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POWER
SYSTEMS

STN 50-470F

October 22, 1984
LD-84-061

Mr. Darrell G. Eisenhut, Director
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: CESSAR Consistency Review Changes

Dear Mr. Eisenhut:

As a result of a review of the technical specifications for the first System 80™ plant, several CESSAR-F changes are found to be necessary. These changes provide clarification and technical consistency of information given in CESSAR-F. A description of these changes is attached with the marked-up affected pages of the CESSAR FSAR.

Additionally, in this review, one apparent inconsistency involving technical information was identified in the CESSAR SER (NUREG-0852). A suggested correction is, therefore, provided as well.

This package provides one of a series of changes identified in the technical specification review process. Other changes will be forwarded as soon as possible and will be added in a subsequent amendment to CESSAR.

If you have any questions or comments concerning these changes, please contact me or Mr. G. A. Davis of my staff at (203) 285-5207.

Very truly yours,

COMBUSTION ENGINEERING, INC.

G A Davis for

A. E. Scherer
Director
Nuclear Licensing

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cc: K. Eccleston (NRC project manager)

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CESSAR CONSISTENCY CHANGES

Design of Structures, Components, Equipment, and Systems (Ch pter 3)

Table 3.9.1-1 is clarified to indicate that the Primary System hydrostatic test and leak test design transient cycles are between 120°F and 400°F.

Reactor (Chapter 4)

Table 4.4-9 is changed to delete the word "core" from the average coolant enthalpy. The given value now correctly corresponds to the reactor outlet coolant conditions. Also, the total steam flow per generator is changed to 8.59×10^6 lb/h to correct a previous typographical error.

Reactor Coolant System and Connected Systems (Chapter 5)

CESSAR FSAR Table 5.1.1-1 is changed to reflect value of 82×10^6 lbm/hr for the SG 1A midpoint to correct a previous typographical error.

CESSAR FSAR Section 5.2.2.4.4 is modified to more accurately reflect the actual SIS relief valve design and specificiations.

Section 5.4.13.4.1 is changed to indicate the actual method used by valve manufacturers to test the primary safety valves.

Figure 5.4.10-2 is changed to reflect the actual installed level program. The new figure is consistent with and bounded by the CESSAR safety analysis.

Engineered Safety Features (Chapter 6)

Table 6.2.4-1 is modified to include both post-accident valve position for CH-524 as indicated in the Technical Specifications.

Instrumentation and Controls (Chapter 7)

Table 7.2-1 is changed to indicate that removal of DNBR and Local Power Density bypass is at $\geq$ 1% power vice > 10^{-4}%.

Table 7.3-3 is changed to indicate that steam generator differential pressure is monitored for EFAS.

Auxiliary Systems (Chapter 9)

Section 9.1.4.1.2 item a. is changed to indicate an updated procurement specification. The outdated Hoist Manufacturers Institute (HMI-100-74) specification is deleted.

Table 9.3-1 is modified to more accurately depict operating chemistry limits.

CESSAR SER Suggestion

SER Section 6.2.1 - A change is suggested to correct an apparent typographical error in the description of the Containment Spray System. CESSAR Appendix 6A indicates 58 seconds from CSAS to delivery of flow, not 50 seconds as indicated in this SER Section paragraph 2.

TABLE 3.9.1-1

TRANSIENTS USED IN STRESS ANALYSIS OF CODE CLASS 1 COMPONENTS

(Sheet 3 of 3)

Test Condition

Occurrence	Conditions
Primary system hydrostatic	10 primary side cycles from 15 $lb/in.^2$ to 3,125 $lb/in.^2$ at a temperature between ~~100F~~ 120 to 400F. These cycles are based on one initial hydrostatic test plus a major repair every 4 years for 36 years which includes equipment failure and normal plant cycles. The secondary side of the steam generator is at atmospheric pressure during this test.
Primary system leak	200 cycles from 15 $lb/in.^2$ to 2250 $lb/in.^2$ at a temperature between ~~100F~~ 120 to 400F. These cycles are based on a normal plant maintenance operation involving 5 shutdowns per year for 40 years.

