SCE&G
A SCANA Company

South Carolina Electric & Gas Company
P.O. Box 764
Columbia, SC 29218
(803) 748-3513

Dan A. Nauman
Vice President
Nuclear Operations

November 20, 1987

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Dr. J. Nelson Grace
Regional Administrator
U. S. Nuclear Regulatory Commission
Suite 2900
101 Marietta Street, NW
Atlanta, GA 30233

Subject: Virgil C. Summer Nuclear Station
Docket No. 50/395
Operating License No. NPF-12
Response to Valve Design Basis
for IEB 85-03

Dear Dr. Grace:

This letter forwards the design basis information for seventeen valves being added to the IEB 85-03 program, "Motor Operated Valves Common Mode Failures During Plant Transients Due to Improper Switch Settings," as committed to in our letter of September 17, 1987. Upon further review, two valves, XVG-8884-SI and XVG-8886-SI have been added to the program in addition to the fifteen valves identified in your letter of August 18, 1987. This information satisfies the requirements of Action a. identifed in the IEB.

Should you have any questions, please call at your convenience.

Sincerely,

D. A. Nauman

MDB/DAN:bjh

pc: O.W. Dixon, Jr./T. C. Nichols, Jr.
E. C. Roberts
O. S. Bradham
D. R. Moore
W. A. Williams, Jr.
Group Managers
W. R. Baehr
C. A. Price
R. B. Clary
W. R. Higgins
W. T. Frady
M. D. Blue
M. R. Hazel
C. L. Ligon
R. M. Campbell
K. E. Nodland
J. C. Snelson
G. O. Percival
R. L. Prevatte
J. B. Knotts, Jr.
NPCF
RTS
File

IE11

DEFINITIONS

ΔP	Differential Pressure
EFW	Emergency Feedwater
EOP	Emergency Operating Procedure
gpm	Gallons Per Minute
psid	Pounds Per Square Inch-Differential
psig	Pounds Per Square Inch-Gage
RCS	Reactor Coolant System
SI	Safety Injection
VCT	Volume Control Tank

NOTE: Line loss and losses associated with flow path components are neglected in maximum differential pressure development. Thus, the maximum differential pressures calculated result in conservative values.

Valve Tag No.: XVG-8130A,B-CS
Valve Description: Charging Pumps Suction Crossover Line
Normal Position: Open
Valve Type: 8" Gate

1. **Design Basis for Valve:**

Valves are normally aligned open to provide water to the charging pumps, and this alignment is correct for the safety injection function so the valves do not have to change position. These valves do not receive an SI signal. The operator will close one pair of the 8130 or 8131 valves for switchover to cold leg recirculation per the EOPs.

The ΔP across these valves is from the VCT to the charging pumps suction. The VCT is located at elevation 463' with a maximum overgas pressure of 75 psig. The valves are at elevation 388' in the suction header. Assuming eight feet of water in the VCT and zero psig in the pump suction lines gives a ΔP of 111 psig.

2. **Design Conditions:**

	Max ΔP (psid)/Temp (°F)
Opening	220/250
Closing	220/250

3. **Operating Conditions:**

	Normal Operation Max ΔP (psid)/Temp (°F)	Abnormal Operation Max ΔP (psid)/Temp (°F)
Opening	N/A*	111/115
Closing	111/115	N/A*

* Valve operation in this direction is neither required nor desired.

Valve Tag No.: XVG-8131A,B-CS
Valve Description: Charging Pumps Suction Crossover Line
Normal Position: Open
Valve Type: 8" Gate

1. **Design Basis for Valve:**

Valves are normally aligned open to provide water to the charging pumps, and this alignment is correct for the safety injection function so the valves do not have to change position. These valves do not receive an SI signal. The operator will close one pair of the 8130 or 8131 valves for switchover to cold leg recirculation per the EOPs.

The ΔP across these valves is from the VCT to the charging pumps suction. The VCT is located at elevation 463' with a maximum overgas pressure of 75 psig. The valves are at elevation 388' in the suction header. Assuming eight feet of water in the VCT and zero psig in the pump suction lines gives a ΔP of 111 psig.

2. **Design Conditions:**

	Max ΔP (psid)/Temp (°F)
Opening	220/250
Closing	220/250

3. **Operating Conditions:**

	Normal Operation Max ΔP (psid)/Temp (°F)	Abnormal Operation Max ΔP (psid)/Temp (°F)
Opening	N/A*	111/115
Closing	111/115	N/A*

*Valve operation in this direction is neither required nor desired.

