NEXTera ENERGY
DUANE ARNOLD

July 26, 2012

NG-12-0309
10 CFR 50.90

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Duane Arnold Energy Center
Docket No. 50-331
Renewed Op. License No. DPR-49

Response to Request for Additional Information (RAI) Regarding License Amendment Request (TSCR-135): Application for One-Time Technical Specification Change Regarding Core Spray Operability during Shutdown

Reference: (1) P. Wells (NextEra Energy Duane Arnold, LLC) to USNRC, "License Amendment Request (TSCR-135): Application for One-Time Technical Specification Change Regarding Core Spray Operability during Shutdown Section Affected: 3.3.5.1," NG-12-0167, dated May 1, 2012 (ML12122A212)

(2) R. Anderson (NextEra Energy Duane Arnold, LLC) to USNRC, "Response to Request for Additional Information (RAI) Regarding License Amendment Request (TSCR-135): Application for One-Time Technical Specification Change Regarding Core Spray Operability during Shutdown," NG-12-0256, dated June 27, 2012 (ML12179A299)

In Reference 1, NextEra Energy Duane Arnold, LLC (hereafter NextEra Energy Duane Arnold) requested, pursuant to 10 CFR 50.90, a one-time revision to the Technical Specifications (TS) for the Duane Arnold Energy Center (DAEC). Subsequently, on June 15, 2012 the NRC Staff requested, via electronic mail, additional information regarding that application (ML12170A800). Reference 2 provided the responses to those requests for information.

On July 16, 2012 NRC Staff requested, via electronic mail, additional information regarding the application based upon review by the Health Physics and Human Performance Branch (ML12199A130). The Attachment to this letter provides the responses to those requests for information.

A001
NRR

This response to request for additional information does not require any additional changes to TS pages. The original evaluation of No Significant Hazards Consideration, per 10 CFR 50.92, submitted with the Reference 1 application, is not changed.

There are no new commitments or changes to any existing commitment being made in this letter. If you have any questions or require additional information, please contact Steve Catron at 319-851-7234.

I declare under penalty of perjury that the foregoing is true and correct. Executed on July 26, 2012.

(For)

Richard L. Anderson
Vice President, Duane Arnold Energy Center
NextEra Energy Duane Arnold, LLC

Attachment: Responses to Requests for Additional Information

cc: Regional Administrator, USNRC, Region III
Project Manager, USNRC, Duane Arnold Energy Center
Resident Inspector, Duane Arnold Energy Center, USNRC
M. Rasmusson (State of Iowa)

REQUEST FOR ADDITIONAL INFORMATION REGARDING LICENSE AMENDMENT REQUEST (TSCR-135) FOR ONE-TIME CHANGE TO TECHNICAL SPECIFICATION 3.3.5.1 REGARDING CORE SPRAY OPERABILITY DURING SHUTDOWN DOCKET NUMBER 50-331

By a letter dated May 1, 2012, NextEra Energy Duane Arnold, LLC, requested a license amendment to Technical Specifications (TS) 3.3.5.1 of Operating License #DPR-49. The proposed amendment would make a one-time change to allow operation in Modes 4 and 5 of Refueling Outage 23 without operable Emergency Core Cooling equipment. Accident mitigation under the proposed change would rely solely on the available, but technically inoperable, Core Spray System (CS). The May 1, 2012 submittal was supplemented on June 27, 2012 in a response to an e-mailed NRC Request for Additional Information (RAI).

The Health Physics and Human Performance Branch (AHPB) performed a preliminary review of the human performance associated changes in the license amendment request. The licensee's responses to the following request for additional information items (RAII) with regard to the human performance aspects of the license amendment will enable the NRC staff to complete its review in a timely manner.

Six RAII follow. The tracking number applied to each item expedites delivery to the cognizant reviewer. The "issued date" within the tracking number is approximate to your actual receipt date. Please apply the tracking number in your response. Please expedite responding to RAII. Please contact me to clarify any item.

ME8572-RAII-Lapinsky-001-2012-07-16

1. In addition to the following operator actions, are there any other operator actions necessary to support the proposed LAR?

   Pre-staged actions:

   1a. Isolate the CS minimum flow path to the Suppression Chamber;

   1b. Ensure that one CS pump flow path to the reactor is established;

   Post-initiation actions:

   1c. Verify flow to be ≥ 600 gpm immediately following CS initiation;

   1d. If CST level falls too low align alternate sources of coolant.

NEXTERA ENERGY RESPONSE TO QUESTION 1

No additional actions beyond those listed have been identified.

ME8572-RAII-Lapinsky-002-2012-07-16

2. For the actions identified above and any others that may be inferred by Question 1, answer the following, keeping in mind the conditions appropriate to Modes 4 and 5:

   2a. How will personnel know when to initiate the action(s)?

   2b. Are any actions performed outside of the control room? If yes, what are the expected conditions in the location of the action(s)?

   2c. How will personnel know that the action(s) was performed correctly?

   2d. How will personnel know when the action(s) should be terminated?

   2e. Are required alarms, annunciators, and displays available, readable, and based on direct measurement of the variable of interest, and not just the reflection of a demand signal?

   2f. For action 1d, how low is "too low"? Is the supporting display incremented so that TS values, procedure values, and display values are consistent, e.g., in feet or inches or gallons, but not more than one of these.

   For additional actions inferred by Question 1, continue the numbering in Question 1 (that is, use 1e., 1f., 1g. and so forth).

NEXTERA ENERGY RESPONSE TO QUESTION 2

2.a (1.a) Core Spray minimum flow isolation is directed by OI 151,"Core Spray System," during alignment to the Condensate Storage Tanks (CSTs) to flood the refueling cavity. The line will also be isolated using an equipment clearance to prevent water intrusion to the Torus during the recoat project.

2.a (1.b) Core Spray subsystems will remain in the standby readiness lineup when required to be operable per TS 3.5.2. In this lineup, the injection path remains isolated to the RPV by one motor operated valve MO-2117[2137]. This is necessary to maintain conditions to satisfy SR 3.5.2.3. Another motor operated valve MO-2115[2135] is maintained normally open. Manual inject isolation V21-42[43] is normally locked open. All valves provide position indication at the control room panel.

Standby readiness in this condition will differ slightly, as the suction path will be aligned to the CSTs rather than the Torus. The suction path lineup is reconfigured per OI 151 during preparations to flood the refueling cavity.

2.a (1.c) Whether by automatic or manual initiation, verification that flow has exceeded 600 gpm will be per procedural guidance in OI 151 using available indicators FI-2110 or FI-2130.

2.a (1.d) Lowering CST level is observable on Control Room indicators (LI-5216A and LI-5217A (0-24 ft)), and alarm panels will annunciate on lowering level. Control Room annunciators 1C06A B-8 and B-9 alarm to notify the operator that CST level has lowered to 6 feet ¼ inch. Control Room annunciators 1C06A C-8 and C-9 will alarm to notify the operator that CST level has lowered to approximately 1 foot.

2.b (1.a) Manual isolation of the minimum flow lines is performed at the associated subsystem pump. This is a normally accessible radiation area. One subsystem will be adjacent to an in-service shutdown cooling subsystem. This will have minor impact on the environment with increased noise and temperature.

2.b (1.b) Establishment of the standby readiness lineup involves confirmation of the system valve and breaker alignment outside of the control room. All areas are normally accessible except the primary containment (PC) and Reactor Water Cleanup Heat Exchanger Room (RWCU HX Room). The PC is made accessible during refueling outages and is maintained habitable for worker access and is controlled as a Locked High Radiation Area. The RWCU HX Room is normally habitable and is controlled as a Locked High Radiation Area. All other areas are normal access radiation areas.

2.b (1.c) No actions outside the control room.

2.b (1.d) For large losses of inventory there are multiple contingency injection sources that involve procedural actions outside of the control room. None would involve access to normally inaccessible or uninhabitable areas.

2.c (1.a) Minimum flow line isolation is assured through human performance tools such as self-checking and independent verification of the equipment clearance. Also, with the suction path aligned to the CST and the minimum flow line not isolated there would be a drain path from the CST to the Torus. This would be directly observable by workers in the Torus and unexpected trends on level indicators for the CST and Torus.

2.c (1.b) Verification of system configuration is performed by electrical, valve and control panel lineups prior to establishing operability. Thereafter, Core Spray subsystems are presumed to remain operable given surveillances continue to be met and no conditions are identified that would change the operability status. Surveillance Test Procedure (STP) 3.0.0-02 "Panel Checks" satisfies SR 3.5.2.4 every 7 days (Surveillance Requirement is 31 days) to ensure that system configuration is as expected.

The alternate suction path lineup will create an exception to satisfaction of this STP, as the Torus suction flow path will be isolated. The lineup from the CSTs to the Core Spray subsystems includes individual outlet isolations from each tank and a manual isolation valve to each Core Spray suction line. The CST outlet valves supply a common suction line to Reactor Core Isolation Cooling (RCIC) and Core Spray. As the CST is the normal water supply for RCIC, these valves are locked open and administratively maintained in this position by the Locked Valve Program. The individual CS subsystem isolation valves are opened during alignment for refueling cavity flooding. Administrative controls will be put in place to ensure this lineup remains in a condition to support CS operability by using the equipment clearance program to apply physical tags maintaining the valves in the open position. Additionally, the CS logic contains a no suction path trip interlocked with the Torus suction valves. This trip is defeated when aligned to the CST by a key-lock switch in the Control Room. This switch will also have a physical tag applied to ensure it is not inadvertently repositioned.

