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VICE PRESIDENT
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May 22, 1987

U. S. Nuclear Regulatory Commission
Region I
631 Park Avenue
King of Prussia, PA 19406

ATTENTION: Mr. William T. Russell
Regional Administrator

SUBJECT: Calvert Cliffs Nuclear Power Plant
Unit No. 1; Docket No. 50-317
Environmental Qualification of Unit One Electrical Equipment

REFERENCE: (a) Generic Letter 86-15, Information Relating to Compliance with
10 CFR 50.49, "Environmental Qualification of Electric Equipment
Important to Safety for Nuclear Power Plants," September 22, 1986

Gentlemen:

During an NRC inspection of our Environmental Qualification (EQ) Program the week of March 23, 1987, it was noted that Calvert Cliffs Units 1 and 2 each had two solenoid valves under the scope of 10 CFR 50.49 with undocumented taped splices. Subsequent to the NRC inspection, a sampling of Unit 2 10 CFR 50.49 solenoid valves revealed additional undocumented taped splices. Based on this, the Baltimore Gas and Electric Company decided to shutdown Unit 1 on April 1, 1987, (Unit 2 was already in a refueling outage), and perform a review of the installed configuration of 10 CFR 50.49 equipment.

Management led the effort to develop a comprehensive program to inspect in detail all splices on 10 CFR 50.49 equipment, to inspect 10 CFR 50.49 equipment to check the installed configurations against the EQ files, and to resolve or repair discrepancies when identified. Our Quality Assurance organization has provided independent review to ensure complete and proper documentation of inspections and subsequent reinspections following corrective maintenance in response to discrepancies. We have also contracted an EQ consultant to provide additional expertise.

A summary of corrective measures, as well as interim EQ program modifications, is provided in Enclosure (1). Additionally, a summary of all 10 CFR 50.49 equipment inspected is provided in Enclosure (2).

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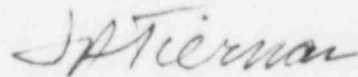
In the course of our review of the Environmental Qualification Program, we chose to upgrade and maintain additional equipment in accordance with EQ requirements. We will control that equipment by an Interim Program pending engineering review for possible permanent addition to the list of 10 CFR 50.49 equipment. This equipment is listed in Enclosure (3). The summary of equipment inspected provided in Enclosure (2) reflects these additions.

Calvert Cliffs Unit 2 is undergoing a similar review of 10 CFR 50.49 equipment. Upon completion of this review, we will provide a similar letter stating the status of the qualification of Unit 2's 10 CFR 50.49 equipment.

Based on our inspections, verification of installed equipment and/or review of documentation, and corrective measures, all Unit 1 equipment within the scope of 10 CFR 50.49 is qualified with the exception of equipment for which a justification for continued operation has been written in accordance with Reference (a). To prevent recurrence in the future, additional long-term measures will be taken including upgraded program controls and an independent evaluation of our EQ program. These measures are summarized in Enclosure (4).

Should you have any further questions regarding this matter, we will be pleased to discuss them with you.

Very truly yours,



JAT/LSL/dln

Enclosures

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ENCLOSURE (1)

ACTIONS THE BALTIMORE GAS & ELECTRIC COMPANY HAS TAKEN PRIOR TO START-UP OF UNIT 1 TO ENSURE QUALIFICATION OF UNIT 1 EQUIPMENT WITHIN THE SCOPE OF 10 CFR 50.49

It was demonstrated to the Manager-Nuclear Operations that all 10 CFR 50.49 equipment (with the exception of that equipment for which a justification for continued operation has been written) complies with Environmental Qualification (EQ) requirements and is qualified without exception. This demonstration consisted of the below items.

