PSNH

Public Service of New Hampshire

SEABROOK STATION
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December 1, 1983

SBN- 587
T.F. B7.1.2

United States Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Mr. George W. Knighton, Chief
Licensing Branch No. 3
Division of Licensing

References: (a) Construction Permits CPPR-135 and CPPR-136, Docket Nos. 50-443 and 50-444
(b) PSNH Letter SBN-427, dated January 20, 1983, "Open Item Responses", J. DeVincentis to G. Knighton

Subject: Electrical Interconnections Between Redundant Divisions

Dear Sir:

As part of the continuing design verification, and to satisfy the commitment made in response to RAI430.44 referenced in (b) above, we have performed a study to identify any cables between redundant divisions where physical separation is not fully in accordance with the criteria established in the FSAR.

Deviations identified and proposed corrective actions, where necessary, are documented as a part of the study. The corrective actions will be implemented prior to fuel loading.

The methodology used to perform this study is summarized below:

Each piece of electrical equipment in the plant is assigned one or more three-character node numbers and each node number is assigned to one of the four separation groups. In addition, every cable in the plant is assigned a circuit code which relates the cable to one of the four separation groups. Based on these design parameters, a subroutine of the plant's computerized program for routing cables (CASP), is developed to check each node number in the plant against the cables routed to these nodes. A report is then produced, listing the node numbers that have cables from different separation groups. This information is then reviewed for conformance to the separation criteria established in the FSAR.

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A report providing the results of this study is attached. The report identifies cases where cables have been found between redundant divisions where the existing separation does not fully meet the guidelines. The report also describes corrective actions for these cases, and any special cases where nonconformances are analyzed and justified. None of the above mentioned cases fall under the 10CFR50.55(e) category.

The report does not list the cases where cables from different separation groups appear in the same node but proper separation exists, or where the separation and isolation have been previously justified by NSSS supplier analysis or testing. The complete subroutine report listing all cases will be available in our files for review.

The above described subroutine will be periodically run to identify potential nonconformances on systems and components that might have been added since the last time the subroutine was run.

Very truly yours,

YANKEE ATOMIC ELECTRIC COMPANY

John DeVincentis
Project Manager

GTs/smh

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CABLES BETWEEN REDUNDANT SEPARATION GROUPS

ITEM	EQUIPMENT DESCRIPTION	NODE NO.	ANALYSIS/RECOMMENDED MODIFICATION EVALUATION
1.	13.8 kV Switchgear Feeder Breaker Compartments for Reactor Coolants Pumps	A05 A09 A20 A24	The Separation Group A switchgear compartments contain Separation Group A (Train A Associated) and Separation Group B (Train B Associated) cables. The Separation Group B cables that enter the Separation Group A switchgear compartments are the power feeders for the 13.8 kV Reactor Coolant Pumps and the cables for the power connections to the potential transformers (see Item 2) that is utilized for the solid-state protection system circuits. These cables enter the rear section of the switchgear compartment from the bottom and connect to lugs provided in the rear section. The cables are separated from the Separation Group A control wiring by metal barriers, except for the current transformers, ground sensor and space heaters wiring. A postulated failure in one of the above mentioned switchgear compartments could impact the contained Separation Group A circuits and the specific Separation Group B cables mentioned above, i.e., feeder to the RC pumps, feeder to the PTs; it will not challenge other Separation Group B circuits, as these cables are routed in dedicated raceways and do not intermix with any other Separation Group B circuits. Therefore, this interconnection between separation groups is acceptable and no modification is recommended.

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2.	Compartments for 13.8 kV Reactor Coolant Pump Potential Transformers	A64 A65 A66 A70	For qualification purposes (seismic, etc.) these compartments are located in the Emergency Switchgear Rooms and are part of the 4 kV Class 1E switchgear lineup. They contain the 13.8 kV - 120 V potential transformers and associated relaying utilized to provide underfrequency and undervoltage information to the SSPS for the Reactor Coolant Pumps; as such, these four compartments are associated with the four instrumentation Channels I, II, III, and IV. As mentioned in Item 1, the cables connecting the PTs to their power source, the 13.8 kV buses, are Train B Associated. Therefore, in the compartments for Channels I, III, and IV, cables of different separation groups are present. The 13.8 kV Train B associated cables enter the bottom of these compartments and they terminate on a bus. This section of the compartment is isolated by metal barriers from the rest of the PT compartment. The bus is routed to another section which contains the 13.8 kV - 120 V potential transformer and fuses. This section is isolated from the instrument and relaying section by metal barriers. Because of the metal barriers provided and the Class 1E fuses and PT which serve as the interface between the separation groups, we consider this interconnection between separation groups acceptable.

