APPENDIX G
ATTACHMENT 1

SHUTDOWN OPERATIONS
SIGNIFICANCE DETERMINATION PROCESS
PHASE 1 OPERATIONAL CHECKLISTS FOR BOTH PWRs AND BWRs

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CHECKLIST 1

PWR Hot Shutdown Operation: Time to Core Boiling < 2 Hours

I Core Heat Removal Guidelines

A. Instrumentation

_____(1) DHR heat exchanger inlet/outlet temperature and DHR flow indication in the control room with flow hi/low alarm.

_____(2) 2 core exit thermocouples with readout and hi alarm in the control room.

B. Training/Procedures

____ (1) Training and Procedures for normal and abnormal DHR operation. Procedure for loss of normal DHR include: prioritized alternate core cooling paths (e.g steam generator cooling, low pressure pump feed and bleed, etc.) , initial magnitude of decay heat, versus time to boiling, time to core uncovery, (NUMARC 91-06 guideline 4.1.1 1)).

____ (2) Training and Procedures for DHR recovery.

C. Equipment

_____(1) Two heat removal paths consisting of any combination of RCS loops and RHR systems and necessary support systems. (WOG STS 3.4-11)

_____(2) Available equipment to support two alternate core cooling paths for at least 24 hours, steam generator cooling and feed and bleed. Minimum equipment needs include:

- _____ Steam generator inventory, auxiliary feed water (if needed), secondary steam relief
- _____ one available high pressure injection train (one operable ECCS train WOG STS 3.5-7)
- _____ RWST operable (WOG STS 3.5.4),
- _____ An RCS vent path of sufficient size to support feed and bleed (e.g. a PORV) (WOG LTOP TS 3.4.12)
- _____ Recirculation capability if needed

II Inventory Control Guidelines

A. Instrumentation

_____ 2 independent pressurizer level instruments with a Hi/Lo alarm or level deviation annunciator.

B. Training/Procedures

_____(1) Loss of Inventory procedures which address: source and magnitude of loss, providing sufficient makeup capability, coping with high radiation levels in containment. (NUMARC 91-06 guidelines 4.2.2.1)

_____(2) No plant configurations where a single active failure or personnel error can result in a rapid loss of RCS inventory (includes overlapping activities, e.g. Wolf Creek drain down in 1994) [NUMARC 91-06 guideline 4.2.2 2])

C. Equipment

_____ Available equipment sufficient to keep the core covered given a loss of RCS inventory. Minimum equipment needs include:

_____ one available high pressure injection train (one ECCS train operable by WOG STS 3.5-7)

_____ RWST operable (WOG STS 3.5.4).

III Power Availability Guidelines

A. Equipment

____ (1)Two qualified circuits between the offsite transmission network and the onsite class 1E AC Electrical Power Distribution Systems (WOG STS 3.8.1).

____ (2)Two sources of onsite AC power sources (WOG STS 3.8.1)

____ (3)Two trains of DC electrical power subsystems (WOG STS 3.8.4)

IV Containment Control Guidelines

A. Equipment

____ (1)Containment operable (WOG STS 3.6.1)

____ (2)Containment isolation valves operable (WOG STS 3.6.3)

____ (3)Containment Spray and Containment cooling operable (WOG STS 3.6.6)

____ (4)Containment ice beds, ice condenser doors, divider barrier integrity, containment Recirculation drains, and shield buildings operable if applicable (WOG STS 3.6.15 -19)

V Reactivity Guidelines

_____assumes compliance with Technical Specifications

Findings requiring phase 2 or phase 3 analysis:

_____ Findings that result in non-compliance with LTOP Tech. Specs.

_____ Findings that increase the likelihood that a loss of DHR will occur due to failure of the system itself or support systems, includes findings on DHR and vessel temperature instrumentation such that degraded DHR system performance may not be detected. Applicable Sections: I.A., I.C.(1)

____ Findings that increase the likelihood of a loss of RCS inventory, includes: findings that could result in a loss of RCS level instrumentation. Applicable Sections: II.A., II.B.(2)

____ Findings that increase the likelihood of a loss of offsite power or findings that degrade the licensee's ability to cope with a loss of offsite power. Applicable Sections: III.