TABLE 4.4-9

REACTOR COOLANT SYSTEM COMPONENT
THERMAL AND HYDRAULIC DATA[(a)]

(Sheet 1 of 2)

Component	Data
Reactor Vessel	
Rated core thermal power, MWt	3,800
Design pressure, lb/in.^{2}a	2,500
Operating pressure, lb/in.^{2}a	2,250
Coolant outlet temperature, °F	621.2
Coolant inlet temperature, °F	564.5
Coolant outlet state	Subcooled
Total coolant flow, 10^6 lb/h	164
Core average coolant enthalpy	
Inlet, Btu/lb	565
Outlet, Btu/lb	645
Average coolant density	
Inlet, lb/ft^3	45.9
Outlet, lb/ft^3	41.2
Steam Generators	
Number of units	2
Primary Side (or tube sides)	
Design pressure/temperature, lb/in.^{2}a/°F	2,500/650
Operating pressure, lb/in.^{2}a	2,250
Inlet temperature, °F	621.2
Outlet temperature, °F	564.5
Secondary (or shell side)	
Design pressure/temperature, lb/in.^{2}a/°F	1270/575
Full load steam pressure/temperature, lb/in.^{2}/°F	1070/552.86
Zero load steam pressure, lb/in.^{2}a	1,170
Total steam flow per gen., lb/h	~~9.59×10^6~~ 8.59×10^6
Full load steam quality, %	99.75
Feedwater temperature, full power, °F	450
Pressurizer	
Design pressure, 1/bin.^{2}a	2,500
Design temperature, °F	700
Operating pressure, lb/in.^{2}a	2,500
Operating temperature, °F	653
Internal volume (ft^3)	1,800
Heaters	
Type and rating of heaters, kW	Immersion/50
Installed heater capacity, kW	1,800

a. Full power conditions

TABLE 5.1.1-1

PROCESS DATA POINT TABULATION*

Parameter	Pressurizer	S.G. 1-A Midpoint	Pump 1-B Outlet	R.V. Midpoint	Pump 1-A Outlet	S.G. 2-A Midpoint	Pump 2-A Outlet	Pump 2-B Outlet
Data Point Fig. 5.1.2-1	1	2	3	4	5	6	7	8
Pressure, psia	2250	2235.3	2325.1	2292.2	2325.1	2235.3	2325.1	2325.1
Temperature °F	652.7	592.8	564.5	595.8	564.5	592.8	564.5	564.5
Mass Flow Rate lbm/hr	-	~~80.0×10^6~~ 82.0×10^6	41.0×10^6	164.0×10^6	41.0×10^6	82×10^6	41.0×10^6	41.0×10^6
Volumetric Flow Rate, gpm	-	233.6×10^3	111.4×10^3	4[illegible]18$\times 10^3$	111.4×10^3	233.6×10^3	111.4×10^3	111.4×10^3

*For normal steady state 100% power conditions

c) ± 10°F step change from 553°F, 10^6 cylces (normal plant variations).

d) 75°F to 565°F and return to 75°F at a rate of 100°F/hr with pressures at saturation levels for 500 cycles (plant heatup and cool down).

Note: Heat up and cool down are separate transients, each beginning at steady state conditions.

e) Pressurize to 1.5 times set pressure at 100°F - 200°F for 10 cycles plus number of hydros conducted prior to valve shipment (hydrostatic test).

f) 480 opening and closing cycles to full stem movement (turbine trip).

5.2.2.4.3.3 Environment. The main steam safety valves are designed to operate in the following environmental conditions:

5.2.2.4.3.3.1 Normal Environment

a) 104°F maximum

b) Relative humidity 95% at 60°F to 80°F.

c) Fixed mositure content equivalent to 95% relative humidity at 80°F, up to 104°F.

5.2.2.4.3.3.2 Main Steam Line Break (One Occurrence)

a) 330°F maximum for 3 minutes

b) Relative humidity of 100%.

5.2.2.4.4 Safety Injection System ~~Safety~~ Relief Valves SI-165 and SI-465

~~The miscellaneous safety~~ These relief valves are direct acting, spring loaded, stainless steel valves with enclosed bonnets. The design parameters of these valves are:

set pressure	~~2500~~ 2485 psig
rated flow	15 gpm
water chemistry	0 - ~~3~~ 4 weight percent boric acid
throat area	.023 in^2
design temperature	650°F

~~Schematic drawing of a miscellaneous safety valve is given in Figure 5.2-13.~~

5.2.2.4.4.1 **Valve Operation**. As the set pressure is reached, the disc raises off the nozzle seat. This lift continues until the valve is fully open at 10 percent acccumulation. The lift decreases as pressure drops until the seat and disc contacts and seals closed. The valve is fully closed at a maximum of 10% below set pressure (10% blowdown).

5.2.2.4.4.2 Transients. These relief ~~The miscellaneous safety~~ valves are designed to withstand the following transients without failure or malfunction.

a) 60°F to 400 ~~350~~°F in 5 seconds, 400 ~~350~~°F to 60°F in 15 minutes for 55 ~~50~~ cycles.

b) 60°F to 350°F in 15 minutes, 350°F to 60°F in 2.9 ~~2.5~~ hours for 500 cycles.

c) 120°F to 60°F in 5 seconds, 60°F to 120°F in 15 minutes for ~~1000~~ 660 cycles.

