Technical Specification 5.5.14

APS

Palo Verde Nuclear
Generating Station

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102-05859-TNW/CJS
May 20, 2008

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

Dear Sirs:

Subject: **Palo Verde Nuclear Generating Station (PVNGS)**
Units 1, 2, and 3
Docket Nos. STN 50-528/529/530
Technical Specifications Bases Revision 48 Update

Pursuant to PVNGS Technical Specification (TS) 5.5.14, "Technical Specifications Bases Control Program," Arizona Public Service Company (APS) is submitting changes to the TS Bases incorporated into Revision 48, implemented on May 14, 2008.

The revision insertion instructions and replacement pages are provided in the Enclosure.

No commitments are being made to the NRC by this letter. Should you have any questions, please contact Russell A. Stroud, at (623) 393-5111.

Sincerely,

TNW/RAS/CJS/gat

A member of the **STARS** (Strategic Teaming and Resource Sharing) Alliance

Callaway • Comanche Peak • Diablo Canyon • Palo Verde • South Texas Project • Wolf Creek

A001
NRR

Enclosure - PVNGS Technical Specification Bases Revision 48 Insertion Instructions and Replacement Pages

cc:	E. E. Collins Jr.	NRC Region IV Regional Administrator (enclosure)
	M. T. Markley	NRC NRR Project Manager (enclosure)
	R. I. Treadway	NRC Senior Resident Inspector for PVNGS (enclosure)

ENCLOSURE

PVNGS
Technical Specification Bases
Revision 48

Insertion Instructions and
Replacement Pages

Insertion Instructions for the Technical Specifications Bases
Revision 48

REMOVE PAGES	**INSERT PAGES**
Cover page	Cover page
List of Effective Pages 1/2 through 7/8	List of Effective Pages 1/2 through 7/8
B 3.0-5 / B 3.0-6 B 3.0-7 / B 3.0-8	B 3.0-5 / B 3.0-6 B 3.0-7 / B 3.0-8
B 3.1.7-3 / B 3.1.7-4	B 3.1.7-3 / B 3.1.7-4
B 3.2.4-7 / B 3.2.4-8 B 3.2.4-9 / B 3.2.4-10	B 3.2.4-7 / B 3.2.4-8 B 3.2.4-9 / B 3.2.4-10
B 3.3.9-1 / B 3.3.9-2	B 3.3.9-1 / B 3.3.9-2
B 3.4.12-3 / B 3.4.12-4	B 3.4.12-3 / B 3.4.12-4
B 3.4.15-1 / B 3.4.15-2	B 3.4.15-1 / B 3.4.15-2
B 3.5.1-1 / B 3.5.1-2	B 3.5.1-1 / B 3.5.1-2
B 3.5.3-1 / B 3.5.3-2	B 3.5.3-1 / B 3.5.3-2
B 3.5.5-1 / B 3.5.5-2 through B 3.5.5-7 / Blank	B 3.5.5-1 / B 3.5.5-2 through B 3.5.5-15 / B 3.5.5-16
B 3.6.5-3 / B 3.6.5-4	B 3.6.5-3 / B 3.6.5-4
B 3.6.6-7 / B 3.6.6-8	B 3.6.6-7 / B 3.6.6-8
B 3.7.11-3 / B 3.7.11-4 B 3.7.11-5 / B 3.7.11-6	B 3.7.11-3 / B 3.7.11-4 B 3.7.11-5 / B 3.7.11-6
B 3.8.1-11 / B 3.8.1-12 through B 3.8.1-15 / B 3.8.1-16	B 3.8.1-11 / B 3.8.1-12 through B 3.8.1-15 / B 3.8.1-16
B 3.8.1-33 / B 3.8.1-34 B 3.8.1-35 / B 3.8.1-36	B 3.8.1-33 / B 3.8.1-34 B 3.8.1-35 / B 3.8.1-36

B 3.8.1-39 / B 3.8.1-40	B 3.8.1-39 / B 3.8.1-40
B 3.8.3-9 / B 3.8.3-10	B 3.8.3-9 / B 3.8.3-10
B 3.8.4-11 / Blank	B 3.8.4-11 / Blank
B 3.8.6-7 / Blank	B 3.8.6-7 / Blank
B 3.8.7-1 / B 3.8.7-2	B 3.8.7-1 / B 3.8.7-2
B 3.8.7-3 / B 3.8.7-4	B 3.8.7-3 / B 3.8.7-4
B 3.8.10-3 / B 3.8.10-4	B 3.8.10-3 / B 3.8.10-4
B 3.9.2-1 / B 3.9.2-2	B 3.9.2-1 / B 3.9.2-2

PVNGS

Palo Verde Nuclear Generating Station

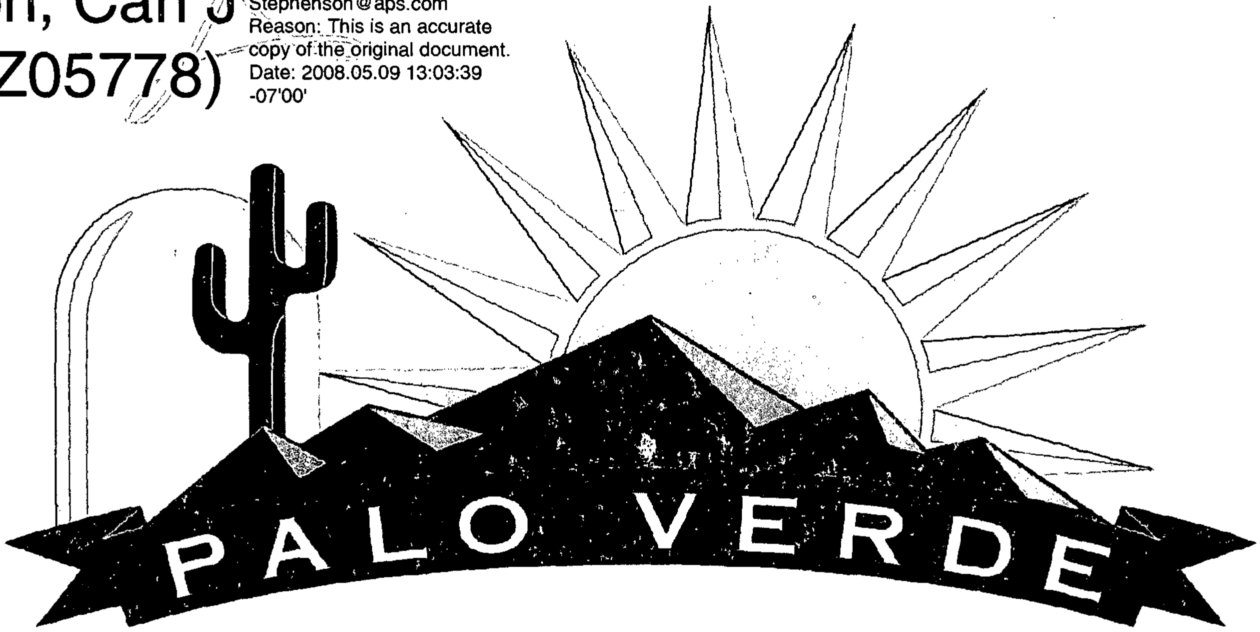
Units 1, 2, and 3

Technical Specification Bases

Stephenson, Carl J (Z05778)

Digitally signed by Stephenson, Carl J(Z05778)
DN: cn=Stephenson, Carl J (Z05778), email=Carl.Stephenson@aps.com
Reason: This is an accurate copy of the original document.
Date: 2008.05.09 13:03:39 -07'00'

Revision 48
May 14, 2008



TECHNICAL SPECIFICATION BASES
LIST OF EFFECTIVE PAGES

Page No.	**Rev. No.**	**Page No.**	**Rev No.**
B 2.1.1-1	0	B 3.1.4-4	0
B 2.1.1-2	0	B 3.1.4-5	0
B 2.1.1-3	37	B 3.1.5-1	0
B 2.1.1-4	21	B 3.1.5-2	28
B 2.1.1-5	23	B 3.1.5-3	28
B 2.1.2-1	0	B 3.1.5-4	28
B 2.1.2-2	31	B 3.1.5-5	28
B 2.1.2-3	0	B 3.1.5-6	28
B 2.1.2-4	23	B 3.1.5-7	46
B 2.1.2-5	0	B 3.1.5-8	46
B 3.0-1	0	B 3.1.5-9	46
B 3.0-2	0	B 3.1.5-10	46
B 3.0-3	0	B 3.1.5-11	46
B 3.0-4	0	B 3.1.6-1	0
B 3.0-5	42	B 3.1.6-2	46
B 3.0-6	48	B 3.1.6-3	42
B 3.0-7	48	B 3.1.6-4	42
B 3.0-8	42	B 3.1.6-5	46
B 3.0-9	42	B 3.1.6-6	46
B 3.0-10	42	B 3.1.7-1	0
B 3.0-11	42	B 3.1.7-2	0
B 3.0-12	42	B 3.1.7-3	28
B 3.0-13	42	B 3.1.7-4	48
B 3.0-14	42	B 3.1.7-5	25
B 3.0-15	42	B 3.1.7-6	0
B 3.0-16	42	B 3.1.7-7	0
B 3.0-17	42	B 3.1.7-8	0
B 3.0-18	42	B 3.1.7-9	0
B 3.0-19	42	B 3.1.8-1	28
B 3.0-20	42	B 3.1.8-2	28
B 3.1.1-1	28	B 3.1.8-3	28
B 3.1.1-2	0	B 3.1.8-4	28
B 3.1.1-3	43	B 3.1.8-5	28
B 3.1.1-4	43	B 3.1.9-1	0
B 3.1.1-5	27	B 3.1.9-2	0
B 3.1.1-6	31	B 3.1.9-3	0
B 3.1.2-1	28	B 3.1.9-4	0
B 3.1.2-2	0	B 3.1.9-5	47
B 3.1.2-3	43	B 3.1.9-6	1
B 3.1.2-4	28	B 3.1.10-1	0
B 3.1.2-5	0	B 3.1.10-2	28
B 3.1.2-6	43	B 3.1.10-3	0
B 3.1.2-7	12	B 3.1.10-4	37
B 3.1.2-8	47	B 3.1.10-5	37
B 3.1.2-9	0	B 3.1.10-6	0
B 3.1.3-1	0	B 3.1.11-1	0
B 3.1.3-2	0	B 3.1.11-2	28
B 3.1.3-3	0	B 3.1.11-3	0
B 3.1.3-4	0	B 3.1.11-4	34
B 3.1.3-5	0	B 3.1.11-5	0
B 3.1.3-6	0	B 3.2.1-1	28
B 3.1.4-1	0	B 3.2.1-2	10
B 3.1.4-2	31	B 3.2.1-3	28
B 3.1.4-3	0	B 3.2.1-4	0

TECHNICAL SPECIFICATION BASES
LIST OF EFFECTIVE PAGES

Page No.	Rev. No.	Page No.	Rev No.	
B 3.2.1-5	0	B 3.3.1-17	35	
B 3.2.1-6	0	B 3.3.1-18	35	
B 3.2.1-7	0	B 3.3.1-19	35	
B 3.2.1-8	0	B 3.3.1-20	35	
B 3.2.2-1	28	B 3.3.1-21	35	
B 3.2.2-2	10	B 3.3.1-22	35	
B 3.2.2-3	0	B 3.3.1-23	35	
B 3.2.2-4	28	B 3.3.1-24	35	
B 3.2.2-5	1	B 3.3.1-25	35	
B 3.2.2-6	0	B 3.3.1-26	35	
B 3.2.2-7	0	B 3.3.1-27	35	
B 3.2.3-1	28	B 3.3.1-28	35	Corrected
B 3.2.3-2	10	B 3.3.1-29	35	
B 3.2.3-3	0	B 3.3.1-30	35	Corrected
B 3.2.3-4	28	B 3.3.1-31	35	Corrected
B 3.2.3-5	0	B 3.3.1-32	35	Corrected
B 3.2.3-6	0	B 3.3.1-33	35	
B 3.2.3-7	0	B 3.3.1-34	35	
B 3.2.3-8	0	B 3.3.1-35	35	
B 3.2.3-9	0	B 3.3.1-36	35	
B 3.2.3-10	0	B 3.3.1-37	35	
B 3.2.4-1	28	B 3.3.1-38	35	
B 3.2.4-2	10	B 3.3.1-39	35	
B 3.2.4-3	0	B 3.3.1-40	35	
B 3.2.4-4	28	B 3.3.1-41	35	
B 3.2.4-5	25	B 3.3.1-42	35	
B 3.2.4-6	25	B 3.3.1-43	35	
B 3.2.4-7	27	B.3.3.1-44	35	
B 3.2.4-8	48	B.3.3.1-45	38	
B 3.2.4-9	48	B.3.3.1-46	42	
B.3.2.4-10	31	B.3.3.1-47	35	
B 3.2.5-1	28	B.3.3.1-48	42	
B 3.2.5-2	10	B.3.3.1-49	35	
B 3.2.5-3	0	B.3.3.1-50	35	
B 3.2.5-4	28	B.3.3.1-51	35	
B 3.2.5-5	0	B.3.3.1-52	35	
B 3.2.5-6	28	B.3.3.1-53	35	
B 3.2.5-7	0	B.3.3.1-54	35	
B 3.3.1-1	35	B.3.3.1-55	35	
B 3.3.1-2	25	B.3.3.1-56	35	
B 3.3.1-3	25	B.3.3.1-57	35	
B 3.3.1-4	25	B 3.3.1-58	35	
B 3.3.1-5	25	B 3.3.1-59	35	
B 3.3.1-6	27	B 3.3.1-60	35	
B 3.3.1-7	25	B 3.3.2-1	35	
B 3.3.1-8	25	B 3.3.2-2	0	
B 3.3.1-9	34	B 3.3.2-3	1	
B 3.3.1-10	35	B 3.3.2-4	35	
B 3.3.1-11	35	B 3.3.2-5	35	
B 3.3.1-12	35	B 3.3.2-6	35	
B 3.3.1-13	35	B 3.3.2-7	35	
B 3.3.1-14	35	B 3.3.2-8	35	
B 3.3.1-15	35	B 3.3.2-9	35	
B 3.3.1-16	35	B 3.3.2-10	38	

TECHNICAL SPECIFICATION BASES
LIST OF EFFECTIVE PAGES

Page No.	Rev. No.	Page No.	Rev No.
B 3.3.2-11	42	B 3.3.5-11	0
B 3.3.2-12	42	B 3.3.5-12	1
B 3.3.2-13	35	B 3.3.5-13	0
B 3.3.2-14	35	B 3.3.5-14	0
B 3.3.2-15	35	B 3.3.5-15	35
B 3.3.2-16	35	B 3.3.5-16	35
B 3.3.2-17	35	B 3.3.5-17	35
B 3.3.2-18	35	B 3.3.5-18	35
B 3.3.3-1	25	B 3.3.5-19	35
B 3.3.3-2	27	B 3.3.5-20	35
B 3.3.3-3	25	B 3.3.5-21	35
B 3.3.3-4	25	B 3.3.5-22	35
B 3.3.3-5	25	B 3.3.5-23	38
B 3.3.3-6	25	B 3.3.5-24	38
B 3.3.3-7	27	B 3.3.5-25	42
B 3.3.3-8	27	B 3.3.5-26	35
B 3.3.3-9	27	B 3.3.5-27	35
B 3.3.3-10	46	B 3.3.5-28	35
B 3.3.3-11	25	B 3.3.5-29	35
B.3.3.3-12	25	B 3.3.5-30	35
B.3.3.3-13	25	B 3.3.6-1	0
B.3.3.3-14	46	B 3.3.6-2	0
B.3.3.3-15	27	B 3.3.6-3	0
B.3.3.3-16	25	B 3.3.6-4	0
B.3.3.3-17	25	B 3.3.6-5	31
B.3.3.3-18	25	B 3.3.6-6	0
B.3.3.3-19	27	B 3.3.6-7	27
B.3.3.3-20	27	B 3.3.6-8	27
B.3.3.3-21	27	B 3.3.6-9	0
B 3.3.4-1	0	B 3.3.6-10	0
B 3.3.4-2	0	B 3.3.6-11	0
B 3.3.4-3	0	B 3.3.6-12	0
B 3.3.4-4	0	B 3.3.6-13	0
B 3.3.4-5	0	B 3.3.6-14	0
B 3.3.4-6	31	B 3.3.6-15	0
B 3.3.4-7	0	B 3.3.6-16	0
B 3.3.4-8	0	B 3.3.6-17	27
B 3.3.4-9	0	B 3.3.6-18	0
B 3.3.4-10	0	B 3.3.6-19	0
B 3.3.4-11	0	B 3.3.6-20	0
B 3.3.4-12	0	B 3.3.6-21	1
B 3.3.4-13	0	B 3.3.6-22	46
B 3.3.4-14	0	B 3.3.7-1	2
B 3.3.4-15	0	B 3.3.7-2	2
B 3.3.5-1	0	B 3.3.7-3	0
B 3.3.5-2	0	B 3.3.7-4	0
B 3.3.5-3	0	B 3.3.7-5	0
B 3.3.5-4	35	B 3.3.7-6	42
B 3.3.5-5	0	B 3.3.7-7	0
B 3.3.5-6	0	B 3.3.7-8	0
B 3.3.5-7	0	B 3.3.7-9	2
B 3.3.5-8	31	B 3.3.8-1	0
B 3.3.5-9	0	B 3.3.8-2	44
B 3.3.5-10	0	B 3.3.8-3	0