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2. (Cont'd)			Furthermore, in order to provide 125 V dc power supplies to the four PT channel compartments in strict accordance with FSAR Figure 8.3-2, the following modifications will be performed to the PT compartments: 1) Provide a separate Train A dc power supply to Channel I instrument section from a distribution panel powered from 125 V dc Switchgear EDE-SWG-11A. 2) Provide a separate Train B dc power supply to Channel II instrument section from a distribution panel powered from 125 V dc Switchgear EDE-SWG-11B. 3) Provide a separate Train A dc power supply to Channel III instrument section from distribution panel powered from 125 V dc Switchgear EDE-SWG-11C. 4) Provide a separate Train B dc power supply to Channel IV instrument section from a distribution panel powered from 125 V dc Switchgear EDE-SWG-11D. 5) Delete the space heater wiring from the compartment.
3.	4160 Volt Switchgear Compartments for Preferred Power Supplies	A71 A72	To satisfy IEEE-308, preferred power supply has to be provided to the Train B 4160 volt emergency switchgear. According to the plant design, the preferred power supply (UAT and RAT) is Train A Associated and, therefore, by design, there is an interface between the Train A Associated UAT and RAT bus ducts

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3. (Cont'd)			and the Train B switchgear. The interface is the Class 1E 4160 volt UAT and RAT incoming line breakers. This interconnection between separation groups is acceptable and no modifications are recommended.
4.	Vital Instrumentation Distribution Panels		The Separation Group C Distribution Panel EDE-PP-1C contains Separation Group A
	EDE-PP-1C	E03	(Train A and Train A
	EDE-PP-1D	E04	Associated) cables (i.e., alternate power feeds) and Separation Group C (Channel III) cables. Similarly, the Separation Group D Distribution Panel EDE-PP-1D contains Separation Group B (Train B and Train B Associated) and Separation Group D (Channel IV) cables.
	Uninterruptible Power Supply		The Separation Group A UPS EDE-I-1C contains Separation Group A (Train A and Train A
	EDE-I-1C	HE3	Associated) cables and a
	EDE-I-1D	HE4	Separation Group C (Channel III) cable. The Separation Group B UPS EDE-I-1D contains Separation Group B (Train B and Train B Associated) cables and a Separation Group D (Channel IV) cable. This interface between the above mentioned separation groups is acceptable because the plant design (W RESAR) requires that the power supplies for the four protection system channels be derived from the two redundant emergency power sources (i.e., Train A and Train B). As a result, there is an interface, by design, between Train A and Channel I, Train A and Channel III, Train B and Channel II, and Train B Channel

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4.	(Cont'd)		IV. This interface is applicable to these distribution panels and UPS.
5.	Process Protection Cabinets MM-CP-2 MM-CP-4	 FA2 FA4	Problems were identified internal to the cabinets where non-vital instrument signals from different separation groups (Train A Associated and Train B Associated) were commoned without proper isolation devices. This problem will be rectified by providing qualified isolation devices. This modification provides assurance that a failure in one separation group will not prevent other separation group safety circuits from performing their safety function.
6.	SSPS Train B Output 1 Cabinet MM-CP-13	 FBO	The Separation Group B SSPS Train B Output 1 Cabinet MM-CP-13 contains Separation Group A (Train A Associated) and Separation Group B (Train B and Train B Associated) cables. The Separation Group A cable that is associated with the Feedwater Pump FW-P-32B trip circuits is not properly separated from the other separation groups. This will be rectified by changing the cable to Separation Group B and rerouting it to the Isolation Cabinet MM-CP-470 where the signal will be converted to a Separation Group A via a qualified isolation device. Therefore, upon completion of the modifications, the Seabrook physical separation criteria are satisfied.

