PROPOSED CHANGE RTS-228 TO THE DUANE ARNOLD ENERGY CENTER TECHNICAL SPECIFICATIONS

The holders of license DPR-49 for the Duane Arnold Energy Center propose to amend Appendix A (Technical Specifications) to said license by deleting current pages and replacing them with the attached, new pages. The List of Affected Pages is given below.

List of Affected Pages

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Summary of Changes:

The following list of proposed changes is in the order that the changes appear in the Technical Specifications.

Page	Description of Changes
i	Revise the Table of Contents to delete the surveillance requirement for 3.4.B.
ii	Revise the Table of Contents to reflect the correct page numbers for pages revised in this change request.
1.0-2	Revise the definition of OPERABLE - OPERABILITY to specify requirements for "verification" of OPERABILITY.

3.4-2 Specification 3.4.B.1 is revised to require verification of operability of redundant components, to clarify the requirements of the specification, and for consistency throughout the Technical Specifications. Specification 4.4.B.1, which required surveillance testing of redundant components during the LCO specified in 3.4.B.1, is deleted.

3.4-5 Revise the Bases for Section 3.4 to reflect the changes mentioned above by deleting the words ", and by increased testing of the operable redundant component."

3.5-2 Specification 3.5.A.2 is revised to require verification of operability of redundant components and to clarify the requirements of the specification. Specification 4.5.A.2, which required surveillance testing of the redundant Core Spray and LPCI subsystems during the LCO specified in 3.5.A.2, is deleted.

3.5-3 Specifications 3.5.A.3 and 4.5.A.3 are moved to this page from page 3.5-2. Specifications 3.5.A.4 and 3.5.A.5 are revised to require verification of operability of redundant components and to clarify the requirements of the specifications. Specifications 4.5.A.4 and 4.5.A.5, which required surveillance testing of redundant components during the LCOs specified in 3.5.A.4 and 3.5.A.5, are deleted. Additionally, specification 4.5.A.6 is moved to this page from page 3.5-4 and renumbered as 4.5.A.3.e for consistency of format.

3.5-4 Specification 4.5.A.6 is renumbered as described above. In 3.5.A.6 the action statement for plant shutdown is revised to require the plant to be in hot shutdown in 12 hours and cold shutdown in the following 24 hours instead of requiring cold shutdown in 24 hours. Specification 3.5.B is revised to specify an LCO for the suppression pool spray subsystem of the Containment Spray system. Specification 3.5.B.3 is added to specify an LCO for both loops of either Drywell or Suppression Pool spray inoperable.

3.5-5 Specifications 3.5.C.1 and 4.5.C.1 are moved to this page from page 3.5-4. Specifications 3.5.C.2, 3.5.C.3, and 3.5.C.4 are revised to require verification of operability of redundant components, to clarify the requirements of the specification, and for consistency throughout the Technical Specifications. Specification 3.5.C.5 is deleted, with the actions previously required in this specification included in specifications 3.5.C.2, 3.5.C.3 and 3.5.C.4. The action statement for plant shutdown is revised to require the plant to be in hot shutdown in 12 hours and cold shutdown in the following 24 hours instead of requiring cold shutdown in 24 hours. Specifications 4.5.C.2, 4.5.C.3, and 4.5.C.4, which required surveillance testing of redundant components during LCOs specified in 3.5.C.2, 3.5.C.3, and 3.5.C.4, are deleted.

3.5-6 Specification 3.5.C.4 is moved to this page from page 3.5-5.

3.5-7 The requirements of specification 3.5.D.3 are incorporated into 3.5.D.2 and 3.5.D.3 is deleted. Specification 3.5.D.2 is revised to allow 14 days of operation with the HPCI system inoperable, to require verification of operability of redundant components and to clarify the requirements of the specification. Specification 3.5.D.2 is revised to require the plant to be in hot shutdown in 12 hours and steam dome pressure be reduced below 150 psig in the following 24 hours instead of cold shutdown in 24 hours. Specification 4.5.D.1.e. is moved to this page from page 3.5-6. Specification 4.5.D.1.f., requiring surveillance testing of the HPCI pump suction transfer valve is added for consistency with the surveillance requirements for the RCIC system. Specification 4.5.D.2, which requires surveillance testing of other systems during the LCO specified in 3.5.D.2, is deleted.

3.5-8 Specification 4.5.E.1.d. is moved to this page from page 3.5-7.

3.5-9 Specification 3.5.E.2 is moved to this page from page 3.5-8 and is revised to require verification of operability of redundant components and to clarify the requirements of this specification. The allowed out-of-service time for the RCIC system is changed to 14 days and the shutdown times are revised to require the plant to be in hot shutdown in 12 hours and steam dome pressure be reduced below 150 psig in the following 24 hours. Specification 3.5.E.3 is deleted as the present requirements are incorporated into revised specification 3.5.E.2. Specification 4.5.E.2, which requires the surveillance testing of HPCI system, is deleted. Specifications 3.5.F.2 and 3.5.F.3 are revised for clarity. A plant shutdown to hot shutdown in 12 hours and reduce steam dome pressure to below 100 psig in the following 24 hours replaces the requirement for an orderly plant shutdown and reduction in pressure to 100 psig in 24 hours. Specification 4.5.F.2, which requires surveillance testing of other components when an ADS valve is inoperable, is deleted.

3.5-10 Specification 3.5.G.1 is moved to this page from page 3.5-9 and revised for clarity. The action statement for plant shutdown is revised to require the plant to be in hot shutdown in 12 hours and cold shutdown in the following 24 hours instead of requiring cold shutdown in 24 hours. Specification 4.3.G.1 is revised to eliminate daily operability surveillances for all low pressure core and containment cooling subsystems and require a verification of operabilty of those subsystems.

3.5-10a A portion of the text of Specification 3.5.G.3.b is moved to this page from page 3.5-10. The word "subsystem" in Specification 3.5.G.4.(b) is replaced with the word "pump

capable of transferring water to the vessel". The parentheses on the subheadings under 3.5.G.4 are deleted.

