFR 51.22 for environmental considerations. Since the proposed change involves no change to the design or operation of the facility (apart from reduced testing of the affected equipment during normal plant operation), the proposed change (1) does not significantly increase individual or cumulative occupational radiation exposures, (2) does not significantly change the types or significantly increase the amount of effluents that may be released offsite, and (3) as discussed in this enclosure, does not involve a significant hazards consideration. Based on the foregoing, it has been concluded that the proposed Technical Specification change meets the criteria given in 10 CFR 51.22(c)(9) for categorical exclusion from the requirement for an Environmental Impact Statement.

Marked-up Pages of the CPS Technical Specifications

3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS) AND REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

3.5.2 ECCS—Shutdown

LCO 3.5.2 Two ECCS injection/spray subsystems shall be OPERABLE.

APPLICABILITY: MODE 4,
MODE 5 except with the reactor cavity to steam dryer pool gate removed and water level ≥ 23 ft over the top of the reactor pressure vessel flange.

22ft 8inches

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One required ECCS injection/spray subsystem inoperable.	A.1	Restore required ECCS injection/spray subsystem to OPERABLE status.	4 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1	Initiate action to suspend operations with a potential for draining the reactor vessel (OPDRVs).	Immediately
C. Two required ECCS injection/spray subsystems inoperable.	C.1	Initiate action to suspend OPDRVs.	Immediately
	<u>AND</u>		
	C.2	Restore one ECCS injection/spray subsystem to OPERABLE status.	4 hours

(continued)

3.9 REFUELING OPERATIONS

3.9.6 Reactor Pressure Vessel (RPV) Water Level—Irradiated Fuel

22 ft 8 inches

LCO 3.9.6 RPV water level shall be ≥ 23 ft above the top of the RPV flange.

APPLICABILITY: During movement of irradiated fuel assemblies within the RPV.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. RPV water level not within limit.	A.1 Suspend movement of irradiated fuel assemblies within the RPV.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.9.6.1	22 ft 8 inches Verify RPV water level is ≥ 23 ft above the top of the RPV flange.	24 hours

3.9 REFUELING OPERATIONS

3.9.8 Residual Heat Removal (RHR)—High Water Level

LCO 3.9.8 One RHR shutdown cooling subsystem shall be OPERABLE and be in operation.

---NOTE---
The required RHR shutdown cooling subsystem may be removed from operation for up to 2 hours per 8 hour period.

APPLICABILITY: MODE 5 with irradiated fuel in the reactor pressure vessel (RPV) and the water level ≥ 23 ft above the top of the RPV flange.

22 ft 8 inches

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. Required RHR shutdown cooling subsystem inoperable.	A.1	Verify an alternate method of decay heat removal is available.	1 hour AND Once per 24 hours thereafter
B. Required Action and associated Completion Time of Condition A not met.	B.1	Suspend loading irradiated fuel assemblies into the RPV.	Immediately
	AND		
	B.2	Initiate action to restore secondary containment to OPERABLE status.	Immediately
	AND		
			(continued)

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
B. (continued)	B.3	Initiate action to restore one standby gas treatment subsystem to OPERABLE status.	Immediately
	<u>AND</u>		
	B.4	Initiate action to restore isolation capability in each required secondary containment and secondary containment bypass penetration flow path not isolated.	Immediately
	<u>AND</u>		
	B.5	-------NOTE------- Entry and exit is permissible under administrative control. -----------------	
		Initiate action to close one door in the upper containment personnel air lock.	Immediately

(continued)

No changes this page.

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
C. No RHR shutdown cooling subsystem in operation.	C.1	Verify reactor coolant circulation by an alternate method.	1 hour from discovery of no reactor coolant circulation AND Once per 12 hours thereafter
	AND		
	C.2	Monitor reactor coolant temperature.	Once per hour

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.9.8.1	Verify one RHR shutdown cooling subsystem is operating.	12 hours

No changes this page.

3.9 REFUELING OPERATIONS

3.9.9 Residual Heat Removal (RHR)—Low Water Level

LCO 3.9.9 Two RHR shutdown cooling subsystems shall be OPERABLE, and one RHR shutdown cooling subsystem shall be in operation.

---------------------------NOTE---------------------------
The required operating shutdown cooling subsystem may be removed from operation for up to 2 hours per 8 hour period.

APPLICABILITY: MODE 5 with irradiated fuel in the reactor pressure vessel (RPV) and the water level < 23 ft above the top of the RPV flange.