TECHNICAL SPECIFICATION BASES
LIST OF EFFECTIVE PAGES

Page No.	Rev. No.	Page No.	Rev No.
B 3.3.8-4	0	B 3.4.3-1	0
B 3.3.8-5	0	B 3.4.3-2	0
B 3.3.8-6	1	B 3.4.3-3	0
B 3.3.8-7	0	B 3.4.3-4	2
B 3.3.8-8	44	B 3.4.3-5	2
B 3.3.9-1	48	B 3.4.3-6	0
B 3.3.9-2	48	B 3.4.3-7	0
B 3.3.9-3	21	B 3.4.3-8	2
B 3.3.9-4	10	B 3.4.4-1	0
B 3.3.9-5	1	B 3.4.4-2	38
B 3.3.9-6	0	B 3.4.4-3	7
B 3.3.9-7	0	B 3.4.4-4	0
B 3.3.10-1	0	B 3.4.5-1	0
B 3.3.10-2	0	B 3.4.5-2	38
B 3.3.10-3	0	B 3.4.5-3	38
B 3.3.10-4	0	B 3.4.5-4	0
B 3.3.10-5	18	B 3.4.5-5	6
B 3.3.10-6	0	B 3.4.6-1	0
B 3.3.10-7	0	B 3.4.6-2	6
B 3.3.10-8	14	B 3.4.6-3	38
B 3.3.10-9	14	B 3.4.6-4	6
B 3.3.10-10	14	B 3.4.6-5	6
B 3.3.10-11	14	B 3.4.7-1	0
B 3.3.10-12	14	B 3.4.7-2	6
B 3.3.10-13	14	B 3.4.7-3	6
B 3.3.10-14	32	B 3.4.7-4	38
B 3.3.10-15	32	B 3.4.7-5	0
B 3.3.10-16	32	B 3.4.7-6	0
B 3.3.10-17	42	B 3.4.7-7	27
B 3.3.10-18	32	B 3.4.8-1	0
B 3.3.10-19	32	B 3.4.8-2	6
B 3.3.10-20	32	B 3.4.8-3	6
B 3.3.10-21	33	B 3.4.9-1	41
B 3.3.10-22	32	B 3.4.9-2	31
B 3.3.11-1	0	B 3.4.9-3	41
B 3.3.11-2	2	B 3.4.9-4	41
B 3.3.11-3	2	B 3.4.9-5	0
B 3.3.11-4	42	B 3.4.9-6	0
B 3.3.11-5	42	B 3.4.10-1	0
B 3.3.11-6	2	B 3.4.10-2	7
B 3.3.11-7	2	B 3.4.10-3	0
B 3.3.12-1	15	B 3.4.10-4	0
B 3.3.12-2	15	B 3.4.11-1	0
B 3.3.12-3	37	B 3.4.11-2	7
B 3.3.12-4	37	B 3.4.11-3	0
B 3.3.12-5	6	B 3.4.11-4	0
B 3.3.12-6	6	B 3.4.11-5	0
B 3.4.1-1	10	B 3.4.11-6	0
B 3.4.1-2	28	B 3.4.12-1	1
B 3.4.1-3	0	B 3.4.12-2	34
B 3.4.1-4	0	B 3.4.12-3	48
B 3.4.1-5	0	B 3.4.12-4	0
B 3.4.2-1	7	B 3.4.12-5	31
B 3.4.2-2	1	B 3.4.13-1	0

TECHNICAL SPECIFICATION BASES
LIST OF EFFECTIVE PAGES

Page No.	Rev. No.	Page No.	Rev No.
B 3.4.13-2	0	B 3.5.1-10	35
B 3.4.13-3	1	B 3.5.2-1	0
B 3.4.13-4	0	B 3.5.2-2	35
B 3.4.13-5	0	B 3.5.2-3	0
B 3.4.13-6	0	B 3.5.2-4	0
B 3.4.13-7	2	B 3.5.2-5	0
B 3.4.13-8	42	B 3.5.2-6	0
B 3.4.13-9	42	B 3.5.2-7	1
B 3.4.13-10	42	B 3.5.2-8	22
B 3.4.13-11	42	B 3.5.2-9	1
B 3.4.14-1	0	B 3.5.2-10	35
B 3.4.14-2	34	B 3.5.3-1	0
B 3.4.14-3	34	B 3.5.3-2	48
B 3.4.14-4	38	B 3.5.3-3	0
B 3.4.14-5	38	B 3.5.3-4	0
B 3.4.14-6	38	B 3.5.3-5	0
B 3.4.14-7	38	B 3.5.3-6	2
B.3.4.14-8	38	B 3.5.3-7	2
B 3.4.15-1	0	B 3.5.3-8	1
B 3.4.15-2	48	B 3.5.3-9	0
B 3.4.15-3	0	B 3.5.3-10	2
B 3.4.15-4	0	B 3.5.4-1	15
B 3.4.15-5	0	B 3.5.4-2	0
B 3.4.15-6	35	B 3.5.4-3	42
B 3.4.15-7	35	B 3.5.5-1	48
B 3.4.16-1	2	B 3.5.5-2	48
B 3.4.16-2	10	B 3.5.5-3	48
B 3.4.16-3	0	B 3.5.5-4	48
B 3.4.16-4	42	B 3.5.5-5	48
B 3.4.16-5	0	B 3.5.5-6	48
B 3.4.16-6	0	B 3.5.5-7	48
B 3.4.17-1	0	B 3.5.5-8	48
B 3.4.17-2	27	B 3.5.5-9	48
B 3.4.17-3	42	B 3.5.5-10	48
B 3.4.17-4	42	B 3.5.5-11	48
B 3.4.17-5	0	B 3.5.5-12	48
B 3.4.17-6	0	B 3.5.5-13	48
B.3.4.18-1	38	B 3.5.5-14	48
B.3.4.18-2	40	B 3.5.5-15	48
B.3.4.18-3	38	B 3.5.5-16	48
B.3.4.18-4	38	B 3.5.6-1	0
B.3.4.18-5	38	B 3.5.6-2	1
B.3.4.18-6	38	B 3.5.6-3	0
B.3.4.18-7	38	B 3.5.6-4	24
B.3.4.18-8	38	B 3.5.6-5	27
B 3.5.1-1	0	B 3.6.1-1	0
B 3.5.1-2	48	B 3.6.1-2	35
B 3.5.1-3	7	B 3.6.1-3	0
B 3.5.1-4	0	B 3.6.1-4	29
B 3.5.1-5	0	B 3.6.1-5	29
B 3.5.1-6	0	B 3.6.2-1	45
B 3.5.1-7	1	B 3.6.2-2	35
B 3.5.1-8	1	B 3.6.2-3	0
B 3.5.1-9	0	B 3.6.2-4	0

TECHNICAL SPECIFICATION BASES
LIST OF EFFECTIVE PAGES

Page No.	Rev. No.	Page No.	Rev No.
B 3.6.2-5	0	B 3.7.2-5	40
B 3.6.2-6	0	B 3.7.2-6	40
B 3.6.2-7	0	B 3.7.2-7	40
B 3.6.2-8	0	B 3.7.2-8	40
B 3.6.3-1	36	B 3.7.2-9	40
B 3.6.3-2	43	B 3.7.3-1	1
B 3.6.3-3	47	B 3.7.3-2	1
B 3.6.3-4	43	B 3.7.3-3	37
B 3.6.3-5	43	B 3.7.3-4	0
B 3.6.3-6	43	B 3.7.3-5	0
B 3.6.3-7	43	B 3.7.4-1	0
B 3.6.3-8	43	B 3.7.4-2	31
B 3.6.3-9	43	B 3.7.4-3	42
B 3.6.3-10	43	B 3.7.4-4	0
B 3.6.3-11	43	B 3.7.5-1	0
B 3.6.3-12	43	B 3.7.5-2	0
B 3.6.3-13	43	B 3.7.5-3	40
B 3.6.3-14	43	B 3.7.5-4	27
B 3.6.3-15	43	B 3.7.5-5	42
B 3.6.3-16	43	B 3.7.5-6	42
B 3.6.3-17	27	B 3.7.5-7	9
B.3.6.3-18	43	B 3.7.5-8	9
B.3.6.3-19	43	B 3.7.5-9	9
B 3.6.4-1	35	B 3.7.5-10	9
B 3.6.4-2	38	B.3.7.5-11	9
B 3.6.4-3	1	B 3.7.6-1	0
B 3.6.5-1	0	B 3.7.6-2	28
B 3.6.5-2	1	B 3.7.6-3	28
B 3.6.5-3	48	B 3.7.6-4	0
B 3.6.5-4	0	B 3.7.7-1	0
B 3.6.6-1	0	B 3.7.7-2	1
B 3.6.6-2	0	B 3.7.7-3	1
B 3.6.6-3	38	B 3.7.7-4	1
B 3.6.6-4	7	B 3.7.7-5	1
B 3.6.6-5	1	B 3.7.8-1	1
B 3.6.6-6	0	B 3.7.8-2	1
B 3.6.6-7	1	B 3.7.8-3	1
B 3.6.6-8	48	B 3.7.8-4	1
B 3.6.6-9	0	B 3.7.9-1	0
B 3.6.7-1	0	B 3.7.9-2	44
B 3.6.7-2	0	B 3.7.9-3	44
B 3.6.7-3	42	B 3.7.10-1	10
B 3.6.7-4	0	B 3.7.10-2	1
B 3.6.7-5	0	B 3.7.10-3	1
B 3.7.1-1	28	B 3.7.10-4	1
B 3.7.1-2	34	B 3.7.11-1	0
B 3.7.1-3	34	B 3.7.11-2	0
B 3.7.1-4	34	B 3.7.11-3	21
B 3.7.1-5	34	B 3.7.11-4	48
B 3.7.1-6	28 Corrected	B 3.7.11-5	48
B 3.7.2-1	40	B 3.7.11-6	10
B 3.7.2-2	42	B 3.7.12-1	1
B 3.7.2-3	40	B 3.7.12-2	21
B 3.7.2-4	40	B 3.7.12-3	21

TECHNICAL SPECIFICATION BASES
LIST OF EFFECTIVE PAGES

Page No.	Rev. No.	Page No.	Rev No.
B 3.7.12-4	10	B 3.8.1-34	45
B 3.7.13-1	0	B 3.8.1-35	48
B 3.7.13-2	0	B 3.8.1-36	45
B 3.7.13-3	0	B 3.8.1-37	45
B 3.7.13-4	0	B 3.8.1-38	45
B 3.7.13-5	0	B 3.8.1-39	45
B 3.7.14-1	0	B 3.8.1-40	48
B 3.7.14-2	21	B 3.8.1-41	45
B 3.7.14-3	21	B 3.8.1-42	45
B 3.7.15-1	3	B 3.8.1-43	45
B 3.7.15-2	3	B 3.8.1-44	45
B 3.7.16-1	7	B 3.8.1-45	45
B 3.7.16-2	0	B.3.8.1-46	45
B 3.7.16-3	0	B.3.8.1-47	45
B 3.7.16-4	0	B.3.8.1-48	45
B 3.7.17-1	23	B 3.8.2-1	0
B 3.7.17-2	3	B 3.8.2-2	0
B 3.7.17-3	3	B 3.8.2-3	0
B 3.7.17-4	3	B 3.8.2-4	21
B 3.7.17-5	3	B 3.8.2-5	21
B 3.7.17-6	3	B 3.8.2-6	0
B 3.8.1-1	35	B 3.8.3-1	0
B 3.8.1-2	2	B 3.8.3-2	0
B 3.8.1-3	34	B 3.8.3-3	38
B 3.8.1-4	34	B 3.8.3-4	0
B 3.8.1-5	20	B 3.8.3-5	34
B 3.8.1-6	27	B 3.8.3-6	41
B 3.8.1-7	42	B 3.8.3-7	41
B 3.8.1-8	42	B 3.8.3-8	41
B 3.8.1-9	42	B 3.8.3-9	41
B 3.8.1-10	43	B 3.8.3-10	48
B 3.8.1-11	43	B 3.8.4-1	0
B 3.8.1-12	48	B 3.8.4-2	37
B 3.8.1-13	48	B 3.8.4-3	0
B 3.8.1-14	48	B 3.8.4-4	2
B 3.8.1-15	48	B 3.8.4-5	2
B 3.8.1-16	41	B 3.8.4-6	2
B 3.8.1-17	41	B 3.8.4-7	35
B 3.8.1-18	41	B 3.8.4-8	35
B 3.8.1-19	41	B 3.8.4-9	35
B 3.8.1-20	41	B 3.8.4-10	37
B 3.8.1-21	41	B 3.8.4-11	48
B 3.8.1-22	41	B 3.8.5-1	1
B 3.8.1-23	41	B 3.8.5-2	1
B 3.8.1-24	41	B 3.8.5-3	21
B 3.8.1-25	41	B 3.8.5-4	21
B 3.8.1-26	45	B 3.8.5-5	2
B 3.8.1-27	45	B 3.8.5-6	2
B 3.8.1-28	41	B 3.8.6-1	0
B 3.8.1-29	41	B 3.8.6-2	0
B 3.8.1-30	45	B 3.8.6-3	0
B 3.8.1-31	45	B 3.8.6-4	6
B 3.8.1-32	45	B 3.8.6-5	37
B 3.8.1-33	48	B 3.8.6-6	37

TECHNICAL SPECIFICATION BASES
LIST OF EFFECTIVE PAGES

Page No.	Rev. No.	Page No.	Rev No.
B 3.8.6-7	48		
B 3.8.7-1	48		
B 3.8.7-2	48		
B 3.8.7-3	48		
B 3.8.7-4	0		
B 3.8.8-1	1		
B 3.8.8-2	1		
B 3.8.8-3	21		
B 3.8.8-4	21		
B 3.8.8-5	1		
B 3.8.9-1	34		
B 3.8.9-2	0		
B 3.8.9-3	0		
B 3.8.9-4	0		
B 3.8.9-5	0		
B 3.8.9-6	0		
B 3.8.9-7	0		
B 3.8.9-8	0		
B 3.8.9-9	0		
B 3.8.9-10	0		
B 3.8.9-11	0		
B 3.8.10-1	0		
B 3.8.10-2	21		
B 3.8.10-3	48		
B 3.8.10-4	0		
B 3.9.1-1	34 Corrected		
B 3.9.1-2	0		
B 3.9.1-3	0		
B 3.9.1-4	0		
B 3.9.2-1	48		
B 3.9.2-2	15		
B 3.9.2-3	15		
B 3.9.2-4	15		
B 3.9.3-1	18		
B 3.9.3-2	19		
B 3.9.3-3	27		
B 3.9.3-4	19		
B 3.9.3-5	19		
B 3.9.3-6	19		
B 3.9.4-1	0		
B 3.9.4-2	1		
B 3.9.4-3	0		
B 3.9.4-4	0		
B 3.9.5-1	0		
B 3.9.5-2	16		
B 3.9.5-3	27		
B 3.9.5-4	16		
B 3.9.5-5	16		
B 3.9.6-1	0		
B 3.9.6-2	0		
B 3.9.6-3	0		
B 3.9.7-1	0		
B 3.9.7-2	0		
B 3.9.7-3	0		

BASES

LCO 3.0.3 (continued)

The requirements of LCO 3.0.3 do not apply in other specified conditions of the Applicability (unless in MODE 1, 2, 3, or 4) because the ACTIONS of individual Specifications sufficiently define the remedial measures to be taken. Exceptions to LCO 3.0.3 are provided in instances where requiring a unit shutdown, in accordance with LCO 3.0.3, would not provide appropriate remedial measures for the associated condition of the unit. An example of this is in LCO 3.7.14, "Fuel Storage Pool Water Level." LCO 3.7.14 has an Applicability of "During movement of irradiated fuel assemblies in the fuel storage pool." Therefore, this LCO can be applicable in any or all MODES. If the LCO and the Required Actions of LCO 3.7.14 are not met while in MODE 1, 2, or 3, there is no safety benefit to be gained by placing the unit in a shutdown condition. The Required Action of LCO 3.7.14 of "Suspend movement of irradiated fuel assemblies in fuel storage pool" is the appropriate Required Action to complete in lieu of the actions of LCO 3.0.3. These exceptions are addressed in the individual Specifications.