3.5-11 Specification 3.5.G.5 is moved to this page from page 3.5-10a. Specifications 4.5.H.1.a. and 4.5.H.1.b. are revised to change the frequency of functional tests of the pressure switches to quarterly from annually and add a calibration requirement for the pressure switches with a once/operating cycle periodicity. These changes are added for consistency with the BWR 4 Standard Technical Specifications (NUREG-0123).

3.5-12 Specification 3.5.J.2 is revised for clarity, to require verification of operability of redundant components and addition of a requirement for the plant to be in hot shutdown in 12 hours and in cold shutdown in the following 24 hours. Specification 4.5.J.2, which requires surveillance testing of redundant components, is deleted. 3.5.J.3 requirements are incorporated into 3.5.J.2 and 3.5.J.3 is deleted.

NOTE: THE BASES FOR SECTION 3.5, STARTING WITH PAGE 3.5-15 ARE CONDENSED TO REMOVE BLANK SPACE.

3.5-15 The bases for Section 3.5.A are revised to correct a typographical error. The bases for Section 3.5.A are revised to delete the reference to increased frequency of testing when one component or loop is out of service.

3.5-16 The bases for Sections 3.5.B and 3.5.C are revised to add a statement from the UFSAR clarifying the number of spray headers provided for Drywell and Suppression Pool Spray subsystems. References to RHR Service Water and Containment Spray LCOs are clarified. The bases for Sections 3.5.B and 3.5.C are revised to delete the reference to increased frequency of testing when one component or loop is out of service.

3.5-17 The bases for Section 3.5.D are revised to reflect the requirement that Core Spray and LPCI must be operable during periods when HPCI is inoperable to reflect 14 day LCO for the HPCI system.

3.5-18 The basis for Section 3.5.D is revised to inlcude the requirement for low pressure ECCS and RCIC operability when HPCI is out of service. The bases for Section 3.5.E are revised to reflect 14 day LCO for the RCIC system and eliminate reference to increased HPCI system testing when RCIC is inoperable.

3.5-19 The bases for Section 3.5.F are revised to remove the reference to increased testing of the HPCI system when ADS is inoperable. The bases for Section 3.5.G are revised for clarity and consistency with the specifications.

3.5-21 The bases for Section 3.5.J are revised to eliminate reference to increased testing of the operable River Water Supply loop.

3.5-22	A typographical error in the date of APED 5736 (1968 changed to 1969) is corrected.
3.5-23	The bases for Section 4.5 are revised to change frequency of simulated automatic actuation test to "once per year" vice "once per operating cycle", delete the reference to increased frequency of testing during periods of system inoperability, and add a statement to require an evaluation of the cause of the system outage to identify any generic concerns.
3.7-16	Specification 3.7.B.3. is revised to clarify the requirements of the specification, to require verification of operability of redundant components and require the plant to be in hot shutdown in 12 hours and cold shutdown in the following 24 hours instead of cold shutdown in 24 hours. In addition, a requirement to suspend fuel handling operations if the SGTS system is inoperable, is incorporated. Specification 3.7.B.4 is deleted, as the contents are incorporated in revised specification 3.7.B.3. Specification 4.7.B.3, which required surveillance testing of redundant components, is deleted.
3.7-46	The bases for Sections 3.7.A and 4.7.A are revised to delete the reference to increased frequency of testing during periods of system inoperability.

TECHNICAL SPECIFICATIONS
TABLE OF CONTENTS

5. OPERABLE-OPERABILITY

A system, subsystem, train, component or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified function(s). Implicit in this definition shall be the assumption that all necessary attendant instrumentation, controls, normal and emergency electrical power sources, cooling or seal water, lubrication or other auxiliary equipment that are required for the system, subsystem, train, component or device to perform its function(s) are also capable of performing their related support function(s).

A verification of OPERABILITY is an administrative check, by examination of appropriate plant records (logs, surveillance test records), to determine that a system, subsystem, train, component or device is not inoperable.

6. OPERATING

Operating means that a system or component is performing its intended functions in its required manner.

7. IMMEDIATE

Immediate means that the required action will be initiated as soon as practical considering the safe operation of the unit and the importance of the required action.

8. REACTOR POWER OPERATION

Reactor power operation is any operation with the mode switch in the "Startup" or "Run" position with the reactor critical and above 1% rated power.

a) SINGLE LOOP OPERATION (SLO): REACTOR POWER OPERATION with only one of the two recirculation loops in operation.

9. HOT STANDBY CONDITION

Hot standby condition means operation with coolant temperature greater than 212°F, reactor vessel pressure less than 1055 psig, and the mode switch in the Startup/Hot Standby position.

10. COLD CONDITION

Reactor coolant temperature equal to or less than 212°F.

11. HOT SHUTDOWN

The reactor is in the shutdown mode and the reactor coolant temperature greater than 212°F.

12. COLD SHUTDOWN

The reactor is in the shutdown mode, the reactor coolant temperature equal to or less than 212°F, and the reactor vessel is vented to atmosphere.

LIMITING CONDITION FOR OPERATION	SURVEILLANCE REQUIREMENT
	b. Manually initiate the system to open both explosion actuated valves and conduct flow tests to inject demineralized water through one Standby Liquid Control pump directly into the reactor vessel. Explode one of three charges manufactured in same batch to verify proper function. Then install the untested charges in the explosion valves.
	c. Prove capability of the sodium pentaborate storage tank discharge line to convey the minimum pump flow rate of 26.2 gpm.
B. Operation with Inoperable Components	
1. With an inoperable redundant SLCS component, operation may continue provided that the redundant SLCS components are verified to be OPERABLE; restore the inoperable component to OPERABLE status within 7 days.	
C. Sodium Pentaborate Solution	C. Sodium Pentaborate Solution
At all times when the Standby Liquid Control System is required to be operable the following conditions shall be met:	The following tests shall be performed to verify the availability of the Liquid Control Solution:
1. The net volume versus concentration of the Liquid Control Solution in the liquid control tank shall be maintained as required in Figure 3.4-1.	1. Volume: Check and record at least once per day.

rule requirements,* only one of the two standby liquid control pumps is needed for meeting the SLCS design basis. One inoperable pumping circuit does not immediately threaten shutdown capability, and reactor operation can continue while the circuit is being repaired. Assurance that the remaining system will perform its intended function and that the long-term average availability of the system is not reduced is obtained for a one-out-of-two system by an allowable equipment out-of-service time of one third of the normal surveillance frequency. This method determines an equipment out-of-service time of ten days. Additional conservatism is introduced by reducing the allowable out-of-service time to seven days.