____ Findings that degrade the licensee's ability to terminate a leak path or add RCS inventory. Applicable Sections: II.A, II.B.(1), II.C,

____ Findings that degrade the licensee's ability to recover DHR once it is lost. Applicable sections: I.A, I.B.(2),

____ Finding that degrade the licensee's ability to established an alternate core cooling path if DHR cannot be re-established. Applicable Sections: I.B.(1), I.C.(2)

____ Findings that degrade the ability of containment to remain intact following a severe accident. Applicable Sections: IV.

CHECKLIST 2

PWR Cold Shutdown Operation: RCS Closed And SGs Available for DHR Removal (Loops Filled and Inventory in Pressurizer) Time to Boiling Less than 2 Hours

I Core Heat Removal Guidelines

A. Instrumentation

_____(1) DHR heat exchanger inlet/outlet temperature and DHR flow indication in the control room with flow hi/low alarm.

_____(2) Two core exit thermocouples with control room readout and hi alarm.

B. Training/Procedures

._____ (1) Procedures for normal and abnormal DHR operation. Procedure for loss of normal DHR include: prioritized alternate core cooling paths (e.g steam generator cooling, low pressure pump feed and bleed, etc.) , initial magnitude of decay heat, versus time to boiling, time to core uncovery, (NUMARC 91-06 guideline 4.1.1 1))

_____(2) Training and Procedures for DHR recovery.

C. Equipment

_____(1) one RHR loop operable and one additional RHR loop operable or the secondary side water level of at least two steam generators sufficient for DHR (includes necessary support systems (WOG STS 3.4.7)

_____(2) Available equipment to support two alternate core cooling paths for at least 24 hours, steam generator cooling and feed and bleed. Minimum equipment needs include:

- _____ steam generator inventory, secondary steam relief , and auxiliary feed water (if needed)
- _____ one available high pressure injection pump train AND one other pump train capable of keeping the core covered in addition to the pumps that are part of the normal DHR system.
- _____ An adequate vent path to support feed and bleed (e.g. a PORV) (WOG LTOP STS 3.4.12),
- _____ available RWST.
- _____ Recirculation from emergency sump (if needed).

II Inventory Control Guidelines

A. Instrumentation

_____2 pressurizer level instruments with hi/low alarm or level deviation in control room.

B. Training/Procedures

_____(1) Loss of Inventory procedures address: source and magnitude of loss, providing sufficient makeup capability, coping with high radiation levels in containment. (NUMARC 91-06, guideline 4.2.2.1)

_____(2) No plant configurations where a single active failure or personnel error can result in a rapid loss of RCS inventory, includes overlapping activities. (NUMARC 91-06, guideline 4.2.2. 2.)

C. Equipment

_____ Available equipment sufficient to keep the core covered given a loss of RCS inventory. Minimum equipment needs include:

_____ one available high pressure injection pump train AND one other pump train capable of keeping the core covered in addition to the pumps that are part of the normal DHR system.

III Power Availability Guidelines

A. Procedures/Training

____ (1)Control over switch yard and transformer yard activities. (NUMARC 91-06 guideline 4.3.2.1)

____ (2)Work activities do not have significant potential to affect existing operable power supplies (NUMARC 91-06 guidelines 4.3.1.2)

B. Equipment

____ (1)3 sources of AC power including: 1 offsite and 1 onsite source.

____ (2)Necessary DC and AC vital bus electrical power distribution subsystems to support the equipment needed to meet the core heat removal and inventory control safety function guidelines.

IV Containment Control Guidelines

A. Procedures/Training

____ Procedures and training to close containment before core uncovery commensurate with plant conditions [should consider unavailability of AC power and environmental conditions in containment) following a loss of RHR AND a loss of RCS inventory. (NUMARC 91-06 guideline 4.5.1)]

B. Equipment

____ Containment penetrations (including temporary) have a differential pressure equal to the ultimate pressure capability of containment or would be expected to remain intact following a severe accident .

V Reactivity Guidelines

____ assumes compliance with Technical Specifications

Findings requiring phase 2 or phase 3 analysis:

_____ Findings that result in non-compliance with LTOP Tech. Specs.

_____ Findings that increase the likelihood that a loss of DHR will occur due to failure of the system itself or support systems, includes findings on DHR instrumentation and vessel temperature instrumentation such that degraded DHR system performance may not be detected. Applicable Sections: I.A., I.C.(1)

____ Findings that increase the likelihood of a loss of RCS inventory, includes: findings that could result in a loss of RCS level instrumentation. Applicable Sections: II.A, II.B.(2)

____ Findings that degrade the licensee's ability to terminate a leak path or add RCS inventory when needed. Applicable Sections: II.A, II.B.(1), II.C

____ Findings that increase the likelihood of a loss of offsite power or findings that degrade the licensee's ability to cope with a loss of offsite power. Applicable Sections: III.