LCO 3.0.4

LCO 3.0.4 establishes limitations on changes in MODES or other specified conditions in the Applicability when an LCO is not met. It allows placing the unit in a MODE or other specified condition stated in that Applicability (e.g., the Applicability desired to be entered) when Unit conditions are such that the requirements of the LCO would not be met in accordance with LCO 3.0.4.a, LCO 3.0.4.b, or LCO 3.0.4.c.

LCO 3.0.4.a allows entry into a MODE or other specified condition in the Applicability with the LCO not met when the associated ACTIONS to be entered permit continued operation in the MODE or other specified condition in the Applicability for an unlimited period of time.

(continued)

BASES

LCO 3.0.4 (continued)

Compliance with Required Actions that permit continued operation of the unit for an unlimited period of time in a MODE or other specified condition provides an acceptable level of safety for continued operation. This is without regard to the status of the unit before or after the MODE change. Therefore, in such cases, entry into a MODE or other specified condition in the Applicability may be made in accordance with the provisions of the Required Actions.

LCO 3.0.4.b allows entry into a MODE or other specified condition in the Applicability with the LCO not met after performance of a risk assessment addressing inoperable systems and components, consideration of the results, determination of the acceptability of entering the MODE or other specified condition in the Applicability, and establishment of risk management actions, if appropriate.

The risk assessment may use quantitative, qualitative, or blended approaches, and the risk assessment will be conducted using the plant program, procedures, and criteria in place to implement 10 CFR 50.65(a)(4), which requires that risk impacts of maintenance activities to be assessed and managed. The risk assessment, for the purposes of LCO 3.0.4 (b), must take into account all inoperable Technical Specification equipment regardless of whether the equipment is included in the normal 10 CFR 50.65(a)(4) risk assessment scope. The risk assessments will be conducted using the procedures and guidance endorsed by Regulatory Guide 1.182, "Assessing and Managing Risk Before Maintenance Activities at Nuclear Power Plants." Regulatory Guide 1.182 endorses the guidance in Section 11 of NUMARC 93-01, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." These documents address general guidance for conduct of the risk assessment, quantitative and qualitative guidelines for establishing risk management actions, and example risk management actions. These include actions to plan and conduct other activities in a manner that controls overall risk, increased risk awareness by shift and management personnel, actions to reduce the duration of the condition, actions to minimize the magnitude of risk increases (establishment of backup success paths or compensatory measures), and determination that the proposed MODE change is acceptable. Consideration should also be given to the probability of completing restoration such that the requirements of the LCO would be met prior to the expiration of ACTIONS Completion Times that would require exiting the Applicability.

(continued)

BASES

LCO 3.0.4 (continued)

LCO 3.0.4.b may be used with single, or multiple systems and components unavailable. NUMARC 93-01 provides guidance relative to consideration of simultaneous unavailability of multiple systems and components.

The results of the risk assessment shall be considered in determining the acceptability of entering the MODE or other specified condition in the Applicability, and any corresponding risk management actions. The LCO 3.0.4.b risk assessments do not have to be documented.

The Technical Specifications allow continued operation with equipment unavailable in MODE 1 for the duration of the Completion Time. Since this is allowable, and since in general the risk impact in that particular MODE bounds the risk of transitioning into and through the applicable MODES or other specified conditions in the Applicability of the LCO, the use of the LCO 3.0.4.b allowance should be generally acceptable, as long as the risk is assessed and managed as stated above. However, there is a small subset of systems and components that have been determined to be more important to risk and use of the LCO 3.0.4.b allowance is prohibited. The LCOs governing these systems and components contain Notes prohibiting the use of LCO 3.0.4.b by stating that LCO 3.0.4.b is not applicable.

LCO 3.0.4.c allows entry into a MODE or other specified condition in the Applicability with the LCO not met based on a Note in the Specification which states LCO 3.0.4.c is applicable. These specific allowances permit entry into MODES or other specified conditions in the Applicability when the associated ACTIONS to be entered do not provide for continued operation for an unlimited period of time and a risk assessment has not been performed. This allowance may apply to all the ACTIONS or to a specific Required Action of a Specification. The risk assessments performed to justify the use of LCO 3.0.4.b usually only consider systems and components. For this reason, LCO 3.0.4.c is typically applied to Specifications which describe values and parameters (e.g., RCS Specific Activity), and may be applied to other Specifications based on NRC plant-specific approval.

The provisions of this Specification should not be interpreted as endorsing the failure to exercise the good practice of restoring systems or components to OPERABLE status before entering an associated MODE or other specified condition in the Applicability.

(continued)

BASES

LCO 3.0.4 (continued)

The provisions of LCO 3.0.4 shall not prevent changes in MODES or other specified conditions in the Applicability that are required to comply with ACTIONS. In addition, the provisions of LCO 3.0.4 shall not prevent changes in MODES or other specified conditions in the Applicability that result from any unit shutdown. In this context, a unit shutdown is defined as a change in MODE or other specified condition in the Applicability associated with transitioning from MODE 1 to MODE 2, MODE 2 to MODE 3, MODE 3 to MODE 4, and MODE 4 to MODE 5.

Upon entry into a MODE or other specified condition in the Applicability with the LCO not met, LCO 3.0.1 and LCO 3.0.2 require entry into the applicable Conditions and Required Actions until the Condition is resolved, until the LCO is met, or until the unit is not within the Applicability of the Technical Specification.

Surveillances do not have to be performed on the associated inoperable equipment (or on variables outside the specified limits), as permitted by SR 3.0.1. Therefore, utilizing LCO 3.0.4 is not a violation of SR 3.0.1 or SR 3.0.4 for any Surveillances that have not been performed on inoperable equipment. However, SRs must be met to ensure OPERABILITY prior to declaring the associated equipment OPERABLE (or variable within limits) and restoring compliance with the affected LCO.

LCO 3.0.5

LCO 3.0.5 establishes the allowance for restoring equipment to service under administrative controls when it has been removed from service or declared inoperable to comply with ACTIONS. The sole purpose of this Specification is to provide an exception to LCO 3.0.2 (e.g., to not comply with the applicable Required Action(s)) to allow the performance of required testing to demonstrate:

a. The OPERABILITY of the equipment being returned to service; or

b. The OPERABILITY of other equipment.

The administrative controls ensure the time the equipment is returned to service in conflict with the requirements

(continued)

BASES

BACKGROUND (continued)

event of a CEA ejection accident, and the shutdown and regulating bank insertion limits ensure the required SDM is maintained.

Operation within the subject LCO limits will prevent fuel cladding failures that would breach the primary fission product barrier and release fission products to the reactor coolant in the event of a LOCA, loss of flow, ejected CEA, or other accident requiring termination by a Reactor Protection System trip function.

APPLICABLE SAFETY ANALYSES

The fuel cladding must not sustain damage as a result of normal operation (Condition I) and anticipated operational occurrences (Condition II). The acceptance criteria for the regulating CEA insertion, part length or part strength CEA insertion, ASI, and T_q LCOs preclude core power distributions from occurring that would violate the following fuel design criteria:

a. During a large break LOCA, the peak cladding temperature must not exceed a limit of 2200°F, 10 CFR 50.46 (Ref. 2);

b. During CEA misoperation events, there must be at least a 95% probability at a 95% confidence level (the 95/95 DNB criterion) that the hot fuel rod in the core does not experience a DNB condition;

c. During an ejected CEA accident, the fission energy input to the fuel must not exceed 280 cal/gm (Ref. 3); and

d. The CEAs must be capable of shutting down the reactor with a minimum required SDM, with the highest worth CEA stuck fully withdrawn, GDC 26 (Ref. 1).

Regulating CEA position, ASI, and T_q are process variables that together characterize and control the three dimensional power distribution of the reactor core.

Fuel cladding damage does not occur when the core is operated outside these LCOs during normal operation. However, fuel cladding damage could result, should an

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

accident occur with simultaneous violation of one or more of these LCOs. Changes in the power distribution can cause increased power peaking and corresponding increased local LHRs.

The SDM requirement is ensured by limiting the regulating and shutdown CEA insertion limits, so that the allowable inserted worth of the CEAs is such that sufficient reactivity is available in the CEAs to shut down the reactor to hot zero power with a reactivity margin that assumes the maximum worth CEA remains fully withdrawn upon trip (Ref. 4).

The most limiting SDM requirements for MODE 1 and 2 conditions at BOC are determined by the requirements of several transients, e.g., Loss of Flow, Seized Rotor, etc. However, the most limiting SDM requirements for MODES 1 and 2 at EOC come from just one transient, Steam Line Break (SLB). The requirements of the SLB event at EOC for both the full power and no load conditions are significantly larger than those of any other event at that time in cycle and, also, considerably larger than the most limiting requirements at BOC.

Although the most limiting SDM requirements at EOC are much larger than those at BOC, the available SDM obtained via the scramming of the CEAs are also substantially larger due to the much lower boron concentration at EOC. To verify that adequate SDM are available throughout the cycle to satisfy the changing requirements, calculations are performed at both BOC and EOC. It has been determined that calculations at these two times in cycle are sufficient since the differences between available SDM and the limiting SDM requirements are the smallest at these times in the cycle. The measurement of CEA bank worth performed as part of the Startup Testing Program demonstrates that the core has expected shutdown capability. Consequently, adherence to LCOs 3.1.6 and 3.1.7 provides assurance that the available SDM at any time in cycle will exceed the limiting SDM requirements at that time in the cycle.

(continued)

BASES

LCO (After CPC Upgrade) (continued)

With the COLSS out of service, the limitation on DNBR as a function of the ASI represents a conservative envelope of operating conditions consistent with the analysis assumptions that have been analytically demonstrated adequate to maintain an acceptable minimum DNBR for all AOOs. Operation of the core with a DNBR at or above this limit ensures that an acceptable minimum DNBR is maintained in the event of the most limiting AOO (i.e., loss of flow transient, CEA misoperation events, or asymmetric SG transient).

APPLICABILITY

Power distribution is a concern any time the reactor is critical. The power distribution LCOs, however, are only applicable in MODE 1 above 20% RTP. The reasons these LCOs are not applicable below 20% RTP are:

a. The incore neutron detectors that provide input to the COLSS, which then calculates the operating limits, are inaccurate due to the poor signal to noise ratio that they experience at relatively low core power levels.

b. As a result of this inaccuracy, the CPCs assume a minimum core power of 20% RTP when generating the Local Power Density (LPD) and DNBR trip signals. When the core power is below this level, the core is operating well below the thermal limits and the resultant CPC calculated LPD and DNBR trips are highly conservative.

The upgraded CPC system consists of eight total CEACs instead of the two found in the CPC System prior to upgrade. To facilitate the difference in the number of CEACs as well as to support the enhanced features found in the upgraded CPC system, a second 3.2.4 Technical Specification has been developed. The determination on which Specification applies in based on whether or not the unit has received the upgraded CPCs. Each unit shall only use the Specification that reflects the status of their unit's CPC system (i.e., before or after CPC upgrade).

(continued)

ACTIONS

A.1

Operating at or above the minimum required value of the DNBR ensures that an acceptable minimum DNBR is maintained in the event of a postulated AOO. If the core power as calculated by the COLSS exceeds the core power limit calculated by the COLSS based on the DNBR, fuel design limits may not be maintained following an AOO and prompt action must be taken to restore the DNBR above its minimum Allowable Value. With the COLSS in service, 1 hour is a reasonable time for the operator to initiate corrective actions to restore the DNBR above its specified limit, because of the low probability of a severe transient occurring in this relatively short time.

B.1, B.2.1, and B.2.2

If the COLSS is not available the OPERABLE DNBR channels are monitored to ensure that the DNBR is not exceeded. Maintaining the DNBR within this specified range ensures that no postulated accident results in consequences more severe than those described in the UFSAR, Chapter 15. A 4 hour Frequency is allowed to restore the DNBR limit to within the region of acceptable operation. This Frequency is reasonable because the COLSS allows the plant to operate with less DNBR margin (closer to the DNBR limit) than when monitoring with the CPCs.

When operating with the COLSS out of service and DNBR outside the region of acceptable operation, there is a possibility of a slow undetectable transient that degrades the DNBR slowly over the 4 hour period and is then followed by an anticipated operational occurrence or an accident. To remedy this, the CPC calculated values of DNBR are monitored every 15 minutes when the COLSS is out of service and DNBR outside the region of acceptable operation. The 15 minute frequency is adequate to allow the operator to identify an adverse trend in conditions that could result in an approach to the DNBR limit. Also, a maximum allowable change in the CPC calculated DNBR ensures that further degradation requires the operators to take immediate action to restore DNBR to within limits or reduce reactor power to comply with the Technical Specifications (TS). With an adverse trend, 1 hour is allowed for restoring DNBR to within limits if the COLSS is not restored to OPERABLE status. Implementation of this requirement ensures that reductions in core thermal margin are quickly detected and, if necessary, results in a

(continued)

ACTIONS (continued)

B.1, B.2, and B.2.2 (continued)

decrease in reactor power and subsequent compliance with the existing COLSS out of service TS limits. If DNBR cannot be monitored every 15 minutes, assume that there is an adverse trend.

With no adverse trend, 4 hours is allowed for restoring the DNBR to within limits if the COLSS is not restored to OPERABLE status. This duration is reasonable because the Frequency of the CPC determination of DNBR has been increased, and, if operation is maintained steady, the likelihood of exceeding the DNBR limit during this period is not increased. The likelihood of induced reactor transients from an early power reduction is also decreased.

C.1

If the DNBR cannot be restored or determined within the allowed times of Conditions A and B, core power must be reduced. Reduction of core power to ≤ 20% RTP ensures that the core is operating within its thermal limits and places the core in a conservative condition based on trip setpoints generated by the CPCs, which assume a minimum core power of 20% RTP.

The allowed Completion Time of 6 hours is reasonable, based on operating experience, to reach 20% RTP from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.2.4.1

With the COLSS out of service, the operator must monitor the DNBR as indicated on all of the OPERABLE DNBR channels of the CPCs to verify that the DNBR is within the specified limits shown in the COLR. A 2 hour Frequency is adequate to allow the operator to identify trends in conditions that would result in an approach to the DNBR limit.

(continued)

SURVEILLANCE REQUIREMENTS

SR 3.2.4.1 (continued)

This SR is modified by a Note that states that the SR is only applicable when the COLSS is out of service. Continuous monitoring of the DNBR is provided by the COLSS, which calculates core power and core power operating limits based on the DNBR and continuously displays these limits to the operator. A COLSS margin alarm is annunciated in the event that the THERMAL POWER exceeds the core power operating limit based on the DNBR. This SR is also modified by a Note that states that the SR is not required to be performed until 2 hours after MODE 1 with THERMAL POWER > 20% RTP. During plant startup (increase from 15-18% RTP), the plant dynamics associated with the downcomer to economizer swapover may result in a temporary power increase above 20% RTP. The 2 hours after reaching 20% RTP is required for plant stabilization.

SR 3.2.4.2

Verification that the COLSS margin alarm actuates at a power level equal to or less than the core power operating limit, as calculated by the COLSS, based on the DNBR, ensures that the operator is alerted when operating conditions approach the DNBR operating limit. The 31 day Frequency for performance of this SR is consistent with the historical testing frequency of reactor protection and monitoring systems. The Surveillance Frequency for testing protection systems was extended to 92 days by CEN 327. Monitoring systems were not addressed in CEN 327; therefore, this Frequency remains at 31 days.

REFERENCES

1. UFSAR, Chapter 15.
2. UFSAR, Chapter 6.
3. CE-1 Correlation for DNBR.
4. 10 CFR 50, Appendix A, GDC 10.
5. 10 CFR 50.46.
6. Regulatory Guide 1.77, Rev. 0, May 1974.
7. 10 CFR 50, Appendix A, GDC 26.

B 3.3 INSTRUMENTATION

B 3.3.9 Control Room Essential Filtration Actuation Signal (CREFAS)

BASES

BACKGROUND

This LCO encompasses CREFAS actuation, which is an instrumentation channel that performs an actuation Function required for plant protection but is not otherwise included in LCO 3.3.6, "Engineered Safety Features Actuation System (ESFAS) Logic and Manual Trip," or LCO 3.3.7, "Diesel Generator (DG) - Loss of Voltage Start (LOVS)." This is a BOP ESFAS Function that, because of differences in purpose, design, and operating requirements, is not included in LCO 3.3.6 and LCO 3.3.7.

The CREFAS initiates actuation of the Control Room Essential Filtration System to minimize operator radiation exposure. The CREFAS includes two independent, redundant subsystems, including actuation trains. Each train has a gaseous activity radiation monitor for the control room air intake activity. If either train radiation monitor indicates an unsafe condition, both CREFAS trains will be actuated (one-out-of-two logic). The two trains actuate separate equipment. Actuating either train will perform the intended function. A CREFAS is also initiated by a Containment Purge Isolation Actuation Signal (CPIAS) from either of the two CPIAS channels or by a Fuel Building Essential Ventilation Actuation Signal (FBEVAS) from either of the two FBEVAS channels. Control room filtration also occurs on a Safety Injection Actuation Signal (SIAS).