3. Level indication and alarm indicate whether the solution volume has changed, which might indicate a possible solution concentration change. The test interval has been established in consideration of these factors. Temperature and liquid level alarms for the system are annunciated in the control room.

* The NRC's final rule on Anticipated Transients Without Scram (ATWS), 10 CFR §50.62, requires that the Standby Liquid Control System (SLCS) be modified to provide an equivalent shutdown capability of 86 gpm at 13.4 weight percent natural boron for a 251 inch I.D. vessel. For the DAEC, ATWS equivalence is achieved by running both SLCS pumps simultaneously at a minimum combined flow of 45 gpm at a nominal boron concentration of 13% weight percent natural boron, (NEDC-30859, "Duane Arnold ATWS Assessment," December, 1984). (The equivalence is also met if both pumps supply their minimum tech spec flowrate of 26.2 gpm each with a solution concentration of at least 11.2 weight percent natural boron.) Because ATWS is a very low probability event and is considered to be beyond the design basis for the DAEC, the surveillance and LCO requirements need not be more stringent than the original SLCS design basis requirements.

LIMITING CONDITION FOR OPERATION	SURVEILLANCE REQUIREMENT	
	Item	Frequency
	d. Pump flow rate- Both loops shall deliver at least 3020 gpm against a system head corresponding to a reactor vessel pressure of 113 psig.	Once/3 months
2. With one Core Spray subsystem inoperable, provided the other Core Spray subsystem, LPCI, and the diesel generators are verified to be OPERABLE, restore the inoperable Core Spray subsystem to OPERABLE status within 7 days.		

LIMITING CONDITION FOR OPERATION	SURVEILLANCE REQUIREMENT
3. The LPCI Subsystem shall be OPERABLE whenever irradiated fuel is in the reactor vessel, and prior to reactor startup from a COLD CONDITION, except as specified in 3.5.A.4, 3.5.A.5 and 3.5.G.3 below.	3. LPCI Subsystem Testing shall be as follows:

Item	Frequency
a. Simulated Automatic Actuation Test	Annual
b. Pump Operability	Once/3 months
c. Motor Operated Valve Operability	Once/3 months
d. Pump Flow Rate Three LPCI pumps shall deliver 14,400 gpm against a system head corresponding to a vessel pressure of 20 psig based on individual pump tests.	Once/3 months
e. Once per shift visually inspect and verify that RHR valve panel lights and instrumentation are functioning normally.	

4. With one RHR (LPCI) pump inoperable, provided the remaining RHR (LPCI) active components, both Core Spray subsystems, the containment spray subsystem, and the diesel generators are verified to be OPERABLE, restore the inoperable RHR (LPCI) pump to OPERABLE status within 30 days.

5. With two RHR (LPCI) pumps inoperable, providing both Core Spray subsystems, the containment spray subsystem, and the diesel generators are verified to be OPERABLE, restore at least one RHR (LPCI) pump to OPERABLE status within 7 days.

LIMITING CONDITION FOR OPERATION	SURVEILLANCE REQUIREMENT
6. Otherwise, be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.	
B. <u>Containment Spray Cooling Capability</u>	B. <u>Containment Spray Cooling Capability</u>
1. The suppression pool and drywell spray modes of the residual heat removal (RHR) system shall be OPERABLE with two independent loops each when the reactor water temperature is greater than 212°F except as specified in 3.5.B.2 and 3.5.B.3.	Surveillance of the containment spray loops shall be performed as follows: 1. During each five year period, an air test shall be performed on the drywell and suppression pool spray headers and nozzles.
2. With one suppression pool spray loop and/or one drywell spray loop inoperable, restore the inoperable loop to OPERABLE status within 30 days or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.	
3. With both suppression pool spray loops and/or both drywell spray loops inoperable, restore at least one loop to OPERABLE status within 8 hours or be in HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.	

LIMITING CONDITION FOR OPERATION	SURVEILLANCE REQUIREMENT
C. Residual Heat Removal (RHR) Service Water System	C. Surveillance of the RHR Service Water System
1. Except as specified in 3.5.C.2, 3.5.C.3, 3.5.C.4, 3.5.C.5, and 3.5.G.3 below, both RHR service water subsystem loops shall be operable whenever irradiated fuel is in the reactor vessel and reactor coolant temperature is greater than 212°F.	1. Surveillance of the RHR service water system shall be as follows: RHR Service Water Subsystem Testing: Item — Frequency a. Pump and Motor operated valve operability. — Once/3 months b. Flow Rate Test-Each RHR service water pump shall deliver at least 2040 gpm at a TDH of 610 ft. or more. — after major pump maintenance and every 3 months
2. With one RHRSW pump inoperable, provided the remaining active components of both RHRSW subsystems are verified to be OPERABLE, restore the inoperable pump to OPERABLE status within 30 days or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.	
3. With one RHRSW pump in each subsystem inoperable, provided the remaining active components of both RHRSW subsystems and the diesel generators are verified to be OPERABLE, restore at least one inoperable pump to OPERABLE status within 7 days or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.	

LIMITING CONDITION FOR OPERATION	SURVEILLANCE REQUIREMENT
4. With one RHRSW subsystem inoperable, provided the remaining RHRSW subsystem and its associated diesel generator are verified to be OPERABLE, restore the inoperable system to OPERABLE status with at least one OPERABLE pump within 7 days or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.	
D. HPCI Subsystem	D. HPCI Subsystem
1. The HPCI Subsystem shall be OPERABLE whenever there is irradiated fuel in the reactor vessel, reactor pressure is greater than 150 psig, and prior to reactor startup from a COLD CONDITION, except as specified in 3.5.D.2 and 3.5.D.3 below.	1. HPCI Subsystem testing shall be performed as follows:

	Item	Frequency
a.	Simulated Automatic Actuation Test	Annual
b.	Pump Operability	Once/3 Months
c.	Motor Operated Valve Operability	Once/3 Months
d.	At rated reactor pressure demonstrate ability to deliver rated flow at a discharge pressure greater than or equal to that pressure required to accomplish vessel injection if vessel pressure were as high as 1040 psig.	Once/3 months