22 ft 8 inches

ACTIONS

-------------------------------------NOTE-------------------------------------
Separate Condition entry is allowed for each RHR shutdown cooling subsystem.

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One or two RHR shutdown cooling subsystems inoperable.	A.1	Verify an alternate method of decay heat removal is available for each inoperable RHR shutdown cooling subsystem.	1 hour AND Once per 24 hours thereafter

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
B. Required Action and associated Completion Time of Condition A not met.	B.1	Initiate action to restore secondary containment to OPERABLE status.	Immediately
	<u>AND</u>		
	B.2	Initiate action to restore one standby gas treatment subsystem to OPERABLE status.	Immediately
	<u>AND</u>		
	B.3	Initiate action to restore isolation capability in each required secondary containment and secondary containment bypass penetration flow path not isolated.	Immediately
	<u>AND</u>		
	B.4	-------NOTE------- Entry and exit is permissible under administrative control. ----------------- Initiate action to close one door in the upper containment personnel air lock.	Immediately

(continued)

No changes this page.

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. No RHR shutdown cooling subsystem in operation.	C.1 Verify reactor coolant circulation by an alternate method.	1 hour from discovery of no reactor coolant circulation AND Once per 12 hours thereafter
	AND C.2 Monitor reactor coolant temperature.	Once per hour

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.9.9.1	Verify one RHR shutdown cooling subsystem is operating.	12 hours

No changes this page.

Associated Marked-up Pages of the CPS TS Bases

B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS) AND REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

B 3.5.2 ECCS—Shutdown

BASES

BACKGROUND	A description of the High Pressure Core Spray (HPCS) System, Low Pressure Core Spray (LPCS) System, and low pressure coolant injection (LPCI) mode of the Residual Heat Removal (RHR) System is provided in the Bases for LCO 3.5.1, "ECCS—Operating."
APPLICABLE SAFETY ANALYSES	ECCS performance is evaluated for the entire spectrum of break sizes for a postulated loss of coolant accident (LOCA). The long term cooling analysis following a design basis LOCA (Ref. 1) demonstrates that only one ECCS injection/spray subsystem is required, post LOCA, to maintain the peak cladding temperature below the allowable limit. It is reasonable to assume, based on engineering judgement, that while in MODES 4 and 5, one ECCS injection/spray subsystem can maintain adequate reactor vessel water level. To provide redundancy, a minimum of two ECCS subsystems are required to be OPERABLE in MODES 4 and 5. The ECCS satisfy Criterion 3 of the NRC Policy Statement.
LCO	Two ECCS injection/spray subsystems are required to be OPERABLE. The ECCS injection/spray subsystems are defined as the three LPCI subsystems, the LPCS System, and the HPCS System. The LPCS System and each LPCI subsystem consist of one motor driven pump, piping, and valves to transfer water from the suppression pool to the reactor pressure vessel (RPV). The HPCS System consists of one motor driven pump, piping, and valves to transfer water from the suppression pool or RCIC storage tank to the RPV. One LPCI subsystem (A or B) may be aligned for decay heat removal in MODE 4 or 5 and considered OPERABLE for the ECCS function, if it can be manually realigned (remote or local) to the LPCI mode and is not otherwise inoperable. Because of low pressure and low temperature conditions in MODES 4

(continued)

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BASES

LCO (continued)

and 5, sufficient time will be available to manually align and initiate LPCI subsystem operation to provide core cooling prior to postulated fuel uncovery.

APPLICABILITY

OPERABILITY of the ECCS injection/spray subsystems is required in MODES 4 and 5 to ensure adequate coolant inventory and sufficient heat removal capability for the irradiated fuel in the core in case of an inadvertent draindown of the vessel. Requirements for ECCS OPERABILITY during MODES 1, 2, and 3 are discussed in the Applicability section of the Bases for LCO 3.5.1. ECCS subsystems are not required to be OPERABLE during MODE 5 with the reactor cavity to steam dryer pool gate removed, and the water level maintained at ≥ 23 ft above the RPV flange. This provides sufficient coolant inventory to allow operator action to terminate the inventory loss prior to fuel uncovery in case of an inadvertent draindown.

22 ft 8inches

The Automatic Depressurization System is not required to be OPERABLE during MODES 4 and 5 because the RPV pressure is < 150 psig, and the LPCS, HPCS, and LPCI subsystems can provide core cooling without any depressurization of the primary system.