A cross-train trip function is provided as a defense-in-depth function that is not required for CREFAS operability.

Trip Setpoints and Allowable Values

Trip setpoints used in the bistables are based on the analytical limits (Ref. 1). The selection of these trip setpoints is such that adequate protection is provided when all sensor and processing time delays are taken into account. The trip setpoints are digitally generated by the radiation monitors. These trip values are not subject to drifts common to analog type equipment. The allowable value for this trip is therefore the same as the trip setpoint.

(continued)

BASES (continued)

BACKGROUND

Trip Setpoints and Allowable Values (continued)

Setpoints in accordance with the Allowable Value will ensure that the consequences of Design Basis Accidents will be acceptable, providing the plant is operated from within the LCOs at the onset of the AOO or accident and the equipment functions as designed.

APPLICABLE SAFETY ANALYSES

The CREFAS maintains the control room atmosphere within conditions suitable for prolonged occupancy throughout the duration of any one of the accidents discussed in Reference 1. The radiation exposure of control room personnel, through the duration of any one of the postulated accidents discussed in "Accident Analysis," FSAR, Chapter 15 (Ref. 1), does not exceed the limits set by 10 CFR 50, Appendix A, GDC 19 (Ref. 2).

The CREFAS satisfies the requirements of Criterion 3 of 10 CFR 50.36 (c)(2)(ii).

LCO

LCO 3.3.9 requires one channel of CREFAS to be OPERABLE. The required channel consists of Actuation Logic, Manual Trip, and a gaseous radiation monitor. The specific trip setpoint for the CREFAS is listed in the SR.

Each trip setpoint specified is more conservative than the analytical limit assumed in the transient and accident analysis in order to account for instrument uncertainties appropriate to the trip Function. A channel is inoperable if its actual trip setpoint is not set to the value specified in SR 3.3.9.2.

The Bases for the LCO on the CREFAS are discussed below for each Function:

(continued)

LCO (continued)

A vent path is flow capability from the pressurizer to the RDT or from the pressurizer to containment atmosphere. Loss of any single valve in the pressurizer vent system will cause two flow paths to become inoperable. A pressurizer vent path is required to depressurize the RCS in a SGTR design basis event which assumes LOP and APSS unavailable.

APPLICABILITY

In MODES 1, 2, 3, and MODE 4 with RCS pressure ≥ 385 psia the four pressurizer vent paths are required to be OPERABLE. The safety analysis for the SGTR with LOP and a Single Failure (loss of APSS) credits a pressurizer vent path to reduce RCS pressure.

In MODES 1, 2, 3, and MODE 4 with RCS pressure ≥ 385 psia the SGs are the primary means of heat removal in the RCS, until shutdown cooling can be initiated. In MODES 1, 2, 3, and MODE 4 with RCS pressure ≥ 385 psia, assuming the APSS is not available, the pressurizer vent paths are the credited means to depressurize the RCS to Shutdown Cooling System entry conditions. Further depressurization into MODE 5 requires use of the pressurizer vent paths. In MODE 5 with the reactor vessel head in place, temperature requirements of MODE 5 (< 210°F) ensure the RCS remains depressurized. In MODE 6 the RCS is depressurized.

ACTIONS

A.1

If two or three pressurizer vent paths are inoperable, they must be restored to OPERABLE status. Loss of any single valve in the pressurizer vent system will cause two flow paths to become inoperable. Any vent path that provides flow capability from the pressurizer to the RDT or to the containment atmosphere, independent of which train is powering the valves in the flow path, can be considered an operable vent path. The Completion Time of 72 hours is reasonable because there is at least one pressurizer vent path that remains OPERABLE.

(continued)

B.1

If all pressurizer vent paths are inoperable, then restore at least one pressurizer vent path to OPERABLE status. The Completion Time of 6 hours is reasonable to allow time to correct the situation, yet emphasize the importance of restoring at least one pressurizer vent path. If at least one pressurizer vent path is not restored to OPERABLE within the Completion Time, then Action C is entered.

C.1

If the required Actions, A and B, cannot be met within the associated Completion Times, the plant must be brought to a MODE in which the requirement does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours, and to MODE 4 with RCS pressure < 385 psia within 24 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.4.12.1

SR 3.4.12.1 requires complete cycling of each pressurizer vent path valve. The vent valves must be cycled from the control room to demonstrate their operability. Pressurizer vent path valve cycling demonstrates its function. The frequency of 18 months is based on a typical refueling cycle and industry accepted practice. This surveillance test must be performed in Mode 5 or Mode 6.

SR 3.4.12.2

SR 3.4.12.2 requires verification of flow through each pressurizer vent path. Verification of pressurizer vent path flow demonstrates its function. The frequency of 18 months is based on a typical refueling cycle and industry accepted practice. This surveillance test must be performed in Mode 5 or Mode 6.

(continued)

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.15 RCS Pressure Isolation Valve (PIV) Leakage

BASES

BACKGROUND

10 CFR 50.2, 10 CFR 50.55a(c), and GDC 55 of 10 CFR 50, Appendix A (Refs. 1, 2, and 3), define RCS PIVs as any two normally closed valves in series within the RCS pressure boundary that separate the high pressure RCS from an attached low pressure system. During their lives, these valves can produce varying amounts of reactor coolant leakage through either normal operational wear or mechanical deterioration. The RCS PIV LCO allows RCS high pressure operation when leakage through these valves exists in amounts that do not compromise safety.

The PIV leakage limit applies to each individual valve. Leakage through both PIVs in series in a line must be included as part of the identified LEAKAGE, governed by LCO 3.4.14, "RCS Operational LEAKAGE." This is true during operation only when the loss of RCS mass through two valves in series is determined by a water inventory balance (SR 3.4.14.1). A known component of the identified LEAKAGE before operation begins is the least of the two individual leakage rates determined for leaking series PIVs during the required surveillance testing; leakage measured through one PIV in a line is not RCS operational LEAKAGE if the other is leaktight.

Although this specification provides a limit on allowable PIV leakage rate, its main purpose is to prevent overpressure failure of the low pressure portions of connecting systems. The leakage limit is an indication that the PIVs between the RCS and the connecting systems are degraded or degrading. PIV leakage could lead to overpressure of the low pressure piping or components. Failure consequences could be a Loss of Coolant Accident (LOCA) outside of containment, an unanalyzed condition that could degrade the ability for low pressure injection.

The basis for this LCO is the 1975 NRC "Reactor Safety Study" (Ref. 4) that identified potential intersystem LOCAs as a significant contributor to the risk of core melt. A subsequent study (Ref. 5) evaluated various PIV configurations to determine the probability of intersystem LOCAs.

(continued)

BASES

BACKGROUND (continued)

PIVs are provided to isolate the RCS from the following typically connected systems:

a. Shutdown Cooling (SDC) System; and

b. Safety Injection System;

The PIVs are listed in UFSAR section 3.9.6.2 (Ref. 6).

Violation of this LCO could result in continued degradation of a PIV, which could lead to overpressurization of a low pressure system and the loss of the integrity of a fission product barrier.

APPLICABLE SAFETY ANALYSES

Reference 4 identified potential intersystem LOCAs as a significant contributor to the risk of core melt. The dominant accident sequence in the intersystem LOCA category is the failure of the low pressure portion of the SDC System outside of containment. The accident is the result of a postulated failure of the PIVs, which are part of the Reactor Coolant Pressure Boundary (RCPB), and the subsequent pressurization of the SDC System downstream of the PIVs from the RCS. Because the low pressure portion of the SDC System is typically designed for 485 psig, overpressurization failure of the SDC low pressure line would result in a LOCA outside containment and subsequent risk of core melt.

Reference 5 evaluated various PIV configurations, leakage testing of the valves, and operational changes to determine the effect on the probability of intersystem LOCAs. This study concluded that periodic leakage testing of the PIVs can substantially reduce the probability of an intersystem LOCA.

RCS PIV leakage satisfies Criterion 2 of 10 CFR 50.36 (C)(2)(ii).

LCO

RCS PIV leakage is identified LEAKAGE into closed systems connected to the RCS. Isolation valve leakage is usually on the order of drops per minute. Leakage that increases

(continued)

B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

B 3.5.1 Safety Injection Tanks (SITs) - Operating

BASES

BACKGROUND

The functions of the four SITs are to supply water to the reactor vessel during the blowdown phase of a Loss of Coolant Accident (LOCA), to provide inventory to help accomplish the refill phase that follows thereafter, and to provide Reactor Coolant System (RCS) makeup for a small break LOCA.

The blowdown phase of a large break LOCA is the initial period of the transient during which the RCS departs from equilibrium conditions, and heat from fission product decay, hot internals, and the vessel continues to be transferred to the reactor coolant. The blowdown phase of the transient ends when the RCS pressure falls to a value approaching that of the containment atmosphere.

The refill phase of a LOCA follows immediately where reactor coolant inventory has vacated the core through steam flashing and ejection out through the break. The core is essentially in adiabatic heatup. The balance of the SITs' inventory is then available to help fill voids in the lower plenum and reactor vessel downcomer to establish a recovery level at the bottom of the core and ongoing reflood of the core with the addition of Safety Injection (SI) water.

The SITs are pressure vessels partially filled with borated water and pressurized with nitrogen gas. The SITs are passive components, since no operator or control action is required for them to perform their function. Internal tank pressure is sufficient to discharge the contents to the RCS, if RCS pressure decreases below the SIT pressure.

Each SIT is piped into one RCS cold leg via the injection lines utilized by the High Pressure Safety Injection and Low Pressure Safety Injection (HPSI and LPSI) Systems. Each SIT is isolated from the RCS by a motor operated isolation valve and two check valves in series. The motor operated isolation valves are normally open, with power removed from the valve motor to prevent inadvertent closure prior to or during an accident.

(continued)

BACKGROUND (continued)

Additionally, the isolation valves are interlocked with the pressurizer pressure instrumentation channels to ensure that the valves will automatically open as RCS pressure increases above SIT pressure and to prevent inadvertent closure prior to an accident. The valves also receive a Safety Injection Actuation Signal (SIAS) to open. These features ensure that the valves meet the requirements of the Institute of Electrical and Electronic Engineers (IEEE) Standard 279-1971 (Ref. 1) for "operating bypasses" and that the SITs will be available for injection without reliance on operator action.

During operations at RCS pressure greater than 430 psia the SIT isolation valves are procedurally locked open and motive power is removed with the breakers locked open.

The open and closure interlocks are tested as described in UFSAR 7.6.2.2.2 (Reference 7). The open interlock is functionally tested per Reference 8 (TRM, T3.5 (ECCS); TSR 3.5.200.4). The SIAS function to open these valves is tested per Reference 8 using the method described in Reference 7.

The SIT gas and water volumes, gas pressure, and outlet pipe size are selected to allow three of the four SITs to partially recover the core before significant clad melting or zirconium water reaction can occur following a LOCA. The need to ensure that three SITs are adequate for this function is consistent with the LOCA assumption that the entire contents of one SIT will be lost via the break during the blowdown phase of a LOCA.

APPLICABLE SAFETY ANALYSES

The SITs are taken credit for in both the large and small break LOCA analyses at full power (Ref. 2). These are the Design Basis Accidents (DBAs) that establish the acceptance limits for the SITs. Reference to the analyses for these DBAs is used to assess changes to the SITs as they relate to the acceptance limits.

In performing the LOCA calculations, conservative assumptions are made concerning the availability of SI flow. These assumptions include signal generation time, equipment starting times, and delivery time due to system piping. In the early stages of a LOCA with a loss of offsite power, the SITs provide the sole source of makeup water to the RCS. (The assumption of a loss of offsite power is required by regulations.) This is because the LPSI pumps and HPSI pumps cannot deliver flow until the Diesel Generators (DGs) start, come to rated speed, and go through their timed loading sequence. In cold leg breaks, the entire contents of one SIT are assumed to be lost through the break during the blowdown and reflood phases.

The limiting large break LOCA is a double ended guillotine cold leg break at the discharge of the reactor coolant pump.

(continued)

B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

B 3.5.3 ECCS - Operating

BASES

BACKGROUND

The function of the ECCS is to provide core cooling and negative reactivity to ensure that the reactor core is protected after any of the following accidents:

a. Loss of Coolant Accident (LOCA);

b. Control Element Assembly (CEA) ejection accident;

c. Loss of secondary coolant accident, including uncontrolled steam release or loss of feedwater; and

d. Steam Generator Tube Rupture (SGTR).

The addition of negative reactivity is designed primarily for the loss of secondary coolant accident where primary cooldown could add enough positive reactivity to achieve criticality and return to significant power.

There are two phases of ECCS operation: injection and recirculation. In the injection phase, all injection is initially added to the Reactor Coolant System (RCS) via the cold legs. After the blowdown stage of the LOCA stabilizes, injection flow is split equally between the hot and cold legs. After the Refueling Water Tank (RWT) has been depleted, the ECCS recirculation phase is entered as the ECCS suction is automatically transferred to the containment sump.

Two redundant, 100% capacity trains are provided. In MODES 1, 2, and 3, with pressurizer pressure ≥ 1837 psia or with RCS T_c ≥ 485°F each train consists of High Pressure Safety Injection (HPSI) and Low Pressure Safety Injection (LPSI) subsystems. In MODES 1, 2, and 3, with pressurizer pressure ≥ 1837 psia or with RCS Tc ≥ 485°F both trains must be OPERABLE. This ensures that 100% of the core cooling requirements can be provided in the event of a single active failure.

(continued)

BACKGROUND (continued)

A suction header supplies water from the RWT or the containment sump to the ECCS pumps. Separate piping supplies each train. The discharge headers from each HPSI pump divide into four supply lines. Both HPSI trains feed into each of the four injection lines. The discharge header from each LPSI pump divides into two supply lines, each feeding the injection line to two RCS cold legs. Control valves or orifices are set to balance the flow to the RCS. This flow balance directs sufficient flow to the core to meet the analysis assumptions following a LOCA in one of the RCS cold legs.

The Safety Injection (SI) systems are actuated upon receipt of an SIAS. The actuation of safeguard loads is accomplished in a programmed time sequence. If offsite power is available, the safeguard loads start immediately in the programmed sequence. If offsite power is not available, the Engineered Safety Feature (ESF) buses shed normal operating loads and are connected to the Diesel Generators (DGs). Safeguard loads are then actuated in the programmed time sequence. The time delay associated with diesel starting, sequenced loading, and pump starting determines the time required before pumped flow is available to the core following a LOCA.

The active ECCS components, along with the passive Safety Injection Tanks (SITs) and the RWT, covered in LCO 3.5.1, "Safety Injection Tanks (SITs)-Operating"; LCO 3.5.2, "SITs-Shutdown"; and LCO 3.5.5, "Refueling Water Tank (RWT)," provide the cooling water necessary to meet GDC 35 (Ref. 1).

APPLICABLE SAFETY ANALYSES

The LCO helps to ensure that the following acceptance criteria, established by 10 CFR 50.46 (Ref. 2) for ECCSs, will be met following a LOCA:

a. Maximum fuel element cladding temperature is ≤ 2200°F;

b. Maximum cladding oxidation is ≤ 0.17 times the total cladding thickness before oxidation;

(continued)

B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

B 3.5.5 Refueling Water Tank (RWT)

BASES (Units 1 & 3 only)

BACKGROUND

The RWT supports the ECCS and the Containment Spray System by providing a source of borated water for Engineered Safety Feature (ESF) pump operation.

The RWT supplies two ECCS trains by separate, redundant supply headers. Each header also supplies one train of the Containment Spray System. A motor operated isolation valve is provided in each header to allow the operator to isolate the usable volume of the RWT from the ECCS after the ESF pump suction has been transferred to the containment sump following depletion of the RWT during a Loss of Coolant Accident (LOCA). A separate header is used to supply the Chemical and Volume Control System (CVCS) from the RWT. Use of a single RWT to supply both trains of the ECCS is acceptable since the RWT is a passive component, and passive failures are not assumed to occur coincidently with the Design Basis Event during the injection phase of an accident. Not all the water stored in the RWT is available for injection following a LOCA; the location of the ECCS suction piping in the RWT will result in some portion of the stored volume being unavailable.

The High Pressure Safety Injection (HPSI), Low Pressure Safety Injection (LPSI), and containment spray pumps are provided with recirculation lines that ensure each pump can maintain minimum flow requirements when operating at shutoff head conditions. These lines discharge back to the RWT, which vents to the Fuel Building Ventilation System. When the suction for the HPSI and containment spray pumps is transferred to the containment sump, this flow path must be isolated to prevent a release of the containment sump contents to the RWT. If not isolated, this flow path could result in a release of contaminants to the atmosphere and the eventual loss of suction head for the ESF pumps.