Proper system functioning while aligned to the CST will be demonstrated during refueling cavity flooding. The flooding activity includes ASME surveillance testing which requires demonstration of system flow in excess of system capacity. This will occur prior to CS being relied on solely to satisfy TS 3.5.2.

2.c (1.c) Indication of flow greater than 600 gpm is directly observable on control panel indicators FI-2110[2130].

2.c (1.d) As CST contents are consumed by a loss of inventory event, transfer of reserve water to the CST would begin and contingency systems would be placed in service as needed. Each has a formal procedure (e.g. Alternate Injection Procedure) that provides indications of success. Injection to the RPV would also be indicated directly by RPV level indicators.

2.d (1.a) Not applicable. Isolation of the minimum flow line is a discrete action that is not part of event response.

2.d (1.b) Not applicable. System alignment for standby readiness will remain in effect until not required to be operable per TS 3.5.2 or 3.5.1.

2.d (1.c) Monitoring of system flow will be required when either Core Spray pump is in service. System flow is directly observable on control room panel indicators FI-2110[2130] to provide indication that pump flow is sufficient to preclude dead head conditions. Upon removal of a Core Spray pump from service, minimum flow protection is no longer required.

2.d (1.d) Action would only be terminated to align alternate sources of water when no threat existed to uncovering irradiated fuel in the core.

2.e (1.a) Not applicable.

2.e (1.b) System power and position indicators are available on the control panel and provide direct measurement.

2.e (1.c) Flow indication has been detailed in question 2.d.

2.e (1.d) CST level alarms and indicators have been detailed in question 2.a. Additionally, the level indication meters have a linear scale with increments of 0.5 ft and are shaded red at 6 ft as a visual cue for low level.

2.f (1.d) The value at which CST level would be insufficient is monitored by SR 3.5.2.2. Both CSTs are normally in service to provide suction to the Core Spray subsystems, with 7 ft. sufficient to consider the LCO met. The surveillance is performed every 12 hours by direct observation of indicators in the control room. The scaling is in feet, which is consistent with the SR requirement. The SR requirement has been human factored as a whole number and is easily viewed on the indicator.

ME8572-RAII-Lapinsky-003-2012-07-16

3. Describe any changes to procedures or any new procedures that will be required to support the proposed LAR. List by the procedure number(s) and title(s).

NEXTERA ENERGY RESPONSE TO QUESTION 3

OI 151 Core Spray System is planned to be revised for Refuel Outage 23 (RFO 23) to note the change in operability status and to detail strategies and precautions for operating the system with no minimum flow line available. A draft procedure revision is included in Enclosure 1.

ME8572-RAII-Lapinsky-004-2012-07-16

4. In its response to the NRC's previous RAI, the licensee stated that there are alternative sources of coolant if the CST is completely drained. Are the alternative sources of coolant listed in a relevant procedure(s)? In priority order?

If yes, please provide relevant pages from those procedures.

If in a priority order, please describe the prioritization that was applied.

NEXTERA ENERGY RESPONSE TO QUESTION 4

Alternate sources of coolant are detailed in two main procedures, Emergency Operating Procedures (EOPs) and Emergency Management Guidelines (EMGs). Although EOPs

are written for execution in Mode 1-3, they could be used as a guideline in Mode 4 or 5. EOPs contain injection source tables that prioritize based on capacity and water quality. EMGs would be applicable in Mode 4 or 5 and are designed to provide a comprehensive list of mitigation strategies for events even beyond design basis. The RPV Makeup table in EMGs is prioritized broken into categories of Normal Sources, Alternate Sources and External Sources. These sources are consistent with those listed in the EOPs and are prioritized in a similar manner. Since the makeup source tables are within flow charts for the EOP and EMG, only copies of the EOP and EMG makeup source tables are provided in Enclosures 2 and 3.

Onsite inventory of water will be unchanged from normal outages, although the Torus inventory will be stored in alternate locations. The ability to transfer onsite inventory to available injection systems will exist, albeit through systems not credited within TS. These include water processing systems which transfer water to storage tanks as part of their normal functions.

Complete draining of the CSTs would require implementation of procedures that provide water from alternate and external sources. This is not credible and the volume requirements for operability of TS 3.5.2 were not requested to be exempted by the amendment request (LAR). TS 3.5.2 establishes defense in depth in advance of postulated events. If CST loss occurred prior to an event, the applicable condition of TS 3.5.2 would be entered as required to establish appropriate barriers for potential inventory losses. Potential losses of the CST during an event would have been considered when deriving the LCO requirements.

The inventory requirements of TS 3.5.2 were not requested to be exempted per the amendment request.

ME8572-RAII-Lapinsky-005-2012-07-16

5. What specific changes to the training program will be required?

NEXTERA ENERGY RESPONSE TO QUESTION 5

Operator training programs will not be permanently modified for this amendment request, as it is a one time change. Training provided in preparation for RFO 23 will include applicable revisions to the operating procedure. The Shutdown Safety Plan for RFO 23 will detail available injection sources, and in this case the absence of minimum flow protection, during risk sectors where Core Spray is a primary makeup source.

It should be noted that the practice of using Core Spray as a makeup source without minimum flow protection is not new. The amendment request only changes the operability state of the subsystem, not how the system is operated.

ME8572-RAII-Lapinsky-006-2012-07-16

6. The licensee stated in the proposed LAR, "Strict administrative and procedural controls, operator training, and use of human performance tools will be essential to preventing these types of consequential human errors. Furthermore, both CS subsystems will be guarded and no work or testing will be permitted on either of the CS subsystems during RFO 23..."

   6a. What human performance tools are planned?

   6b. What does "guarded" mean?

   6c. What barriers are being credited for preventing an operator from putting an isolated CS pump minimum bypass flow valve in its normally open position, i.e., un-isolating the minimum bypass flow?

NEXTERA ENERGY RESPONSE TO QUESTION 6

6.a The two consequential errors described in the amendment request include CS pump damage from prolonged low flow or dead head operation and diversion of CS injection flow through the minimum flow line as a result of failure to ensure the line is isolated.

To prevent dead head or prolonged operation without minimum flow protection, fundamental human performance tools such as procedure usage, self checking and three part communication will be used along with the Operator Fundamentals of Closely Monitoring Plant Equipment, Precise Control of the Plant and Teamwork. These techniques are all practiced and reinforced as part of normal control room duties and in training settings. "Flagging" will also be used as a conditional human performance tool. A visual cue will be provided at the system controls to remind the operator that the minimum flow line is isolated. This is standard practice during outages.

Diversion of flow through the minimum flow line employs fundamental human performance tools self checking, independent verification and procedure usage. Administrative controls through the equipment clearance program will establish an isolated condition on this flow path prior to draining the Torus. Failure to isolate the flow path will also be evident by direct observation of water flow into the Torus (above waterline). "Questioning attitude" and "stop when unsure" would be applied to identify the source of in-leakage as fundamental human performance tools. Once again, this would occur prior to Core Spray being the lone source of injection per TS 3.5.2.

6.b Administrative procedures OP-AA-102-1003, "Guarded Equipment" and OP-AA-102-1003 (DAEC), "Protected Trains and Guarded Equipment (DAEC Specific

Information)," detail the site specific requirements for implementation of the industry practice of maintaining defense in depth through divisionalized scheduling and establishment of physical barriers around redundant equipment when risk significant equipment is unavailable. Guarding is that application of physical barriers. Physical barriers at DAEC include tensa-barrier systems with orange and black ribbon stating that permission is required before passing. Other equivalent barriers, postings and placards are used where tensa-barrier systems are not feasible.

6.c Manual isolation for the minimum flow line will be assured through the equipment clearance program. The physical tag applied to each manual isolation valve will prohibit operation of the valve, and require the valve to remain in the closed position. These tags can only be authorized for removal by Operations supervision. For RFO 23, an additional tag will be added for administrative control to ensure no change in status occurs from end of Torus Recoat until Residual Heat Removal (RHR) subsystems are restored to operable status.

Enclosure 1

Draft OI 151 Core Spray System Operating Instruction

38 pages follow

OPERATING INSTRUCTION

OI 151

CORE SPRAY SYSTEM

This procedure is used as an implementing procedure for a Recurring Use Tmod. An engineering Tmod package is associated with this procedure, and any revision to this procedure shall first review the Recurring Use Tmod package to verify the procedure change does not affect the conclusions or requirements of the Recurring Use Tmod package. The Recurring Use Tmod number for this procedure is RTM-04-OI 151.

Usage Level

Multiple Use

Approved for **'Point-of-Use'** printing **IF NO Temporary Changes** are in effect for this procedure.

