PROPOSED CHANGE TO RTS-141
TO
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 proposed pages. A list of the affected pages is included.

The proposed amendment incorporates a common reference level for reactor vessel water level instrumentation as described in NUREG-0737, item II.K.3.27. This item was also discussed in the NRC order of July 10, 1981 and NRC staff review of Iowa Electric's proposed implementation is documented by NRC letter of April 15, 1982 to Mr. Duane Arnold from Mr. Domenic Vassallo.

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LIMITING CONDITIONS FOR OPERATION	SURVEILLANCE REQUIREMENT

3. APRM Rod Block when in Run Mode.

   For operation with MFLPD less than or equal to FRP the APRM Control Rod Block setpoint shall be as shown on Figure 2.1-1 and shall be:

   $S \leq (0.66\ W + 42)$

   The definitions used above for the APRM scram trip apply.

   For a MFLPD greater than FRP, the APRM Control Rod Block setpoint shall be:

   $$S \leq (0.66\ W + 42)\ \frac{FRP}{MFLPD}$$

4. IRM - The IRM scram shall be set at less than or equal to 120/125 of full scale.

B.	Scram and Isolation on reactor low water level	≥ 514.5 inches above vessel zero (+170" indicated level)
C.	Scram - turbine stop valve closure	≤ 10 percent valve closure

D. Turbine control valve fast closure shall occur within 30 milliseconds of the start of turbine control valve fast closure.

LIMITING CONDITIONS FOR OPERATION	SURVEILLANCE REQUIREMENT	
	E. Scram - main steam line isolation valve	< 10 percent valve closure
	F. Main steam isolation valve closure nuclear system low pressure	> 880 psig
	G. Core spray & LPCI actuation - reactor low level	> 363 inches above vessel zero (+18.5 inches water indicated level)
	H. HPCI & RCIC actuation - reactor low water level	> 464 inches above vessel zero (+119.5 inches indicated level)
	I. Main steam isolation valve closure- reactor low water level	> 464 inches above vessel zero (+119.5 inches indicated level.)
	J. Main steam isolation valve closure- loss of main condenser vacuum	< 10 inches Hg vacuum

TABLE 3.1-1 (Continued)

REACTOR PROTECTION SYSTEM (SCRAM) INSTRUMENTATION REQUIREMENT

Minimum No. of Operable instrument Channels for Trip System (1)	Trip Function	Trip Level Setting	Modes in Which Function Must be Operable			Number of Instrument Channels Provided By Design	Action (1)
			Refuel (6)	Startup	Run		
2	High Drywell Pressure	≤ 2.0 psig	X(7)	X(8)	X	4 Instrument Channels	A
2	Reactor Low Water Level	≥ +170" Indicated Level (15)	X	X	X	4 Instrument Channels	A
2	High Water Level in Scram Discharge Volume	≤ 60 Gallons	X(2)	X	X	4 Instrument Channels	A
2	Main Steam Line High Radiation	≤ 3 x Normal Rated Power Background*	X	X	X	4 Instrument Channels	A
4	Main Steam Line Isolation Valve Closure	≤ 10% Valve Closure	X (3)(13)	X (3)(13)	X(13)	8 Instrument Channels	A or C
2	Turbine Control Valve Fast Closure (Loss of Control Oil Pressure)	Within 30 milliseconds of the Start of Control Valve Fast Closure			X(4)	4 Instrument Channels	A or D
4	Turbine Stop Valve Closure	≤10% Valve Closure			X(4)	8 Instrument Channels	A or D
2	First Stage	Bypass below 192 psig	X	X	X	4 Instrument Channels	A or D

*Alarm setting ≤1.5 X Normal Rated Power Background

7. Not required to be operable when primary containment integrity is not required.

8. Not required to be operable when the reactor pressure vessel head is not bolted to the vessel.

9. The APRM downscale trip is automatically bypassed when the IRM instrumentation is operable and not high.

10. To be considered operable, APRM's A, B, C and D must have at least 9 LPRM inputs while APRM's E and F must have at least 13 LRPM inputs. Additionally each APRM must have at least 2 LPRM inputs per level.