This LCO ensures that:

a. The RWT contains sufficient borated water to support the ECCS during the injection phase;

(continued)

BACKGROUND (continued)

b. Sufficient water volume exists in the containment sump to support continued operation of the ESF pumps at the time of transfer to the recirculation mode of cooling; and

c. The reactor remains subcritical following a LOCA.

Insufficient water inventory in the RWT could result in insufficient cooling capacity of the ECCS when the transfer to the recirculation mode occurs. Improper boron concentrations could result in a reduction of SDM or excessive boric acid precipitation in the core following a LOCA, as well as excessive caustic stress corrosion of mechanical components and systems inside containment.

The RWT also provides a source of borated water to the charging system for makeup to the RCS to compensate for contraction of the RCS coolant during plant cooldown while maintaining adequate shutdown margin. Although this charging system boration function is not required to be in a Technical Specification LCO per 10 CFR 50.36(c)(2)(ii) criteria, the RWT volume requirements of Figure 3.5.5-1 include this function in order to provide the plant operators with a single requirement for RWT volume.

For hot zero power temperature of 565 degrees F, the RWT volume requirement of 600,000 gallons will ensure adequate shutdown margin during a subsequent cooldown. For power levels greater than zero, with a corresponding increase in average RCS temperature, the volume of borated water to maintain the shutdown margin is the same as at zero power. Contraction requirements are greater at higher average RCS temperatures; however, the additional contraction is accommodated by an acceptable reduction in pressurizer level. Consequently, for operation at average RCS temperatures greater than 565 degrees F, the minimum volume required in the RWT is constant at 600,000 gallons.

(continued)

BASES (Units 1 & 3 only)

APPLICABLE SAFETY ANALYSES

During accident conditions, the RWT provides a source of borated water to the HPSI, LPSI and containment spray pumps. As such, it provides containment cooling and depressurization, core cooling, and replacement inventory and is a source of negative reactivity for reactor shutdown (Ref. 1). The design basis transients and applicable safety analyses concerning each of these systems are discussed in the Applicable Safety Analyses section of Bases B 3.5.3, "ECCS – Operating," and B 3.6.6, "Containment Spray." These analyses are used to assess changes to the RWT in order to evaluate their effects in relation to the acceptance limits.

The volume limit of Figure 3.5.5-1 for the ESF function is based on two factors:

a. A required volume of 558,978 gallons (138' 11") must be available to provide inventory to the ESF pumps prior to reaching a low level switchover to the containment sump for recirculation. This ESF Reserve Volume ensures that the ESF pump suction will not be aligned to the containment sump until the point at which 75% of the minimum design flow of one HPSI pump is capable of meeting or exceeding the decay heat boil-off rate.

b. A required volume of 576,616 gallons to ensure that sufficient water will be transferred to the sump for adequate net positive suction head to support continued ESF pump operation after the switchover to recirculation occurs.

By time of recirculation, the water level in the containment sump must be sufficient to provide adequate Net Positive Suction Head (NPSH) for both trains of HPSI, LPSI, and containment spray pumps operating at runout conditions. Accounting for LPSI pump operation is conservative because these pumps trip automatically upon RAS and are not

(continued)

APPLICABLE SAFETY ANALYSES (continued)

required during recirculation. The minimum containment sump level can be achieved considering only the inventory specified in the RWT plus limited contributions from safety injection tanks and the reactor coolant. The resultant containment water inventory is further reduced due to the effects of evaporation and flashing of post-accident fluid; holdup in containment atmosphere, subcompartments, and reservoirs due to containment spray operation; and diversions of RWT to the CVCS via the high suction nozzle. Leakages from injection and recirculation equipment to areas outside the containment during the first 24 hours of the event are expected to be small in comparison with the overall conservatism in the analysis and are therefore neglected. Consistent with the positions in Regulatory Guides 1.1 and 1.82, no credit was taken for containment pressure in calculating available NPSH.

The 4000 ppm limit for minimum boron concentration was established to ensure that, following a LOCA with a minimum level in the RWT, the reactor will remain subcritical in the cold condition following mixing of the RWT and RCS water volumes. Small break LOCAs assume that all control rods are inserted, except for the Control Element Assembly (CEA) of highest worth, which is withdrawn from the core. Large break LOCAs assume that all CEAs remain withdrawn from the core. The most limiting case occurs at beginning of core life.

The maximum boron limit of 4400 ppm in the RWT is based on boron precipitation in the core following a LOCA. With the reactor vessel at saturated conditions, the core dissipates heat by pool nucleate boiling. Because of this boiling phenomenon in the core, the boric acid concentration will increase in this region. If allowed to proceed in this manner, a point will be reached where boron precipitation will occur in the core. Post LOCA emergency procedures direct the operator to establish simultaneous hot and cold leg injection to prevent this condition by establishing a forced flow path through the core regardless of break location. These procedures are based on the minimum time in which precipitation could occur, assuming that maximum boron concentrations exist in the borated water sources used for injection following a LOCA. Boron concentrations in the RWT in excess of the limit could result in precipitation earlier than assumed in the analysis.

(continued)

APPLICABLE SAFETY ANALYSES (continued)

The upper limit of 120°F and the lower limit of 60°F on RWT temperature are the limits assumed in the accident analysis. Although RWT temperature affects the outcome of several analyses, the upper and lower limits established by the LCO are not limited by any of these analyses.

The RWT ESF function satisfies Criterion 3 of 10 CFR 50.36 (c)(2)(ii).

LCO

The RWT ensures that an adequate supply of borated water is available to cool and depressurize the containment in the event of a Design Basis Accident (DBA) and to cool and cover the core in the event of a LOCA, that the reactor remains subcritical following a DBA, and that an adequate level exists in the containment sump to support ESF pump operation in the recirculation mode.

To be considered OPERABLE, the RWT must meet the limits established in the SRs for water volume, boron concentration, and temperature.

APPLICABILITY

In MODES 1, 2, 3, and 4, the RWT OPERABILITY requirements are dictated by the ECCS and Containment Spray System OPERABILITY requirements. Since both the ECCS and the Containment Spray System must be OPERABLE in MODES 1, 2, 3, and 4, the RWT must be OPERABLE to support their operation.

Core cooling requirements in MODE 5 are addressed by LCO 3.4.7, "RCS Loops – MODE 5, Loops Filled," and LCO 3.4.8, "RCS Loops – MODE 5, Loops Not Filled." MODE 6 core cooling requirements are addressed by LCO 3.9.4, "Shutdown Cooling (SDC) and Coolant Circulation – High Water Level," and LCO 3.9.5, "Shutdown Cooling (SDC) and Coolant Circulation – Low Water Level."

ACTIONS

A.1

With RWT boron concentration or borated water temperature not within limits, it must be returned to within limits within 8 hours. In this condition neither the ECCS nor the Containment Spray System can perform their design functions; therefore, prompt action must be taken to restore the tank to OPERABLE condition. The allowed Completion Time of

(continued)

BASES (Units 1 & 3 only)

ACTIONS

A.1 (continued)

8 hours to restore the RWT to within limits was developed considering the time required to change boron concentration or temperature and that the contents of the tank are still available for injection and core cooling.

B.1

With RWT borated water volume not within limits, it must be returned to within limits within 1 hour. In this condition, neither the ECCS nor Containment Spray System can perform their design functions; therefore, prompt action must be taken to restore the tank to OPERABLE status or to place the unit in a MODE in which these systems are not required. The allowed Completion Time of 1 hour to restore the RWT to OPERABLE status is based on this condition since the contents of the tank are not available for injection and core cooling.

C.1 and C.2

If the RWT cannot be restored to OPERABLE status within the associated Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.5.5.1

RWT borated water temperature shall be verified every 24 hours to be within the limits assumed in the accident analysis. This Frequency has been shown to be sufficient to identify temperature changes that approach either acceptable limit.

(continued)

SURVEILLANCE REQUIREMENTS

SR 3.5.5.1 (continued)

The SR is modified by a Note that eliminates the requirement to perform this Surveillance when ambient air temperatures are within the operating temperature limits of the RWT. With ambient temperatures within this range, the RWT temperature should not exceed the limits.

SR 3.5.5.2

The RWT water volume level shall be verified every 7 days in accordance with Figure 3.5.5-1. This Frequency ensures that a sufficient initial water supply is available for injection and to support continued ESF pump operation on recirculation. Since the RWT volume is normally stable and is provided with a Low Level Alarm in the Control Room, a 7 day Frequency is appropriate and has been shown to be acceptable through operating experience.

SR 3.5.5.3

Boron concentration of the RWT shall be verified every 7 days to be within the required range. This Frequency ensures that the reactor will remain subcritical following a LOCA and the boron precipitation in the core will not occur earlier than predicted. Further, it ensures that the resulting sump pH will be maintained in an acceptable range such that the effect of chloride and caustic stress corrosion on mechanical systems and components will be minimized. Since the RWT volume is normally stable, a 7 day sampling Frequency is appropriate and has been shown through operating experience to be acceptable.

REFERENCES

1. UFSAR, Chapter 6 and Chapter 15.

B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

B 3.5.5 Refueling Water Tank (RWT)

BASES (Unit 2 only)

BACKGROUND

The RWT supports the ECCS and the Containment Spray System by providing a source of borated water for Engineered Safety Feature (ESF) pump operation.

The RWT supplies two ECCS trains by separate, redundant supply headers. Each header also supplies one train of the Containment Spray System. A motor operated isolation valve is provided in each header to allow the operator to isolate the usable volume of the RWT from the ECCS after the ESF pump suction has been transferred to the containment sump following depletion of the RWT during a Loss of Coolant Accident (LOCA). A separate header is used to supply the Chemical and Volume Control System (CVCS) from the RWT. Use of a single RWT to supply both trains of the ECCS is acceptable since the RWT is a passive component, and passive failures are not assumed to occur coincidently with the Design Basis Event during the injection phase of an accident. Not all the water stored in the RWT is available for injection following a LOCA; the location of the ECCS suction piping in the RWT will result in some portion of the stored volume being unavailable.

The High Pressure Safety Injection (HPSI), Low Pressure Safety Injection (LPSI), and containment spray pumps are provided with recirculation lines that ensure each pump can maintain minimum flow requirements when operating at shutoff head conditions. These lines discharge back to the RWT. The RWT vents to the Fuel Building Ventilation System. When the suction for the HPSI and containment spray pumps is transferred to the containment sump, this flow path must be isolated to prevent a release of the containment sump contents to the RWT. If not isolated, this flow path could result in a release of contaminants to the atmosphere and the eventual loss of suction head for the ESF pumps.

This LCO ensures that:

a. The RWT contains sufficient borated water to support the ECCS during the injection phase;

(continued)

BACKGROUND (continued)

b. Sufficient water volume exists in the containment sump to support continued operation of the ESF pumps at the time of transfer to the recirculation mode of cooling; and

c. The reactor remains subcritical following a LOCA.

Insufficient water inventory in the RWT could result in (1) insufficient cooling capacity of the ECCS, or (2) insufficient water level to support continued ESF pump operation when the transfer to the recirculation mode occurs. Improper boron concentrations could result in a reduction of SDM or excessive boric acid precipitation in the core following a LOCA, as well as excessive caustic stress corrosion of mechanical components and systems inside containment.

The RWT also provides a source of borated water to the charging system for makeup to the RCS to compensate for contraction of the RCS coolant during plant cooldown while maintaining adequate shutdown margin. Although this charging system boration function is not required to be in a Technical Specification LCO per 10 CFR 50.36(c)(2)(ii) criteria, the RWT volume requirements of Figure 3.5.5-1 include this function in order to provide the plant operators with a single requirement for RWT volume.

(continued)

BASES (Unit 2 only)

The table below provides the required RWT level at selected RCS average temperature values corresponding to Figure 3.5.5-1. The RWT volume is the total volume of water in the RWT above the vortex breaker. This volume includes the volumes required to be transferred, as discussed below, an allowance for instrument uncertainty, and the volume that will remain the RWT after the switch over to the recirculation mode.

RWT Required Level at RCS Temperatures

RCS Temperature (°F) average	RWT Required Level (%)	RWT Volume * (Gallons)
210	79.9	601,000
250	80.1	603,000
300	80.4	605,000
350	80.8	608,000
400	81.2	611,000
450	81.6	614,000
500	82.1	618,000
565	83.0	624,000
600	83.0	624,000

* The volumes include instrument uncertainty and have been rounded up or down to the nearest 1,000 gallons.

(continued)

APPLICABLE SAFETY ANALYSES

During accident conditions, the RWT provides a source of borated water to the HPSI, LPSI and containment spray pumps. As such, it provides containment cooling and depressurization, core cooling, and replacement inventory and is a source of negative reactivity for reactor shutdown (Ref. 1). The design basis transients and applicable safety analyses concerning each of these systems are discussed in the Applicable Safety Analyses section of Bases B 3.5.3, "ECCS – Operating," and B 3.6.6, "Containment Spray." These analyses are used to assess changes to the RWT in order to evaluate their effects in relation to the acceptance limits.

The level limit of Figure 3.5.5-1 for the ESF function is based on the largest of the following four factors:

a. A volume of 476,338 gallons must be transferred to containment via the ESF pumps prior to reaching a low level switchover to the containment sump for recirculation. This ESF Reserve Volume ensures that the ESF pump suction will not be aligned to the containment sump until the point at which 75% of the minimum design flow of one HPSI pump is capable of meeting or exceeding the decay heat boil-off rate.

b. A volume of 543,200 gallons (at 600°F) must be transferred to the RCS and containment for flooding of sump strainers to prevent vortexing and to ensure adequate net positive suction head to support continued ESF pump operation after the switchover to recirculation occurs.

c. A volume of 400,000 gallons must be available for Containment Spray System operation as credited in the containment pressure and temperature analyses.

d. A volume of borated water is needed during ECCS functions to ensure shut down margin (SDM) is maintained. The volume required is similar to that needed for the charging system function of compensating for contraction of the RCS coolant during plant cooldown. The volume required will vary depending upon the event and is bounded by the volume

(continued)

APPLICABLE SAFETY ANALYSES (continued)

needed for a LOCA. The volume needed for boration purposes for a LOCA is smaller than the volumes discussed in a, b, and c above.

The quantities specified above are transfer volumes to be available for delivery to the ESF pumps. They are located between the required level of Figure 3.5.5-1 and the low level switchover to the containment sump for recirculation (RAS). The required level of Figure 3.5.5-1 also considers applicable instrument uncertainty for the indicators used to verify level, the switch that actuates the recirculation actuation signal, and the indicators for average RCS temperature.

The level required by Figure 3.5.5-1 ensures that adequate water volume exists in the tank to provide the transfer volumes discussed above. The temperatures of note on the Figure are (1) 600°F which bounds the highest expected average RCS temperature, (2) 565°F, which corresponds to hot zero power, and (3) 210°F, which is the lowest temperature for Mode 4, when this LCO is applicable. Between 600°F and 565°F the required level is constant for ease of use by operators to have a single value for all hot conditions. Between 565°F and 210°F the required level decreases as the volume required to makeup for RCS coolant contraction decreases.

By time of recirculation, the water level in the containment sump must be sufficient to provide adequate Net Positive Suction Head (NPSH) for both trains of HPSI, LPSI, and containment spray pumps operating at runout conditions. Accounting for LPSI pump operation is conservative because these pumps trip automatically upon RAS and are not required during recirculation. The minimum containment sump level can be achieved considering only the inventory specified in the RWT with no contributions from safety injection tanks and the reactor coolant. The resultant containment water inventory is further reduced due to the effects of evaporation and flashing of post-accident fluid; holdup in containment atmosphere, subcompartments, and reservoirs due to containment spray operation; and diversions of RWT to the CVCS via the high suction nozzle. Leakages from injection and recirculation

(continued)

BASES (Unit 2 only)

APPLICABLE SAFETY ANALYSES (continued)

equipment to areas outside the containment during the first 24 hours of the event are expected to be small in comparison with the overall conservatism in the analysis and are therefore neglected. Consistent with the positions in Regulatory Guides 1.1 and 1.82, no credit was taken for containment pressure in calculating available NPSH.

The 4000 ppm limit for minimum boron concentration was established to ensure that, following a LOCA with a minimum level in the RWT, the reactor will remain subcritical in the cold condition following mixing of the RWT and RCS water volumes. Small break LOCAs assume that all control rods are inserted, except for the Control Element Assembly (CEA) of highest worth, which is withdrawn from the core. Large break LOCAs assume that all CEAs remain withdrawn from the core. The most limiting case occurs at beginning of core life.