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7.	Auxiliary Relay Rack 2 NI-CP-10	FB2	The Separation Group A Auxiliary Relay Rack 2 contains Separation Group A (Train A Associated) and Separation Group B (Train B Associated) cables. The Separation Group B cables that are associated with the Group B Pressurizer Heaters, the Boric Acid Pump CS-P-3B, the Power-Operated Relief Valve RC-PCV-456B, and the PORV Block Valve RC-V-124 are not properly separated from the other separation group. This will be rectified by changing the cables to Separation Group A and rerouting them to the Isolation Cabinet MM-CP-470 where the signals will be converted to Separation Group B via a qualified isolation device. Therefore, upon completion of the modifications, the Seabrook physical separation criteria are satisfied.
8.	Turbine Generator EHC Cabinet Bay 4 TSI-CP-26	FE4	The Separation Group A EHC cabinet contains Separation Group A (Train A Associated) cables and a Separation Group B, (Train B Associated) cable. The Separation Group B cable that is associated with the turbine trip circuit is not properly separated from the other separation group. This will be rectified by changing the cable to Separation Group A and rerouting it to the Isolation Cabinet MM-CP-470 where the signal will be converted to Separation Group B via a qualified isolation device. Therefore, upon completion of the modifications, the Seabrook physical separation criteria are satisfied.

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9.	Switching Station Relay Cabinets		The Separation Group A switching station relay cabinets located in the Unit 1 Relay Room
	SY-CP-87	GA0	contain Separation Group A
	SY-CP-87	GA6	(Train A Associated) and
	SY-CP-87	GA7	certain Separation Group B
	SY-CP-86	GB0	(Train B Associated) cables.
	SY-CP-85	GB3	These relay cabinets are
	SY-CP-83	GB4	supporting systems for the
	SY-CP-85	GB7	preferred power supply. The
	SY-CP-84	GC0	interface between the preferred
	SY-CP-86	GC1	power supply and the Train B,
	SY-CP-86	GC4	4160 volt Switchgear Bus E6
	SY-CP-84	GC6	(see Item 3) requires certain
	SY-CP-86	GE6	interlocks which utilize relays
	SY-CP-87	GE7	contained in the switching station relay cabinets. Since these interlock circuits are part of Bus E6 circuits, they are Train B Associated and are routed to the Separation Group A relay cabinets. These circuits interface with the safety-related Train B circuits utilizing Class 1E fuses mounted in seismically qualified switchgear compartments in the nuclear island. The cables are run in dedicated conduits outside the nuclear island up to the relay cabinets. The relay cabinets contain only control level circuits and equipment. This precludes challenges to the circuits within the cabinets from high voltage cables and wiring. The above analysis indicates that a failure in these cabinets will not challenge safety-related Separation Group B circuits, therefore, this interconnection between separation groups is acceptable and no modification is recommended.

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10.	Computer IRTU		Analysis is still in progress; results will be submitted as soon as they become available.
	IRTU 1 SC-CP-122	FD9	
	IRTU 2 SC-CP-125	FE5	
	IRTU 4 SC-CP-204	GY5	
	IRTU 6 SC-CP-212	JW0	
11.	IRTU RTD/Thermocouple Conversion Cabinet		The Separation Group B RTD/TC Conversion Cabinet contains a Separation Group A (Train A Associated) cable and Separation Group B (Train B Associated) cables. The Separation Group A cable is the 120 V ac power supply to the cabinet. This cable enters the top of the cabinet and terminates on a terminal block near the AC control panel at the bottom of the cabinet. This cable will be installed in flexible conduit inside the panel. All other 120 V ac wiring will be barriered or separated by a minimum of 6 inches from the Separation Group B wiring and cables.
	IRTU 4 SC-CP-217	G1G	
	IRTU 6 SC-CP-245	JZ8	
			The interface between the Separation Group A circuit and the Separation Group B circuit is the power supply for the Computer Products RTP 7504/20 RTD Signal Conditioning Chassis. This power supply consists of a filter, two 2 amp fuses and a 115-12.5 volt transformer. The output of this power supply feeds the individual circuit cards which contain a power supply with a 10 volt dc power supply and four RTD bridge completion networks. The electrically isolated Train B associated RTDs are connected to the bridge completion network which provide a Train B Associated analog output to the Train B Associated

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ITEM	EQUIPMENT DESCRIPTION	NODE NO.	ANALYSIS/RECOMMENDED MODIFICATION EVALUATION
11. (Cont'd)			computer termination cabinet. There is no electrical interconnection with any Train B power supplies. A failure in the Train A Associated portion of the circuit will have no impact on the Train B or Train B Associated equipment except to cause loss of indication from the non-safety-related RTDs. A failure in the Train B Associated portion of the circuit will not cause damage to Train B or Train A cables due to the number of protective devices (fuses and circuit breakers) in the circuit (approximately 5) which could be expected to operate to isolate the fault. In addition, because of the inherent current limiting capabilities of the inverter, the dc power supplies on the RTD cabinet card frames and the connecting cables, a failure at the RTDs would not cause sufficient short circuit current to cause damage to safety-related cables routed with the Train B Associated RTD cables. Therefore, although there is an interconnection between separation groups, the separation and protection incorporated in the design provides assurance that a failure in the Separation Group A or Separation Group B circuits will not prevent the safety-related circuits from performing their safety function.