Record the following: Date / Time: _____ / _____ Initials: ____

NOTE: *A check to ensure current revision and no temporary changes shall be performed and documented every 24 hours if active document use exceeds a 24 hour period as determined from the date and time recorded above.*

Prepared By: _____ / _____ Date: _____
Print Signature

CROSS-DISCIPLINE REVIEW (AS REQUIRED)

Reviewed By: _____ / _____ Date: _____
Print Signature

Reviewed By: _____ / _____ Date: _____
Print Signature

Reviewed By: _____ / _____ Date: _____
Print Signature

PROCEDURE APPROVAL BY QUALIFIED REVIEWER

Approved By _____ / _____ Date: _____
Print Signature

Table of Contents

1.0 PURPOSE

To provide detailed instructions to the plant operating personnel for proper operation of the Core Spray System.

2.0 PRECAUTIONS AND LIMITATIONS

(1) Operating the Core Spray pumps at shutoff head for any length of time should be avoided to preclude overheating and damage to the pumps.

(2) Following maintenance of Core Spray System components, the pumps and piping shall be vented and filled per Section 8.2, Fill and Vent of the Core Spray System Following Maintenance, prior to placing the system in Standby/Readiness Condition to avoid hydraulic hammer.

(3) Prior to maintenance that requires draining A Core Spray thru V-21-19 CASING DRAIN and V-21-21 CASING VENT ensure operator awareness to restricted ORW drain at that site.

(4) The Core Spray pumps should not be operated unless the net positive suction head (NPSH) at the pump suction is at least 15 in. Hg. As indicated on Pressure Indicators PI-2101[2121] at Panel 1C123[124].

(5) To prevent gravity draining of the Core Spray discharge piping, test bypass valves should be closed before securing the Core Spray pumps.

(6) The acceptable range of the Core Spray pump bearing temperatures is 70°F to 153°F for the upper bearing and 70°F to 173°F for the lower bearing.

(7) During system operation, periodically monitor torus level and torus air and water temperature indicators on 1C-29.

(8) Core Spray Pump starts should be limited to two starts per hour when the pump **has not** been running within the previous hour (i.e.: two starts cold). This **does not** apply under emergency conditions.

(9) Core Spray Pump starts should be limited to one start per hour when the pump **has** been running within the previous hour (i.e.: one start hot). This **does not** apply under emergency conditions.

(10) CORE SPRAY PUMP 1P-211A[B] 186M L.O. RELAY shall be reset at Essential Switchgear 1A3[1A4] following a pump trip on overcurrent or ground fault. Prior to resetting any lockout relay, CRS permission must be obtained.

(11) Core Spray Pump 1P-211A[B] is interlocked to prevent operation when either (Torus Keylock Suction) OUTBD TORUS SUCTION MO-2100[2120] or INBD TORUS SUCTION MO-2147[2146] is not fully open. Keylock switch E21A-S16A[B] 1P-211A[B] SUCTION PATH INTERLOCK HS-2103A[2123C] in BYPASS position at Panel 1C43[44] bypasses this interlock.

(12) When Remote Shutdown Panel 1C388 is operational, control of the following Core Spray Loop B components from the Control Room is disabled:

Torus Suction MO-2146	Inboard Isolation MO-2137
Pump Suction MO-2120	Pump 1P-211B
Minimum Flow MO-2124	Full Flow Test MO-2132
Outboard Isolation MO-2135	

(13) Each CORE SPRAY MIN FLOW VALVE MO-2104 and MO-2124 has time delay relays installed to prevent the valve from automatically opening/closing until the valve has been CLOSED/OPEN for a nominal 2 seconds.

(14) Prolonged operation (over one hour) at minimum flow should be avoided; it could result in serious pump degradation.

(15) Comply with Tech Spec requirements for Core Spray and ECCS operability as follows:

ECCS Operating - T.S. 3.5.1

ECCS Shutdown - T.S. 3.5.2

(16) If a Core Spray subsystem is operated in the Torus to Torus test mode (MO-2112[MO-2132] open) when Core Spray is required to be operable, then the affected Core Spray subsystem must be declared inoperable and Tech Specs for ECCS-Operating and ECCS-Shutdown complied with.

Usage Level
Continuous Use

3.0 PLACING THE CORE SPRAY SYSTEM IN STANDBY/READINESS CONDITION

(1) Verify that the Torus contains adequate water volume to provide Core Spray pumps with a reliable suction source. _____

(2) Verify that the Condensate/Demin Service Water System is in operation per OI 537 with the CST 1T-5A[B] LO LEVEL annunciators (1C06A, B-8[9]) reset. _____

(3) Verify that the Emergency Service Water System is operational per OI 454. _____

(4) Complete the Core Spray System Electrical Lineup OI 151A1 (Attachment 1). _____

(5) Complete the "A" Core Spray System Valve Lineup and Checklist OI 151A2 (Attachment 2 and 3). _____

(6) Complete the "B" Core Spray System Valve Lineup and Checklist OI 151A4 (Attachment 4 and 5). _____

(7) Complete the Core Spray System Control Panel Lineup OI 151A6 (Attachment 6). _____

(8) Reset A[B] CORE SPRAY INITIATION SEALED-IN by depressing Pushbuttons HS-2151A and B on 1C03 and observing that the Amber indicating light is reset. _____

(9) Verify RHR/Core Spray Fill Pump 1P-70 is running with "A" CORE SPRAY DISCHARGE LINE LO PRESSURE (1C03A, B-8) and "B" CORE SPRAY DISCHARGE LINE LO PRESSURE (1C03C, B-1) annunciators reset. _____

(10) Vent Core Spray loops per Section 8.1, or fill and vent Core Spray per Section 8.2. _____

Usage Level
Continuous Use

4.0 AUTOMATIC STARTUP/INITIATION OF THE CORE SPRAY SYSTEM

NOTE

Anytime automatic CORE SPRAY INITIATION occurs, Core Spray Pumps are automatically started and sequenced onto their respective buses after a 5 second time delay.

CAUTION

When Core Spray suction is aligned with the Condensate Storage Tanks, the minimum flow line is manually isolated and MO-2104[2124] Min Flow Bypass position is not relevant. Automatic start of the pump while in this lineup may result in dead head operation which if prolonged will cause pump damage.

CONTINUOUS RECHECK STATEMENT
(through Step (5)

IF Core Spray suction is aligned with the Condensate Storage Tanks	**THEN** maintain system flow greater than 600 gpm **OR** remove the pump from service by closing the inject valve and immediately stopping the pump.

(1) Upon receipt of an auto initiation signal, verify that the Core Spray System automatically achieves the following configuration:

Core Spray A Equipment	Configuration	
A CORE SPRAY PUMP 1P-211A	RUNNING	_____
MIN FLOW BYPASS MO-2104	OPEN	_____
TEST BYPASS MO-2112	CLOSED	_____
OUTBD INJECT MO-2115	OPEN	_____
INBD INJECT MO-2117	CLOSED	_____
A ESW PUMP 1P-99A	RUNNING	_____

Core Spray B Equipment	Configuration	
B CORE SPRAY PUMP 1P-211B	RUNNING	_____
MIN FLOW BYPASS MO-2124	OPEN	_____
TEST BYPASS MO-2132	CLOSED	_____
OUTBD INJECT MO-2135	OPEN	_____
INBD INJECT MO-2137	CLOSED	_____
B ESW PUMP 1P-99B	RUNNING	_____

(2) When reactor vessel pressure drops below the low pressure permissive setpoint of 450 psig, verify that the INBD INJECT MO-2117 [MO-2137] valves OPEN to inject to the reactor vessel. _____

(3) When system flow reaches 600 gpm, as indicated on (A[B] CORE SPRAY PUMP) INJECT/TEST FLOW indicator FI-2110 [FI-2130] on 1C03, verify MIN FLOW BYPASS MO-2104 [MO-2124] valve CLOSES. _____

(4) Verify the following Loop A and Loop B Process Parameters:

Parameter	Indication	Instrument Location	Location	
PUMP DISCHARGE PRESSURE	225 to 380 psig	PI-2106	1C03	_____
PUMP DISCHARGE PRESSURE	225 to 380 psig	PI-2126	1C03	_____
(A CORE SPRAY PUMP) INJECT/TEST FLOW	<3100 gpm	FI-2110	1C03	_____
(B CORE SPRAY PUMP) INJECT/TEST FLOW	<3100 gpm	FI-2130	1C03	_____

CAUTION _____

IF an ECCS system initiation is overridden, it will NOT initiate automatically.
DO NOT secure OR override an ECCS system initiation unless, by AT LEAST two independent indication:

(a) Misoperation in AUTOMATIC mode is confirmed,

OR

(b) Adequate core cooling is assured.

(5) As RPV pressure lowers, throttle INBD INJECT MO-2117 [MO-2137] valve using handswitch HS-2117 [HS-2137] on 1C03 to maintain <3100 gpm. When throttled, observe that the Amber light adjacent to handswitch HS-2117 [HS-2137] on 1C03 is ON and remains ON until auto initiation signal is reset. _____

Usage Level
Continuous Use

5.0 MANUAL STARTUP/INITIATION OF THE CORE SPRAY SYSTEM

(1) Verify ESW Pumps 1P-99A[B] running per OI 454. _____

CAUTION

When Core Spray suction is aligned with the Condensate Storage Tanks, the minimum flow line is manually isolated and MO-2104[2124] Min Flow Bypass position is not relevant. Automatic start of the pump while in this lineup may result in dead head operation which if prolonged will cause pump damage.