ACTIONS

A.1 and B.1

If any one required ECCS injection/spray subsystem is inoperable, the required inoperable ECCS injection/spray subsystem must be restored to OPERABLE status within 4 hours. In this Condition, the remaining OPERABLE subsystem can provide sufficient RPV flooding capability to recover from an inadvertent vessel draindown. However, overall system reliability is reduced because a single failure in the remaining OPERABLE subsystem concurrent with a vessel draindown could result in the ECCS not being able to perform its intended function. The 4 hour Completion Time for restoring the required ECCS injection/spray subsystem to OPERABLE status is based on engineering judgment that considered the availability of one subsystem and the low probability of a vessel draindown event.

(continued)

BASES

ACTIONS

A.1 and B.1 (continued)

With the inoperable subsystem not restored to OPERABLE status within the required Completion Time, action must be initiated immediately to suspend operations with a potential for draining the reactor vessel (OPDRVs) to minimize the probability of a vessel draindown and the subsequent potential for fission product release. Actions must continue until OPDRVs are suspended.

C.1, C.2, D.1, D.2, D.3, and D.4

If both of the required ECCS injection/spray subsystems are inoperable, all coolant inventory makeup capability may be unavailable. Therefore, actions must be initiated immediately to suspend OPDRVs in order to minimize the probability of a vessel draindown and the subsequent potential for fission product release. Actions must continue until OPDRVs are suspended. One ECCS injection/spray subsystem must also be restored to OPERABLE status within 4 hours.

If at least one ECCS injection/spray subsystem is not restored to OPERABLE status within the 4 hour Completion Time, additional actions are required to minimize any potential fission product release to the environment. This includes ensuring secondary containment is OPERABLE; one standby gas treatment subsystem is OPERABLE; and secondary containment isolation capability (i.e., at least one isolation valve and associated instrumentation are OPERABLE or other acceptable administrative controls to assure isolation capability) in each secondary containment and secondary containment bypass penetration flow path not isolated that is assumed to be isolated to mitigate radioactivity releases. This may be performed as an administrative check, by examining logs or other information, to determine if the components are out of service for maintenance or other reasons. It is not necessary to perform the Surveillances needed to demonstrate the OPERABILITY of the components. If, however, any required component is inoperable, then it must be restored to OPERABLE status. In this case, the Surveillances may need to be performed to restore the component to OPERABLE status.

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BASES

ACTIONS

C.1, C.2, D.1, D.2, D.3, and D.4 (continued)

Secondary containment isolation capability as described above, can be achieved by identifying all secondary containment and secondary containment bypass penetration flow paths that remain open (e.g., not isolated by at least one closed isolation valve or damper) and determining which of these penetrations involve manual isolation valves and which involve valves (or dampers) that are designed to close automatically upon receipt of an applicable isolation signal. If automatic isolation capability for any open penetration(s) is desired, then a sufficient number of automatic isolation instrument channels should be verified to be available for at least one of the isolation devices for that penetration. It is not necessary for all of the normal LCO requirements associated with the applicable isolation devices and their associated instrumentation to be fully met as long as isolation capability exists with consideration given to existing plant conditions.

For open penetrations that must be isolated manually (including open penetrations for which automatic isolation capability is not being maintained), isolation capability may be accomplished by ensuring that the associated controls are readily available and accessible (locally or remotely) for at least one isolating mechanism (e.g., valve or damper) in the event isolation becomes necessary. This includes assigning responsibility particularly for closing such valves or dampers to ensure prompt isolation in the event of a demand.

In addition to the above actions, Required Action D.4 requires action to be taken to close at least one door in the upper containment personnel air lock. The closed air lock door completes the boundary for control of potential radioactive releases. With the appropriate administrative controls, however, the closed door can be opened intermittently for entry and exit. This allowance is acceptable due to the need for containment access and due to the slow progression of events, such as an inadvertent vessel draindown, that may occur during the identified Conditions.

The lack of available ECCS during shutdown conditions would not be expected to result in the immediate release of

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BASES

ACTIONS

C.1, C.2, D.1, D.2, D.3, and D.4 (continued)

appreciable fission products to the containment atmosphere. Actions must continue until all requirements of this Condition are satisfied.

The 4 hour Completion Time to restore at least one ECCS injection/spray subsystem to OPERABLE status ensures that prompt action will be taken to provide the required cooling capacity or to initiate actions to place the plant in a condition that minimizes any potential fission product release to the environment.