____ Findings that degrade the licensee's ability to recover DHR once it is lost. Applicable Sections: I.A, I.B.(2)

_____ Findings that degrade the licensee's ability to established an alternate core cooling path if DHR cannot be re-established. Applicable sections: I.B.(1), I.C.(2)

____ Findings that degrade the ability of containment to remain intact following a severe accident. Applicable Sections: IV.

CHECKLIST 3

PWR Cold Shutdown and Refueling Operation
RCS Open and Refueling Cavity Level < 23'
Or RCS Closed and No Inventory in Pressurizer
Time to Boiling < 2 hours

I Core Heat Removal Guidelines

A. Instrumentation

_____(1) DHR heat exchanger inlet/outlet temperature, DHR flow indication with hi/low flow alarm, and DHR pump motor current with alarm. (GL 88-17)

_____(2) At least two core exit thermocouples with control room readout and hi alarm until must be removed for preparations for vessel head removal (GL 88-17).

B. Training/Procedures

._____ (1) Procedures for normal and abnormal DHR operation. Procedure for loss of normal DHR include: alternate core cooling paths (e.g feed and bleed), initial magnitude of decay heat, versus time to boiling, time to core uncovery, initial RCS condition (e.g. filled, mid-loop, etc.), RCS configuration (open/closed, nozzle dams installed or loop isolation valves closed, etc.) (NUMARC 91-06 guideline 4.1.1.1)

_____(2) Training and Procedures for DHR recovery.

C. Equipment

_____(1) Both trains of DHR operable with necessary support systems. (TS)

_____ (2) Available equipment to support feed and bleed for at least 24 hours. Minimum equipment needs include:

_____One high pressure injection pump train AND one other pump train capable of keeping the core covered in addition to the pumps that are part of the normal DHR system (GL 88-17)

_____An adequate vent path that can (1) support feed and bleed and (2) prevent loss of a nozzle dam during RCS re-pressurization following a postulated loss of DHR (e.g. pressurizer manway). (GL 88-17),

_____Available RWST (GL 88-17)

_____Recirculation capability from sump (if needed).

II Inventory Control Guidelines

A. Instrumentation

_____(1) 2 sources of pressurizer level instrumentation with hi/low alarm or level deviation in control room when inventory in pressurizer.

_____(2) Two sources of level continuous level instrumentation with pressurizer empty. Monitoring performed by an operator in the control room or from a

location other than the control room with a provision for providing immediate water level values to an operator in the control room if significant changes occur. (GL 88-17)

B. Procedures/Training

_____(1) Outage schedule minimizes the overall time that the plant is in a reduced inventory condition (NUMARC 91-06 guideline 4.2.1.3)

_____(2) Outage schedule delays to the extent practical going to reduced inventory conditions when decay heat load is high. (NUMARC 91-06 guideline 4.2.1.2)

_____(3) Training, procedures and administrative controls implemented to avoid operations that could lead to perturbations in RCS level control or DHR flow (GL 88-17, NUMARC 91-06 guideline 4.2.1.4)

_____ (4) Loss of Inventory procedures address: source and magnitude of loss, providing sufficient makeup capability, coping with high radiation levels in containment. (NUMARC 91-06 guideline 4.2.2.1)

_____ (5) Drain down is controlled; inventory balances performed and appropriate action taken on level deviation.

C. Equipment

_____(1) At least, one large hot leg vent established and maintained prior to opening an RCS cold leg penetration. (GL 88-17)

_____(2) Equipment sufficient to keep the core covered given a loss of RCS inventory. Minimum equipment needs include: one high pressure injection pump train (after breaker racked -in) AND one other pump capable of keeping the core covered in addition to the pumps that are part of the normal DHR system. (GL 88-17).