LIMITING CONDITION FOR OPERATION	SURVEILLANCE REQUIREMENT	
	e. At reactor pressure of 150 +/- 10 psig demonstrate ability to deliver rated flow at a discharge pressure greater than or equal to that pressure required to accomplish vessel injection.	Once/operating cycle
2. With HPCI inoperable, provided that both Core Spray subsystems, LPCI, ADS, and RCIC are verified to be OPERABLE, restore HPCI to OPERABLE status within 14 days. or be in at least HOT SHUTDOWN within the next 12 hours and reduce reactor steam dome pressure to less than or equal to 150 psig within the following 24 hours.	The HPCI pump shall deliver at least 3000 gpm for a system head corresponding to a reactor pressure of 1040 to 150 psig.	
	f. Verify that the suction for the HPCI system is automatically transferred from the condensate storage tank to the suppression pool on a condensate storage tank water level-low signal and on a suppression pool water level-high signal.	Once/operating Cycle
E. <u>Reactor Core Isolation Cooling (RCIC) Subsystem</u>	E. <u>Reactor Core Isolation Cooling (RCIC) Subsystem</u>	
1. The RCIC Subsystem shall be OPERABLE whenever there is irradiated fuel in the reactor vessel, the reactor pressure is greater than 150 psig, and prior to reactor startup from a COLD CONDITION, except as specified in 3.5.E.2 below.	1. RCIC Subsystem testing shall be performed as follows:	
	<u>Item</u>	<u>Frequency</u>
	a. Simulated Automatic Actuation Test (and restart)	Annual
	b. Pump Operability	Once/3 months
	c. Motor Operated Valve Operability	Once/3 months

LIMITING CONDITION FOR OPERATION	SURVEILLANCE REQUIREMENT	
	Item	Frequency
	d. At rated reactor pressure demonstrate ability to deliver rated flow at a discharge pressure greater than or equal to that pressure required to accomplish vessel injection if vessel pressure were as high as 1040 psig.	Once/3 months
	e. At reactor pressure of 150 ± 10 psig demonstrate ability to deliver rated flow at a discharge pressure greater than or equal to that pressure required to accomplish vessel injection. The RCIC pump shall deliver at least 400 gpm for a system head corresponding to 1040 to 150 psig.	Once/operating cycle
	f. Verify that the suction for the RCIC system is automatically transferred from the condensate storage tank to the suppression pool on a condensate storage tank water level-low signal.	Once/operating cycle

LIMITING CONDITION FOR OPERATION	SURVEILLANCE REQUIREMENT
2. With the RCIC system inoperable, provided the HPCI system is verified to be OPERABLE, restore the RCIC system to OPERABLE status within 14 days or be in at least HOT SHUTDOWN within the next 12 hours and reduce reactor steam dome pressure to less than or equal to 150 psig within the following 24 hours.	
F. <u>Automatic Depressurization System(ADS)</u>	F. <u>Automatic Depressurization System(ADS)</u>
1. The Automatic Depressurization Subsystem shall be OPERABLE whenever there is irradiated fuel in the reactor vessel and the reactor pressure is greater than 100 psig and prior to a startup from a Cold Condition, except as specified in 3.5.F.2 below.	1. Once per operating cycle the following tests shall be performed on the ADS: a. A simulated automatic actuation test shall be performed prior to startup from each REFUELING OUTAGE. b. The ADS Nitrogen Accumulator check valves will be leak tested for a maximum acceptable system leakage rate of 25 scc/minute.
2. With one ADS valve inoperable, provided that HPCI is verified to be OPERABLE, restore the inoperable ADS valve to OPERABLE status within 30 days or be in at least HOT SHUTDOWN within the next 12 hours and reduce reactor steam dome pressure to less than or equal to 100 psig within the following 24 hours.	
3. With two or more ADS valves inoperable, be in at least HOT SHUTDOWN within the next 12 hours and reduce reactor steam dome pressure to less than or equal to 100 psig within the following 24 hours.	

LIMITING CONDITION FOR OPERATION	SURVEILLANCE REQUIREMENT
G. Minimum Low Pressure Cooling and Diesel Generator Availability	G. Minimum Low Pressure Cooling and Diesel Generator Availability
1. During any period when one diesel generator is inoperable, continued reactor operation is permissible only during the succeeding seven days unless such diesel generator is sooner made OPERABLE, provided that the remaining diesel generator and all low pressure core and containment cooling subsystems supported by the OPERABLE diesel generator are OPERABLE. If this requirement cannot be met, an orderly SHUTDOWN shall be initiated and the reactor shall be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.	1. When it is determined that one diesel generator is inoperable, the remaining diesel generator shall be demonstrated to be OPERABLE within eight (8) hours and daily thereafter. In addition, all low pressure core cooling and containment cooling subsystems supported by the OPERABLE diesel shall be verified to be OPERABLE.
2. Any combination of inoperable components in the core and containment cooling systems shall not defeat the capability of the remaining OPERABLE components to fulfill the cooling functions.	
3. When irradiated fuel is in the reactor vessel and the reactor is in the COLD SHUTDOWN Condition or Refuel Mode:	
a. If no work is being performed which has the potential for draining the reactor vessel, both core spray and RHR systems may be inoperable; or	
b. If work is being performed which has the potential for draining the reactor vessel, at least two of any combination of core spray and/or RHR (LPCI or shutdown cooling mode) pumps shall be OPERABLE (including the capability to inject water into the reactor vessel with suction from the suppression pool) except as	

LIMITING CONDITION FOR OPERATION	SURVEILLANCE REQUIREMENT
specified in Specification 3.5.G.3.b(1) and (2), below. A diesel generator required for operation of at least one of these pumps shall be OPERABLE. (1) With one of the two pumps inoperable, restore the inoperable pump to OPERABLE status within four hours or suspend all operations with a potential for draining the reactor vessel. (2) With both pumps inoperable, suspend all operations with a potential for draining the reactor vessel. 4. During a refueling outage, CORE ALTERATIONS may continue with the suppression pool volume below the minimum values specified in Specification 3.7.A.1 provided all of the following conditions are met: a. The reactor head is removed, the cavity is flooded, the spent fuel pool gates are removed and spent fuel pool water level is maintained within the limits of Specification 3.9.C. b. At least one Core Spray pump capable of transferring water to the vessel is OPERABLE with suction aligned to the condensate storage tank(s). c. The condensate storage tanks contain at least 75,000 gallons of water which is available to the core spray subsystem. Condensate storage tank(s) level shall be recorded at least every 12 hours. d. No work is being performed which has the potential for draining the reactor vessel.	