CONTINUOUS RECHECK STATEMENT
(through Step (7)

IF Core Spray suction is aligned with the Condensate Storage Tanks	**THEN** maintain system flow greater than 600 gpm **OR** remove the pump from service by closing the inject valve and immediately stopping the pump.

(2) Manually start A[B] CORE SPRAY PUMP 1P-211A[B] by placing handswitch HS-2103 [HS-2123] on 1C03 to the START position. _____

(3) When reactor pressure is < 450 psig, open INBD INJECT MO-2117 [MO-2137] valve on 1C03 to inject to the reactor vessel. _____

(4) When system flow reaches 600 gpm as indicated on (A[B] CORE SPRAY PUMP) INJECT/TEST FLOW indicator FI-2110 [FI-2130] on 1C03, verify MIN FLOW BYPASS MO-2104 [MO-2124] valve CLOSES. _____

(5) Verify the following Loop A and Loop B Process Parameters:

Parameter	Indication	Instrument	Location	
A Core Spray Pump Discharge Pressure	225 to 380 psig	PI-2106	1C03	_____
B Core Spray Pump Discharge Pressure	225 to 380 psig	PI-2126	1C03	_____
A Core Spray Pump 1P-211A Motor Amperage	<95 amps	AO304B	1C03	_____
B Core Spray Pump 1P-211B Motor Amperage	<95 amps	AO404B	1C03	_____

(6) Verify A[B] RHR/CS RM CLG UNIT, 1V-AC-12 [1V-AC-11] is running. _____

(7) As RPV pressure lowers, throttle INBD INJECT MO-2117 [MO-2137] valve using handswitch HS-2117 [HS-2137] on 1C03 to maintain <3100 gpm. When throttled, observe that the Amber light adjacent to handswitch HS-2117 [HS-2137] on 1C03 is ON and remains ON only as long as HS-2117 [HS-2137] is in CLOSE. _____

6.0 NORMAL OPERATION OF THE CORE SPRAY SYSTEM

(1) The following parameters should be monitored and logged periodically in the Second Assistants log:

Component	Location	Low	Norm	High
CORE SPRAY SPARGER BREAK DETECTION ΔP	PDIS-2119	2.46		6.0
CORE SPRAY SPARGER BREAK DETECTION ΔP	PDIS-2139	2.46		4.50

7.0 SHUTDOWN OF THE CORE SPRAY SYSTEM

Usage Level
Continuous Use

CAUTION

IF an ECCS system initiation is overridden, it will NOT initiate automatically.
DO NOT secure OR override an ECCS system initiation unless, by AT LEAST two independent indication:

(a) Misoperation in AUTOMATIC mode is confirmed,

OR

(b) Adequate core cooling is assured.

7.1 CORE SPRAY RETURN TO STANDBY READINESS

(1) When all initiation signals have cleared, depress A[B] CORE SPRAY INITIATION SEALED-IN reset pushbutton HS-2151A [HS-2151B] on 1C03, and observe the amber Core Spray System A[B] initiation seal-in indicator is reset.

CAUTION

When Core Spray suction is aligned with the Condensate Storage Tanks, the minimum flow line is manually isolated and MO-2104[2124] Min Flow Bypass position is not relevant. Prolonged operation with no system flow will result in pump damage.

(2) Throttle closed the INBD INJECT MO-2117 [MO-2137] valve using handswitch HS-2117 [HS-2137] on 1C03.

(3) Verify that MIN FLOW BYPASS MO-2104 [MO-2124] OPENS when system flow drops to 300 gpm as indicated on (A[B] CORE SPRAY PUMP) INJECT/TEST FLOW indicator FI-2110 [FI-2130] on 1C03.

(4) Shut down A[B] CORE SPRAY PUMP 1P-211A[B] by placing handswitch HS-2103 [HS-2123] on 1C03 to the STOP position.

(5) Vent Core Spray loops per Section 8.1.

(6) Verify 1V-AC-12[11] A[B] RHR/CS RM CLG UNIT HS-7119 [HS7116] are in AUTO on 1C23.

Usage Level

Continuous Use

7.2 DISABLE AUTO-INITIATION OF THE CORE SPRAY SYSTEM

CAUTION

This section provides a means to disable portions of the Core Spray logic during periods the Core Spray System is not required to be operable.

(1) Core Spray may be disabled upon order of Operations Management if Core Spray is not required to be operable in accordance with DAEC Technical Specifications (refer to T.S. sections 3.3.5.1, ECCS Instrumentation; 3.5.1, ECCS - Operating; and 3.5.2, ECCS - Shutdown). _____

(2) As applicable, perform the following (mark substeps N/A if not performed):

(a) At 1C03, place Information Tag on A CORE SPRAY PUMP HS-2103 to identify that the A Core Spray System will NOT auto-start on Drywell High Pressure or Reactor Lo-Lo-Lo Level. _____

(b) At 1C03, place Information Tag on B CORE SPRAY PUMP HS-2123 to identify that the B Core Spray System will NOT auto-start on Drywell High Pressure or Reactor Lo-Lo-Lo Level. _____

(3) As applicable, perform the following (mark substeps N/A if not performed):

(a) Enter A Core Spray System in the TS/TRM/FP/ODAM Equipment-Out-of-Service Log. _____

(b) Enter B Core Spray System in the TS/TRM/FP/ODAM Equipment-Out-of-Service Log. _____

NOTE

A Work Order and associated electrical termination sheet controls the installation of all relay blocks and jumpers.

(4) If desired to prevent auto-initiation of A Core Spray due to a LOCA signal, at 1C43 at E21A-K10A (CS "A" Auto-Initiation Relay), install the following relay blocks/jumpers:

(a) Concurrently Block open contacts 3-4. _____

_____ (CV)

(b) Concurrently Block open contacts 7-8. _____

_____ (CV)

(c) Concurrently Block open contacts 11-12. _____

_____ (CV)

(d) Concurrently Jumper contacts 9-10. _____

_____ (CV)

(5) If desired to prevent auto-initiation of B Core Spray due to a LOCA signal, at 1C44 at E21A-K10B (CS "B" Auto-Initiation Relay), install the following relay blocks/jumpers:

(a) Concurrently Block open contacts 3-4. _____

_____ (CV)

(b) Concurrently Block open contacts 7-8. _____

_____ (CV)

(c) Concurrently Block open contacts 11-12. _____

_____ (CV)

(d) Concurrently Jumper contacts 9-10. _____

_____ (CV)

7.3 ENABLING CORE SPRAY SYSTEM AUTO-INITIATION LOGIC

NOTE

A Work Order and associated electrical termination sheet controls the installation of all relay blocks and jumpers.

(1) At 1C03, verify all initiation signals are reset by observing the associated amber Core Spray System A or B initiation seal-in indicator is reset. _____

(2) To enable A Core Spray LOCA initiation logic, remove the following relay blocks/jumpers installed at 1C43 at relay E21A-K10A (CS "A" Auto-Initiation Relay):

(a) Concurrently Remove jumper from contacts 9-10. _____

_____ (CV)

(b) Concurrently Remove relay block from contacts 3-4. _____

_____ (CV)

(c) Concurrently Remove relay block from contacts 7-8. _____

_____ (CV)

(d) Concurrently Remove relay block from contacts 11-12. _____

_____ (CV)

(3) To enable B Core Spray LOCA initiation logic, remove the following relay blocks/jumpers installed at 1C44 at relay E21A-K10B (CS "B" Auto-Initiation Relay):

(a) Concurrently Remove jumper from contacts 9-10. _____

_____ (CV)

(b) Concurrently Remove relay block from contacts 3-4. _____

_____ (CV)

(c) Concurrently Remove relay block from contacts 7-8. _____

_____ (CV)

(d) Concurrently Remove relay block from contacts 11-12. _____

_____ (CV)

(4) If the relays will not be disabled again, remove the Information tags installed on the following switches:

Handswitch	Description	Location	
HS-2103	A CORE SPRAY PUMP HS-2103	1C03	_____
HS-2123	B CORE SPRAY PUMP HS-2123	1C03	_____

(5) As applicable, perform the following (mark substeps N/A if not performed):

(a) Remove A Core Spray System in the TS/TRM/FP/ODAM Equipment-Out-of-Service Log. _____

(b) Remove B Core Spray System in the TS/TRM/FP/ODAM Equipment-Out-of-Service Log. _____

8.0 FILL AND VENT OF THE CORE SPRAY SYSTEM

8.1 FILL AND VENT OF THE CORE SPRAY SYSTEM

NOTE

Venting of Core Spray Loop A[B] should only be attempted with discharge pressure indicated on (A CORE SPRAY PUMP) PUMP DISCHARGE PRESSURE indicator PI-2106 and (B CORE SPRAY PUMP) PUMP DISCHARGE PRESSURE indicator PI-2126, and either the RHR/Core Spray Fill Pump 1P-70 running or an alternate means of system pressurization in place.

