FUNCTION	LIMITING SAFETY SYSTEM SETTINGS
7) Low Pressure Main Steam Line, MSIV Closure	≥825 psig (initiated in IRM range 10)
8) Main Steam Line Isolation Valve Closure, Scram	≤10% Valve Closure from full open
9) Reactor Low Water Level, Scram	≥11',5" above the top of the active fuel as indicated under normal operating conditions.
10) Reactor Low-Low Water Level, Main Steam Line Isolation Valve Closure.	≥7',2" above the top of the active fuel as indicated under normal operating conditions.
11) Reactor Low-Low Water Level, Core Spray Initiation	≥7'2" above the top of the active fuel
12) Reactor Low-Low Water Level, Isolation Condenser Initiation	≥7'2" above the top of the active fuel with time delay ≤3 seconds.
13) Turbine Trip Scram	10 percent turbine stop valve(s) closure from full open.
14) Generator Load Rejection Scram	Initiation upon loss of oil pressure from turbine acceleration relay.
15) Loss of Power	
a. 4.16 KV Emergency Bus Undervoltage (Loss of Voltage)	0 volts with 3 seconds ± 0.5 seconds time delay.
b. 4.16 KV Emergency Bus Undervoltage (Degraded Voltage)	3671 ± 1% (36.7) volts 10 ± 10%(1.0) second time delay.

BASES: Safety limits have been established in Specifications 2.1 and 2.2 to protect the integrity of the fuel cladding and reactor coolant system barriers. Automatic protective devices have been provided in the plant design to take corrective action to prevent the safety limits from being exceeded in normal operation or operational transients caused by reasonable expected single operator error or equipment malfunction. This Specification establishes the trip settings for these automatic protection devices.

The Average Power Range Monitor, APRM[1], trip setting has been established to assure never reaching the fuel cladding integrity safety limit. The APRM system responds to changes in neutron flux. However, near rated thermal power the APRM is calibrated, using a plant heat balance, so that the neutron flux that is sensed is read out as percent of rated thermal power. For slow maneuvers, those where core thermal power, surface heat flux, and the power transferred to the water follow the neutron flux, the APRM will read reactor thermal power. For fast transients, the neutron flux will lead the power transferred from the cladding to the water due to the effect of the fuel time constant. Therefore when the neutron flux increases to the scram setting, the percent increase in heat flux and power transferred to the water will be less than the percent increase in neutron flux.

The APRM trip setting will be varied automatically with recirculation flow with the trip setting at rated flow 61.0×10^6 lb/hr or greater being 115.7% of rated neutron flux. Based on a complete

The low water level trip setting of 11'5" above the top of the active fuel has been established to assure that the reactor is not operated at a water level below that for which the fuel cladding integrity safety limit is applicable. With the scram set at this point, the generation of steam, and thus the loss of inventory, is stopped. For example, for a loss of feedwater flow a reactor scram at the value indicated and isolation valve closure at the low-low water level set point results in more than 4 feet of water remaining above the core after isolation. (11).

During periods when the reactor is shut down, decay heat is present and adequate water level must be maintained to provide core cooling. Thus, the low-low level trip point of 7'2" above the core is provided to actuate the core spray system to provide cooling water should the level drop to this point. In addition, the normal reactor feedwater system and control rod drive hydraulic system provide protection for the water level safety limit both when the reactor is operating at power or in the shutdown condition.

The turbine stop valve (s) scram anticipates the pressure, neutron flux, heat flux increase caused by the rapid closure of the turbine stop valve(s) and failure of the turbine bypass system. With a scram setting of 10% of valve closure from full open and with a failure of the turbine bypass system at 1930 MWt, the peak pressure will remain well below the first safety valve setting and no thermal limits are approached (7,10).

The generator load rejection scram is provided to anticipate the rapid increase in pressure and neutron flux resulting from fast closure of the turbine control valves to a load rejection and failure of the turbine bypass system. This scram is initiated by the loss of turbine acceleration relay oil pressure. The timing for this scram is almost identical to the turbine trip and the resultant peak pressure and MCHFR are essentially the same.

The undervoltage protection system is a 2 out of 3 coincident logic relay system designed to shift emergency buses C and D to on site power should normal power be lost or degraded to an unacceptable level. The trip points and time delay settings have been selected to assure an adequate power source to emergency safeguards systems in the event of a total loss of normal power or degraded conditions which would adversely affect the functioning of engineered safety features connected to the plant emergency power distribution system.