LIMITING CONDITION FOR OPERATION	SURVEILLANCE REQUIREMENT
5. If the requirements of Specification 3.5.G.4 cannot be met, suspend CORE ALTERATIONS.	
H. Maintenance of Filled Discharge Pipe	H. Maintenance of Filled Discharge Pipe
1. Whenever core spray subsystems, LPCI subsystems, HPCI, or RCIC are required to be OPERABLE, the discharge piping from the pump discharge of these systems to the last block valve shall be filled.	1. The following surveillance requirements shall be adhered to, to assure that the discharge piping of the core spray and LPCI subsystems are filled:
a. If the pump discharge piping of the core spray or LPCI subsystems depressurizes below the system low pressure alarm setpoint while these systems are required to be OPERABLE, the pressure shall be restored within one hour.	a. The pressure switches which monitor the LPCI and core spray lines to ensure they are full shall be functionally tested quarterly.
b. If Specification 3.5.H.1 or 3.5.H.1.a cannot be met, either place the affected system(s) in the test mode or declare the affected system(s) inoperable and enter the applicable LIMITING CONDITION FOR OPERATION as described in Specification 3.5.A, 3.5.D or 3.5.E.	b. The pressure switches which monitor the LPCI and Core Spray lines to ensure they are full shall be calibrated once per operating cycle.
I. Engineered Safeguards Compartments Cooling and Ventilation	I. Engineered Safeguards Compartments Cooling and Ventilation
If both unit coolers serving either the RCIC or HPIC room are out of service, the associated pump shall be considered inoperable for purposes of Specifications 3.5.D or 3.5.E as applicable.	The unit coolers for each of the RCIC, HPCI, Core Spray, and RHR pump rooms shall be checked for operability during surveillance testing of the associated pumps.
If the single unit cooler serving either compartment which houses two RHR pumps and a core spray pump is out of service for a period greater than seven days, the associated pumps shall be considered inoperable for purposes of Specification 3.5.A.	

LIMITING CONDITION FOR OPERATION

J. River Water Supply System

1. Except as specified in 3.5.J.2 below, at least one pump in each river water supply system loop shall be OPERABLE whenever irradiated fuel is in the reactor vessel and reactor coolant temperature is greater than 212°F.

2. With one river water supply loop inoperable, provided the other river water supply loop and its associated diesel generator are verified to be OPERABLE, restore at least one pump in the inoperable loop to OPERABLE status within 7 days or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

SURVEILLANCE REQUIREMENT

J. River Water Supply System

1. River Water Supply System Testing:

	Item	Frequency
a.	Simulated automatic actuation test.	Once/operating cycle
b.	Pump and motor operated valve operability.	Once/3 months
c.	Flow Rate Test	
	Each river water supply system pump shall deliver at least 6000 gpm at TDH of 46 ft. or more.	After major pump maintenance and once per 3 months Daily when river elevation is less than 727 feet.
d.	Operating Pump Flow Rate Demonstration	
	Each Operating River Water Supply System Pump shall deliver at least 6000 gpm.	Daily

Core spray distribution has been shown, in full-scale tests of systems similar in design to that of DAEC to exceed the minimum requirements. In addition, cooling effectiveness has been demonstrated at less than half the rated flow in simulated fuel assemblies with heater rods to duplicate the decay heat characteristics of irradiated fuel. The accident analysis is additionally conservative in that no credit is taken for spray coolant entering the reactor before the internal pressure has fallen to 150 psig.

The LPCI subsystem is designed to provide emergency cooling to the core by flooding in the event of a loss-of-coolant accident. This system functions in combination with the core spray system to prevent excessive fuel clad temperature. The LPCI subsystem and the core spray subsystem provide adequate cooling for break areas of approximately 0.2 square feet up to and including the double-ended recirculation line break without assistance from the high pressure emergency core cooling subsystems.

The allowable repair times are established so that the average risk rate for repair would be no greater than the basic risk rate. The method and concept are described in Reference 1.

Using the results developed in this reference, the repair period is found to be 1/2 the test interval. This assumes that the core spray subsystems and LPCI constitute a 1 out of 3 system; however, the combined effect of any of the two subsystems to limit excessive clad temperatures must also be considered.

The surveillance requirements provide adequate assurance that the Core Spray subsystems and the LPCI subsystem will be operable when required.

Should the loss of one LPCI pump occur, a nearly full complement of core and containment spray equipment is available. The remaining three LPCI pumps and a core spray subsystem will perform the core cooling function. Because of the availability of the majority of the core cooling equipment, which will be verified to be operable, a thirty day repair period is justified. If the LPCI subsystem is not available, at least 1 LPCI pump must be available to fulfill the containment spray function. The 7 day repair period is set on this basis.

B & C. Containment Spray and RHR Service Water

The containment spray subsystem for DAEC consists of 2 loops each with 2 LPCI pumps and 2 RHR service water pumps per loop. The water pumped through the RHR heat exchangers may be diverted to two spray headers in the drywell and one above the suppression pool. The design of these systems is predicated upon use of 1 LPCI, and 2 RHR service water pumps for heat removal after a design basis event. Thus, there are ample spares for margin above the design conditions. Loss of margin should be avoided and the equipment maintained in a state of operability so a 30-day out-of-service time is chosen for this equipment. If one loop is out-of-service, or one pump in each loop is out-of-service, reactor operation is permitted for seven days. The surveillance requirements provide adequate assurance that the Containment Spray subsystem and RHRSW system will be operable when required.

Analyses were performed to determine the minimum required flow rate of the RHR Service Water pumps in order to meet the design basis case (Reference 4) and the NUREG-0783 requirements (Reference 5). (See Section 3.7.A.1 Bases for a discussion of the NUREG requirements). The results of these analyses justify reducing the required flowrate to 2040 gpm per pump, a 15% reduction in the original 2400 gpm per pump requirement.