SURVEILLANCE REQUIREMENTS

SR 3.5.2.1 and SR 3.5.2.2

The minimum water level of 12 ft 8 inches required for the suppression pool is periodically verified to ensure that the suppression pool will provide adequate net positive suction head (NPSH) for the ECCS pumps, recirculation volume, and vortex prevention. With the suppression pool water level less than the required limit, all ECCS injection/spray subsystems are inoperable unless they are aligned to an OPERABLE RCIC storage tank.

With regard to suppression pool water level values obtained pursuant to this SR, as read from plant indication instrumentation, the specified limit is not considered to be a nominal value with respect to instrument uncertainties. This requires additional margin to be added to the limit to compensate for instrument uncertainties, for implementation in the associated plant procedures (Ref. 2).

When the suppression pool level is < 12 ft 8 inches, the HPCS System is considered OPERABLE only if it can take suction from the RCIC storage tank and the RCIC storage tank water level is sufficient to provide the required NPSH for the HPCS pump. Therefore, a verification that either the suppression pool water level is ≥ 12 ft 8 inches or the HPCS System is aligned to take suction from the RCIC storage tank and the RCIC storage tank contains ≥ 125,000 available gallons of water ensures that the HPCS System can supply makeup water to the RPV. Verification that the RCIC storage tank contains ≥ 125,000 available gallons of water may be performed by verifying that the trip light for 1E51-N801 is on.

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BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.5.2.1 and SR 3.5.2.2 (continued)

With regard to RCIC storage tank water level values obtained pursuant to this SR, as read from plant indication instrumentation, the specified limit is considered to be a nominal value and therefore does not require compensation for instrument indication uncertainties (Ref. 2).

The 12 hour Frequency of these SRs was developed considering operating experience related to suppression pool and RCIC storage tank water level variations during the applicable MODES. Furthermore, the 12 hour Frequency is considered adequate in view of other indications in the control room, including alarms, to alert the operator to an abnormal suppression pool or RCIC storage tank water level condition.

SR 3.5.2.3, SR 3.5.2.5, and SR 3.5.2.6

The Bases provided for SR 3.5.1.1, SR 3.5.1.4, and SR 3.5.1.5 are applicable to SR 3.5.2.3, SR 3.5.2.5, and SR 3.5.2.6, respectively.

With regard to pump flow rates and differential pressure values obtained pursuant to this SR, as read from plant indication instrumentation, the specified limit is considered to be a nominal value and therefore does not require compensation for instrument indication uncertainties (Ref. 3, 4, 5).

SR 3.5.2.4

Verifying the correct alignment for manual, power operated, and automatic valves in the ECCS flow paths provides assurance that the proper flow paths will exist for ECCS operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position since these valves were verified to be in the correct position prior to locking, sealing, or securing. A valve that receives an initiation signal is allowed to be in a nonaccident position provided the valve will automatically reposition in the proper stroke time. This SR does not require any testing or valve manipulation; rather, it involves verification that those valves capable of potentially being mispositioned are

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BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.5.2.4 (continued)

in the correct position. This SR does not apply to valves that cannot be inadvertently misaligned, such as check valves. The 31 day Frequency is appropriate because the valves are operated under procedural control and the probability of their being mispositioned during this time period is low.

In MODES 4 and 5, the RHR System may operate in the shutdown cooling mode to remove decay heat and sensible heat from the reactor. Therefore, RHR valves that are required for LPCI subsystem operation may be aligned for decay heat removal. This SR is modified by a Note that allows one LPCI subsystem of the RHR System to be considered OPERABLE for the ECCS function if all the required valves in the LPCI flow path can be manually realigned (remote or local) to allow injection into the RPV and the system is not otherwise inoperable. This will ensure adequate core cooling if an inadvertent vessel draindown should occur.

REFERENCES

1. USAR, Section 6.3.3.
2. Calculation IP-0-0049.
3. Calculations 01HP09/10/11 and IP-C-0042.
4. Calculations 01LP08/11/14 and IP-C-0043.
5. Calculations 01RH19/20/22/24/25 and IP-C-0041.

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B 3.9 REFUELING OPERATIONS

B 3.9.6 Reactor Pressure Vessel (RPV) Water Level—Irradiated Fuel

BASES

BACKGROUND

The movement of irradiated fuel assemblies within the RPV requires a minimum water level of 23 ft above the top of the RPV flange. During refueling, this maintains a sufficient water level in the upper containment pool. Sufficient water is necessary to retain iodine fission product activity in the water in the event of a fuel handling accident (Refs. 1 and 2). Sufficient iodine activity would be retained to limit offsite doses from the accident to < 25% of 10 CFR 100 limits, as provided by the guidance of Reference 3.