5.2.2.4.4.3 Environment. These relief ~~This miscellaneous safety~~ valves are designed to operate in the following environmental conditions.

a) 122°F maximum

b) 95% relative humidity at 60°F to 80°F.

c) Fixed mositure content equivalent to 95% RH at 80°F at temperatures above 8

5.2.2.4.4.4 Material Specifications. Material specifications for the primary safety valves are given in Table 5.4.13-1.

Material specifications for the main steam safety valves are given in Table ~~5.4-14.~~ 5.4.13-2.

Typical materials used for these relief ~~the miscellaneous~~ safety valves are:

Body	ASME SA351 GR. CF 8M
Disc	Stellite No. 6B
Nozzle	ASME SA 479 Type 316 with Stellite Seat.
Inlet Stud	ASME SA 193 GR. B6.

5.2.2.5 Mounting of Pressure-Relief Devices

See Applicant's SAR

5.2.2.6 Applicable Codes and Classification

The applicable codes and classifications for the overpressurization protection system are contained in Table 3.2-1. The applicable codes and classification for the secondary safety valves are identified in Section 5.1.4.

5.4.13.4 Tests and Inspections

The valves are inspected during fabrication in accordance with ASME III Code requirements.

5.4.13.4.1 Pressurizer Safety Valves

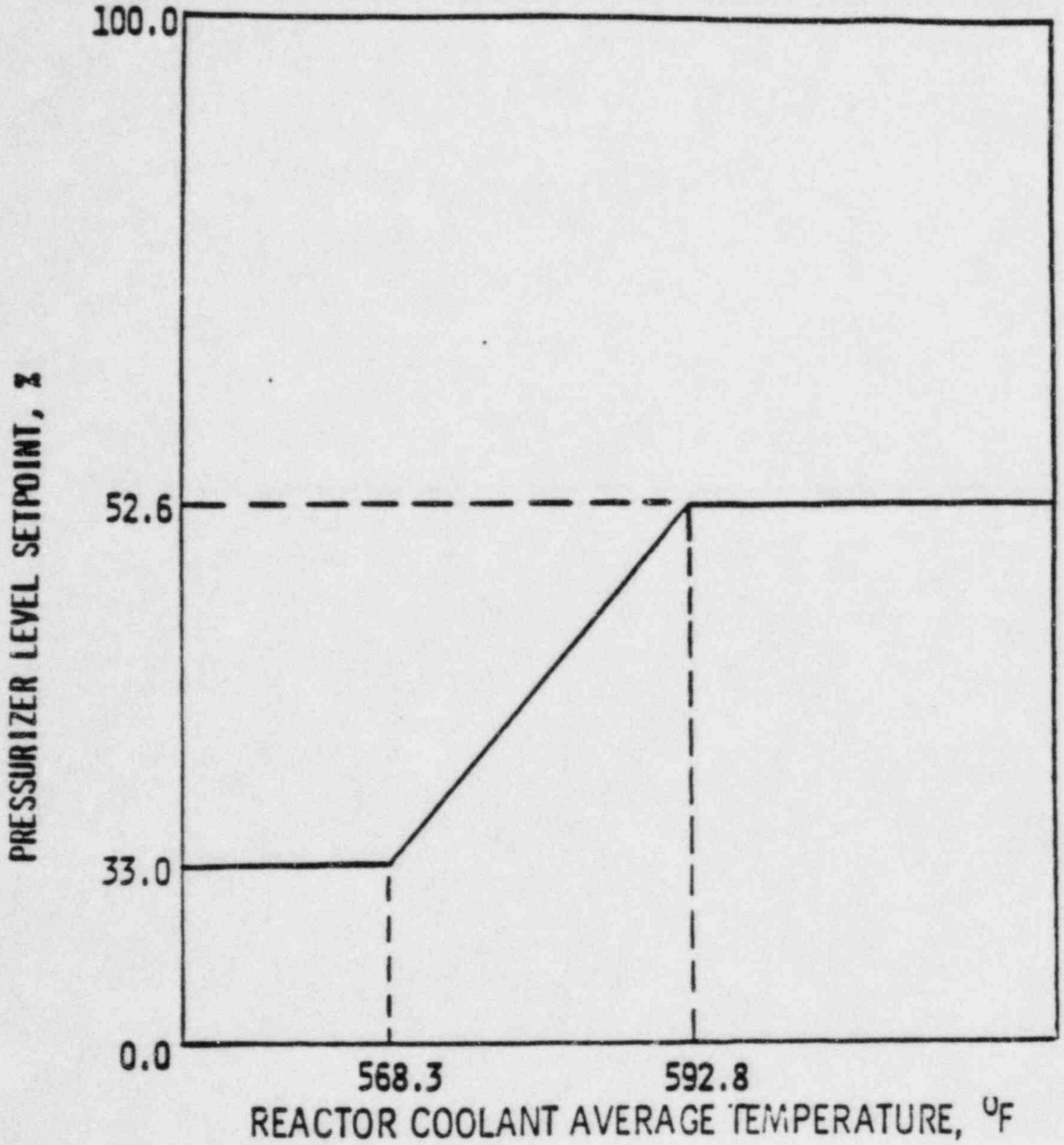
The inlet and outlet portions of the valves are hydrostatically tested with water at the appropriate pressures required by the applicable section of the ASME Code. Set pressure and seat leakage TESTS CAN BE performed with steam using a pro-rated spring. Final set pressure tests are performed with the final springs using either high pressure STEAM or low pressure steam with an ~~hydraulic~~ assist device. Final seat leakage tests are performed prior to shipment with the final springs using either hot air or hot nitrogen. Valve adjustment shall be made to a valve ring setting combination selected to provide stable valve operation on the basis of the EPRI Safety Valve Test Program results.[1]