III Power Availability Guidelines

A. Procedures/Training/Administrative Controls

____ (1) Work activities do not have significant potential to affect existing operable power supplies (NUMARC 91-06 guidelines 4.3.1.2)

___ (2) Control over switch yard and transformer yard activities. (NUMARC 91-06 guideline 4.3.2.1)

B. Equipment

____ (1) 3 sources of AC power including: 1 offsite and 1 onsite source.

____ (2) Necessary DC and AC vital bus electrical power distribution subsystems to support the equipment needed to meet the core heat removal and inventory control safety function guidelines.

IV Containment Control Guidelines

A. Procedures/Training

____ (1) Procedures and training to close containment prior to core boiling if the RCS is open. (NUMARC 91-06 guideline 4.2.5 and GL 88-17

____ (2) Procedures and training to close containment before core uncovery commensurate with plant conditions if the RCS is closed (should consider unavailability of AC power and environmental conditions in containment) following a loss of RHR AND a loss of RCS inventory. (NUMARC 91-06 guideline 4.5.1))

B. Equipment

____ Containment penetrations (including temporary) have a differential pressure equal to the ultimate pressure or would be expected to remain intact following a severe accident. (GL 88-17)

V Reactivity Guidelines

_____(assumes compliance with Technical Specifications)

Findings requiring phase 2 analysis or phase 3 analysis

____ Findings that increase the likelihood that a loss of DHR will occur due to failure of the system itself or support systems, includes findings on DHR instrumentation and vessel temperature instrumentation such that degraded DHR system performance may not be detected. Applicable Sections: IA., IC.(1)

____ Findings that increase the likelihood of a loss of RCS inventory, especially during reduced inventory conditions, includes: findings that could result in a loss of RCS level instrumentation. Applicable Sections: II.A, II.B (1), II.B(2)., II.B.(5)

____ Findings that increase the likelihood of a loss of RCS level control or RHR flow control during midloop operations such that the likelihood of losing suction to the RHR pumps due to air entrainment is increased. Applicable Sections: I.A.(1), II.A.(2), II.B (1), II.B(2)., II.B(3), II.B.(5)

____ Findings that increase the likelihood of a loss of offsite power or findings that degrade the licensee's ability to cope with a loss of offsite power. Applicable Sections: III.

____ Findings that degrade the licensee's ability to terminate a leak path or add RCS inventory. Applicable Sections: II.A, II.B(4), II.C

____ Findings that degrade the licensee's ability to recover DHR once it is lost. Applicable Sections: I.A, I.B(2)

____ Finding that degrade the licensee's ability to established an alternate core cooling path if DHR cannot be re-established. Applicable Sections: I.B.(1), I.C.(2)

____ Findings that degrade the ability of containment to remain intact following a severe accident. Applicable Sections: IV.

CHECKLIST 4

PWR Refueling Operation: RCS level > 23'OR PWR Shutdown Operation with Time to Boil > 2 hours And Inventory in the Pressurizer

I Core Heat Removal Guidelines

A. Instrumentation

_____(1) DHR heat exchanger inlet/outlet temperature and DHR flow indication in the control room with flow hi/low alarm.

_____(2) Two sources of vessel temperature instrumentation (as soon as practical during vessel head re-installation).

B. Procedures/Training

____ (1) Procedures for normal and abnormal DHR operation. Procedure for loss of normal DHR include: alternate core cooling paths (e.g feed and bleed, use of fuel storage pool cooling), initial magnitude of decay heat, versus time to boiling, time to core uncovery, initial RCS condition (NUMARC 91-06 guideline 4.1.1.1))

____ (2)Procedures for RHR recovery.

C. Equipment

_____ At least one RHR loop shall be operable and in operation with support systems (WOG STS 3.9.8.1 or applicable RHR TS)

II Inventory Control Guidelines

A. Instrumentation

_____ Two sources of level instrumentation system with low level setpoint alarm with level < 23 ‘ above reactor vessel flange. One source of level instrumentation with refueling cavity flooded.

B. Procedures/Training/Administrative Controls

_____(1) Preventive maintenance/inspection or post-installation testing performed on reactor cavity seals prior to filling the reactor cavity to preclude potential seal failure. (NUMARC 91-06 guideline 4.2.5.1)

_____(2) Verify procedures for reactor cavity seal failure or loss of cavity inventory (NUMARC 91-06 guideline 4.2.5.2)

____ (3) Loss of Inventory procedures address: source and magnitude of loss, providing sufficient makeup capability, coping with high radiation levels in containment. (NUMARC 91-06 4.2.2.1).