APPLICABLE SAFETY ANALYSES

During movement of irradiated fuel assemblies, the water level in the RPV is an initial condition design parameter in the analysis of a fuel handling accident in containment postulated by Regulatory Guide 1.25 (Ref. 1). A minimum water level of 23 ft allows a decontamination factor of 100 to be used in the accident analysis for iodine. This relates to the assumption that 99% of the total iodine released from the pellet to cladding gap of all the dropped fuel assembly rods is retained by the refueling cavity water. The fuel pellet to cladding gap is assumed to contain 10% of the total fuel rod iodine inventory (Ref. 1).

Analysis of the fuel handling accident inside containment is described in Reference 2. With a minimum water level of 23 ft and a minimum decay time of 24 hours prior to fuel handling, the analysis and test programs demonstrate that the iodine release due to a postulated fuel handling accident is adequately captured by the water, and that offsite doses are maintained within allowable limits (Ref. 4).

While the worst case assumptions include the dropping of the irradiated fuel assembly being handled onto the reactor core, the possibility exists of the dropped assembly striking the RPV flange and releasing fission products. Therefore, the minimum depth for water coverage to ensure acceptable radiological consequences is specified from the RPV flange.

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Insert (p B 3.9-19)

Since the worst case event results in failed fuel assemblies seated in the core, as well as the dropped assembly itself, dropping ~~an~~ a single assembly onto the RPV flange will result in reduced releases of fission gases. Based on this conclusion, a minimum water level of 22 ft, 8 inches is acceptable.

BASES

APPLICABLE SAFETY ANALYSES (continued)

RPV water level satisfies Criterion 2 of the NRC Policy Statement.

22ft 8inches

LCO

A minimum water level of 23 ft above the top of the RPV flange is required to ensure that the radiological consequences of a postulated fuel handling accident are within acceptable limits, as provided by the guidance of Reference 3.

APPLICABILITY

LCO 3.9.6 is applicable when moving irradiated fuel assemblies within the RPV. The LCO minimizes the possibility of a fuel handling accident in containment that is beyond the assumptions of the safety analysis. Requirements for handling of new fuel assemblies or control rods (where water depth to the RPV flange is not of concern) are covered by LCO 3.9.7, "RPV Water Level—New Fuel or Control Rods." Requirements for fuel handling accidents in the spent fuel storage pool are covered by LCO 3.7.7, "Fuel Pool Water Level."

ACTIONS

A.1

22ft 8inches

If the water level is < 23 ft above the top of the RPV flange, all operations involving movement of irradiated fuel assemblies within the RPV shall be suspended immediately to ensure that a fuel handling accident cannot occur. The suspension of irradiated fuel movement shall not preclude completion of movement of a component to a safe position.

SURVEILLANCE REQUIREMENTS

SR 3.9.6.1

22ft 8inches

Verification of a minimum water level of 23 ft above the top of the RPV flange ensures that the design basis for the postulated fuel handling accident analysis during refueling operations is met. Water at the required level limits the consequences of damaged fuel rods, which are postulated to result from a fuel handling accident in containment (Ref. 2).

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.9.6.1 (continued)

The Frequency of 24 hours is based on engineering judgment and is considered adequate in view of the large volume of water and the normal procedural controls on valve positions, which make significant unplanned level changes unlikely.

With regard to RPV water level values obtained pursuant to this SR, as read from plant indication instrumentation, the specified limit is considered to be a nominal value and therefore does not require compensation for instrument indication uncertainties (Ref. 5).

REFERENCES

1. Regulatory Guide 1.25, March 1972.
2. USAR, Section 15.7.4.
3. NUREG-0800, Section 15.7.4.
4. 10 CFR 100.11.
5. Calculation IP-0-0134.

No changes this page.

B 3.9 REFUELING OPERATIONS

B 3.9.8 Residual Heat Removal (RHR)—High Water Level

BASES

BACKGROUND

The purpose of the RHR System in MODE 5 is to remove decay heat and sensible heat from the reactor coolant, as required by GDC 34. Each of the two shutdown cooling loops of the RHR System can provide the required decay heat removal. Each loop consists of one motor driven pump, a heat exchanger, and associated piping and valves. Both loops have a common suction from the same recirculation loop. Each pump discharges the reactor coolant, after it has been cooled by circulation through the respective heat exchanger, to the reactor via separate feedwater lines or to the upper containment pool via a common single flow distribution sparger, or to the reactor via the low pressure coolant injection path. The RHR heat exchangers transfer heat to the Shutdown Service Water System. The RHR shutdown cooling mode is manually controlled.