5.4.13.4.2 Main Steam Safety Valves

The inlet portion of the valve is hydrostatically tested with water in accordance with the ASME Code. Set pressure and set leakage tests are performed using steam. Adjustment is made to provide a valve blowdown meeting the requirement specified in Table 5.4.13-2.

(1) CEN-227 "Summary Report on the Operability of Pressurizer Safety Relief Valve in C-E Designed Plants", December 1982.

New Figure



C-E SYSTEM 80	TYPICAL PRESSURIZER LEVEL SETPOINT PROGRAM	Figure 5.4.10-2

TABLE 6.2.4-1 (Cont'd.) (Sheet 4 of 5)

CONTAINMENT ISOLATION SYSTEM

Penetration Number	Applicable GDC	System[4]	Valve Operator	Primary[2] Actuation Mode	Secondary[2] Actuation Mode	Valve Position: Normal	Valve Position: Shut-down	Valve Position: Post-Accident	Valve Position: Failure	ESF[3] Actuation Signal	Closure Time (Sec)	Power Source
28	55	SCS	Motor	R	M	C	0 or C	0 or C	FAI	None	30	EA
			Motor	R	M	C	0	0 or C	FAI	None	80	EA
			Motor	R	R	C	0	0 or C	FAI	None	80	EC
29	55	SIS	None	M	M	C	0 or C	C	FAI	None	N.A.	N.A.
			Air	A	R	C	0 or C	C	FC	SIAS	5	EA
40	55	CVCS	Air	A	R, M	0	C	C	FC	CIAS/SIAS	5	EB
			Air	A	R	0	C	C	FC	CIAS	5	EA
41	55/56	CVCS	Motor	R	M	0	0	0 or C	FAI	None	5	EB
			None	A	A	C	0 or C	0 or C	N.A.	None	N.A.	N.A.
			None	A	A	0	0 or C	0 or C	N.A.	None	N.A.	N.A.
			Hand	M	M	C	C	C	N.A.	None	N.A.	N.A.
			Hand	M	M	C	C	C	N.A.	None	N.A.	N.A.
43	55	CVCS	Air	A	R,M	0	0 or C	C	FC	CIAS	5	EB
			Air	A	R	0	0 or C	C	FC	CIAS	5	EA
44	55	CVCS	Air	A	R	0 or C	C	C	FC	CIAS	5	EA
			Air	A	R, M	0 or C	C	C	FC	CIAS	5	EB
45	55	CVCS	None	A	A	0 or C	C	C	N.A.	None	N.A.	N.A.
			Air	A	R, M	0 or C	C	C	FC	CIAS	5	EA
57	55	CVCS	Motor	R	M	0	0	0 or C	FAI	None	5	EA
			None	A	A	0	0	0 or C	N.A.	None	N.A.	N.A.