D. HPCI System

The HPCI system is provided to assure that the reactor core is adequately cooled to limit fuel clad temperature in the event of a small break in the nuclear system and loss-of-coolant, which does not result in rapid depressurization of the reactor vessel. The HPCIS permits the reactor to be shut down while maintaining sufficient reactor vessel water level inventory until the vessel is depressurized. The HPCIS continues to operate until reactor vessel pressure is below the pressure at which LPCI operation or Core Spray System operation maintains core cooling.

The capacity of the system is selected to provide this required core cooling. The HPCI pump is designed to pump 3000 gpm at reactor pressures between approximately 1135 and 150 psig. Two sources of water are available. Initially, demineralized water from the condensate storage tank is used instead of injecting water from the suppression pool into the reactor.

When the HPCI System begins operation, the reactor depressurizes more rapidly than would occur if HPCI was not initiated due to the condensation of steam by the cold fluid pumped into the reactor vessel by the HPCI System. As the reactor vessel pressure continues to decrease, the HPCI flow momentarily reaches equilibrium with the flow through the break. Continued depressurization causes the break flow to decrease below the HPCI flow and the liquid inventory begins to rise. This type of response is typical of the small breaks. The core never uncovers and is continuously cooled throughout the transient so that no core damage of any kind occurs for breaks that lie within the capacity range of the HPCI.

As mentioned in Section 6.3.1 of the Updated FSAR, the ADS provides a single failure proof path for depressurization for postulated transients and accidents. The RCIC serves as an alternate to the HPCI only for decay heat removal even if the feedwater is assumed to be lost. The surveillance requirements provide adequate assurance that the HPCI system will be operable when required. With the HPCI system inoperable, adequate core cooling is assured by the operability of the redundant and diversified ADS and both the CS and LPCI systems. The HPCI out-of-service period of 14 days is based on the

operability of redundant and diversified low pressure core cooling systems and the RCIC system.

The HPCI and RCIC as well as all other Core Standby Cooling Systems must be operable when starting up from a Cold Condition. It is realized that the HPCI is not designed to operate until reactor pressure exceeds 150 psig and is automatically isolated before the reactor pressure decreases below 100 psig. It is the intent of this specification to assure that when the reactor is being started up from a Cold Condition, the HPCI is not known to be inoperable.

E. RCIC System

The RCIC is designed to provide makeup to the nuclear system as part of the planned operation for periods when the main condenser is unavailable. RCIC also serves for decay heat removal when feedwater is lost. In all other postulated accidents and transients, the ADS provides redundancy for the HPCI. Based on this, an allowable repair time of 1 month is justified, however, a maximum allowable repair time of 14 days is selected for conservatism.

F. Automatic Depressurization System (ADS)

The operability of the ADS under all conditions of depressurization of the nuclear system automatically or manually, insures an essential response to station abnormalities.

The nuclear system pressure relief system provides automatic nuclear system depressurization for small breaks in the nuclear system so that the low pressure coolant injection (LPCI) and the core spray subsystems can operate to protect the fuel barrier.

Because the Automatic Depressurization System does not provide makeup to the reactor primary vessel, no credit is taken for the steam cooling of the core caused by the system actuation to provide further conservatism to the CSCS. Performance analysis of the Automatic Depressurization System is considered only with respect to its depressurizing effect in conjunction with LPCI and Core Spray and is based on 3 valves. There are four valves in the ADS and each has a capacity of approximately 810,000 lb/hr at a set pressure of 1125 psig.

The allowable out-of-service time for one ADS valve is determined as thirty days because of the redundancy and provided the HPCI system is operable. Therefore, redundant protection for the core with a small break in the nuclear system is still available.

The ADS test circuit permits continued surveillance on the operable relief valves to assure that they will be available if required.

The Nitrogen Supply to the ADS utilizes accumulators and inlet check valves to ensure the operability of the ADS in the event that a break occurs in the nonseismic portion of the nitrogen supply piping. The accumulators are sized to allow the ADS to operate at least 5 times after a period of 100 days post accident with a maximum system leakage rate of 30 scc/minute. To provide an additional margin of safety, the leakage test allows for a maximum acceptable leakage rate of 25 scc/minute.

G. Minimum Low Pressure Cooling and Diesel Generator Availability

The purpose of Specification G is to assure that adequate core and containment cooling equipment (i.e., as specified in Specifications 3.5.A, 3.5.B and 3.5.C) is available at all times. It is during refueling outages that major maintenance is performed and during such time that all low pressure core cooling systems may be out of service. This specification provides that should this occur, no work will be performed on the primary system which could lead to draining the vessel. Work would include work on certain control rod drive components and recirculation system. Thus, the specification precludes the events which could require core cooling. If work must be performed which has the potential for draining the vessel, Specification 3.5.G.3.b requires that certain low pressure core cooling subsystems be available and capable of injecting water into the reactor vessel from the suppression pool water supply. The condensate storage tanks are not considered to be an appropriate water supply as they are not safety related and could provide makeup water for core cooling for only a finite period of time.

The makeup capability of either one core spray pump or one low pressure coolant injection (LPCI) pump is more than double the leakage rate expected from a

postulated failure of the control rod velocity limiter section. Since the system cannot be pressurized during refueling, the potential need for core flooding only exists and the specified combination of the core spray or the LPCI system can provide this. Specification 3.8 must also be consulted to determine other requirements for the diesel generators. To prevent extensive wear and stress on the diesel engines, the diesels are manually started and the speed incrementally increased to synchronous speed.

H. Maintenance of Filled Discharge Pipe

If the discharge piping of the core spray, LPCI subsystem, HPCI, and RCIC are not filled, a water hammer can develop in this piping when the pump and/or pumps are started. If a water hammer were to occur at the time at which the system were required, the system would still perform its design function. However, to minimize damage to the discharge piping, Specification 3.5.H requires that the core spray and LPCI discharge piping pressure be restored within one hour after system depressurization when the system is required to be operable. Likewise, for HPCI and RCIC, the discharge piping to the last block valve shall be filled when these systems are required to be operable. If the discharge piping pressure for the core spray and LPCI subsystems cannot be restored within one hour or the discharge piping for HPCI and RCIC cannot be maintained in a filled condition to the last block valve, the operator is required to perform either of the following actions:

1) place the affected system(s) in the test mode which will ensure that the discharge piping is filled with water, or

2) declare the affected system(s) inoperable in which case the operator will enter the applicable LCO for the affected system(s) as defined in Specification 3.5.A (core spray and LPCI), 3.5.D (HPCI), or 3.5.E (RCIC).