In addition to the above RHR subsystems, the volume of water above the reactor pressure vessel (RPV) flange provides a heat sink for decay heat removal.

APPLICABLE SAFETY ANALYSES

With the unit in MODE 5, the RHR System is not required to mitigate any events or accidents evaluated in the safety analyses. The RHR System is required for removing decay heat to maintain the temperature of the reactor coolant.

Although the RHR System does not meet a specific criterion of the NRC Policy Statement, it was identified in the NRC Policy Statement as an important contributor to risk reduction. Therefore, the RHR System is retained as a Specification.

22 ft 8 inches

LCO

Only one RHR shutdown cooling subsystem is required to be OPERABLE in MODE 5 with irradiated fuel in the RPV and with the water level ≥ 23 ft above the RPV flange. Only one subsystem is required because the volume of water above the RPV flange provides backup decay heat removal capability.

(continued)

BASES

LCO (continued)

An OPERABLE RHR shutdown cooling subsystem consists of an RHR pump, a heat exchanger, valves, piping, instruments, and controls to ensure an OPERABLE flow path.

Additionally, each RHR shutdown cooling subsystem is considered OPERABLE if it can be manually aligned (remote or local) in the shutdown cooling mode for removal of decay heat. Operation (either continuous or intermittent) of one subsystem can maintain and reduce the reactor coolant temperature as required. However, to ensure adequate core flow to allow for accurate average reactor coolant temperature monitoring, nearly continuous operation is required. A Note is provided to allow a 2 hour exception to shut down the operating subsystem every 8 hours.

APPLICABILITY

22 ft 8 inches

One RHR shutdown cooling subsystem must be OPERABLE in MODE 5, with irradiated fuel in the RPV and the water level ≥ 23 ft above the top of the RPV flange, to provide decay heat removal. RHR System requirements in other MODES are covered by LCOs in Section 3.4, Reactor Coolant System (RCS); Section 3.5, Emergency Core Cooling Systems (ECCS) and Reactor Core Isolation Cooling (RCIC) System; and Section 3.6, Containment Systems. RHR Shutdown Cooling System requirements in MODE 5, with the water level < 23 ft above the RPV flange, are given in LCO 3.9.9, "Residual Heat Removal (RHR)—Low Water Level."

22 ft 8 inches

ACTIONS

A.1

With no RHR shutdown cooling subsystem OPERABLE, an alternate method of decay heat removal must be established within 1 hour. In this condition, the volume of water above the RPV flange provides adequate capability to remove decay heat from the reactor core. However, the overall reliability is reduced because loss of water level could result in reduced decay heat removal capability. The 1 hour Completion Time is based on the decay heat removal function and the probability of a loss of the available decay heat removal capabilities. Furthermore, verification of the functional availability of these alternate method(s) must be reconfirmed every 24 hours thereafter. This will ensure continued heat removal capability.

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BASES

ACTIONS

A.1 (continued)

Alternate decay heat removal methods are available to the operators for review and preplanning in the unit's Operating Procedures. For example, this may include the use of the Reactor Water Cleanup System, operating with the regenerative heat exchanger bypassed, or the Spent Fuel Pool Cooling System. The method used to remove the decay heat should be the most prudent choice based on unit conditions.

B.1, B.2, B.3, B.4, and B.5

If no RHR shutdown cooling subsystem is OPERABLE and an alternate method of decay heat removal is not available in accordance with Required Action A.1, actions shall be taken immediately to suspend operations involving an increase in reactor decay heat load by suspending the loading of irradiated fuel assemblies into the RPV.