____ (4) Freeze seals used in locations that can impact RCS inventory are continuously monitored. Procedures and contingency plans are established in the event of freeze seal failure. (NUMARC 4.2.2.6)

C. Equipment

____ Equipment necessary for makeup to the refueling cavity

III Power Availability Guidelines

____ TS for AC and DC power are being met.

IV Containment Control Guidelines

____ TS for core alterations are being met, if applicable. Containment closure should be addressed in contingency plans and/or in procedures.

V Reactivity Guidelines

____ TS are being met.

Findings requiring phase 2 or phase 3 analysis:

____ Findings that increase the likelihood of a loss of RCS inventory, includes: findings that could result in a loss of RCS level instrumentation. Applicable Sections: II.A, II.B.(1),

____ Findings that degrade the licensee's ability to terminate a leak path or add RCS inventory when needed. Applicable Sections: II.A., II.B (2), II.B.(3), II.B(4) II.C

____ Findings that degrade the licensee's ability to recover DHR once it is lost. Applicable: Sections: I.A, I.B.2

CHECKLIST 5

BWR Hot Shutdown: Time to Boil < 2 Hours
RHR in Operation (RCS pressure < RHR Cut-in Permissive)

I Core Heat Removal Guidelines

A. Instrumentation

_____(1) DHR heat exchanger inlet/outlet temperature and DHR flow indication in the control room with hi/low flow alarm.

_____(2) Two Sources of vessel level instrumentation

B. Procedures/Training

____ (1) Procedures for normal and abnormal DHR operation. Procedure for loss of normal DHR include: alternate core cooling paths (e.g feed and bleed), initial magnitude of decay heat, time to boiling, time to core uncovery, initial RCS condition (NUMARC 91-06 guideline 4.1.1.1))

_____(2) Procedures for DHR recovery if lost.

C. Equipment

_____(1) Two RHR shutdown cooling subsystems shall be operable with one RHR system in operation (BWR/4 STS 3.4.8)

_____(2) Available equipment to support an alternate core cooling path (Recirculation using SRVs and suppression pool) for at least 24 hours, includes:

_____ operable SRVs (BWR/4 STS 3.4.3)

_____ Each ECCS injection/spray subsystem shall be operable except HPCI and ADS (BWR/4 STS 3.5-1)

____ Two operable RHR suppression pool cooling subsystems. (BWR/4 STS 3.6.2.3)

II Inventory Control Guidelines

A. Instrumentation

_____ (1) The automatic isolation function of the DHR system (on low vessel level) is operable (BWR/4 STS 3.3.6.1 Primary Containment Isolation Instrumentation) (NUMARC 91-06 guideline 4.2.3.1)

_____(2) Two sources of vessel level instrumentation.

B. Procedures/Administrative Controls/Training

_____(1) Special administrative controls are used for valves which can cause rapid inventory loss (e.g. inventory losses to suppression pool) (NUMARC 91-06 guideline 4.2.3.2)

____ (2) Loss of Inventory procedures address: source and magnitude of loss, providing sufficient makeup capability, coping with high radiation levels in containment. (NUMARC 91-06 4.2.2.1).

C. Equipment

_____ Equipment sufficient to keep the core covered given a loss of RCS inventory, includes:

_____ operable SRVs (BWR/4 STS 3.4.3)

_____ Each ECCS injection/spray subsystem shall be operable except HPCI and ADS (BWR/4 STS 3.5-1)

_____ Two operable RHR suppression pool cooling subsystems (BWR/4 STS 3.6.2.3)

III Power Availability Guidelines

A. Procedures/Training

____ (1) Control over switch yard and transformer yard activities (NUMARC 91-06 guidelines 4.3.2.1)

____ (2) Work activities do not have significant potential to affect existing operable power supplies (NUMARC 91-06 guidelines 4.3.1.2)

B. Equipment (same as full power)

____ (1) Two qualified circuit between the offsite transmission network and the onsite 1E AC electrical power distribution subsystems shall be operable(BWR/4 STS 3.8.1)

____ (2) Necessary diesel generators and automatic sequencers to support Technical Specification (TS) compliance. (BWR/4 STS 3.8.1)

____ (3) The necessary portions of the AC, DC, and vital AC bus electrical power distribution subsystems shall be operable to support equipment required to be operable.