CAUTION

Vent rigs have failed in the past due to poor material condition.

(1) Inspect the vent rig material condition for flaws, the condition of tygon tubing, poly bottle, HEPA filter, and fittings prior to use. _____

(2) Verify Core Spray Loop A[B] High Point Vent Outboard Isolation V-21-47[44] closed and attached to appropriate container. _____

(3) Open Core Spray Loop A[B] High Point Vent Inboard Isolation V-21-46[67]. _____

(4) Crack open Core Spray Loop A[B] High Point Vent Outboard Isolation V-21-47[44] and leave open until a steady stream of water is observed. _____

(5) If venting is being performed to reduce system pressure, perform the following:

(a) Reduce system pressure to <100 psig as indicated by (A[B] CORE SPRAY PUMP) PUMP DISCHARGE PRESSURE indicator PI-2106 [PI-2126] on 1C03. _____

(b) Reset annunciators "A"["B"] CORE SPRAY DISCHARGE LINE HI PRESSURE (1C03A, C-9) [(1C03C, C-2)]. _____

(6) Close Core Spray Loop A[B] High Point Vent Outboard Isolation V-21-47[44]. _____

(7) Close Core Spray Loop A[B] High Point Vent Inboard Isolation V-21-46[67]. _____

(8) Remove container attached in step (2). _____

Usage Level
Continuous Use

8.2 FILL AND VENT OF THE CORE SPRAY SYSTEM FOLLOWING MAINTENANCE

NOTE

This procedure is to be performed following maintenance which has drained the Core Spray system. This procedure assumes Core Spray is already inoperable. If not, actions taken per this procedure will render Core Spray inoperable.

Steps that fill and vent specific portions of Core Spray piping are identified by notes. These specific steps may be marked N/A as directed by the OSM or CRS if there is reasonable assurance the identified section of piping is full of water. However, the steps for the Core Spray run after the initial fill and vent, for the second venting of the Core Spray discharge line and for the UT exam of the Core Spray inject line may NOT be marked N/A unless specifically allowed by the step.

NOTE

During filling and venting operations, if any unexpected conditions are encountered (e.g., unable to establish a solid stream, a frothy fluid while venting, etc.) a CAP shall be written and the system engineer notified.

NOTE

To maintain RCIC operability, CST level has to be greater than or equal to (≥) 8 feet.

To maintain HPCI operability, CST level has to be greater than or equal to (≥) 8 feet, OR the HPCI low pressure keep fill is in service.

NOTE

The following steps fill and vent the Core Spray suction lines from the torus and CSTs.

Experience has shown that using a larger diameter vent hose discharging into a large container, or to a floor drain, will increase flow and aid in removing any air void inside the piping.

(1) Verify Core Spray has been declared inoperable and unavailable, and the associated Tech Spec LCOs have been entered and risk assessments performed.

★ ********** CRITICAL STEPs **********

Step (2) through Step (50)

(2) Verify valve V-21-8[11] CORE SPRAY PUMP 1P-211A[B] MINIMUM FLOW ISOLATION is closed.

(3) At 1C03, verify MO-2112[2132] TEST BYPASS VALVE is closed. _____

(4) Verify that OUTBD TORUS SUCTION MO-2100[2120] valves and INBD TORUS SUCTION MO-2147[2146] valves are open. _____

(5) Open V-21-14[13] 1P-211A[B] DISCHARGE CHECK VALVE BYPASS. _____

CAUTION _____

CST SUCTION VALVE V-21-1[2] should only be throttled open approximately two to four turns to ensure the valve can be closed quickly when a rise in Torus water level is noted; otherwise, the Torus may overfill during the time it takes the operator to close the valve.

CONTINUOUS RECHECK STATEMENT _____
(through step (7))

IF CST level at 1C06, lowers to less than or equal to (≤) 8 feet,	**THEN** immediately close MO-2100[2120] and MO-2147[2146].
IF Torus water level at 1C03 or 1C29, rises to greater than or equal to (≥) 10.34 feet,	**THEN** immediately close MO-2100[2120] and MO-2147[2146].

(6) Unlock and throttle open Core Spray Pump 1P-211A[B] CST Suction Isolation V-21-01[02] up to four turns to flow CST water through the Core Spray CST suction line thru the Core Spray torus suction line to the torus. _____

(7) After 1 minute of throttling V-21-01[02] or as soon as any rise in torus water level is observed, close MO-2100[2120] and MO-2147[2146]. _____

(8) Verify V-21-81[85] PRESSURE POINT PP-2144B [PP-2145B] ISOLATION closed. _____

(9) Remove pipe cap (or plug) at pressure point PP-2144B[PP-2145B]. _____

(10) Attach hose, tygon tubing, or plastic sleeving to PP-2144B[PP-2145B] and route to a container or floor drain. _____

(11) Open V-21-81[85] and vent until a steady stream of water is observed. _____

(12) Close V-21-81[85] and removed hose, tygon tubing, or plastic sleeving. _____

(13) Reinstall pipe cap (or plug) at PP-2144B[PP-2145B]. _____

NOTE

The following steps partially fill and vent the Core Spray discharge line and vent the Core Spray Pump Seals.

(14) Open V-21-01[2] fully. _____

(15) Verify Core Spray Loop A[B] High Point Vent Outboard Isolation V-21-47[44] closed and attached to an appropriate container. _____

(16) Open Core Spray Loop A[B] High Point Vent Inboard Isolation V-21-46[67]. _____

(17) Open Core Spray Loop A[B] High Point Vent Outboard Isolation V-21-47[44]. _____

(18) Monitor air flow from vent valves V-21-47[44]. When the air flow ceases, close V-21-46[67] and V-21-47[44]. _____

(19) Cycle V-21-18[23] CS PUMP 1P-211A[B] CASING DRAIN INBOARD ISOLATION and V-21-19[24] CS PUMP 1P-211A[B] CASING DRAIN OUTBOARD ISOLATION open and closed to vent A[B] Core Spray pump seals. _____

(20) Cycle V-21-20 [25] CS PUMP 1P-211A[B] CASING VENT INBOARD ISOLATION and V-21-21[26] CS PUMP 1P-211A[B] CASING VENT OUTBOARD ISOLATION open and closed to vent A[B] Core Spray pump seals. _____

(21) Open V-21-8[11] for approximately 30 seconds and then close V-21-8[11]. _____

(22) Close and lock V-21-1[2]. _____

(23) Independently verify V-21-1[2] locked closed. _____ (IV)

(24) At 1C03, open MO-2100[2120] and MO-2147[2146]. _____

(25) Close V-21-14[13]. _____

(26) Open and lock V-21-8[11]. _____

(27) Independently verify V-21-8[11] locked open. _____ (IV)

NOTE

The following steps complete filling the Core Spray discharge line.

(28) Verify the RHR/CS Keep Fill system is in service per OI 149. _____

(29) Verify V-19-128[23] A[B] CORE SPRAY KEEP FILL SUPPLY LINE STOP CHECK, is open. _____

(30) Continue to fill Core Spray discharge piping from RHR/CS Keep Fill for 30 minutes before continuing in this procedure. _____

(31) Open Core Spray Loop A[B] High Point Vent Inboard Isolation V-21-46[67] _____

(32) Crack open Core Spray Loop A[B] High Point Vent Outboard Isolation V-21-47[44] and leave open until a steady stream of water is observed. _____

(33) Close Core Spray Loop A[B] High Point Vent Outboard Isolation V-21-47[44]. _____

(34) Close Core Spray Loop A[B] High Point Vent Inboard Isolation V-21-46[67]. _____

(35) Remove container attached in Step (15). _____

NOTE

The following steps fill and vent Core Spray discharge piping located inside the drywell. Unless stated otherwise, these steps are performed inside the drywell.

(36) If the drywell is inaccessible, then marked Steps (37) through (50) N/A. Otherwise mark this step N/A. _____

(37) Unlock and close V-21-42[43] CS LOOP A[B] INJECTION HEADER MANUAL BLOCK. _____

(38) Verify V-21-64[62] CS LOOP A[B] INJECT HDR OUTBD VENT/TEST CONN and V-21-65[63] CS LOOP A[B] INJECT HDR INBD VENT/TEST CONN are closed. _____

(39) At V-21-64[62] CS LOOP A[B] INJECT HDR OUTBD VENT/TEST CONN, remove pipe cap and attach a hose or plastic sleeving . Route hose or plastic sleeving to a container. _____

(40) Open valve V-21-65[63] CS LOOP A[B] INJECT HDR INBD VENT/TEST CONN. _____

(41) At 1C03, verify MO-2115[2135] OUTBD INJECT open. _____

(42) At 1C03, open MO-2117[2137] INBD INJECT. _____

(43) Open V-21-64[62] until a steady stream of water is observed. _____

(44) Close V-21-64[62] and reinstall pipe cap. _____

(45) Close V-21-65[63]. _____

(46) At 1C03, closed MO-2117[2137]. _____

(47) At 1C03, position MO-2115[2135] as directed by CRS. _____

(48) Open and lock V-21-42[43]. _____

(49) Independently verify V-21-42[43] locked open. _____ (IV)

(50) At 1C03, verify ZS-2142[ZS-2143] MANUAL ISOLATION V-21-42[V-21-43] indicates OPEN. _____

NOTE

Removing FIS-2111 or FIS-2131 from service for filling and venting will require identification of an additional Tech Spec LCO related to the Core Spray minimum flow valve control per Tech Spec 3.3.5.1.