Additional actions are required to minimize any potential fission product release to the environment. This includes ensuring secondary containment is OPERABLE; one standby gas treatment subsystem is OPERABLE; and secondary containment isolation capability (i.e., at least one isolation valve and associated instrumentation are OPERABLE or other acceptable administrative controls to assure isolation capability) in each secondary containment and secondary containment bypass penetration flow path not isolated that is assumed to be isolated to mitigate radioactivity releases. This may be performed as an administrative check, by examining logs or other information, to determine if the components are out of service for maintenance or other reasons. It is not necessary to perform the Surveillances needed to demonstrate the OPERABILITY of the components. If, however, any required component is inoperable, then it must be restored to OPERABLE status. In this case, the Surveillances may need to be performed to restore the component to OPERABLE status. In addition, at least one door in the upper containment personnel air lock must be closed. The closed air lock door completes the boundary for control of potential radioactive releases. With the appropriate administrative controls however, the closed door can be opened intermittently for entry and exit. This allowance is acceptable due to the need for containment access and due to the slow progression of events which may result from inadequate decay heat removal. Loss of decay heat removal

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BASES

ACTIONS

B.1, B.2, B.3, B.4, and B.5 (continued)

would not be expected to result in the immediate release of appreciable fission products to the containment atmosphere. Actions must continue until all requirements of this Condition are satisfied.

C.1 and C.2

If no RHR shutdown cooling subsystem is in operation, an alternate method of coolant circulation is required to be established within 1 hour. The Completion Time is modified such that 1 hour is applicable separately for each occurrence involving a loss of coolant circulation.

During the period when the reactor coolant is being circulated by an alternate method (other than by the required RHR shutdown cooling subsystem), the reactor coolant temperature must be periodically monitored to ensure proper functioning of the alternate method. The once per hour Completion Time is deemed appropriate.

SURVEILLANCE REQUIREMENTS

SR 3.9.8.1

This Surveillance demonstrates that the RHR shutdown cooling subsystem is in operation and circulating reactor coolant. The required flow rate is determined by the flow rate necessary to provide sufficient decay heat removal capability. The Frequency of 12 hours is sufficient in view of other visual and audible indications available to the operator for monitoring the RHR subsystem in the control room.

REFERENCES

1. USAR, Section 5.4.7.

B 3.9 REFUELING OPERATIONS

B 3.9.9 Residual Heat Removal (RHR)—Low Water Level

BASES

BACKGROUND

The purpose of the RHR System in MODE 5 is to remove decay heat and sensible heat from the reactor coolant, as required by GDC 34. Each of the two shutdown cooling loops of the RHR System can provide the required decay heat removal. Each loop consists of one motor driven pump, a heat exchanger, and associated piping and valves. Both loops have a common suction from the same recirculation loop. Each pump discharges the reactor coolant, after it has been cooled by circulation through the respective heat exchanger, to the reactor via separate feedwater lines, to the upper containment pool via a common single flow distribution sparger, or to the reactor via the low pressure coolant injection path. The RHR heat exchangers transfer heat to the Shutdown Service Water System. The RHR shutdown cooling mode is manually controlled.

APPLICABLE SAFETY ANALYSES

With the unit in MODE 5, the RHR System is not required to mitigate any events or accidents evaluated in the safety analyses. The RHR System is required for removing decay heat to maintain the temperature of the reactor coolant.

Although the RHR System does not meet a specific criterion of the NRC Policy Statement, it was identified in the NRC Policy Statement as an important contributor to risk reduction. Therefore, the RHR System is retained as a Specification.

22ft 8 inches

LCO

In MODE 5 with irradiated fuel in the reactor pressure vessel (RPV) and with the water level < 23 ft above the RPV flange both RHR shutdown cooling subsystems must be OPERABLE.

An OPERABLE RHR shutdown cooling subsystem consists of an RHR pump, a heat exchanger, valves, piping, instruments, and controls to ensure an OPERABLE flow path.

(continued)

BASES

LCO (continued)

Additionally, each RHR shutdown cooling subsystem is considered OPERABLE if it can be manually aligned (remote or local) in the shutdown cooling mode for removal of decay heat. Operation (either continuous or intermittent) of one subsystem can maintain and reduce the reactor coolant temperature as required. However, to ensure adequate core flow to allow for accurate average reactor coolant temperature monitoring, nearly continuous operation is required. A Note is provided to allow a 2 hour exception to shut down the operating subsystem every 8 hours.

APPLICABILITY

22ft 8inches

22ft 8inches

Two RHR shutdown cooling subsystems are required to be OPERABLE in MODE 5, with irradiated fuel in the RPV and the water level < 23 ft above the top of the RPV flange, to provide decay heat removal. RHR System requirements in other MODES are covered by LCOs in Section 3.4, Reactor Coolant System (RCS); Section 3.5, Emergency Core Cooling Systems (ECCS) and Reactor Core Isolation Cooling (RCIC) System; and Section 3.6, Containment Systems. RHR Shutdown Cooling System requirements in MODE 5, with the water level ≥ 23 ft above the RPV flange, are given in LCO 3.9.8, "Residual Heat Removal (RHR)—High Water Level."