IV Containment Guidelines

A. Equipment

____ Primary Containment and Secondary Containment are required to be operable. Most containment systems are required to be operable, exceptions include: primary oxygen concentration and hydrogen re-combiners (if permanently installed)

Findings requiring phase 2 or phase 3 analysis:

_____ Finding that increase the likelihood that a loss of DHR will occur due to failure of the system itself or support systems, includes findings on DHR

instrumentation or vessel level instrumentation such that degraded core cooling via DHR not be detected. Applicable Sections: I.A, I.C.(1)

____ Findings that increase the likelihood of a loss of RCS inventory, includes: findings that could result in a loss of RCS level instrumentation. Applicable Sections: II.A.(2), II.B.(1)

____ Findings that increase the likelihood of a loss of offsite power or findings that degrade the licensee's ability to cope with a loss of offsite power. Applicable Sections: III.

____ Findings that degrade the licensee's ability to terminate a leak path or add RCS inventory when needed. Applicable Sections: II.A. , II.B(2), II.C.

____ Findings that degrade the licensee's ability to recover DHR once it is lost. Applicable Sections: I.A, I.B.(2)

_____ Findings that degrade the licensee's ability to establish an alternate core cooling path if DHR cannot be re-established for 24 hours. Applicable Sections: I.B(1), I.C(2)

CHECKLIST 6

BWR Cold Shutdown or Refueling Operation
Time to Boil < 2 hours: RCS level < 23' Above Top of Flange

I Core Heat Removal Guidelines

A. Instrumentation

_____(1) DHR heat exchanger inlet/outlet temperature and DHR flow indication in the control room with hi/low flow alarm.

_____(2) Two sources of vessel level instrumentation

B. Procedures/Training

____ (1) Procedures for normal and abnormal DHR operation. Procedure for loss of normal DHR include: alternate core cooling paths (e.g feed and bleed), initial magnitude of decay heat, time to boiling, time to core uncovery, initial RCS condition (NUMARC 91-06 guideline 4.1.1.1))

____ (2) Procedures for DHR recovery if lost.

C. Equipment

_____ (1) Two RHR shutdown cooling subsystems shall be operable with one RHR system in operation (BWR/4 STS 3.4.9, BWR/4 STS 3.9.9)

_____ (2) Available equipment to support an alternate core cooling path (Recirculation using SRVs and suppression pool) for at least 24 hours, includes:

_____ (1) two available SRVs, if vessel head is on

_____ (2) two operable low pressure ECCS injection/spray subsystems (BWR/4 STS 3.5-7)

II Inventory Control Guidelines

A. Instrumentation

_____(1) The automatic isolation function of the DHR system (on low vessel level) is operable (BWR/4 STS 3.3.6.1 Primary Containment Isolation Instrumentation) (NUMARC 91-06 guideline 4.2.3.1)

_____(2) Two sources of level instrumentation with low level set point alarm.

B. Procedures/Administrative Controls/Training

_____(1) Special administrative controls used for valves which can cause rapid inventory loss (e.g. inventory losses to suppression pool) (NUMARC 91-06 guideline 4.2.3.2)

____ (2) Loss of Inventory procedures address: source and magnitude of loss, providing sufficient makeup capability, coping with high radiation levels in containment. (NUMARC 91-06 4.2.2.1).

____ (3) Freeze seals used in locations than can impact RCS inventory are continuously monitored. Procedures and contingency plans are established if freeze seal fails. (NUMARC guideline 4.2.2.6).

C. Equipment

_____ Equipment sufficient to keep the core covered given a loss of RCS inventory, includes two operable low pressure ECCS injection/spray subsystems (BWR/4 STS 3.5-7).

III Power Availability Guidelines

A. Procedures/Training

____ (1) Control over switch yard and transformer yard activities (NUMARC 91-06 guidelines 4.3.2.1)

____ (2) Work activities do not have significant potential to affect existing operable power supplies (NUMARC 91-06 guidelines 4.3.1.2)

B. Equipment

____ (1) One qualified circuit between the offsite transmission network and the onsite 1E AC electrical power distribution subsystems shall be operable(BWR/4 STS 3.8.2)

____ (2) One diesel generator capable of supplying one division of the onsite class 1E electrical power distribution subsystems shall be operable (BWR/4 STS 3.8.2)

____ (3) The necessary portions of the AC, DC, and vital AC bus electrical power distribution subsystems shall be operable to support equipment required to be operable. (BWR/ STS 3.8.10)