Removing PS-2107A, PS-2107B, PS-2127A or PS-2127B from service for filling and venting will require identification of an additional Tech Spec LCO related to the ADS logic per Tech Spec 3.3.5.1.

(51) Contact I&C to fill and vent the instruments listed below as required. _____

For A Core Spray:

Instrument	Description
FT-2110	CORE SPRAY PUMP 1P-211A DISCHARGE FLOW
FIS-2111	CS PUMP 1P-211A DISCH FLOW (MO-2104 INTLK)
PS-2107A	CORE SPRAY PUMP 1P-211A DISCH PRESS (ADS PERM)
PS-2107B	CORE SPRAY PUMP 1P-211A DISCH PRESS (ADS PERM)
PS-2116A	CORE SPRAY SYS A DISCH HEADER HIGH PRESSURE
PS-2116B	CORE SPRAY SYS A DISCH HEADER LOW PRESSURE
PT-2106	CORE SPRAY PUMP 1P-211A DISCHARGE PRESSURE

For B Core Spray:

Instrument	Description
FT-2130	CORE SPRAY PUMP 1P-211B DISCHARGE FLOW
FIS-2131	CS PUMP 1P-211B DISCH FLOW (MO-2124 INTLK)
PS-2127A	CORE SPRAY PUMP 1P-211B DISCH PRESS (ADS PERM)
PS-2127B	CORE SPRAY PUMP 1P-211B DISCH PRESS (ADS PERM)
PS-2136A	CORE SPRAY SYS B DISCH HEADER HIGH PRESSURE
PS-2136B	CORE SPRAY SYS B DISCH HEADER LOW PRESSURE
PT-2126	CORE SPRAY PUMP 1P-211B DISCHARGE PRESSURE

(52) A[B] Core Spray may be declared available. _____

(53) A[B] Core Spray may be declared operable, provided all other required post maintenance testing has been completed satisfactorily. _____

NOTE

The following steps run Core Spray in torus-to-torus mode, vents the Core Spray discharge line a second time and directs performance of a UT exam of the Core Spray discharge line high point vent.

(54) If filling and venting of Core Spray is limited to the piping downstream of MO-2117[MO-2137], then there is reasonable assurance that all Core Spray piping upstream of MO-2117[MO-2137] is filled. Steps (55) thru (58) may be marked N/A. _____

(55) Run the A[B] Core Spray system in torus-to-torus mode by one of the following methods:

(a) Perform STP 3.5.1-01A[B] "A[B] Core Spray System Operability Test" or STP 3.5.1-12A[B] "A[B] Core Spray System Operability Test and Comprehensive Pump Test." If step (55)(b) is performed, mark this step N/A. _____

(b) Perform OI 151, Section 12.0 "Operating Core Spray in Torus-to-Torus Mode". If run per OI the duration of Core Spray operation is to be 1 to 5 minutes, unless directed otherwise by the CRS. If step (55)(a) is performed, mark this step N/A. _____

(56) Once A[B] Core Spray has been secured, vent the A[B] Core Spray discharge line per OI 151, Section 8.1. _____

(57) Notify QC to perform a UT examination for air accumulation by examining the first section of vertical vent pipe coming from the large bore piping upstream of vent line valve V-21-46/[67] and V-21-47[44] to verify the A[B] Core Spray discharge piping is full of water. _____

(58) If the QC UT exam does not verify the A[B] Core Spray discharge piping is full of water, generate a CAP to document and evaluate the condition. _____

(59) Independently verify pipe cap (or plug) is installed at PP-2144B[PP-2145B]. _____ (IV)

(60) Independently verify pipe cap is installed downstream of V-21-64[62]. Mark this step N/A if the Drywell is inaccessible. _____ (IV)

9.0 MAINTAINING CORE SPRAY SYSTEM DISCHARGE PIPING FILLED WHEN 1P-70 IS UNAVAILABLE

Usage Level

Continuous Use

9.1 USING RHR SYSTEM AS A PRESSURE SOURCE

NOTE

This section can only be used when 1P-70 piping is intact and the valve lineup in a normal configuration. The time RHR and Core Spray are cross-connected via V-19-21 should be minimized and V-19-21 should not be left unattended when open.

(1) Verify adequate pressure available in the B RHR system to supply the Core Spray system. B RHR may be pressurized with condensate service in accordance with OI 149 if required. _____

(2) Establish communication from the Reactor Building NWCR to the control room to monitor Core Spray system pressure at 1C03 (PI-2106 and/or PI-2126) when raising Core Spray system pressure. _____

NOTE

If TORUS SUCTION MO-1989 is open and 1P-70 is OFF, V-19-18 needs to be closed to prevent condensate service water from being short cycled to the torus.

(3) If TORUS SUCTION MO-1989 is OPEN, close V-19-18, RHR/CS Keep Fill Pump 1P-70 Suction Isolation. _____

(4) Raise core Spray system pressure as follows:

(a) Throttle open V-19-21, Core Spray Keep Fill Bypass, to start pressurizing each Core Spray system that is not isolated. _____

(b) When Core Spray system pressure reaches the desired value, then close V-19-21. _____

(5) If previously closed, re-open V-19-18, RHR/CS Keep Fill Pump 1P-70 Suction Isolation. _____

(6) Secure Condensate Service to RHR in accordance with OI 149 if used in Step (1). _____

9.2 USING DEMIN WATER SYSTEM AS A PRESSURE SOURCE

NOTE

The installation of mechanical jumpers shall comply with ACP 1411.7, Hose Control Procedure and require a Recurring Temporary Modification (RTM-04-0I 151).

9.2.1 TEMP MOD RTM-04-OI151 INSTALLATION ON "A" CORE SPRAY

(1) Verify Shift Management authorizes installation of the TMod and has signed the TMod tags. _____

(2) Verify double check valve assembly installed at V-09-345 Demin Water Station #25 Outboard Isolation. _____

(3) Concurrently verify installation of one end of contaminated plant service hose (1) to double check valve assembly installed at V-09-345. _____

_____ (CV)

NOTE

Use of a single hose makes removal difficult due to the approximately 80 pounds of pressure trapped in the hose on isolation, and will increase the likelihood of contaminated water spraying personnel and the area on disconnection.

Installing a Chicago wye fitting with isolation valve going to drain hose to funnel or floor drain should eliminate spray contamination.

More than 3 hoses may be needed to reach.

(4) Connect other end of contaminated plant service hose (1) to Chicago wye fitting. _____

(5) Connect one end of contaminated plant service hose (2) to outlet valve on Chicago wye fitting. _____

(a) Route contaminated plant service hose (2) to funnel or floor drain or container of sufficient capacity to drain the hose. _____

(b) Verify drain valve at the Chicago wye fitting is closed. _____

(6) Connect one end of contaminated plant service hose (3) to other end of Chicago wye fitting. _____

(7) Concurrently verify installation of other end of contaminated plant service hose (3) to Connection at V-21-47, Core Spray Loop A High Point Vent Outboard Isolation. _____

_____
(CV)

(8) Open V-09-144 Demin Water Station #25/25A Isolation. _____

(9) Open V-09-345 to pressurize hose, and check for hose and connection leaks, then close. _____

(10) If the hose or connections leak, have hose/connections fixed or replaced then reperform steps (8) thru (9), until no leaks exist. _____

(11) Sign Date and install TMod tag on each connection. _____

(12) Notify Responsible Engineer of TMod installation. _____

(13) Verify Shift Management accepts installation of the TMod. _____

(14) Log installation of TMod in the Recurring Use TM section of the TMod Log (DAEC Information). _____

(15) Performance of section 9.2.3 to pressurize "A" Core Spray may be performed in parallel with the next step (drawing updates). _____

(16) When The TMod will be installed thru a Control Room shift change, then the Responsible Engineer shall verify that all required plant impact and critical drawings updated have been completed per ACP 103.6, otherwise N/A. _____

9.2.2 TEMP MOD RTM-04-OI151 INSTALLATION ON "B" CORE SPRAY

(1) Verify Shift Management authorizes installation of the TMod and has signed the TMod tags. _____

(2) Verify double check valve assembly installed at V-09-350 Demin Water Station #27 Outboard Isolation. _____

(3) Concurrently verify installation of one end of contaminated plant service hose (1) to double check valve assembly installed at V-09-350. _____

_____ (CV)

NOTE

Use of a single hose makes removal difficult due to the approximately 80 pounds of pressure trapped in the hose on isolation, and will increase the likelihood of contaminated water spraying personnel and the area on disconnection.

Installing a Chicago wye fitting with isolation valve going to drain hose to funnel or floor drain should eliminate spray contamination.

More than 3 hoses may be needed to reach.