The above actions minimize the possibility of a water hammer and are considered conservative in nature.

I. Engineered Safeguards Compartments Cooling and Ventilation

One unit cooler in each pump compartment is capable of providing adequate ventilation flow and cooling. Engineering analyses indicate that the temperature rise in safeguards compartments without adequate ventilation flow or cooling is such that continued operation of the safeguards equipment or associated auxiliary equipment cannot be assured.

J. River Water Supply System

Four river water supply pumps in two loops of two pumps each are provided. Both loops discharge into the wet-pit sump of the RHR and emergency service water system. One river water supply pump is sufficient to supply water to an entire train of RHR and emergency service water pumps, which in turn provide sufficient service water for containment and component cooling after a loss-of-coolant accident. An additional pump is required to be operable in Specification 3.5.J.1 to provide a completely redundant river water supply for the other RHR and emergency service water train. Because of the almost continuous operation of the river water supply system during normal operation, two additional pumps, for a total of four, have been installed to provide flexibility in maintenance and operation as well as additional system reliability.

In the event that one river water supply system loop becomes inoperable, plant operation is restricted to seven days.

3.5 REFERENCES

1. Jacobs, I.M., Guidelines for Determining Safe Test Intervals and Repair Times for Engineered Safeguards, General Electric Company, APED, April, 1969 (APED 5736).

2. General Electric Company, The GESTR-LOCA and SAFER Models for the Evaluation of Loss-of-Coolant Accident, NEDC-23785-P, October, 1984.

3. General Electric, Duane Arnold Energy Center SAFER/GESTR-LOCA Loss-of-Coolant Accident Analysis, NEDC-31310P, June, 1988.

4. General Electric Company, Analysis of Reduced RHR Service Water Flow at the Duane Arnold Energy Center, NEDE-30051-P, January, 1983.

5. General Electric Company, Duane Arnold Energy Center Suppression Pool Temperature Response, NEDC-22082-P, March, 1982.

4.5 BASES

Core and Containment Cooling Systems Surveillance Frequencies

The testing interval for the core and containment cooling systems is based on industry practice, quantitative reliability analysis, judgement and practicality. The core cooling systems have not been designed to be fully testable during operation. For example, in the case of the HPCI, automatic initiation during power operation would result in pumping cold water into the reactor water vessel which is not desirable. Complete ADS testing during power operation causes an undesirable loss-of-coolant inventory. To increase the availability of the core and containment cooling systems, the components which make up the system, i.e., instrumentation, pumps, valves, etc., are tested frequently. The pumps and motor operated injection valves are also tested every three months to assure their operability. The test intervals are based upon Section XI of the ASME Code. A simulated automatic actuation test once per year combined with frequent tests of the pumps and injection valves is deemed to be adequate testing of these systems.

When components and subsystems are out-of-service, overall core and containment cooling reliability is maintained by evaluating the operability of the remaining equipment. The degree of evaluation depends on the nature of the reason for the out-of-service equipment. For routine out-of-service periods caused by preventative maintenance, etc., the evaluation may consist of verifying the redundant equipment is not known to be inoperable and applicable surveillance intervals have been satisfied. However, if a failure due to a design deficiency caused the outage, then the evaluation of operability should be thorough enough to assure that a generic problem does not exist.

The RHR valve power bus is not instrumented. For this reason surveillance requirements require once per shift observation and verification of lights and instrumentation operability.

LIMITING CONDITION FOR OPERATION	SURVEILLANCE REQUIREMENT
2.a The results of the inplace cold DOP and halogenated hydrocarbon tests in the flow range of 3600-4000 cfm on HEPA filters and charcoal adsorber banks shall show ≥ 99.9% DOP removal and ≥ 99.9% halogenated hydrocarbon removal.	2.a The tests and sample analysis of Specification 3.7.B.2 shall be performed initially and then annually for standby service or after every 720 hours of system operation and following significant painting, fire or chemical release in any ventilation zone communicating with the system.
b. The results of laboratory carbon sample analysis shall show < 1.0% penetration of radioactive methyl iodide at 70% R.H., 150°F, 40 ± 4 FPM face velocity with an inlet concentration of 0.5 to 1.5 mg/m inlet concentration methyl iodide.	b. Cold DOP testing shall be performed after each complete or partial replacement of the HEPA filter bank or after any structural maintenance on the system housing.
c. Fans shall be shown to be capable of operation from 1800 cfm to the flow range of 3600-4000 cfm.	c. Halogenated hydrocarbon testing shall be performed after each complete or partial replacement of the charcoal adsorber bank or after any structural maintenance on the system housing.
	d. Each circuit shall be operated with the heaters on at least 10 hours every month.
3. With one train of SGTS inoperable, operation or fuel handling may continue provided the remaining SGTS is verified to be OPERABLE; restore the inoperable SGTS train to OPERABLE status within 7 days or be in at least HOT SHUTDOWN within 12 hours and in COLD SHUTDOWN within the following 24 hours and suspend fuel handling operations.	

Demonstration of the automatic initiation capability and operability of filter cooling is necessary to assure system performance capability.

Initiating reactor building isolation and operation of the standby gas treatment system to maintain at least 1/4 inch of water vacuum within the secondary containment provides an adequate test of the operation of the reactor building isolation valves, leaktightness of the reactor building and performance of the standby gas treatment system. Functionally testing the initiating sensors and associated trip channels demonstrates the capability for automatic actuation. Performing these tests prior to refueling will demonstrate secondary containment capability prior to the time the primary containment is opened for refueling. Periodic testing gives sufficient confidence of reactor building integrity and standby gas treatment system performance capability.