References

(1) FDSAR. Volume I, Section VII-4.2.4
(2) FDSAR, Volume I, Section I-5.6
(3) Licensing Application Amendment 28, Item III.A-12
(4) Licensing Application Amendment 32, Question 13
(5) Letters, Peter A. Morris, Director, Division of Reactor Licensing, USAEC to John E. Logan, Vice President, Jersey Central Power & Light Company, dated November 22, 1967 and January 9, 1968.
(6) Licensing Application Amendment 11, Question V-9.
(7) License Application Amendment 76, Supplement No. 1
(8) License Application Amendment 65, Section B.XI.
(9) License Application Amendment 69, Section III-D-5
(10) License Application Amendment 65, Section B.IV.
(11) License Application Amendment 65, Section B.IX.
(12) License Application Amendment 76, Supplement No. 3, Section 2.0.
(13) License Application Amendment 76, Supplement No. 4.

TABLE 3.1.1 PROTECTIVE INSTRUMENTATION REQUIREMENTS (CONTD)

Function	Trip Setting	Reactor Modes in which Function Must be Operable: Shutdown	Refuel	Startup	Run	Min. No. of Operable or Operating (Tripped) Trip Systems	Min.No.of Operable Instrument Channels Per Operable Trip Systems	Action Required*
N. Loss of Power								
a. 4.16KV Emergency Bus Undervoltage (Loss of Voltage)	**	X (ee)	X(ee)	X (ee)	X (ee)	2	1	
b. 4.16 KV Emergency Bus undervoltage (Degraded Voltage)	**	X (ee)	X(ee)	X (ee)	X (ee)	2	3	See Note dd

TABLE 3.1.1 (CON'D)

i. The interlock is not required during the start-up test program and demonstration of plant electrical output but shall be provided following these actions.

j. Not required below 40% of turbine rated steam flow.

k. All four (4) drywell pressure instrument channels may be made inoperable during the integrated primary containment leakage rate test (See Specification 4.5), provided that primary containment integrity is not required and that no work is performed on the reactor or its connected systems which could result in lowering the reactor water level to less than 4'8" above the top of the active fuel.

l. Bypassed in IRM Ranges 8, 9, & 10.

m. There is one time delay relay associated with each of two pumps.

n. One time delay replay per pump must be operable.

o. There are two time delay relays associated with each of two pumps. One timer per pump is for sequence starting (SK1A, SK2A) and one timer per pump is for tripping the pump circuit breaker (SK7A, SK8A).

p. Two time delay relays per pump must be operable.

q. Manual initiation of affected component can be accomplished after the automatic load sequencing is completed.

r. Time delay starts after closing of containment spray pump circuit breaker.

s. These functions not required to be operable with the reactor temperature less than 212°F and the vessel head removed or vented.

t. These functions may be inoperable or bypassed when corresponding portions in the same core spray system logic train are inoperable per Specification 3.4.A.

u. These functions not required to be operable when primary containment integrity is not required to be maintained.

TABLE 3.1.1 (Cont'd)

v. Those functions not required to be operable when the ADS is not required to be operable.

w. These functions must be operable only when irradiated fuel is in the fuel pool or reactor vessel and secondary containment integrity is required per specification 3.5.B.

y. The number of operable channels may be reduced to 2 per Specification 3.9.E and F.

z. The bypass function to permit scram reset in the shutdown or refuel mode with control rod block must be operable in this mode.

aa. Pump circuit breakers will be tripped in 10 seconds ± 15% during a LOCA by relays SK7A and SK8A.

bb. Pump circuit breakers will trip instantaneously during a LOCA.

cc. Only applicable during STARTUP Mode while operating in IRM Range 10.

dd. With the number of operable channels one less than the Min. No. of Operable Instrument Channels per Operable Trip Systems, operation may proceed until performance of the next required Channel Functional Test provided the inoperable channel is placed in the tripped condition within 1 hour.

ee. This function is not required to be operable when the associated safety bus is not required to be energized or fully operable as per applicable sections of these technical specifications.

3.7 AUXILIARY ELECTRICAL POWER

Applicability: Applies to the operating status of the auxiliary electrical power supply.

Objective: To assure the operability of the auxiliary electrical power supply.