Valve Tag No.:	XVG-8106-CS
Valve Description:	Charging Pumps Miniflow Isolation
Normal Position:	As Noted
Valve Type:	3" Gate

1. **Design Basis for Valve:**

   Current mode of operation requires the operator to open and close this valve as a backup to valves 8109A,B,C.

   This valve discharges to the VCT so its backpressure is equal to VCT pressure. Since the suction pressure on the charging pumps is also equal to VCT pressure, the ΔP across the valve is equal to the charging pumps' shut-off head.

2. **Design Conditions:**

	Max ΔP (psid)/Temp (°F)
Opening	2735/250
Closing	2735/250

3. **Operating Conditions:**

	Normal Operation Max ΔP(psid)/Temp (°F)	Abnormal Operation Max ΔP(psid)/Temp (°F)
Opening	2350*/130	2647/130
Closing	2350*/130	2647/130

* Per Westinghouse line specification.

Valve Tag No.: XVT-8109A,B,C-CS
Valve Description: Charging Pumps Miniflow Isolation
Normal Position: As Noted
Valve Type: 2" Globe

1. **Design Basis for Valve:**

   Current mode of operation requires the operator to open and close these valves depending on RCS pressure and SI flowrate. When required, these valves must be closed to allow adequate flow to the RCS, or opened to allow miniflow to protect the pumps if charging flowrate is "deadheaded".

   The miniflow valves are at approximately the same elevation as the charging pumps and discharge to the VCT. Thus, the backpressure on the miniflow valves is equal to VCT pressure. The suction pressure on the charging pumps is also equal to VCT pressure so the pressures cancel, and the ΔP will be equal to the shut-off head of the charging pumps.

2. **Design Conditions:**

	Max ΔP (psid)/Temp (°F)
Opening	2735/250
Closing	2735/250

3. **Operating Conditions:**

	Normal Operation Max ΔP (psid)/Temp (°F)	Abnormal Operation Max ΔP (psid)/Temp (°F)
Opening	2350*/130	2647/130
Closing	2350*/130	2647/130

* Per Westinghouse line specification.

Valve Tag No.: XVG-8132A,B-CS
Valve Description: Charging Pumps Discharge Crossover Line
Normal Position: Open
Valve Type: 4" Gate

1. **Design Basis for Valve:**

Valves are normally aligned open. This alignment is correct for the SI function so the valves do not have to change position. Valves do not receive an SI signal.

However, valves must be able to be re-opened if they are inadvertently closed. Per the EOPs, one pair of valves (8132A,B or 8133A,B) will be closed by the operator on establishing cold leg recirculation.

The maximum operating ΔP is due to a VCT relief valve setpoint of 75 psig, plus 2647 psi charging pump shutoff head, plus the elevation difference between the RCS pressure transmitters at elevation 412', and the VCT at elevation 463', plus eight feet of water in the VCT (net of 26 psi), less the minimum RCS pressure for safety injection of 500 psig.

2. **Design Conditions:**

	Max ΔP (psid)/Temp (°F)
Opening	2800/200*
Closing	2800/200*

* Ref. Westinghouse line specification.

3. **Operating Conditions:**

	Normal Operation Max ΔP (psid)/Temp (°F)	Abnormal Operation Max ΔP (psid)/Temp (°F)
Opening	N/A*	2248/130
Closing	2248/130	N/A*

*Valve operation in this direction is neither required nor desired.

Valve Tag No.: XVG-8133A,B-CS
Valve Description: Charging Pumps Discharge Crossover Line
Normal Position: Open
Valve Type: 4" Gate

1. **Design Basis for Valve:**

Valves are normally aligned open. This alignment is correct for the SI function so the valves do not have to change position. Valves do not receive an SI signal.

However, valves must be able to be re-opened if they are inadvertently closed. Per the EOPs, one pair of valves (8132A,B or 8133A,B) will be closed by the operator on establishing cold leg recirculation.

The maximum operating ΔP is due to a VCT relief valve setpoint of 75 psig, plus 2647 psi charging pump shutoff head, plus the elevation difference between the RCS pressure transmitters at elevation 412', and the VCT at elevation 463', plus eight feet of water in the VCT (net of 26 psi), less the minimum RCS pressure for safety injection of 500 psig.

2. **Design Conditions:**

	Max ΔP (psid)/Temp (°F)
Opening	2800/200*
Closing	2800/200*

* Ref. Westinghouse line specification.