11. W is the recirculation loop flow in percent of rated.

12. See Subsection 2.1.A.1.

13. The design permits closure of any two lines without a scram being initiated.

14. Deleted.

15. Zero referenced to top of active fuel.

TABLE 3.2-A

INSTRUMENTATION THAT INITIATES PRIMARY CONTAINMENT ISOLATION

Minimum No. of Operable Instrument Channels Per Trip System (1)	Instrument	Trip Level Setting	Number of Instrument Channels Provided by Design	Valve Groups Operated by Signal	Action (2)
2 (6)	Reactor Low Water Level	> +170" Indicated Level (3)	4	2,3,4,5 (Sec. Cont., 3	A E)
1	Reactor Low Pressure (Shutdown Cooling Isolation)	≤ 135 psig	2	4	C
2	Reactor Low-Low-Water Level	At or above +119.5" indicated level (3)	4	1, 8	A
2 (6)	High Drywell Pressure	≤ 2.0 psig	4	2,3,4,8,9* (Sec. Cont., 3	A E)
2	High Radiation Main Steam Line Tunnel	≤ 3 X Normal Rated Power Background	4	1	B
2	Low Pressure Main Steam Line	≥ 880 psig (7)	4	1	B
2 (5)	High Flow Main Steam Line	≤ 140% of Rated Steam Flow	4	1	B
2	Main Steam Line Tunnel/Turbine Bldg. High Temperature	≤ 200° F.	4	1	B
1	Reactor Cleanup System High Diff. Flow	≤ 40 gpmd	2	5	D

*Group 9 valves isolate on high drywell pressure combined with reactor steam supply low pressure

NOTES FOR TABLE 3.2-A

1. Whenever Primary Containment integrity is required by Subsection 3.7, there shall be two operable or tripped systems for each function.

2. If the first column cannot be met for one of the trip systems, that trip system shall be tripped or the appropriate action listed below shall be taken.

   ACTION A - Be in at least HOT SHUTDOWN within 6 hours and in COLD SHUTDOWN within the next 30 hours.

   ACTION B - Be in at least STARTUP with the associated isolation valves closed within 6 hours or be in at least HOT SHUTDOWN within 6 hours and in COLD SHUTDOWN within the next 30 hours.

   ACTION C - Close the affected system isolation valves within one hour and declare the affected system inoperable.

   ACTION D - Be in at least STARTUP within 6 hours.

   ACTION E - Isolate secondary containment and start the standby gas treatment system.

3. Zero referenced to top of active fuel.*

* Top of the active fuel zone is defined to be 344.5 inches above vessel zero (see Bases 3.2).

TABLE 3.2-B

INSTRUMENTATION THAT INITIATES OR CONTROLS THE CORE AND CONTAINMENT COOLING SYSTEMS

Minimum No. of Operable Instrument Channels Per Trip System (1)	Trip Function	Trip Level Setting	Number of Instrument Channels Provided by Design	Remarks
2	Reactor Low-Low Water Level	≥ + 119.5 in. indicated level (4)	4 HPCI & RCIC Instrument Channels	Initiates HPCI & RCIC
2	Reactor Low-Low-Low Water Level	≥ + 18.5 in. indicated level (4)	4 Core Spray & RHR Instrument Channels 4 ADS Instrument Channels	1. In conjunction with Low Reactor Pressure initiates Core Spray and LPCI 2. In conjunction with confirmatory low level High Drywell Pressure, 120 second time delay and LPCI or Core Spray pump interlock initiates Auto Blowdown (ADS) 3. Initiates starting of Diesel Generator
2	Reactor High Water Level	≤ + 211 in. indicated level (4)	2 Instrument Channels	Trips HPCI and RCIC turbines

TABLE 3.2-B (Continued)

INSTRUMENTATION THAT INITIATES OR CONTROLS THE CORE AND CONTAINMENT COOLING SYSTEMS

Minimum No. of Operable Instrument Channels Per Trip System (1)	Trip Function	Trip Level Setting	Number of Instrument Channels Provided by Design	Remarks
1	Reactor Low Level (inside shroud)	≥ + 305.5 in. above vessel zero (2/3 core height)	2 Instrument Channels	Prevents inadvertent operation of containment spray during accident condition
2	Containment High Pressure	1 < p < 2 psig	4 Instrument Channels	Prevents inadvertent operation of containment spray during accident condition
1	Confirmatory Low Level	≤ + 170 in. indicated level (4)	2 Instrument Channels	ADS Permissive
2	High Drywell Pressure	≤ 2.0 psig	4 HPCI Instrument Channels	1. Initiates Core Spray LPCI; HPCI
2	Reactor Low Pressure	≥ 450 psig	4 Instrument Channels	Permissive for open Core Spray and LCPI Injection valves. Coincident with high drywell pressure, start LPCI and Core Spray pumps

NOTES FOR TABLE 3.2-B

1. Whenever any CSCS subsystem is required by Subsection 3.5 to be operable, there shall be two operable trip systems. If the first column cannot be met for one of the trip systems, that trip system shall be placed in the tripped condition or the reactor shall be placed in the Cold Shutdown Condition within 24 hours.