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12.	Turbine Building Instrument Rack MM-IR-35B	G11	The Separation Group B instrument rack contains a Separation Group A (Train A Associated) cable and Separation Group B (Train B) cables. The Separation Group A cable is for the sound powered phone jack. This cable and the associated internal wiring satisfy the Seabrook separation criteria. However, the wiring for the Non-Class 1E convenience receptacle, which is considered to be Train A Associated, has not been separated from the Separation Group B wiring. This will be rectified by eliminating the convenience receptacle and associated wiring. Therefore, upon completion of the modifications, the Seabrook physical separation criteria are satisfied.
13.	Reactor Trip Switchgear Cabinet 1 CP-CP-111	HD2	The Separation Group B Reactor Trip Switchgear Cabinet contains a Separation Group A (Train A Associated) cable and Separation Group B (Train B and Train B Associated) cables. The Separation Group A cable that is associated with the turbine trip circuit is not properly separated from the other separation group. This will be rectified by changing the cable to Separation Group B and rerouting it to the Isolation Cabinet MM-CP-470 where the signal will be converted to Separation Group A via a qualified isolation device. Therefore, upon completion of the modifications, the Seabrook physical Separation criteria are satisfied.

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14.	Reactor Coolant Pump Motor		The Separation Group A RCP motor contains Separation Group A (Train A Associated) cables and Separation Group B (Train B Associated) cables. The Separation Group B cables are the 13.8 kV power feeder to the RCP motor. The separation A cables consist of the 480 volt power feeds to the oil lift pump and the motor space heaters and those circuits associated with the oil pressure/level switches and motor RTDs. A postulated failure in these cables could impact the Separation Group A circuits and the above mentioned specific Separation Group B cables, but it will not challenge other Separation Group B circuits, as these cables are routed in dedicated raceways and do not interact with any other Separation Group B circuits. In addition, these cables are protected by Class 1E fuses. Therefore, although there is an interconnection between separation groups, the above analysis provides assurance that a failure in the Separation Group B (Train B Associated) cable will not prevent the Separation Group B safety-related circuits from performing their safety function.
	Pump RC-P-1A	M01	
	Pump RC-P-1B	M02	
	Pump RC-P-1C	M03	
	Pump RC-P-1D	M04	
15.	Pressurizer Heaters		Seventy-eight electrically separate pressurizer immersion heaters are spaced around the bottom of the pressurizer with a minimum separation of approximately 4 inches. Fifteen of these heaters are Separation Group B and the
	RC-E-10	M26	

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15. (Cont'd)			remainder are Separation Group A. The Separation Group A cables are run in separate wireways from the Separation Group B cables up to the bottom of the pressurizer where they exit the wireways and are supported in proximity to one another up to their respective heaters. Each sub-group of three single-phase heaters has an individual Class 1E circuit breaker for protection and a backup Class 1E breaker on each heater group. This separation between redundant groups is acceptable.
16.	Reactor Incore Instrumentation Seal Table 1C-MM-173	HN9	The Separation Group A seal table contains Separation Group A (Train A and Train A Associated) cables and Separation Group B (Train B and Train B associated) cables. The seal table contains 58 thimbles for the fixed/moveable incore instrumentation. Each thimble also contains 5 fixed self-powered neutron detectors, 1 thermocouple (for core exit temperature) and a guide tube for the moveable detector. The fixed detectors are equally divided between Separation Group A (Train A thermocouple and Train A Associated neutron detectors) and Separation Group B (Train B thermocouple and Train B Associated neutron detectors). Because of the congestion at the seal table, cables of redundant separation groups may be separated by only a one-inch air gap in some places.

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16. (Cont'd)			This is acceptable because of the following facts: The voltage level in these circuits is of the signal level and there are no power supplies in the circuit to produce damaging fault currents; these circuits once they leave the congested seal table area are run in separate solid cover trays or conduits that meet the FSAR separation criteria.