(4) Connect other end of contaminated plant service hose (1) to Chicago wye fitting. _____

(5) Connect one end of contaminated plant service hose (2) to outlet valve on Chicago wye fitting. _____

(a) Route contaminated plant service hose (2) to funnel or floor drain or container of sufficient capacity to drain the hose. _____

(b) Verify drain valve at the Chicago wye fitting is closed. _____

(6) Connect one end of contaminated plant service hose (3) to other end of Chicago wye fitting. _____

(7) Concurrently verify installation of other end of contaminated plant service hose (3) to Connection at V-21-44, Core Spray Loop B High Point Vent Outboard Isolation. _____

_____ (CV)

(8) Open V-09-142 Demin Water Station #27 Isolation. _____

(9) Open V-09-350 to pressurize hose, and check for hose and connection leaks, then close. _____

(10) If the hose or connections leak, have hose/connections fixed or replaced then reperform steps (2) thru (9), until no leaks exist. _____

(11) Sign Date and install TMod tag on each connection. _____

(12) Notify Responsible Engineer of TMod installation. _____

(13) Verify Shift Management accepts installation of the TMod. _____

(14) Log installation of TMod in the Recurring Use TM section of the TMod Log (DAEC Information). _____

(15) Performance of section 9.2.4 to pressurize "B" Core Spray may be performed in parallel with the next step (drawing updates). _____

(16) When The TMod will be installed thru a Control Room shift change, then the Responsible Engineer shall verify that all required plant impact and critical drawings updated have been completed per ACP 103.6, otherwise N/A. _____

9.2.3 PRESSURIZING "A" CORE SPRAY WITH DEMIN WATER

(1) Open V-09-345 Demin Water Station #25 Outboard Isolation. _____

(2) Open V-21-46, Core Spray Loop A High Point Vent Inboard Isolation. _____

(3) Open V-21-47, Core Spray Loop A High Point Vent Outboard Isolation to begin pressurizing. _____

(4) When "A" Core Spray pressure as read on PI-2106, "A" Core Spray pump discharge pressure, is at the desired value, then close V-21-47. _____

(5) Close V-21-46. _____

(6) Close V-09-345. _____

9.2.4 PRESSURIZING "B" CORE SPRAY WITH DEMIN WATER

(1) Open V-09-350 Demin Water Station #27 Outboard Isolation. _____

(2) Open V-21-67, Core Spray Loop B High Point Vent Inboard Isolation. _____

(3) Open V-21-44, Core Spray Loop B High Point Vent Outboard Isolation to begin pressurizing. _____

(4) When "A" Core Spray pressure as read on PI-2126, "B" Core Spray pump discharge pressure, is at the desired value, then close V-21-44. _____

(5) Close V-21-67. _____

(6) Close V-09-350. _____

9.2.5 TEMP MOD REMOVAL FROM "A" CORE SPRAY

(1) Verify Shift Management authorizes removal of the TMod. _____

(2) Verify the following valves are closed:

Valve	Description	
V-09-144	Demin Water Station #25/25A Isolation	_____
V-09-345	Demin Water Station #25 Outboard Isolation	_____
V-21-46	Core Spray Loop A High Point Vent Inboard Isolation	_____
V-21-47	Core Spray Loop A High Point Vent Outboard Isolation	_____

NOTE

Approximately 80 pounds of pressure is trapped in the hose on isolation, take care to prevent contaminated water spraying from personnel and the area on hose disconnection.

(3) Open the drain valve at the Chicago wye fitting to vent the trapped pressure and provide a drain path for the water trapped in the hoses. _____

(4) Concurrently verify removal of hose and TMod tag from V-09-345. _____

_____
(CV)

(5) Concurrently verify removal of hose and TMod tag from V-21-47. _____

(CV)

(6) Verify there is no leakage from the Core Spray vent connection and that system pressure is being maintained within normal limits. _____

(7) Log removal of Tmod from the Recurring Use TM section of the Tmod Log (DAEC Information). _____

(8) If critical drawing updates were performed in section 9.2.1, then have the Responsible Engineer, remove the critical drawing updates. _____

(9) Verify Shift Management accepts removal of the Tmod. _____

9.2.6 TEMP MOD REMOVAL FROM "B" CORE SPRAY

(1) Verify Shift Management authorizes removal of the Tmod. _____

(2) Verify the following valves are closed:

Valve	Description	
V-09-142	Demin Water Station #27 Isolation	_____
V-09-350	Demin Water Station #27 Outboard Isolation	_____
V-21-67	Core Spray Loop B High Point Vent Inboard Isolation	_____
V-21-44	Core Spray Loop B High Point Vent Outboard Isolation	_____

NOTE

Approximately 80 pounds of pressure is trapped in the hose on isolation, take care to prevent contaminated water spraying from personnel and the area on hose disconnection.

_____

(3) Open the drain valve at the Chicago wye fitting to vent the trapped pressure and provide a drain path for the water trapped in the hoses. _____

(4) Concurrently verify removal of hose and TMod tag from V-09-350. _____

_____
(CV)

(5) Concurrently verify removal of hose and TMod tag from V-21-44. _____

_____
(CV)

(6) Verify there is no leakage from the Core Spray vent connection and that system pressure is being maintained within normal limits. _____

(7) Log removal of TMod from the Recurring Use TM section of the Tmod Log (DAEC Information). _____

(8) If critical drawing updates were performed in section 9.2.2, then have the Responsible Engineer, remove the critical drawing updates. _____

(9) Verify Shift Management accepts removal of the TMod. _____

Usage Level
Continuous Use

10.0 FILLING REACTOR CAVITY IN PREPARATION FOR REFUELING OPERATIONS

NOTE

Due to poor torus water quality, pump suction is from the CST.

Condensate Service Water Pumps 1P-12A and B, and Service Water Jockey Pump 1P-11 trip on a low CST level of 6 ft.

Hotwell Transfer Pump 1P-258 can be used concurrently to transfer condensate from the condenser hotwell to the CST per OI 644.

CST levels will lower 16 to 16.5 feet when flooding the cavity from the RPV flange to the level where Core Spray pumps are secured. (2-3 inches below the cavity weirs)

CONTINUOUS RECHECK STATEMENT
(Applicable to this section)

IF If filling the reactor cavity with dryer/separator canal plugs and dam installed,	**THEN** ensure that dryer/separator pit water level is maintained greater than reactor cavity water level to preclude dam bowing.

(1) Enter applicable Tech Spec condition for Core Spray Subsystem inoperable during transition from Torus to CST suction path. _____

(2) Line up applicable Core Spray Pump suction from the CST and concurrently place Clearance Tags to maintain in the respective position and provide panel information as follows:

(a) Unlock and close Core Spray Pump Min. Flow Isolation V-21-08[V-21-11]. _____

(b) At 1C03, tag 1P-211A [1P-211B] MIN FLOW BYPASS MO-2104[MO-2124] indicating that min. flow is isolated. _____

(c) Close INBD TORUS SUCTION MO-2147 [MO-2146] and OUTBD TORUS SUCTION MO-2100 [MO-2120] by placing keylock handswitches HS-2147 [HS-2146] and HS-2100 [HS-2120] in the CLOSE position. _____

(d) Unlock and open CST Suction Valve V-21-01 [V-21-02]. _____

(e) At 1C43 [1C44], place 1P-211A [1P-211B] SUCTION PATH INTERLOCK HS-2103A [HS-2123C] in the BYPASS position. _____

(3) Verify ESW Pumps 1P-99A[B] running per OI 454. _____

(4) Start 1V-AC-12[11] A[B] RHR/CS RM CLG UNIT by placing handswitch HS-7119[HS-7116] in START at 1C23. _____

CAUTION _____

Operation of the Core Spray Pumps at shutoff head should be minimized to preclude pump damage.

(5) Start A [B] CORE SPRAY PUMP 1P-211A [1P-211B] by placing handswitch HS-2103 [HS-2123] on 1C03 in the START position. _____

(6) Immediately throttle open INBD INJECT MO-2117 [MO-2137] valve using handswitch HS-2117 [HS-2137] on 1C03 to obtain a greater than or equal to 600 gpm flowrate to prevent pump damage. _____

(7) Adjust Core Spray System flow rate by throttling INBD INJECT MO-2117 [MO-2137] on 1C03 to control the rate of the reactor cavity level rise. _____

(a) Limit injection rate to less than or equal to $\leq$ 3100 GPM per pump or as directed by the CRS to support concurrent STPs. _____

(8) Verify Reactor water level is above reactor vessel flange prior to starting the second core spray pump to prevent a rapid level rise in the reactor vessel. _____

(9) When the desired water level is obtained in the Reactor Cavity, secure the Core Spray Pumps by performing the following Steps (10) through (13). _____

CAUTION _____

Operation of the Core Spray Pumps at shutoff head should be minimized to preclude pump damage.