ACTIONS

A Note has been provided to modify the ACTIONS related to RHR shutdown cooling subsystems. Section 1.3, Completion Times, specifies once a Condition has been entered, subsequent divisions, subsystems, components or variables expressed in the Condition, discovered to be inoperable or not within limits, will not result in separate entry into the Condition. Section 1.3 also specifies Required Actions of the Condition continue to apply for each additional failure, with Completion Times based on initial entry into the Condition. However, the Required Actions for inoperable shutdown cooling subsystems provide appropriate compensatory measures for separate inoperable shutdown cooling subsystems. As such, a Note has been provided that allows separate Condition entry for each inoperable RHR shutdown cooling subsystem.

A.1

With one of the two required RHR shutdown cooling subsystems inoperable, the remaining subsystem is capable of providing the required decay heat removal. However, the overall reliability is reduced. Therefore an alternate method of

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BASES

ACTIONS

A.1 (continued)

decay heat removal must be provided. With both RHR shutdown cooling subsystems inoperable, an alternate method of decay heat removal must be provided in addition to that provided for the initial RHR shutdown cooling subsystem inoperability. This re-establishes backup decay heat removal capabilities, similar to the requirements of the LCO. The 1 hour Completion Time is based on the decay heat removal function and the probability of a loss of the available decay heat removal capabilities. Furthermore, verification of the functional availability of these alternate method(s) must be reconfirmed every 24 hours thereafter. This will ensure continued heat removal capability.

Alternate decay heat removal methods are available to the operators for review and preplanning in the unit's Operating Procedures. For example, this may include the use of the Reactor Water Cleanup System, operating with the regenerative heat exchanger bypassed. The method used to remove decay heat should be the most prudent choice based on unit conditions.

B.1, B.2, B.3, and B.4

With the required RHR shutdown cooling subsystem(s) inoperable and the required alternate method(s) of decay heat removal not available in accordance with Required Action A.1, additional actions are required to minimize any potential fission product release to the environment. This includes ensuring secondary containment is OPERABLE; one standby gas treatment subsystem is OPERABLE; and secondary containment isolation capability (i.e., at least one isolation valve and associated instrumentation are OPERABLE or other acceptable administrative controls to assure isolation capability) in each secondary containment and secondary containment bypass penetration flow path not isolated that is assumed to be isolated to mitigate radioactivity releases. This may be performed as an administrative check, by examining logs or other information, to determine if the components are out of service for maintenance or other reasons. It is not necessary to perform the Surveillances needed to demonstrate the OPERABILITY of the components. If, however, any

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BASES

ACTIONS

B.1, B.2, B.3, and B.4 (continued)

required component is inoperable, then it must be restored to OPERABLE status. In this case, the Surveillances may need to be performed to restore the component to OPERABLE status. In addition, at least one door in the upper containment personnel air lock must be closed. The closed air lock door completes the boundary for control of potential radioactive releases. With the appropriate administrative controls however, the closed door can be opened intermittently for entry and exit. This allowance is acceptable due to the need for containment access and due to the slow progression of events which may result from inadequate decay heat removal. Loss of decay heat removal would not be expected to result in the immediate release of appreciable fission products to the containment atmosphere. Actions must continue until all requirements of this Condition are satisfied.

C.1 and C.2

If no RHR shutdown cooling subsystem is in operation, an alternate method of coolant circulation is required to be established within 1 hour. The Completion Time is modified such that the 1 hour is applicable separately for each occurrence involving a loss of coolant circulation.

During the period when the reactor coolant is being circulated by an alternate method (other than by the required RHR Shutdown Cooling System), the reactor coolant temperature must be periodically monitored to ensure proper function of the alternate method. The once per hour Completion Time is deemed appropriate.

SURVEILLANCE REQUIREMENTS

SR 3.9.9.1

This Surveillance demonstrates that one RHR shutdown cooling subsystem is in operation and circulating reactor coolant. The required flow rate is determined by the flow rate necessary to provide sufficient decay heat removal capability. The Frequency of 12 hours is sufficient in view of other visual and audible indications available to the operator for monitoring the RHR subsystem in the control room.

(continued)

BASES (continued)

REFERENCES 1. USAR, Section 5.4.7.

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