The maximum boron limit of 4400 ppm in the RWT is based on boron precipitation in the core following a LOCA. With the reactor vessel at saturated conditions, the core dissipates heat by pool nucleate boiling. Because of this boiling phenomenon in the core, the boric acid concentration will increase in this region. If allowed to proceed in this manner, a point will be reached where boron precipitation will occur in the core. Post LOCA emergency procedures direct the operator to establish simultaneous hot and cold leg injection to prevent this condition by establishing a forced flow path through the core regardless of break location. These procedures are based on the minimum time in which precipitation could occur, assuming that maximum boron concentrations exist in the borated water sources used for injection following a LOCA. Boron concentrations in the RWT in excess of the limit could result in precipitation earlier than assumed in the analysis.

The upper limit of 120°F and the lower limit of 60°F on RWT temperature are the limits assumed in the accident analysis. Although RWT temperature affects the outcome of several analyses, the upper and lower limits established by the LCO are not limited by any of these analyses.

The RWT ESF function satisfies Criterion 3 of 10 CFR 50.36 (c)(2)(ii).

(continued)

BASES (Unit 2 only)

LCO

The RWT ensures that an adequate supply of borated water is available to cool and depressurize the containment in the event of a Design Basis Accident (DBA) and to cool and cover the core in the event of a LOCA, that the reactor remains subcritical following a DBA, and that an adequate level exists in the containment sump to support ESF pump operation in the recirculation mode.

To be considered OPERABLE, the RWT must meet the limits established in the SRs for water volume, boron concentration, and temperature.

APPLICABILITY

In MODES 1, 2, 3, and 4, the RWT OPERABILITY requirements are dictated by the ECCS and Containment Spray System OPERABILITY requirements. Since both the ECCS and the Containment Spray System must be OPERABLE in MODES 1, 2, 3, and 4, the RWT must be OPERABLE to support their operation.

Core cooling requirements in MODE 5 are addressed by LCO 3.4.7, "RCS Loops — MODE 5, Loops Filled," and LCO 3.4.8, "RCS Loops — MODE 5, Loops Not Filled." MODE 6 core cooling requirements are addressed by LCO 3.9.4, "Shutdown Cooling (SDC) and Coolant Circulation — High Water Level," and LCO 3.9.5, "Shutdown Cooling (SDC) and Coolant Circulation — Low Water Level."

ACTIONS

A.1

With RWT boron concentration or borated water temperature not within limits, it must be returned to within limits within 8 hours. In this condition neither the ECCS nor the Containment Spray System can perform their design functions; therefore, prompt action must be taken to restore the tank to OPERABLE condition. The allowed Completion Time of 8 hours to restore the RWT to within limits was developed considering the time required to change boron concentration or temperature and that the contents of the tank are still available for injection and core cooling.

(continued)

BASES (Unit 2 only)

ACTIONS

B.1

With RWT borated water volume not within limits, it must be returned to within limits within 1 hour. In this condition, neither the ECCS nor Containment Spray System can perform their design functions; therefore, prompt action must be taken to restore the tank to OPERABLE status or to place the unit in a MODE in which these systems are not required. The allowed Completion Time of 1 hour to restore the RWT to OPERABLE status is based on this condition since the contents of the tank are not available for injection and core cooling.

C.1 and C.2

If the RWT cannot be restored to OPERABLE status within the associated Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.5.5.1

RWT borated water temperature shall be verified every 24 hours to be within the limits assumed in the accident analysis. This Frequency has been shown to be sufficient to identify temperature changes that approach either acceptable limit.

The SR is modified by a Note that eliminates the requirement to perform this Surveillance when ambient air temperatures are within the operating temperature limits of the RWT. With ambient temperatures within this range, the RWT temperature should not exceed the limits.

(continued)

BASES (Unit 2 only)

SURVEILLANCE REQUIREMENTS

SR 3.5.5.2

The RWT water volume level shall be verified every 7 days in accordance with Figure 3.5.5-1. This Frequency ensures that a sufficient initial water supply is available for injection and to support continued ESF pump operation on recirculation. Since the RWT volume is normally stable and is provided with a Low Level Alarm in the Control Room, a 7 day Frequency is appropriate and has been shown to be acceptable through operating experience.

SR 3.5.5.3

Boron concentration of the RWT shall be verified every 7 days to be within the required range. This Frequency ensures that the reactor will remain subcritical following a LOCA and the boron precipitation in the core will not occur earlier than predicted. Further, it ensures that the resulting sump pH will be maintained in an acceptable range such that the effect of chloride and caustic stress corrosion on mechanical systems and components will be minimized. Since the RWT volume is normally stable, a 7 day sampling Frequency is appropriate and has been shown through operating experience to be acceptable.

REFERENCES

1. UFSAR, Chapter 6 and Chapter 15.
2. Engineering Calculation 13-JC-CH-0209

BASES (continued)

ACTIONS

A.1

When containment average air temperature is not within the limit of the LCO, it must be restored to within limit within 8 hours. This Required Action is necessary to return operation to within the bounds of the containment analysis. The 8 hour Completion Time is acceptable considering the sensitivity of the analysis to variations in this parameter and provides sufficient time to correct minor problems.

B.1 and B.2

If the containment average air temperature cannot be restored to within its limit within the required Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.6.5.1

Verifying that containment average air temperature is within the LCO limit ensures that containment operation remains within the limit assumed for the containment analyses. In order to determine the containment average air temperature, an arithmetic average is calculated using measurements taken at locations within the containment selected to provide a representative sample of the overall containment atmosphere. The 24 hour Frequency of this SR is considered acceptable based on the observed slow rates of temperature increase within containment as a result of environmental heat sources (due to the large volume of containment). Furthermore, the 24 hour Frequency is considered adequate in view of other indications available in the control room, including alarms, to alert the operator to an abnormal containment temperature condition.

(continued)

BASES

SURVEILLANCE REQUIREMENTS	SR 3.6.5.1 (continued)

The Primary containment average air temperature is determined by taking the arithmetical average of the temperatures at any five of the following locations:

a. Nominal Elevation 85' - 0"
b. Nominal Elevation 85' - 0"
c. Nominal Elevation 126' - 0"
d. Nominal Elevation 126' - 0"
e. Nominal Elevation 145' - 0"
f. Nominal Elevation 188' - 0"
g. Nominal Elevation 188' - 0"

REFERENCES

1. UFSAR, Section 6.2
2. UFSAR, Section 9.4

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.6.2

Verifying that the containment spray header piping is full of water to the 113 ft level minimizes the time required to fill the header. This ensures that spray flow will be admitted to the containment atmosphere within the time frame assumed in the containment analysis. The analyses shows that the header may be filled with unborated water which helps to reduce boron plate out due to evaporation. The 31 day Frequency is based on the static nature of the fill header and the low probability of a significant degradation of water level in the piping occurring between surveillances. The value of 113 ft is an indicated value which accounts for instrument uncertainty.

SR 3.6.6.3

Verifying that each containment spray pump's developed head at the flow test point is greater than or equal to the required developed head ensures that spray pump performance has not degraded during the cycle. Flow and differential pressure are normal tests of centrifugal pump performance required by Section XI of the ASME Code (Ref. 6). Since the containment spray pumps cannot be tested with flow through the spray headers, they are tested on recirculation flow (either full flow or miniflow as conditions permit). This test is indicative of overall performance. Such inservice inspections confirm component OPERABILITY, trend performance, and detect incipient failures by indicating abnormal performance. The Frequency of this SR is in accordance with the Inservice Testing Program.

(continued)

SURVEILLANCE REQUIREMENTS

SR 3.6.6.4 and SR 3.6.6.5 (continued)

These SRs verify that each automatic containment spray valve actuates to its correct position and that each containment spray pump starts upon receipt of an actual or simulated safety injection actuation signal, recirculation actuation signal and containment spray actuation signal as applicable. This Surveillance is not required for valves that are locked, sealed, or otherwise secured in the required position under administrative controls. The 18 month Frequency is based on the need to perform these Surveillances under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillances were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillances when performed at the 18 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

The surveillance of containment sump isolation valves is also required by SR 3.5.3.5. A single surveillance may be used to satisfy both requirements.

SR 3.6.6.6

Unobstructed flow headers and nozzles are determined by either flow testing or visual inspection.

With the containment spray inlet valves closed and the spray header drained of any solution, low pressure air or smoke can be blown through test connections. Performance of this SR demonstrates that each spray nozzle is unobstructed and provides assurance that spray coverage of the containment during an accident is not degraded. Due to the passive design of the nozzle, a test at 10 year intervals is considered adequate to detect obstruction of the spray nozzles.

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

The worst case single active failure of a component of the CREFS, assuming a loss of offsite power, does not impair the ability of the system to perform its design function.

The CREFS satisfies Criterion 3 of 10 CFR 50.36 (c)(2)(ii).

LCO

Two independent and redundant trains of the CREFS are required to be OPERABLE to ensure that at least one is available, assuming that a single failure disables the other train. Total system failure could result in a control room operator receiving a dose in excess of 5 rem whole body or its equivalent in the event of a large radioactive release.

The CREFS is considered OPERABLE when the individual components necessary to control operator exposure are OPERABLE in both trains. A CREFS train is considered OPERABLE when the associated:

a. Fan is OPERABLE;

b. HEPA filters and charcoal adsorber are not excessively restricting flow, and are capable of performing their filtration functions; and

c. Ductwork, valves, and dampers are OPERABLE, and air circulation can be maintained.

In addition, the control room boundary must be maintained, including the integrity of the walls, floors, ceilings, ductwork, and access doors.

APPLICABILITY

In MODES 1, 2, 3, and 4, the CREFS must be OPERABLE to limit operator exposure during and following a DBA.

In MODES 5 and 6, the CREFS is required to cope with the release from a rupture of a waste gas tank.

Movement of spent fuel casks containing irradiated fuel assemblies is not within the scope of the Applicability of this technical specification. The movement of dry casks containing irradiated fuel assemblies will be done with a single-failure-proof handling system and with transport equipment that would prevent any credible accident that could result in a release of radioactivity.

During movement of irradiated fuel assemblies, the CREFS must be OPERABLE to cope with the release from a fuel handling accident.

(continued)

ACTIONS

A.1

With one CREFS train inoperable, action must be taken to restore OPERABLE status within 7 days. In this Condition, the remaining OPERABLE CREFS subsystem is adequate to perform control room radiation protection function. However, the overall reliability is reduced because a single failure in the OPERABLE CREFS train could result in loss of CREFS function. The 7 day Completion Time is based on the low probability of a DBA occurring during this time period, and the ability of the remaining train to provide the required capability.

B.1 and B.2

If the inoperable CREFS cannot be restored to OPERABLE status within the required Completion Time in MODE 1, 2, 3, or 4, the unit must be placed in a MODE that minimizes the accident risk. To achieve this status, the unit must be placed in at least MODE 3 within 6 hours, and in MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

C.1

In MODE 5 or 6, if Required Action A.1 cannot be completed within the required Completion Time, the OPERABLE CREFS train must be immediately placed in the emergency mode of operation (i.e., fan running, valves/dampers aligned to the post-CREFAS mode, etc.). This action ensures that the remaining train is OPERABLE, that no failures preventing automatic actuation will occur, and that any active failure will be readily detected.

D.1 and D.2

During movement of irradiated fuel assemblies, if required Action A.1 cannot be completed within the required Completion Time, the OPERABLE CREFS train must be immediately placed in the emergency mode of operation (i.e., fan running, valves/dampers aligned to the post-CREFAS mode, etc.) or movement of irradiated fuel assemblies must be suspended immediately. The first action ensures that the remaining train is OPERABLE, that no undetected failures preventing system operation will occur, and that any active failure will be readily detected. If the system is not placed in the emergency mode of operation, this action requires suspension

(continued)

ACTIONS

D.1 and D.2 (continued)

of the movement of irradiated fuel assemblies in order to minimize the risk of a release of radioactivity that might require the actuation of CREFS. This does not preclude the movement of fuel to a safe position.

E.1 and E.2

When in MODES 5 and 6, or during movement of irradiated fuel assemblies with two CREFS trains inoperable, action must be taken immediately to suspend activities that could result in a release of radioactivity that might enter the control room. This places the unit in a condition that minimizes the accident risk. This does not preclude the movement of fuel to a safe position.

F.1

If both CREFS trains are inoperable in MODE 1, 2, 3, or 4, the CREFS may not be capable of performing the intended function and the unit is in a condition outside the accident analyses. Therefore, LCO 3.0.3 must be entered immediately.

SURVEILLANCE REQUIREMENTS

SR 3.7.11.1

Standby systems should be checked periodically to ensure that they function properly. Since the environment and normal operating conditions on this system are not severe, testing each train once every month provides an adequate check on this system.

Monthly operations for ≥ 15 minutes to demonstrate the function of the system is required. The 31 day Frequency is based on the known reliability of the equipment, and the two train redundancy available.

SR 3.7.11.2

This SR verifies that the required CREFS testing is performed in accordance with the Ventilation Filter Testing Program (VFTP). The CREFS filter tests are in accordance with Regulatory Guide 1.52 (Ref. 3). The VFTP includes testing HEPA filter performance, charcoal adsorber efficiency,

(continued)

SURVEILLANCE REQUIREMENTS

SR 3.7.11.2 (continued)

minimum system flow rate, and the physical properties of the activated charcoal (general use and following specific operations). Specific test frequencies and additional information are discussed in detail in the VFTP.

SR 3.7.11.3

This SR verifies each CREFS train starts and operates on an actual or simulated actuation signal. This includes verification that the system is automatically placed into a filtration mode of operation with flow through the HEPA filters and charcoal adsorber banks. The Frequency of 18 months is consistent with that specified in Reference 3.

SR 3.7.11.4

This SR verifies the integrity of the control room enclosure and the assumed inleakage rates of potentially contaminated air. The control room positive pressure, with respect to potentially contaminated adjacent areas, is periodically tested to verify proper function of the CREFS. During operation, the CREFS is designed to pressurize the control room ≥ 0.125 inches water gauge positive pressure with respect to adjacent areas in order to prevent unfiltered inleakage. The CREFS is designed to maintain this positive pressure with one train at a ventilation flow rate of ≤1000 cfm. The ventilation flowrate is the outside makeup air flowrate. The Frequency of 18 months on a STAGGERED TEST BASIS is consistent with the guidance provided in NUREG-0800, Section 6.4 (Ref. 4).

REFERENCES

1. UFSAR, Section 6.4.
2. UFSAR, Chapter 15.
3. Regulatory Guide 1.52 (Rev. 2).
4. NUREG-0800, Section 6.4, Rev. 2, July 1981.
5. UFSAR, Section 9.4.
6. UFSAR, Section 2.2.

ACTIONS

B.2 (continued)

allowing time for restoration before subjecting the unit to transients associated with shutdown.

In this Condition, the remaining OPERABLE DG and offsite circuits are adequate to supply electrical power to the onsite Class 1E Distribution System. Thus, on a component basis, single failure protection for the required feature's function may have been lost; however, function has not been lost. The 4 hour Completion Time takes into account the OPERABILITY of the redundant counterpart to the inoperable required feature. Additionally, the 4 hour Completion Time takes into account the capacity and capability of the remaining AC sources, a reasonable time for repairs, and the low probability of a DBA occurring during this period.

If a DG has been declared inoperable and Condition B has been entered, and during that inoperability a new problem with the inoperable DG is discovered, a separate entry into Condition B is not required for the new DG problem. Therefore, the Required Actions of Condition B would not apply to the new DG problem. The new DG problem must be entered into the corrective action program and corrective actions specified in accordance with the corrective action program. Transportability must be addressed in a timely manner in accordance with the corrective action program.

B.3.1 and B.3.2

Required Action B.3.1 provides an allowance to avoid unnecessary testing of OPERABLE DGs. If it can be determined that the cause of the inoperable DG does not exist on the OPERABLE DG, SR 3.8.1.2 does not have to be performed. If the cause of inoperability exists on the other DG, the other DG would be declared inoperable upon discovery and Condition E of LCO 3.8.1 would be entered. Once the failure is repaired, the common cause failure no longer exists and Required Action B.3.1 is satisfied. If the cause of the initial inoperable DG cannot be confirmed not to exist on the remaining DG, performance of SR 3.8.1.2 suffices to provide assurance of continued OPERABILITY of that DG.

In the event the inoperable DG is restored to OPERABLE status prior to completing either B.3.1 or B.3.2, the plant corrective action program will continue to evaluate the common cause possibility. This continued evaluation, however, is no longer under the 24 hour constraint imposed while in Condition B.

(continued)

ACTIONS

B.3.1 and B.3.2 (continued)

According to Generic Letter 84-15 (Ref. 7), 24 hours is reasonable to confirm that the OPERABLE DG(s) is not affected by the same problem as the inoperable DG.

B.4

In Condition B, the remaining OPERABLE DG and offsite circuits are adequate to supply electrical power to the onsite Class 1E Distribution System. The 10 day Completion Time takes into account the capacity and capability of the remaining AC sources, a reasonable time for repairs, and the low probability of a DBA occurring during this period.