Specification: A. The reactor shall not be made critical unless all of the following requirements are satisfied:

1. The following buses or panels energized.

   a. 4160 volt buses 1C and 1D in the turbine building switchgear room.
   b. 460 volt buses 1A2, 1B2, 1A21, 1B21 vital MCC 1A2 and 1B2 in the reactor building switchgear room: 1A3 and 1B3 at the intake structure; 1A21A, 1B21A, 1A21B, and 1B21B and vital MCC 1AB2 on 23'6" elevation in the reactor building; 1A24 and 1B24 at the stack.
   c. 208/120 volt panels 3, 4, 4A, 4B, 4C and VACP-1 in the reactor building switchgear room.
   d. 120 volt protection panel 1 and 2 in the cable room.
   e. 125 volt DC distribution centers C and B, and panel D, Panel DC-F, isolation valve motor control center DC-1 and 125V DC motor control center DC-2.
   f. 24 volt D.C. power panels A and B in the cable room.

2. One 230 KV line is fully operational and switch gear and both startup transformers are energized to carry power to the station 4160 volt AC buses and carry power to or away from the plant.

3. An additional source of power consisting of one of the following is in service connected to feed the appropriate plant 4160 V bus or busses:

   a. A second 230 KV line fully operational.
   b. One 34.5 KV line fully operational.

4. The station batteries B and C are available for normal service and a battery charger is in service for each battery.

5. Bus tie breakers ED and EC are in the open position.

Instrument Channel	Check	Calibrate	Test	Remarks (Applies to Test & Calibration)
19. Manual Scram Buttons	NA	NA	1/3 mo.	
20. High Temperature Main Steamline Tunnel	NA	Each Refueling outage	Each refueling outage	Using heat source box
21. SRM	*	*	*	Using built-in calibration equipment
22. Isolation Condenser High Flow ΔP (Steam and Water)	NA	1/3 mo.	1/3 mo.	By application of test pressure
23. Turbine Trip Scram	NA		Every 3 months	
24. Generator Load Rejection Scram	NA	Every 3 months	Every 3 months	
25. Recirculation Loop Flow	NA	Each Refueling Outage	NA	By application of test pressure
26. Low Reactor Pressure Core Spray Valve Permissive	NA	Every 3 months	Every 3 months	By application of test pressure
27. Scram Discharge Volume (Rod Block)				
a) Water level high	NA	Each Refueling Outage	Every 3 months	By varying level in switch column
b) Scram trip bypass	NA	NA	Each refueling outage	
28. Loss of Power				
a) 4.16 KV Emergency Bus Undervoltage (Loss of voltage)	Daily	1/18 mos.	1/mo.	
b) 4.16 KV Emergency Bus Undervoltage (Degraded Voltage)	Daily	1/18 mos.	1/mo.	

[illegible] shutdown and thereafter check 1/s and test 1/wk until no longer

<u>Basis</u>: The biweekly tests of the diesel generators are primarily to check for failures and deterioration in the system since last use. The manufacturer has recommended the two week test interval, based on experience with many of their engines. One factor in determining this test interval (besides checking whether or not the engine starts and runs) is that the lubricating oil should be circulated through the engine approximately every two weeks. The diesels should be loaded to at least 20% of rated power until engine and generator temperatures have stabilized (about one hour). The minimum 20% load will prevent soot formation in the cylinders and injection nozzles. Operation up to an equilibrium temperature ensures that there is no over-heat problem. The tests also provide an engine and generator operating history to be compared with subsequent engine-generator test data to identify and correct any mechanical or electrical deficiency before it can result in a system failure.

The test during refueling outages is more comprehensive, including procedures that are most effectively conducted at that time. These include automatic actuation and functional capability tests, to verify that the generators can start and assume load in less than 20 seconds and testing of the diesel generator load sequence timers which provide protection from a possible diesel generator overload during LOCA conditions. Thorough inspections will detect any signs of wear long before failure.

The manufacturer's instructions for battery care and maintenance with regard to the floating charge, the equalizing charge, and the addition of water will be followed. In addition, written records will be maintained of the battery performance. Station batteries will deteriorate with time, but precipitous failure is unlikely. The station surveillance procedures follow the recommended maintenance and testing practices of IEEE STD. 450 which have demonstrated, through experience, the ability to provide positive indications of cell deterioration tendencies long before such tendencies cause cell irregularity or improper cell performance.