IV Containment Guidelines

A. Procedures/Training

____ Secondary containment closure can be accomplished in sufficient time before the release of fission products. Procedure includes the unavailability of AC power and expected environmental condition in containment. (NUMARC Guideline 4.5-1)

Findings requiring phase 2 or phase 3 analysis:

_____ Findings that increase the likelihood that a loss of DHR will occur due to failure of the system itself or support systems, includes findings on DHR instrumentation or vessel level instrumentation such that degraded core cooling via DHR could not be detected. Applicable Sections: I.A., I.C(1)

____ Findings that increase the likelihood of a loss of RCS inventory, includes findings that could result in a loss of RCS level instrumentation. Applicable Sections: II.A(2), II.B.(1), II.B.(2), II.B.(3)

____ Findings that increase the likelihood of a loss of offsite power or findings that degrade the licensee's ability to cope with a loss of offsite power. Applicable Sections: III.

____ Findings that degrade the licensee's ability to terminate a leak path or add RCS inventory when needed. Applicable Sections: II.A, II.B(3), II.C.

____ Findings that degrade the licensee's ability to recover DHR once it is lost. Applicable Sections: I.A, I.B.(2)

_____ Findings that degrade the licensee's ability to establish an alternate core cooling path if DHR cannot be re-established for 24 hours. Applicable Sections: I.B(1), I.C(2).

CHECKLIST 7

BWR Refueling Operation with RCS Level > 23'

I Core Heat Removal Guidelines

A. Instrumentation

_____(1) DHR heat exchanger inlet/outlet temperature and DHR flow indication in the control room with hi/low flow alarm.

_____(2) Two sources of vessel level instrumentation

B. Procedures/Training

____ (1) Procedures for normal and abnormal DHR operation. Procedure for loss of normal DHR include: alternate core cooling paths (e.g feed and bleed), nitial magnitude of decay heat, time to boiling, time to core uncovery, initial RCS condition (NUMARC 91-06 guideline 4.1.1.1)

_____(2) Procedures for RHR recovery if lost.

C. Equipment

_____ At least one RHR loop shall be operable and in operation with necessary support systems (BWR/4 STS 3.9.8)

II Inventory Control Guidelines

A. Instrumentation

_____(1) Two sources of level instrumentation system with low level setpoint alarm.

_____(2) The automatic isolation function of the DHR system (on low vessel level) is operable (BWR/STS 3.3.6.1 Primary Containment Isolation Instrumentation) (NUMARC 91-06 guideline 4.2.3.1)

B. Procedures

_____(1) Preventive maintenance/inspection or post-installation testing is performed on reactor cavity seals prior to filling the reactor cavity to preclude potential seal failure. (NUMARC 91-06 guideline 4.2.5.1)

____ (2) Freeze seals used in locations than can impact RCS inventory are continuously monitored. Procedures and contingency's are established in the event of freeze seal failure. (NUMARC guideline 4.2.2.6).

_____ (3) Verify procedures for reactor cavity seal failure or loss of cavity inventory (NUMARC 91-06 guideline 4.2.5.2)

_____(4) Loss of Inventory procedures address: source and magnitude of loss, providing sufficient makeup capability, coping with high radiation levels in containment. (NUMARC 91-06 4.2.2.1).

C. Equipment

____ Two low pressure ECCS injection/spray subsystems shall be operable (BWR STS 3.5-7 except when the spent fuel storage pool gates are removed).

III AC Power Guidelines

____ (1) One qualified circuit between the offsite transmission network and the onsite 1E AC electrical power distribution subsystems shall be operable(BWR/4 STS 3.8.2)

____ (2) One diesel generator capable of supplying one division of the onsite class 1E electrical power distribution subsystems shall be operable (BWR/4 STS 3.8.2)

____ (3) The necessary portions of the AC, DC, and vital AC bus electrical power distribution subsystems shall be operable to support equipment required to be operable. (BWR/ STS 3.8.10)

Containment Control Guidelines

____ Secondary Containment shall be operable during fuel movement, core alterations, and during operations with a potential for draining the reactor vessel. (BWR STS 3.6.4.1)

Reactivity Guidelines

____ assumes existing core alteration TS are being met.

Findings requiring phase 2 or phase 3 analysis:

____ Findings that increase the likelihood of a loss of RCS inventory, includes findings that could result in a loss of RCS level instrumentation. Applicable Sections: II.A, II.B(1), II.B(2)

____ Findings that degrade the licensee's ability to terminate a leak path or add RCS inventory when needed. Applicable Sections: II.A, II.B(2), II.B(3), II.B(4), II.C

____ Findings that degrade the licensee's ability to recover DHR once it is lost. Applicable Sections: I.A, I.B(2)

CHECKLIST 8

BWR Cold Shutdown or Refueling Operation
Time to Boil > 2 Hours: RCS Level < 23' Above Top of Flange

I Core Heat Removal Guidelines

A. Instrumentation

_____(1) DHR heat exchanger inlet/outlet temperature and DHR flow indication in the control room with hi/low flow alarm.

_____(2) Two sources of vessel level instrumentation.

B. Procedures/Training

____ (1) Procedures for normal and abnormal DHR operation. Procedure for loss of normal DHR include: alternate core cooling paths, initial magnitude of decay heat, time to boiling, time to core uncovery, initial RCS condition (NUMARC 91-06 guideline 4.1.1.1))

____ (2) Procedures for RHR recovery if lost

C. Equipment

_____(1) Two RHR shutdown cooling subsystems shall be operable with one RHR system in operation (BWR/4 STS 3.4.9, BWR/4 STS 3.9.9)

_____(2) Available equipment to support an alternate core cooling path for at least 24 hours, includes:

_____ Two available SRVs, if vessel head is on

_____ Two low pressure ECCS injection/spray subsystems shall be operable (BWR/4 STS 3.5-7)

II Inventory Control Guidelines

A. Instrumentation

_____ (1) The automatic isolation function of the DHR system (on low vessel level) is operable (BWR/4 STS 3.3.6.1) (NUMARC 91-06 guideline 4.2.3.1)

____ (2) Two sources of level instrumentation with low level set point alarm.

B. Procedures/Administrative Controls/Training

_____ (1) Special administrative controls used for valves which can cause rapid inventory loss (e.g. inventory losses to suppression pool) (NUMARC 91-06 guideline 4.2.3.2)

____ (2) Freeze seals used in locations that can impact RCS inventory are continuously monitored. Procedures and contingency's are established in the event of freeze seal failure. (NUMARC guideline 4.2.2.6).

___ (3) Loss of Inventory procedures address: source and magnitude of loss, providing sufficient makeup capability, coping with high radiation levels in containment. (NUMARC 91-06 4.2.2.1).

C. Equipment

_____ Equipment sufficient to keep the core covered given a loss of RCS inventory, includes: two operable low pressure ECCS injection/spray subsystems (BWR/4 STS 3.5-7).

III Power Availability Guidelines

Procedures/Training

____ (1) Control over switch yard and transformer yard activities (NUMARC 91-06 guidelines 4.3.2.1)

____ (2) Work activities do not have significant potential to affect existing operable power supplies (NUMARC 91-06 guidelines 4.3.1.2)

Equipment

____ (1) One qualified circuit between the offsite transmission network and the onsite 1E AC electrical power distribution subsystems shall be operable(BWR/4 STS 3.8.2)

____ (2) One diesel generator capable of supplying one division of the onsite class 1E electrical power distribution subsystems shall be operable (BWR/4 STS 3.8.2)

____ (3) The necessary portions of the AC, DC, and vital AC bus electrical power distribution subsystems shall be operable to support equipment required to be operable. (BWR/ STS 3.8.10)

Containment Guidelines

Procedures/Training

____ Secondary containment closure can be accomplished in sufficient time before the release of fission products. This procedure includes unavailability of AC power and expected environmental condition in containment. (NUMARC Guideline 4.5-1)

Findings requiring phase 2 or phase 3 analysis:

____ Findings that increase the likelihood of a loss of RCS inventory, includes findings that could result in a loss of RCS level instrumentation. Applicable Sections: II.A., II.B(1), II.B(2)

____ Findings that degrade the licensee's ability to terminate a leak path or add RCS inventory when needed. Applicable Sections: II.A, II.B(2), II.B(3), II.C

____ Findings that significantly degrade the licensee's ability to recover DHR once it is lost. Applicable Sections: I.A., I.B(2)

_____ Findings identifying that one or less SRVs are available to establish a heat removal path to the suppression pool if the vessel head is on. Applicable Sections: I.C(2)

END