When utilizing an extended DG Completion Time (a Completion Time greater than 72 hours and less than or equal to 10 days), the compensatory measures listed below shall be implemented. For planned maintenance utilizing an extended Completion Time, the compensatory measures shall be implemented prior to entering Condition B. For an unplanned entry into an extended Completion Time, the compensatory measures shall be implemented without delay.

1. The redundant DG (along with all of its required systems, subsystems, trains, components, and devices) will be verified OPERABLE (as required by TS) and no discretionary maintenance activities will be scheduled on the redundant (OPERABLE) DG.
2. No discretionary maintenance activities will be scheduled on the station blackout generators (SBOGs).
3. No discretionary maintenance activities will be scheduled on the startup transformers.
4. No discretionary maintenance activities will be scheduled in the APS switchyard or the unit's 13.8 kV power supply lines and transformers which could cause a line outage or challenge offsite power availability to the unit utilizing the extended DG Completion Time.
5. All activity, including access, in the Salt River Project (SRP) switchyard shall be closely monitored and controlled. Discretionary maintenance within the switchyard that could challenge offsite power supply availability will be evaluated in accordance with 10 CFR 50.65(a)(4) and managed on a graded approach according to risk significance.
6. The SBOGs will not be used for non-safety functions (i.e., power peaking to the grid).

(continued)

ACTIONS

B.4 (continued)

7. Weather conditions will be assessed prior to removing a DG from service during planned maintenance activities. Additionally, DG outages will not be scheduled when severe weather conditions and/or unstable grid conditions are predicted or present.

8. All maintenance activities associated with the unit that is utilizing the extended DG Completion Time will be assessed and managed per 10 CFR 50.65 (Maintenance Rule).

9. The functionality of the SBOGs will be verified by ensuring that the monthly start test has been successfully completed within the previous four weeks before entering the extended DG Completion Time.

10. The OPERABILITY of the steam driven auxiliary feedwater pump will be verified before entering the extended DG Completion Time.

11. The system dispatcher will be contacted once per day and informed of the DG status, along with the power needs of the facility.

12. Should a severe weather warning be issued for the local area that could affect the switchyard or the offsite power supply during the extended DG Completion Time, an operator will be available locally at the SBOG should local operation of the SBOG be required as a result of on-site weather related damage.

13. No discretionary maintenance will be allowed on the main and unit auxiliary transformers associated with the unit.

If one or more of the above compensatory measures is not met while in the extended completion time, the corrective action program shall be entered, the risk managed in accordance with the Maintenance Rule, and the compensatory measure(s) restored without delay.

The second Completion Time for Required Action B.4 establishes a limit on the maximum time allowed for any combination of required AC power sources to be inoperable during any single contiguous occurrence of failing to meet the LCO. If Condition B is entered while, for instance, an offsite circuit is inoperable and that circuit is subsequently returned OPERABLE, the LCO may already have been not met for up to 72 hours (3 days). This could lead to a total of 13 days, since initial failure to meet the LCO, to restore the DG. At this time, an offsite circuit

(continued)

ACTIONS

B.4 (continued)

could again become inoperable, the DG restored OPERABLE, and an additional 72 hours (for a total of 16 days) allowed prior to complete restoration of the LCO. The 13 day Completion Time provides a limit on time allowed in a specified condition after discovery of failure to meet the LCO. This limit is considered reasonable for situations in which Conditions A and B are entered concurrently. The "AND" connector between the 10 day and 13 day Completion Times means that both Completion Times apply simultaneously, and the more restrictive Completion Time must be met.

As in Required Action B.2, the Completion Time allows for an exception to the normal "time zero" for beginning the allowed time "clock." This will result in establishing the "time zero" at the time that the LCO was initially not met, instead of at the time Condition B was entered.

C.1 and C.2

Required Action C.1, which applies when two offsite circuits are inoperable, is intended to provide assurance that an event with a coincident single failure will not result in a complete loss of redundant required safety functions. The Completion Time for this failure of redundant required features is reduced to 12 hours from that allowed for one train without offsite power (Required Action A.2). The rationale for the reduction to 12 hours is that Regulatory Guide 1.93 (Ref. 6) allows a Completion Time of 24 hours for two required offsite circuits inoperable, based upon the assumption that two complete safety trains are OPERABLE. When a concurrent redundant required feature failure exists, this assumption is not the case, and a shorter Completion Time of 12 hours is appropriate. These features are powered from redundant AC safety trains. These features require Class 1E power from PBA-S03 or PBB-S04 ESF buses to be OPERABLE, and are identical to those specified in ACTION A.2. Mode applicability is as specified in each appropriate TS section.

The Completion Time for Required Action C.1 is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." In this Required Action, the Completion Time only begins on discovery that both:

a. All required offsite circuits are inoperable; and

b. A required feature is inoperable.

(continued)

ACTIONS

C.1 and C.2 (continued)

If at any time during the existence of Condition C (two offsite circuits inoperable) and a required feature becomes inoperable, this Completion Time begins to be tracked.

According to Regulatory Guide 1.93 (Ref. 6), operation may continue in Condition C for a period that should not exceed 24 hours. This level of degradation means that the offsite electrical power system does not have the capability to effect a safe shutdown and to mitigate the effects of an accident; however, the onsite AC sources have not been degraded. This level of degradation generally corresponds to a total loss of the immediately accessible offsite power sources.

Because of the normally high availability of the offsite sources, this level of degradation may appear to be more severe than other combinations of two AC sources inoperable that involve one or more DGs inoperable. However, two factors tend to decrease the severity of this level of degradation:

a. The configuration of the redundant AC electrical power system that remains available is not susceptible to a single bus or switching failure; and

b. The time required to detect and restore an unavailable offsite power source is generally much less than that required to detect and restore an unavailable onsite AC source.

With both of the required offsite circuits inoperable, sufficient onsite AC sources are available to maintain the unit in a safe shutdown condition in the event of a DBA or transient. In fact, a simultaneous loss of offsite AC sources, a LOCA, and a worst case single failure were postulated as a part of the design basis in the safety analysis. Thus, the 24 hour Completion Time provides a period of time to effect restoration of one of the offsite circuits commensurate with the importance of maintaining an AC electrical power system capable of meeting its design criteria.

According to Regulatory Guide 1.93 (Ref. 6), with the available offsite AC sources, two less than required by the LCO, operation may continue for 24 hours. If two offsite sources are restored within 24 hours, unrestricted operation may continue. If only one offsite source is restored within 24 hours, power operation continues in accordance with Condition A.

(continued)

ACTIONS

C.1 and C.2 (continued)

Condition C applies only when the offsite circuits are unavailable to commence automatic load sequencing in the event of a design basis accident (DBA). In cases where the offsite circuits are available for sequencing, but a DBA could cause actuation of the Degraded Voltage Relays, Condition G applies.

D.1 and D.2

Pursuant to LCO 3.0.6, the Distribution System ACTIONS would not be entered even if all AC sources to it were inoperable resulting in de-energization. Therefore, the Required Actions of Condition D are modified by a Note to indicate that when Condition D is entered with no AC source to a train, the Conditions and Required Actions for LCO 3.8.9, "Distribution Systems – Operating," must be immediately entered. This allows Condition D to provide requirements for the loss of one offsite circuit and one DG without regard to whether a train is de-energized. LCO 3.8.9 provides the appropriate restrictions for a de-energized train.

According to Regulatory Guide 1.93 (Ref. 6), operation may continue in Condition D for a period that should not exceed 12 hours.

In Condition D, individual redundancy is lost in both the offsite electrical power system and the onsite AC electrical power system. Since power system redundancy is provided by two diverse sources of power, however, the reliability of the power systems in this Condition may appear higher than that in Condition C (loss of both required offsite circuits). This difference in reliability is offset by the susceptibility of this power system configuration to a single bus or switching failure. The 12 hour Completion Time takes into account the capacity and capability of the remaining AC sources, a reasonable time for repairs, and the low probability of a DBA occurring during this period.

(continued)

SURVEILLANCE REQUIREMENTS

SR 3.8.1.10 (continued)

should be maintained as close as practicable to 0.89 while still maintaining acceptable voltage limits on the emergency busses. In other circumstances, the grid voltage may be such that the DG excitation levels needed to obtain a power factor of 0.89 may not cause unacceptable voltages on the emergency busses, but the excitation levels are in excess of those recommended for the DG. In such cases, the power factor shall be maintained as close as practicable to 0.89 without exceeding DG excitation limits.

The following compensatory measures shall be implemented prior to the performance of this SR in MODE 1 or 2:

a. Weather conditions will be assessed, and the SR will not be scheduled when severe weather conditions and/or unstable grid conditions are predicted or present.

b. No discretionary maintenance activities will be scheduled in the APS switchyard or the unit's 13.8 kV power supply lines and transformers which could cause a line outage or challenge offsite power availability to the unit performing this SR.

c. All activity, including access, in the Salt River Project (SRP) switchyard shall be closely monitored and controlled. Discretionary maintenance within the switchyard that could challenge offsite power supply availability will be evaluated in accordance with 10 CFR 50.65(a)(4) and managed on a graded approach according to risk significance.

This SR must be performed at a lagging power factor of ≤ 0.89 at least once every 36 months for each DG. The first performance of this SR at a lagging power factor of ≤ 0.89 shall be within 36 months, plus the 9-month allowance of SR 3.0.2, from the date of implementation of the Technical Specification amendment that is adding the power factor testing requirement to this SR. (Amendment No. 167, implemented on August 29, 2007)

SR 3.8.1.11

As required by Regulatory Guide 1.9 (Ref. 3), paragraph 2.2.4, this Surveillance demonstrates the as designed operation of the standby power sources during loss of the offsite source. This test verifies all actions encountered from the loss of offsite power, including

(continued)

SURVEILLANCE REQUIREMENTS

SR 3.8.1.11 (continued)

shedding of the nonessential loads and energization of the emergency buses and respective loads from the DG. It further demonstrates the capability of the DG to automatically achieve the required voltage and frequency within the specified time.

The DG auto-start time of 10 seconds is derived from requirements of the accident analysis. The Surveillance should be continued for a minimum of 5 minutes in order to demonstrate that all starting transients have decayed and stability has been achieved.

The requirement to verify the connection and power supply of permanent and auto-connected emergency loads is intended to satisfactorily show the relationship of these loads to the DG loading logic. In certain circumstances, many of these loads cannot actually be connected or loaded without undue hardship or potential for undesired operation. For instance, Emergency Core Cooling Systems (ECCS) injection valves are not desired to be stroked open, high pressure injection systems are not capable of being operated at full flow, or shutdown cooling (SDC) systems performing a decay heat removal function are not desired to be realigned to the ECCS mode of operation. In lieu of actual demonstration of connection and loading of loads, testing that adequately shows the capability of the DG system to perform these functions is acceptable. This testing may include any series of sequential, overlapping, or total steps so that the entire connection and loading sequence is verified to the extent possible ensuring power is available to the component.

The Frequency of 18 months is consistent with the recommendations of Regulatory Guide 1.9 (Ref. 3), takes into consideration unit conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths.

This SR is modified by four Notes. The reason for Note 1 is to minimize wear and tear on the DGs during testing. The reason for Note 2 is that performing the Surveillance would remove a required offsite circuit from service, perturb the electrical distribution system, and challenge safety systems. This restriction from normally performing the

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.1.11 (continued)

surveillance in MODE 1, 2, 3, and 4 is further amplified to allow portions of the surveillance to be performed for the purpose of reestablishing OPERABILITY (e.g., post work testing following corrective maintenance, corrective modification, deficient or incomplete surveillance testing, and other unanticipated OPERABILITY concerns) provided an assessment determines plant safety is maintained or enhanced. This assessment shall, as a minimum, consider the potential outcomes and transients associated with the failed partial surveillance, a successful partial surveillance, and a perturbation of the offsite or onsite system within they are tied together or operated independently for the partial surveillance; as well as the operator procedures available to cope with these outcomes. These shall be measured against the avoided risk of a plant shutdown and startup to determine that plant safety is maintained or enhanced when portions of the surveillance are performed in MODE 1, 2, 3, or 4. Risk insights or deterministic methods may be used for this assessment. Note 3 states that momentary voltage and frequency transients induced by load changes do not invalidate this test. Note 4 states that the steady state voltage and frequency limits are analyzed values and have not been adjusted for instrument accuracy. The analyzed values for the steady-state diesel generator voltage limits are ≥ 4000 and ≤ 4377.2 volts and the analyzed values for the steady-state diesel generator frequency limits are ≥ 59.7 and ≤ 60.7 hertz. The indicated steady state diesel generator voltage and frequency limits, using the panel mounted diesel generator instrumentation and adjusted for instrument error, are ≥ 4080 and ≤ 4300 volts (Ref. 12), and ≥ 59.9 and ≤ 60.5 hertz (Ref. 13), respectively. If digital Maintenance and Testing Equipment (M&TE) is used instead of the panel mounted diesel generator instrumentation, the instrument error may be reduced, increasing the range for the indicated steady state voltage and frequency limits.

SR 3.8.1.12

This Surveillance demonstrates that the DG automatically starts and achieves the required voltage and frequency within the specified time (10 seconds) from the design basis accident (LOCA) signal, and subsequently achieves steady state required voltage and frequency ranges, and operates for ≥ 5 minutes. The 5 minute period provides sufficient time to demonstrate stability. SR 3.8.1.12.d and

(continued)

SURVEILLANCE REQUIREMENTS

SR 3.8.1.12 (continued)

SR 3.8.1.12.e ensure that permanently connected loads and auto-connected emergency loads (auto-connected through the automatic load sequencer) are energized from the offsite electrical power system on an ESF signal without loss of offsite power.

The requirement to verify the connection of permanent and auto-connected emergency loads is intended to satisfactorily show the relationship of these loads to the offsite circuit loading logic. In certain circumstances, many of these loads cannot actually be connected or loaded without undue hardship or potential for undesired operation. For instance, ECCS injection valves are not desired to be stroked open, high pressure injection systems are not capable of being operated at full flow, or SDC systems performing a decay heat removal function are not desired to be realigned to the ECCS mode of operation. In lieu of actual demonstration of connection and loading of loads, testing that adequately shows the capability of the offsite circuit system to perform these functions is acceptable.

This testing may include any series of sequential, overlapping, or total steps so that the entire connection and loading sequence is verified to the extent possible ensuring power is available to the component.

The Frequency of 18 months takes into consideration unit conditions required to perform the Surveillance and is intended to be consistent with the expected fuel cycle lengths. Operating experience has shown that these components usually pass the SR when performed at the 18 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

(continued)

SURVEILLANCE REQUIREMENTS

SR 3.8.1.14 (continued)

loads represent the inductive loading that the DG would experience to the extent practicable and is consistent with the intent of Regulatory Guide 1.9 (Ref. 3). Administrative limits have been placed upon the Class 1E 4160 V buses due to high voltage concerns. As a result, power factors deviating much from unity are currently not possible when the DG runs parallel to the grid while the plant is shutdown. To the extent practicable, VARs will be provided by the DG during this SR. The load band is provided to avoid routine overloading of the DG. Routine overloading may result in more frequent teardown inspections in accordance with vendor recommendations in order to maintain DG OPERABILITY.

The following compensatory measures shall be implemented prior to the performance of this SR in MODE 1 or 2 with the DG connected to an offsite circuit:

a. Weather conditions will be assessed, and the SR will not be scheduled when severe weather conditions and/or unstable grid conditions are predicted or present.

b. No discretionary maintenance activities will be scheduled in the APS switchyard or the unit's 13.8 kV power supply lines and transformers which could cause a line outage or challenge offsite power availability to the unit performing this SR.

c. All activity, including access, in the Salt River Project (SRP) switchyard shall be closely monitored and controlled. Discretionary maintenance within the switchyard that could challenge offsite power supply availability will be evaluated in accordance with 10 CFR 50.65(a)(4) and managed on a graded approach according to risk significance.

The 18 month Frequency is consistent with the recommendations of Regulatory Guide 1.9 (Ref. 3), paragraph 2.2.9, takes into consideration unit conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths.