(10) At 1C03, throttle closed INBD INJECT MO-2117 [MO-2137] using handswitch HS-2117 [HS-2137]. _____

(11) Secure Core Spray Pump 1P-211A [1P-211B] by placing handswitch HS-2103 [HS-2123] in the STOP position. _____

(12) When the Torus is available as a suction source and desired to return to a normal lineup, then perform the following actions and concurrently remove Clearance Tags:

(a) Enter applicable Tech Spec condition for Core Spray Subsystem inoperable during transition from CST to Torus suction path. _____

(b) At 1C43, place 1P-211A SUCTION PATH INTERLOCK HS-2103A in the NORMAL position. _____

(c) At 1C44, place 1P-211B SUCTION PATH INTERLOCK HS-2123C in the NORMAL position. _____

(d) Close and lock CST suction valves V-21-01 and V-21-02. _____

(e) Open and lock Core Spray Pump Min. Flow Isolations V-21-08 and V-21-11. _____

(f) At 1C03, remove Clearance Tags on MO-2104 and MO-2124. _____

(g) Open INBD TORUS SUCTION MO-2147 and OUTBD TORUS SUCTION MO-2100 by placing keylock handswitches HS-2147 and HS-2100 in the OPEN position. _____

(h) Open INBD TORUS SUCTION MO-2146 and OUTBD TORUS SUCTION MO-2120 by placing keylock handswitches HS-2146 and HS-2120 in the OPEN position. _____

(i) Independently verify valves V-21-01 and V-21-02 are locked closed. _____ (IV)

(j) Independently verify valves V-21-08 and V-21-11 are locked open. _____ (IV)

(13) Vent Core Spray loops per Section 8.1. _____

(14) Place 1V-AC-12[11] A[B] RHR/CS CLG UNIT in AUTO by placing Handswitch HS-7119[HS-7116] in AUTO at 1C23. _____

Usage Level
Continuous Use

11.0 RAISING TORUS LEVEL WITH THE CORE SPRAY SYSTEM

NOTE

To maintain RCIC operability, CST level has to be greater than or equal to 8 feet.
To maintain HPCI operability, CST level has to be greater than or equal to 8 feet, OR the HPCI high pressure keep fill inservice with PI-2308 indicating greater than 80 psig, OR the HPCI low pressure keep fill in service.

(1) Monitor CST level at 1C06, using LI-5216A CST 1T-5A LEVEL or LI-5217A CST 1T-5B LEVEL and maintain level above the HPCI/RCIC operability values or as directed by the CRS. _____

(2) Verify that OUTBD TORUS SUCTION MO-2100[2120] valves and INBD TORUS SUCTION MO-2147[2146] valves are open. _____

CAUTION

During normal operations, CST SUCTION VALVE V-21-1[2] should only be throttled open approximately two to four turns to ensure the valve can be closed quickly when desired Torus level is reached; otherwise, the Torus may overfill during the time it takes the operator to close the valve.

(3) Unlock and throttle open Core Spray Pump 1P-211A[B] CST Suction Isolation V-21-01[02] as necessary, to gravity drain CST water to the torus. _____

(4) When torus level is adequate, close and lock Core Spray Pump 1P-211A[B] CST Suction Isolation V-21-01[02]. _____

(5) Independently verify valve V-21-01[02] is locked closed. _____
(IV)

12.0 OPERATING CORE SPRAY IN TORUS-TORUS MODE

Usage Level

Continuous Use

CONTINUOUS RECHECK STATEMENT
(applicable to this section)

IF a Core Spray subsystem is operated in the Torus to Torus test mode (MO-2112[MO-2132] open) when Core Spray is required to be operable,	**THEN** the affected Core Spray subsystem shall be declared inoperable and Tech Specs for ECCS-Operating and ECCS-Shutdown complied with.

12.1 LINING UP FOR TORUS-TORUS OPERATION

(1) Verify Core Spray LCO has been entered if applicable. _____

(2) Verify ESW Pumps 1P-99A[B] running per OI 454. _____

(3) Start RHR and Core Spray Pump Room Cooling Units 1V-AC-12[11] A[B] RHR/CS RM CLG UNIT on 1C23. _____

CAUTION

Operation of the Core Spray Pumps at shutoff head should be minimized to preclude pump damage.

(4) Start A [B] CORE SPRAY PUMP 1P-211A [1P-211B] by placing handswitch HS-2103 [HS-2123] on 1C03 in the START position. _____

(5) Throttle open TEST BYPASS MO-2112 [MO-2132] valve using handswitch HS-2112 [HS-2132] on 1C03 to obtain 3050 gpm or as directed by CRS. _____

(6) Verify Core spray Amps stabilize at less than 95 amps. _____

(7) Verify that MIN FLOW BYPASS MO-2104 [MO-2124] CLOSES when system flow rises above approximately 600 gpm. _____

(8) During system operation, periodically monitor torus level and temperature indications on 1C03 and/or 1C29. _____

12.2 SECURING FROM TORUS-TORUS OPERATION

(1) Throttle closed the TEST BYPASS MO-2112 [MO-2132] valve using handswitch HS-2112 [HS-2132] on 1C03. _____

(2) Verify that MIN FLOW BYPASS MO-2104 [MO-2124] OPENS when system flow drops to 300 gpm. _____

(3) Shut down A[B] CORE SPRAY PUMP 1P-211A[B] by placing handswitch HS-2103 [HS-2123] on 1C03 to the STOP position. _____

(4) Vent A[B] Core Spray Loop[s] per Section 8.1. _____

(5) Place 1V-AC-12[11] A[B] RHR/CS CLG UNIT in AUTO by placing Handswitch HS-7119[HS-7116] in AUTO at 1C23. _____

(6) Shutdown ESW Pumps 1P-99A[B] per OI 454. _____

(7) Exit Core Spray LCO if applicable. _____

13.0 REFERENCES

(1) DAEC Technical Specifications

(2) Updated Final Safety Analysis Report, Duane Arnold Energy Center, Section 6.3.2.2.3

(3) OI 518.1, Instrument and Service Air System

(4) OI 537, Condensate/Demin. Service Water System

(5) P&ID BECH-M119 Residual Heat Removal System

(6) P&ID BECH-M120 Residual Heat Removal System

(7) P&ID BECH-M121 Core Spray System

(8) 791E419RS, Sheets 1, 2, and 3 Bechtel VPCR No. 7884-APED-E21-006<1-3>

(9) DCPs 1203, 1305, 1325, 1343, 1355, 1409, 1410, 1451

(10) MMs 132, 135, 171, 172

(11) Commitment 880077, NG-88-0524, NRC IE Notice 87-59

(12) LER 88-13 (Commitment AI 8253)

(13) T.S. Amendment 193, 223

(14) AR 94-0397, 95-1236, AR 16672, AR 32748

(15) ECP 1797

Enclosure 2

EOP Makeup Sources

1 page follows

Table 1A	Preferred Injection Systems	
Systems	**Notes**	**Status**
CRD	Both pumps if necessary. If necessary, maximize CRD flow (AIP 407).	
Condensate/ Feedwater	Condensate shutoff head is about 650 psig.	
RCIC	Preferred suction from the CST. If necessary, bypass low RPV pressure isolation interlock (Defeat 1). If necessary, bypass area high temperature isolations (Defeat 18).	
HPCI	Preferred suction from the CST. If necessary, bypass high torus water level suction transfer interlock (Defeat 2). If necessary, bypass area high temperature isolations (Defeat 18).	
RHR	Inject through the heat exchangers as soon as possible. Shutoff head is about 260 psig.	
Core Spray	Shutoff head is about 330 psig.	

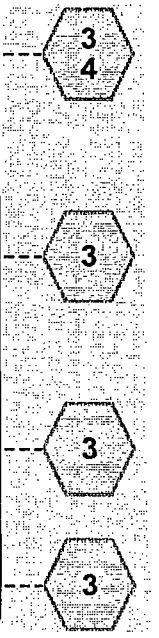

Table 2A	Alternate Injection Systems			
Systems	**Pressure Range (psig)**	**Capacity (gpm)**	**Procedure**	**Status**
RHR Service Water	0-270	0-2400	AIP 401	
Fire System	0-125	0-2500	AIP 404	
Well Water A/C B/D	0-125	0-750 0-1200	AIP 403	
GSW	0-125	0-5100	AIP 403	
ESW	0-110	0-1200	AIP 402	
Condensate Service Water	0-150	0-100	AIP 405	
SBLC (test tank)	0-1400	56	AIP 406	
SBLC (boron tank)	0-1400	56	AIP 406	

Enclosure 3

EMG Makeup Sources

1 page follows

D RPV Makeup

- ☛ If necessary to permit low pressure injection, manually depressurize the RPV per SAMP 707, Emergency SRV Operation Using Portable DC Power.
- ☛ Refill pump suction sources (CST, hotwell, pump pits, cooling tower basin) as required (see Water strategies).

■ **Normal Sources**

- Condensate/Feedwater
- CRD
  - ☛ Maximize flow if necessary (AIP 407).
- RCIC
  - ☛ Use manual operation procedure if necessary (SAMP 703). Note: water will discharge from the barometric condenser onto the RCIC room floor.
- HPCI
- RHR
- Core Spray

■ **Alternate Sources**

- RHR Service Water (AIP 401)
- Fire System (AIP 404)
- Well Water (AIP 403)
- GSW (AIP 403)
- ESW (AIP 402)
- Condensate Service Water (AIP 405)
- SBLC (test or boron tank; (AIP 406)

■ **External Sources**

- Portable Diesel Fire Pump (SAMP 708, Emergency RPV Makeup with the Portable Diesel Fire Pump)