Change

≥ 1%

TABLE 7.2-1

REACTOR PROTECTIVE SYSTEM BYPASSES

Title	Function	Initiated By	Removed By	Notes
DNBR and local power density bypass	Disable low DNBR and high local power density trips	Key-operated switch (1 per channel)	Automatic if power is >10^{-4} %	Allows low power testing
Pressurizer pressure bypass	Disables low pressurizer pressure trip, SIAS, and CIAS	Manual switch (1 per channel) if pressure is <400 psia	Automatic if pressure is >500 psia	
High log power level bypass	Disables high logarithmic power level trip	Manual switch (1 per channel) if power is >10^{-4} %	Automatic if power is <10^{-4} %	Bypassed during reactor startup
Trip channel bypass	Disables any given trip channel	Manually by controlled access switch	Same switch	Interlocks allow only one channel for any one type trip to be bypassed at one time

TABLE 7.3-3

MONITORED VARIABLES REQUIRED FOR ESFAS PROTECTIVE SIGNALS

	CIAS	CSAS	RAS	MSIS	SIAS	EFAS
Pressurizer Pressure	3				3	
Containment Pressure	1	2		1	1	
Steam Generator Pressure				3		4
Refueling Water Tank Level			3			
Steam Generator Water Level				1		3

1 - High

2 - High-High

3 - Low

4 - High Differential

9.0 AUXILIARY SYSTEMS

9.1 FUEL STORAGE AND HANDLING

9.1.1 NEW FUEL STORAGE

See Applicant's SAR. See Sections 4.2.5 and 9.1.4.6 for interface requirements.

9.1.2 SPENT FUEL STORAGE RACKS

See Applicant's SAR. See Sections 4.2.5 and 9.1.4.6 for interface requirements.

9.1.3 SPENT FUEL POOL COOLING AND CLEANUP SYSTEM

See Applicant's SAR. See Section 9.1.4.6 for interface requirements.

9.1.4 FUEL HANDLING SYSTEM

9.1.4.1 Design Bases

9.1.4.1.1 System

The fuel handling system is designed for the handling and storage of fuel assemblies and control element assemblies (CEAs). Associated with the fuel handling system is the equipment used for assembly, disassembly and storage of the reactor closure head and internals. As appropriate, the fuel handling equipment included interlocks, travel limiting features, and other protective devices to minimize the possibility of mishandling or equipment malfunction that could result in inadvertent damage to a fuel assembly and potential fission product release.

The refueling water provides the coolant medium during spent fuel transfer. The spent fuel pool is provided with a pool cooling and purifications system.

All spent fuel transfer and storage operations are designed to be conducted underwater to insure adequate shielding during refueling and to permit visual control of the operation at all times. The arrangement of the fuel handling system is shown in Figure 9.1-1.

9.1.4.1.2 Fuel Handling Equipment

The principle design criteria for the fuel and CEA handling equipment (refueling machine, fuel transfer equipment, spent fuel handling machine, CEA change platform and new fuel and CEA elevators) are as follows:

a. For non-seismic operating conditions, the bridges, trolleys, hoist units, hoisting cable, grapples and hooks conform to the requirements of Crane Manufacturing Association of America Specification #70. and Hoist Manufacturing Institute Specification HMI-100-74. 2 2

TABLE NO. 9.3-1

(Sheet 1 of 2)

OPERATING LIMITS

1.0 MAKEUP WATER

Analysis	Normal	Abnormal
Chloride (Cl)	<0.15 ppm	< .15 ppm
Silica (SiO_2)	<0.01 ppm	< .02 ppm
Conductivity	<1.0 µmhos/cm	< 2 µmhos/cm
pH	6.0 - 8.0 (1)	-
Fluoride (F) (2)	< .1 ppm	<0.1 ppm
Suspended Solids	< .5 ppm	-

2.0 PRIMARY WATER

Analysis	Hot Functionals (3)	Core Load and Initial Criticality	Power Operation
pH (77°)	9.0 - 10.4	4.5 - 10.2 (4)	4.5 - 10.2 (4)
Conductivity	(5)	(5)	(5)
Hydrazine	30 - 50 ppm	30 - 50 ppm	1.5 x Oxygen ppm (max. 20 ppm)
Ammonia	<50 ppm	<50 ppm	<0.5 ppm
Dissolved Gas	---	---	(6)
Lithium	1-2 ppm	0.2 - 1.0 ppm (7)	0.2 - 1.0 ppm (8)
Hydrogen	---	---	10 - 50 cc (STP)/kg (H_2O)
Oxygen	≤0.1 ppm	≤0.1 ppm (9)	≤0.1 ppm
Suspended Solids	<0.5 ppm, 2 ppm max.	<0.5 ppm, 2 ppm max.	<0.5 ppm, 2 ppm max.
Chloride	≤0.15 ppm	≤0.15 ppm	≤0.15 ppm
Fluoride	≤0.1 ppm	≤0.1 ppm	≤0.1 ppm
Boron	---	≤Refueling Concentration	<4400 ppm