8. Primary Containment Power Operated Isolation Valves

Automatic isolation valves are provided on process piping which penetrates the containment and communicates with the containment

SAFETY ANALYSIS

1. INTRODUCTION

By submittal dated December 14, 1990, we propose to modify the Duane Arnold Energy Center (DAEC), Technical Specifications (TS) to delete certain Surveillance Requirement (SR) testing of redundant equipment during a Limiting Condition for Operation (LCO). In place of the existing TS SR testing for the remaining operable equipment during an LCO condition, we propose to perform an administrative verification of the operability of redundant equipment. We perform periodic American Society of Mechanical Engineers (ASME), Section XI tests for ECCS, RCIC, SGTS, River Water Supply, RHRSW, and SLCS. These ASME tests are typically conducted once every three months for both pumps and valves per the DAEC TSs. These tests are more rigorous than the existing TS SR operability tests.

We also propose extending the allowed out of service times (AOTs) for the RCIC and HPCI systems from 7 days to 14 days and revising the LCO pertaining to instances when the TS requires an orderly reactor shutdown to read "hot shutdown in 12 hours and cold shutdown within the following 24 hours" instead of "cold shutdown in 24 hours" in a number of instances. These changes are consistent with the requirements and terminology found in the Standard Technical Specifications (NUREG-0123, Revision 3).

A new LCO for suppression pool sprays is proposed along with increased surveillance for ECCS keep-filled pressure switches and HPCI suction transfer logic. In addition, general minor editorial changes are also proposed.

2. EVALUATION

We propose, by submittal referenced above, to modify the DAEC TS SR during LCOs in which a redundant component is declared inoperable. Specifically, during instances where an ECCS loop is declared inoperable, We propose to delete the current requirements for an immediate demonstration of operability of the remaining redundant loop and the requirement for demonstration of operability of that same redundant loop "daily thereafter."

We have implemented ASME Section XI testing for Class 1, 2, and 3 components that are required to perform a specific function in shutting down the reactor or in mitigating the consequences of an accident. The frequency of these inservice tests is nominally every 3 months during normal plant operations.

The required ASME Section XI testing is a more rigorous verification of pump and valve operability than that required by the existing DAEC TS operability verification for redundant operable equipment. Under the current DAEC TS, the redundant operable ECCS, Reactor Core Isolation Cooling (RCIC) and Standby Gas Treatment (SGTS) systems could be tested seven times a week, for the worst case, just to verify operability. We believe that this is excessive testing and over the life of DAEC could result in undue and unnecessary component wear. Daily testing also increases the probability of equipment failure, and the potential for human error during system

line-up, actual system testing, or returning the operable system to a standby readiness condition.

Also, during the performance of this additional testing, the operable ECCS, RCIC, SLCS, or SGTS loop could be in a condition where it may not be able to perform its intended safety function. In addition, this additional testing requires additional attention by the operator to line up the system for testing, perform the actual test, and restore it back to its required mode of operation. Doing this daily, while the other ECCS, RCIC, SLCS, or SGTS loop is inoperable, would provide an additional and unnecessary distraction from the operator's other activities and responsibilities in the control room.

In lieu of performing the aforementioned additional testing, we will verify that redundant components, systems or subsystems are operable. The following guidelines will be used when verifying the operability of redundant components, systems or subsystems when Technical Specifications require a component, system or subsystem to be "verified operable."

a. Inspect the appropriate records to determine if the components, systems or subsystem satisfactorily completed its most recent surveillance test.

b. Inspect the appropriate records to determine if the most recent surveillance test is currently valid. The most recent surveillance test would be invalid ("expired") if the elapsed time interval since the last test is greater than the maximum allowable test interval.

c. Review the temporary modification log to determine if any temporary modifications are currently in place that would prevent the component, system or subsystem from performing its intended function.

d. Review the protective tagging system records to determine if any protective tags are currently in place that would prevent the component, system or subsystem from performing its intended function.

e. Inspect the controls, annunciators and indicators associated with the components, system or subsystem to determine if any parameters or controls indicate that it would not perform its intended function.

f. Review the operating logs and shift turnover records to determine if any other conditions exist that would prevent the components, systems or subsystem from performing its intended function.

These actions are consistent with those recommended by the NRC Staff in a Generic Letter dated April 10, 1980.

In summary, by deleting the existing surveillance tests and complying with the ASME Section XI testing, DAEC is in compliance with the intent of 10 CFR 50.55a and current industry standards.

The allowed out-of-service times (AOTs) for the HPCI and RCIC systems were determined utilizing methodology used in originally determining the AOTs for components, subsystems or systems at the DAEC. (References: "Methods for Calculating Safe Test Intervals and Allowable Repair Times for Engineered Safeguard Systems," NEDO-10739, January 1973 and "Guidelines for

Determining Safe Test Intervals and Repair Times for Engineered Safeguards," APED 5736, 1969). The AOTs determined using this methodology are greater than specified AOTs, thus, the LCOs are conservative.

The TS required shutdown action statement is revised from "cold shutdown within 24 hours" to "hot shutdown in 12 hours and cold shutdown in the following 24 hours." This revision will allow a more controlled shutdown of the plant, should it be required by the TSs, thus minimizing the likelyhood of plant transients during plant shutdowns. The revised requirement is analogous to the NRC staff position as stated in NRC Generic Letter 87-09, which allows a 24 hour grace period for performance of missed surveillances so as not to risk plant transients during plant shutdowns.

The suppression pool spray LCO and the instrument and logic surveillances were added for consistency with the requirements for similar equipment in the Technical Specifications.

We also proposed to modify the applicable TS Bases sections to reflect the proposed changes documented above.

We have evaluated all of the above proposed TS deletions and changes and have found that over the life of the DAEC, these proposed TS revisions will result in a significant reduction in unnecessary component testing. The ASME Section XI testing frequency, once per 3 months for the ECCS, RCIC, SLCS, and SGTS components, is adequate to ensure system functional operability for instances when redundant equipment is declared inoperable. These frequencies are equivalent to those required by NUREG-0123, Revision 3, Standard Technical Specifications for General Electric Boiling Water Reactors. The proposed changes are also consistent with the intent of the testing required by 10 CFR 50.55a and current industry standards. Therefore, we find the proposed deletions, additions and changes discussed above to be acceptable.