2. Close isolation valves in RCIC subsystem.

3. Close isolation valves in HPCI subsystem.

4. Zero referenced to top of active fuel.*

5. HPCI has only one trip system for these sensors.

6. The relay drop-out voltage will be measured once per operating cycle and the data examined for evidence of relay deterioration.

7. Four undervoltage relays with integral timers per 4KV bus. The relay output contacts are connected to form a one-out-of-two-twice coincident logic matrix. With one relay inoperable, operation may proceed provided that the inoperable relay is placed in the tripped condition within one hour.

*Top of active fuel zone is defined to be 344.5 inches above vessel zero (see Bases 3.2).

TABLE 3.2-G

INSTRUMENTATION THAT INITIATES RECIRCULATION PUMP TRIP

Minimum Number of Operable Instrument Channels per Trip System (1)	Instrument	Trip Level Setting	Number of Instrument Channels Provided By Design	Action (1)
1	(ATWS) Reactor High Pressure	≤ 1120 psig	4	(2)
1	(ATWS) Reactor Low-Low Water Level	≥ +119.5 in indicated level (5)	4	(2)
1	(EOC) RPT Logic	N/A	2	(3)
1	(EOC) RPT System (Response Time)	≤ *msec (4)	2	(3)

NOTES FOR TABLE 3.2-G

1. Whenever the reactor is in the RUN Mode, there shall be one operable trip system for each parameter for operating recirculation pump. If this cannot be met, the indicated action shall be taken.

2. Reduce power and place the mode selector-switch in a mode other than the RUN Mode.

3. Two EOC RPT systems exist, either of which will trip both recirculation pumps. The systems will be individually functionally tested monthly. If the test period for one RPT system exceeds two consecutive hours, the system will be declared inoperable. If both RPT systems are inoperable or if one RPT system is inoperable for more than 72 consecutive hours, an orderly power reduction shall be initiated and the reactor power shall be less than 85% within four hours.

4. This response time is from initiation of turbine control valve fast closure to actuation of the breaker auxiliary contact.

5. Zero referenced to top of active fuel.

* To be determined by testing after installation. (Valve to be design requirement for breaker opening less difference between cycle time for loaded vs. unloaded breaker.)

** Top of active fuel zone is defined to be 344.5" above vessel zero (see Bases 3.2).

explicitly stated where the high and low values are both critical and may have a substantial effect on safety. The setpoints of other instrumentation, where only the high or low end of the setting has a direct bearing on safety, are chosen at a level away from the normal operating range to prevent inadvertent actuation of the safety system involved and exposure to abnormal situations.

Actuation of primary containment valves is initiated by protective instrumentation shown in Table 3.2-A which senses the conditions for which isolation is required. Such instrumentation must be available whenever primary containment integrity is required.

The instrumentation which initiates primary system isolation is connected in a dual bus arrangement.

Many of the reactor water level trip settings are defined or described in terms of "inches above the top of the active fuel." In the new reload fuel the column of fuel pellets in each fuel pin of a bundle is 150 inches long; whereas in the initial core load and first few reloads it was 144 inches long. Thus, during the period of reloads until all of the 144 inch bundles are replaced with bundles with 150 inches of fuel pellets the core will be composed of fuel bundles with fuel pins containing differing lengths of fuel pellet columns and the term "top of active fuel" no longer has a precise physical meaning. Since the basis of all safety analyses is the absolute level (inches above vessel zero) of the trip settings, the "top of the active fuel" has been arbitrarily defined to be 344.5 inches above vessel zero. This definition is the same as that given by the FSAR for the initial core and maintains the consistency between the various level definitions given in the FSAR and the technical specifications.

adequate to prrevent uncovering the core in the case of a break in the largest line assuming a 60 second valve closing time. Required closing times are less than this.

The low-low reactor water level instrumentation is set to trip when reactor water level is 119.5" above the top of the active fuel. This trip closes Main Steam Line Isolation Valves, Main Steam Drain Valves, Recirc Sample Valves (Group 1), initiates the HPCI and RCIC and trips the recirculation pumps. The low-low-low reactor water level instrumentation is set to trip when the water level is 18.5" above the top of the active fuel. This trip activates the remainder of the CSCS subsystems, closes Group 7 valves, and starts the emergency diesel generators. These trip level settings were chosen to be high enough to prevent spurious actuation but low enough to initiate CSCS operation and primary system isolation so that post accident cooling can be accomplished and the guidelines of 10CFR100 will not be exceeded. For large breaks up to the complete circumferential break of a 22-inch recirculation line and with the trip setting given above, CSCS initiation and primary system isolation are initiated in time to meet the above criteria. Reference Paragraph 6.5.4 FSAR.