3. **Operating Conditions:**

	Normal Operation Max ΔP (psid)/Temp (°F)	Abnormal Operation Max ΔP (psid)/Temp (°F)
Opening	N/A*	2248/130
Closing	2248/130	N/A*

*Valve operation in this direction is neither required nor desired.

Valve Tag No.: XVG-8884, 8885, 8886-SI
Valve Description: High Head Safety Injection Isolation Valves
Normal Position: Closed
Valve Type: 3" Gate, flexible wedge

1. **Design Basis for Valve:**

These valves isolate the charging pump discharge header from the RCS during normal plant operation. XVG-8885 provides a path to the cold leg injection points parallel to XVG-8801A,B. XVG-8885 is open for cold leg recirculation; XVG-8884 and 8886 provide parallel paths from each of the charging pump discharge headers to the hot leg injection points. XVG-8884 and 8886 are closed during safety injection and cold leg recirculation and opened for hot leg recirculation. None of these valves are actuated by a SI signal nor any other emergency actuation signal.

The maximum operating ΔP is due to a VCT relief valve setpoint of 75 psig, plus 2647 psi charging pump shutoff head, plus the elevation difference between the RCS pressure transmitters at elevation 412' and the VCT at elevation 463', plus eight feet of water in the VCT (net of 26 psi), less the minimum RCS pressure for safety injection of 500 psig.

2. **Design Conditions:**

	Max ΔP (psid)/Temp (°F)
Opening	2750/650
Closing	2750/650

3. **Operating Conditions:**

	Normal Operation Max ΔP (psid)/Temp (°F)	Abnormal Operation Max ΔP (psid)/Temp (°F)
Opening	2248/130	N/A*
Closing	2248/130	2248/130

*Valve operation in this direction is neither required nor desired.

Valve Tag No.: XVG-2802A,B-MS
Valve Description: Steam Supply to EFW Turbine
Normal Position: Open
Valve Type: 4" Gate

1. **Design Basis for Valve:**

Valves are normally open; therefore, for turbine driven EFW pump start, valve movement is not required. However, if one or both of the valves were inadvertently closed before or during accident mitigation, they would have to be reopened. If only one valve had been closed, the ΔP would be small due to backpressure from the other line. If both valves had been closed, the ΔP would then be equal to main steam pressure.

The maximum ΔP is based on the highest setting of the main steam relief valves and therefore represents the highest possible main steam pressure.

2. **Design Conditions:**

	Max ΔP (psid)/Temp (°F)
Opening	1284/600
Closing	1284/600

* Ref. Westinghouse line specification.

3. **Operating Conditions:**

	Normal Operation Max ΔP (psid)/Temp (°F)	Abnormal Operation Max ΔP (psid)/Temp (°F)
Opening	N/A*	1235/573
Closing	N/A*	N/A*

*Valve operation in this direction is neither required nor desired.

Control Circuit Device	VALVE 'CLOSING' CIRCUIT		VALVE 'OPENING' CIRCUIT	
	Device in Circuit for Normal Operation	Device in Circuit for Accident Operation (5)	Device in Circuit for Normal Operation	Device in Circuit for Accident Operation (5)
Torque Switch	Yes	Yes	Yes	N/A (4)
Torque Switch Bypass (3)	Yes	Yes	Yes	N/A (4)
Opening Limit Switch (1)	No	No	Yes	N/A (4)
Closing Limit Switch (2)	No	No	No	N/A (4)
Overcurrent Device	Yes	Yes	Yes	N/A (4)

NOTES:

(1) Contact opens when valve reaches full open position

(2) Contact opens when valve reaches full closed position

(3) Bypass contact remains closed to initiate valve travel, then opens to allow the torque switch to interrupt travel when full valve displacement is reached

(4) Emergency operation contact does not interface with the valve "opening" circuit

(5) Operator action to close one set of valves after accident

Control Circuit Device	VALVE 'CLOSING' CIRCUIT		VALVE 'OPENING' CIRCUIT	
	Device in Circuit for Normal Operation	Device in Circuit for Accident Operation (5)	Device in Circuit for Normal Operation	Device in Circuit for Accident Operation (5)
Torque Switch	Yes	Yes	Yes	N/A (4)
Torque Switch Bypass (3)	Yes	Yes	Yes	N/A (4)
Opening Limit Switch (1)	No	No	Yes	N/A (4)
Closing Limit Switch (2)	No	No	No	N/A (4)
Overcurrent Device	Yes	Yes	Yes	N/A (4)

NOTES:

(1) Contact opens when valve reaches full open position

(2) Contact opens when valve reaches full closed position

(3) Bypass contact remains closed to initiate valve travel, then opens to allow the torque switch to interrupt travel when full valve displacement is reached

(4) Emergency operation contact does not interface with the valve "opening" circuit

(5) Operator action to close one set of valves after accident

Control Circuit Device	VALVE 'CLOSING' CIRCUIT		VALVE 'OPENING' CIRCUIT	
	Device in Circuit for Normal Operation	Device in Circuit for Accident Operation (6)	Device in Circuit for Normal Operation	Device in Circuit for Accident Operation (6)
Torque Switch	No	No	Yes	N/A (4)
Torque Switch Bypass (3)	No	No	Yes	N/A (4)
Opening Limit Switch (1)	No	No	Yes	N/A (4)
Closing Limit Switch (2)	Yes	Yes	No	N/A (4)
Overcurrent Device	Yes	Yes	Yes	N/A (4)
Closing Limit Bypass Sw. (5)	Yes	Yes	No	N/A (4)

NOTES:

(1) Contact opens when valve reaches full open position

(2) Contact opens when valve reaches full closed position (1.5 handwheel turns into Main Seat)

(3) Bypass contact remains closed to initiate valve travel, then opens to allow the torque switch to interrupt travel when full valve displacement is reached

(4) Emergency operation contact does not interface with the valve "opening" circuit

(5) Contact remains closed to initiate valve travel, then opens to allow closing limit switch to take over

(6) Operator action to close valve after accident

Control Circuit Device	VALVE 'CLOSING' CIRCUIT		VALVE 'OPENING' CIRCUIT	
	Device in Circuit for Normal Operation	Device in Circuit for Accident Operation (5)	Device in Circuit for Normal Operation	Device in Circuit for Accident Operation (5)
Torque Switch	Yes	Yes	Yes	N/A (4)
Torque Switch Bypass (3)	Yes	Yes	Yes	N/A (4)
Opening Limit Switch (1)	No	No	Yes	N/A (4)
Closing Limit Switch (2)	No	No	No	N/A (4)
Overcurrent Device	Yes	Yes	Yes	N/A (4)

NOTES:

(1) Contact opens when valve reaches full open position

(2) Contact opens when valve reaches full closed position

(3) Bypass contact remains closed to initiate valve travel, then opens to allow the torque switch to interrupt travel when full valve displacement is reached

(4) Emergency operation contact does not interface with the valve "opening" circuit

(5) Operator action to close valve after accident

Control Circuit Device	VALVE 'CLOSING' CIRCUIT		VALVE 'OPENING' CIRCUIT	
	Device in Circuit for Normal Operation	Device in Circuit for Accident Operation	Device in Circuit for Normal Operation	Device in Circuit for Accident Operation
Torque Switch	Yes	N/A (4)	Yes	N/A (4)
Torque Switch Bypass (3)	Yes	N/A (4)	Yes	N/A (4)
Opening Limit Switch (1)	Yes	N/A (4)	No	N/A (4)
Closing Limit Switch (2)	No	N/A (4)	No	N/A (4)
Overcurrent Device	Yes	N/A (4)	Yes	N/A (4)

NOTES:

(1) Contact opens when valve reaches full open position.

(2) Contact opens when valve reaches full closed position.

(3) Bypass contact remains closed to initiate valve travel, then opens to allow the torque switch to interrupt travel when full valve displacement is reached.

(4) Valve is not initiated by any emergency contact.

Control Circuit Device	VALVE 'CLOSING' CIRCUIT		VALVE 'OPENING' CIRCUIT	
	Device in Circuit for Normal Operation	Device in Circuit for Accident Operation (3)	Device in Circuit for Normal Operation	Device in Circuit for Accident Operation (3)
Torque Switch	Yes	Yes	Yes	N/A (5)
Torque Switch Bypass (4)	Yes	Yes	Yes	N/A (5)
Opening Limit Switch (1)	Yes	Yes	No	N/A (5)
Closing Limit Switch (2)	No	No	No	N/A (5)
Overcurrent Device	Yes	Yes	Yes	N/A (5)

NOTES:

(1) Contact opens when valve reaches full open position

(2) Contact opens when valve reaches full closed position

(3) Valve opens automatically on diesel buses U.V. or 2/3 Lo-Lo Stm. Gen. Lvl.

(4) Bypass contact remains closed to initiate valve travel, then opens to allow the torque switch to interrupt travel when full valve displacement is reached

(5) Automatic operation contact does not interface with the valve "closing" circuit