(continued)

SURVEILLANCE REQUIREMENTS

SR 3.8.1.14 (continued)

This Surveillance is modified by four Notes. Note 1 states that momentary variations due to changing bus loads do not invalidate the test. Note 2 ensures that the DG is tested under load conditions that are as close to design basis conditions as possible. When synchronized with offsite power, testing should be performed at a lagging power factor of ≤ 0.89. This power factor is representative of the actual inductive loading a DG would see under design basis accident conditions. This power factor should be able to be achieved when performing this SR at power and synchronized with offsite power by transferring house loads from the auxiliary transformer to the startup transformer in order to lower the Class 1E bus voltage. Under certain conditions, however, Note 2 allows the surveillance to be conducted at a power factor other than ≤ 0.89. These conditions occur when grid voltage is high, and the additional field excitation needed to get the power factor to ≤ 0.89 results in voltages on the emergency busses that are too high. This would occur when performing this SR while shutdown, and the loads on the startup transformer are too light to lower the voltage sufficiently to achieve a 0.89 power factor. Under these conditions, the power factor should be maintained as close as practicable to 0.89 while still maintaining acceptable voltage limits on the emergency busses. In other circumstances, the grid voltage may be such that the DG excitation levels needed to obtain a power factor of 0.89 may not cause unacceptable voltages on the emergency busses, but the excitation levels are in excess of those recommended for the DG. In such cases, the power factor shall be maintained as close as practicable to 0.89 without exceeding DG excitation limits. The provisions for prelubricating and warmup, discussed in SR 3.8.1.2, and for gradual loading, discussed in SR 3.8.1.3, are applicable to this SR (Note 3 and Note 4).

This SR must be performed at a lagging power factor of ≤ 0.89 at least once every 36 months for each DG. The first performance of this SR at a lagging power factor of ≤ 0.89 shall be within 36 months, plus the 9-month allowance of SR 3.0.2, from the date of implementation of the Technical Specification amendment that is adding the power factor testing requirement of this SR. (Amendment No. 167, implemented on August 29, 2007)

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.3.4

This Surveillance ensures that, without the aid of the refill compressor, sufficient air start capacity for each DG is available. The system design requirements provide for a minimum of five engine start cycles without recharging. A start cycle is defined by the DG vendor, but usually is measured in terms of time (seconds or cranking) or engine cranking speed. The pressure specified in this SR is intended to reflect the lowest value at which the DG can be considered OPERABLE.

The 31 day Frequency takes into account the capacity, capability, redundancy, and diversity of the AC sources and other indications available in the control room, including alarms, to alert the operator to below normal air start pressure.

SR 3.8.3.5

Microbiological fouling is a major cause of fuel oil degradation. There are numerous bacteria that can grow in fuel oil and cause fouling, but all must have a water environment in order to survive. Removal of water from the fuel oil storage tanks once every 92 days eliminates the necessary environment for bacterial survival. This is the most effective means of controlling microbiological fouling. In addition, it eliminates the potential for water entrainment in the fuel oil during DG operation. Water may come from any of several sources, including condensation, ground water, rain water, contaminated fuel oil, and from breakdown of the fuel oil by bacteria. Frequent checking for and removal of accumulated water minimizes fouling and provides data regarding the watertight integrity of the fuel oil system. The Surveillance Frequencies are established by Regulatory Guide 1.137 (Ref. 10). This SR is for preventive maintenance. The presence of water does not necessarily represent failure of this SR provided the accumulated water is removed during the performance of this Surveillance.

(continued)

BASES

REFERENCES	1.	FSAR, Section 9.5.4.2.
	2.	Regulatory Guide 1.137.
	3.	ANSI N195-1976, Appendix B.
	4.	FSAR, Chapter 6.
	5.	FSAR, Chapter 15.
	6.	ASTM Standards: D4057-81; D975-07b; D976-91; D4737-90; D1796-83; D2276-89, Method A.
	7.	ASTM Standards, D975, Table 1.
	8.	ASME, Boiler and Pressure Vessel Code, Section XI.
	9.	"Emergency Diesel Generator and Diesel Fuel Oil Systems Instrumentation Uncertainty Calculation", 13-JC-DG-203, Parts 23 and 51

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.4.8 (continued)

battery has reached 85% of its expected life and capacity is < 100% of the manufacturer's rating, the Surveillance Frequency is reduced to 12 months. However, if the battery shows no degradation but has reached 85% of its expected life, the Surveillance Frequency is only reduced to 24 months for batteries that retain capacity ≥ 100% of the manufacturer's rating. Degradation is indicated when the battery capacity drops by more than 10% relative to its capacity on the previous performance test, or when it is ≥ 10% below the manufacturer's rating.

This SR is modified by a Note. The reason for the Note is that performing the Surveillance would perturb the electrical distribution system and challenge safety systems.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 17.
2. Regulatory Guide 1.6, March 10, 1971.
3. IEEE-308-1974.
4. UFSAR, Chapter 8.3.2.
5. IEEE-485-1983, June 1983.
6. UFSAR, Chapter 6.
7. UFSAR, Chapter 15.
8. Regulatory Guide 1.93, December 1974.
9. IEEE-450-1995.
10. Regulatory Guide 1.32, Revision 0, August 11, 1972.
11. Regulatory Guide 1.129, Revision 1, February 1978.
12. Design Basis Manual "Class 1E 125 VDC Power System".
13. Calculation 1,2,3ECPK207

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BASES

SURVEILLANCE REQUIREMENTS	Table 3.8.6-1 (continued) Because of specific gravity gradients that are produced during the recharging process, delays of several days may occur while waiting for the specific gravity to stabilize. A stabilized charger current is an acceptable alternative to specific gravity measurement for determining the state of charge. This phenomenon is discussed in IEEE-450 (Ref. 3). Footnote (c) to Table 3.8.6-1 allows the float charge current to be used as an alternate to specific gravity for up to 7 days following a battery equalizing recharge. Within 7 days, each connected cell's specific gravity must be measured to confirm the state of charge. Following a minor battery recharge (such as equalizing charge that does not follow a deep discharge) specific gravity gradients are not significant, and confirming measurements may be made in less than 7 days.
REFERENCES	1. UFSAR, Chapter 6. 2. UFSAR, Chapter 15. 3. IEEE-450-1995.

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B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.7 Inverters – Operating

BASES

BACKGROUND

The inverters are the preferred source of power for the AC vital instrument buses because of the stability and reliability they achieve by being powered from the 125 VDC battery source. The function of the inverter is to provide AC electrical power to the AC vital instrument buses. The AC vital instrument bus can be powered from an AC source via a Class 1E constant voltage regulator or from the inverter connected to the station battery. This configuration provides an uninterruptible power source for the instrumentation and controls for the Reactor Protective System (RPS) and the Engineered Safety Feature Actuation System (ESFAS). There are two inverters per Train (A and B) which totals to four inverters per unit. Specific details on inverters and their operating characteristics are found in the UFSAR, Chapter 8 (Ref. 1).

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the UFSAR, Chapter 6 (Ref. 2) and Chapter 15 (Ref. 3), assume Engineered Safety Feature systems are OPERABLE. The inverters are designed to provide the required capacity, capability, redundancy, and reliability to ensure the availability of necessary power to the RPS and ESFAS instrumentation and controls so that the fuel, Reactor Coolant System, and containment design limits are not exceeded. These limits are discussed in more detail in the Bases for Section 3.2, Power Distribution Limits; Section 3.4, Reactor Coolant System (RCS); and Section 3.6, Containment Systems.

The OPERABILITY of the inverters is consistent with the initial assumptions of the accident analyses and is based on meeting the design basis of the unit. This includes maintaining required AC vital instrument buses OPERABLE during accident conditions in the event of:

a. An assumed loss of all offsite AC electrical power or all onsite AC electrical power; and

b. A worst case single failure.

(continued)

BASES (continued)

SAFETY ANALYSIS (continued)	Inverters are a part of the distribution system and, as such, satisfy Criterion 3 of 10 CFR 50.36 (c)(2)(ii).

LCO

The inverters ensure the availability of AC electrical power for the systems' instrumentation required to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence (AOO) or a postulated DBA.

Maintaining the required inverters OPERABLE ensures that the redundancy incorporated into the design of the RPS and ESFAS instrumentation and controls is maintained. The four inverters (two per train) ensure an uninterruptible supply of AC electrical power to the AC vital instrument buses even if the 4.16 kV safety buses are de-energized.

OPERABLE inverters require the associated AC vital instrument bus to be powered by the inverter with output voltage and frequency within tolerances, and power input to the inverters from a 125 VDC station battery.

This LCO is modified by a Note that allows one inverter to be disconnected from its associated battery for ≤ 24 hours, if the AC vital instrument bus is powered from a Class 1E constant voltage regulator during the period and all other inverters are operable. This allows an equalizing charge to be placed on one battery. If the inverter was not disconnected, the resulting voltage condition might damage the inverter. These provisions minimize the loss of equipment that would occur in the event of a loss of offsite power. The 24 hour time period for the allowance minimizes the time during which a loss of offsite power could result in the loss of equipment energized from the affected AC vital instrument bus while taking into consideration the time required to perform an equalizing charge on the battery bank.

The intent of this Note is to limit the number of inverters that may be disconnected. Only the inverter associated with the single battery undergoing an equalizing charge may be

(continued)

BASES (continued)

LCO (continued)

disconnected. All other inverters must be connected to their associated batteries and aligned to their associated AC vital instrument buses.

APPLICABILITY

The inverters are required to be OPERABLE in MODES 1, 2, 3, and 4 to ensure that:

a. Acceptable fuel design limits and reactor coolant pressure boundary limits are not exceeded as a result of AOOs or abnormal transients; and

b. Adequate core cooling is provided, and containment OPERABILITY and other vital functions are maintained in the event of a postulated DBA.

Inverter requirements for MODES 5 and 6, and during movement of irradiated fuel assemblies are covered in the Bases for LCO 3.8.8, "Inverters – Shutdown."

ACTIONS

A.1

With a required inverter inoperable, its associated AC vital instrument bus becomes inoperable until it is re-energized from its Class 1E constant voltage source regulator.

Required Action A.1 is modified by a Note, which states to enter the applicable conditions and Required Actions of LCO 3.8.9, "Distribution Systems – Operating," when Condition A is entered with one AC vital instrument bus de-energized. This ensures the AC vital instrument bus is re-energized within 2 hours via the Class 1E constant voltage regulator.

Required Action A.1 allows 24 hours to fix the inoperable inverter and return it to service. The 24 hour limit is based upon engineering judgment, taking into consideration the time required to repair an inverter and the additional risk to which the unit is exposed because of the inverter inoperability. This has to be balanced against the risk of an immediate shutdown, along with the potential challenges to safety systems such a shutdown might entail. When the AC

(continued)

BASES (continued)

ACTIONS

A.1 (continued)

vital instrument bus is powered from its constant voltage source, it is relying upon interruptible AC electrical power sources (offsite and onsite). The uninterruptible inverter source to the AC vital instrument buses is the preferred source for powering instrumentation trip setpoint devices.

B.1 and B.2

If the inoperable devices or components cannot be restored to OPERABLE status within the required Completion Time, the unit must be brought to a MODE in which the LCO does not apply. To achieve this status, the unit must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.8.7.1

This Surveillance verifies that the inverters are functioning properly with all required circuit breakers closed and AC vital instrument buses energized from the inverter. The verification of proper voltage and frequency output ensures that the required power is readily available for the instrumentation of the RPS and ESFAS connected to the AC vital instrument buses. The 7 day Frequency takes into account the redundant capability of the inverters and other indications available in the control room that alert the operator to inverter malfunctions.

REFERENCES

1. UFSAR, Chapter 8.
2. UFSAR, Chapter 6.
3. UFSAR, Chapter 15.

ACTIONS

The Actions are modified by a Note that identifies required Action A.2.3 is not applicable to the movement of irradiated fuel assemblies in Modes 1 through 4.

A.1, A.2.1, A.2.2, A.2.3, A.2.4, and A.2.5

Although redundant required features may require redundant trains of electrical power distribution subsystems to be OPERABLE, one OPERABLE distribution subsystem train may be capable of supporting sufficient required features to allow continuation of CORE ALTERATIONS and fuel movement. By allowing the option to declare required features associated with an inoperable distribution subsystem inoperable, appropriate restrictions are implemented in accordance with the affected required features LCO's Required Actions. In many instances, this option may involve undesired administrative efforts. Therefore, the allowance for sufficiently conservative actions is made (i.e., to suspend CORE ALTERATIONS, movement of irradiated fuel assemblies, and operations involving positive reactivity additions). The Required Action to suspend positive reactivity additions does not preclude actions to maintain or increase reactor vessel inventory provided the required SDM is maintained.

Suspension of these activities shall not preclude completion of actions to establish a safe conservative condition. If moving irradiated fuel assemblies while in MODES 1, 2, 3, or 4, the fuel movement is independent of reactor operations. Therefore, inability to immediately suspend movement of irradiated fuel assemblies would not be sufficient reason to require a reactor shutdown. These actions minimize the probability of the occurrence of postulated events. It is further required to immediately initiate action to restore the required AC, DC, and AC vital instrument bus electrical power distribution subsystems and to continue this action until restoration is accomplished in order to provide the necessary power to the unit safety systems.

(continued)

ACTIONS (continued)

Notwithstanding performance of the above conservative Required Actions, a required shutdown cooling (SDC) subsystem may be inoperable. In this case, Required Actions A.2.1 through A.2.4 do not adequately address the concerns relating to coolant circulation and heat removal. Pursuant to LCO 3.0.6, the SDC ACTIONS would not be entered. Therefore, Required Action A.2.5 is provided to direct declaring SDC inoperable, which results in taking the appropriate SDC actions.

The Completion Time of immediately is consistent with the required times for actions requiring prompt attention. The restoration of the required distribution subsystems should be completed as quickly as possible in order to minimize the time the unit safety systems may be without power.

SURVEILLANCE REQUIREMENTS

SR 3.8.10.1

This Surveillance verifies that the AC, DC, and AC vital instrument bus electrical power distribution system is functioning properly, with all the required buses energized. The verification of proper voltage availability on the buses ensures that the required power is readily available for motive as well as control functions for critical system loads connected to these buses. The 7 day Frequency takes into account the redundant capability of the electrical power distribution subsystems, and other indications available in the control room that alert the operator to subsystem malfunctions.

REFERENCES

1. UFSAR, Chapter 6.
2. UFSAR, Chapter 15.

B 3.9 REFUELING OPERATIONS

B 3.9.2 Nuclear Instrumentation

BASES

BACKGROUND

The Startup Channel Neutron Flux Monitors or Startup Range Monitors (SRMs) are used during core alterations or movement of irradiated fuel assemblies in containment to monitor the core reactivity condition. The installed SRMs are part of the Excore Nuclear Instrumentation System. These detectors are located external to the reactor vessel and detect neutrons leaking from the core. The use of portable detectors is permitted, provided the LCO requirements are met.

The installed SRMs are BF3 detectors operating in the proportional region of the gas filled detector characteristic curve. The detectors monitor the neutron flux in counts per second. The instrument range covers five decades of neutron flux (1E+5 cps) with a 5% instrument accuracy. The detectors also provide continuous visual indication in the control room and an audible indication in the control room and containment. An audible BDAS alarm alerts operators to a possible dilution accident. The excore startup channels are designed in accordance with the criteria presented in Reference 1.

APPLICABLE SAFETY ANALYSES

Two OPERABLE SRMs and the associated BDAS are required to provide a signal to alert the operator to unexpected changes in core reactivity from a boron dilution accident. The safety analysis of the uncontrolled boron dilution accident is described in Reference 2. The analysis of the uncontrolled boron dilution accident shows that normally available reactor subcriticality would be reduced, but there is sufficient time for the operator to take corrective actions.

The SRMs satisfy Criterion 3 of 10 CFR 50.36 (c)(2)(ii).

LCO

This LCO requires two SRMs OPERABLE to ensure that redundant monitoring capability is available to detect changes in core reactivity.

(continued)

BASES

LCO (continued)	The SRMs include detectors, preamps, amplifiers, power supplies, indicators, recorders, speakers, alarms, switches and other components necessary to complete the SRM functions. Specifically, each SRM must provide continuous visual indication in the Control Room and each SRM must have the capability to provide audible indication in both the Control Room and Containment via use of the Control Room switch.
APPLICABILITY	In MODE 6, the SRMs must be OPERABLE to determine changes in core reactivity. There is no other direct means available to check core reactivity levels. The requirements for the associated Boron Dilution Alarm System (BDAS) operability in MODE 6 are contained in LCO 3.3.12, "Boron Dilution Alarm System." LCO 3.3.12 also covers SRM and BDAS operability requirements for MODES 3, 4 and 5.
ACTIONS	A.1 and A.2 With only one SRM OPERABLE, redundancy has been lost. Since these instruments are the only direct means of monitoring core reactivity conditions, CORE ALTERATIONS and positive reactivity additions must be suspended immediately. Performance of Required Action A.1 shall not preclude completion of movement of a component to a safe position. With one required SRM channel inoperable, the associated BDAS is also inoperable. Action A.1 of LCO 3.3.12 requires the RCS boron concentration to be determined immediately and at the applicable monitoring frequency specified in the COLR Section 3.3.12 in order to satisfy the requirements of the inadvertent deboration safety analysis. The monitoring frequency specified in the COLR ensures that a decrease in the boron concentration during a boron dilution event will be detected with sufficient time for termination of the event before the reactor achieves criticality. The boron concentration measurement and the OPERABLE BDAS channel provide alternate methods of detection of boron dilution.

(continued)