1. For inspected equipment:
 - an Equipment Qualification Design Engineer (EQDE) or Qualified Equipment Qualification Reviewer (QEQR) reviewed all inspection checksheets for 10 CFR 50.49 equipment to ensure this equipment complies with EQ requirements,
 - an engineer performed the post-maintenance inspection of all reworked splices and the rework of other selected components,
 - a post-maintenance checksheet for equipment that was reworked was reviewed by an EQDE or QEQR to ensure the equipment complies with EQ requirements, and a written notification was provided to the Shift Supervisor, and
 - a normal post-maintenance operational test, as described in Enclosure (2), was or will be performed on all reworked equipment.
2. We have performed inspections and/or review of the documentation of all 10 CFR 50.49 equipment listed in Enclosure (2). These inspections included use of comprehensive checksheets (which include commodities, when appropriate, such as termination hardware, wire, lubricants, gaskets) developed by engineering personnel. Examples of these were recently provided to the NRC. Our Quality Assurance organization has reviewed documentation to ensure that:
 - modifications were completed on items with identified deficiencies, and
 - all documentation (inspections and modifications) was reviewed and determined to be adequate by either an EQDE or a QEQR.
3. Variations in Raychem shrink tubing applications, not specifically approved by the manufacturer, have been incorporated into the EQ files. These are supported by qualification test reports.
4. We have performed a detailed evaluation of one lead of a 10 CFR 50.49 4 Kv motor. This included the complete dissection and analysis of the entire splice to determine the method of application of the tape as well as the tape material. A sample of tape from each 4 Kv motor lead was also analyzed. The insulation for 4 Kv motor lead cable terminations was verified to be adequate and specific qualification data has been added to the 4 Kv motor qualification file.

ENCLOSURE (1)

ACTIONS THE BALTIMORE GAS & ELECTRIC COMPANY HAS TAKEN PRIOR TO START-UP OF UNIT 1 TO TO ENSURE QUALIFICATION OF UNIT 1 EQUIPMENT WITHIN THE SCOPE OF 10 CFR 50.49

5. We pulled random (26) cable scheme numbers and performed complete documentation checks of these cables through our cable routing, tagging, and procurement receipt inspection records.
6. All junction boxes falling within the scope of 10 CFR 50.49 have been inspected and verified to meet EQ requirements.
7. Although not an EQ concern, we have lifted the leads from the power terminal blocks for motor operated valves in containment and spliced them to the field circuit using qualified Raychem shrink tubing.
8. The issue regarding overstress of Raychem as documented in Non-Conformance Report No. 3890 and subsequent memos was resolved.
9. With regard to IE Notice 86-104 (Unqualified Butt Splice Connectors Identified in Qualified Penetrations), no General Electric nylon insulated butt splice connectors are used in EQ penetration assemblies.
10. All 10 CFR 50.49 components associated with the below equipment, which could be visually inspected without disassembling or de-energizing the equipment have been inspected using checksheets. The purpose of the inspection was to confirm the installed configuration with what is detailed in the EQ files. The equipment is located within radiation-only harsh environments.
 - Disconnect Switches

These are 480 volt and 4 Kv disconnect switches with electrical connections of field cables directly bolted to NEMA bolt pads or terminated on qualified terminal blocks.
 - Switchgear

These are 4 Kv and 480 volt switchgear assemblies with electrical connections of field cables directly bolted to NEMA bolt pads or terminated on qualified terminal blocks.
 - Motor Control Centers

The 480 volt motor control centers have electrical connections of field cables directly bolted to NEMA bolt pads or terminated on qualified terminal blocks.
11. RTD cap splice terminations are reworked each refueling outage as part of a Surveillance Test Procedure (STP) which incorporates the EQ requirements for the terminations. We have reviewed the most recent STP performed in December 1986, and have verified the adequacy of the instructions. Finally, a sampling of three Unit 1 RTD terminations was inspected.

ENCLOSURE (1)

ACTIONS THE BALTIMORE GAS & ELECTRIC COMPANY HAS TAKEN PRIOR TO START-UP OF UNIT 1 TO TO ENSURE QUALIFICATION OF UNIT 1 EQUIPMENT WITHIN THE SCOPE OF 10 CFR 50.49

Interim upgraded program controls have been established to ensure clear communication of EQ maintenance requirements to the craftsman and to ensure work is completed as directed in those maintenance requirements. A current 10 CFR 50.49 list has been issued to planners. The major portions of this interim program are summarized below.

To clearly communicate EQ maintenance instructions, we will:

- prepare a checklist (EQ Equipment Traveler) to ensure all EQ requirements are incorporated in the maintenance work package,
- include connection, SIS wire, and terminal block requirements in qualification maintenance requirement sheets (QMRS),
- attach pertinent QMRS and excerpts from E-406 (BG&E Electrical Design and Construction Standard) to the Maintenance Order (MO),
- attach a post-maintenance checklist to the MO, and
- have each planned MO reviewed by an EQDE or QEQR prior to working the job. He will also ensure that all requirements from the EQ files including lubricants, gaskets, cable, cable splices, terminal lugs and tape (for 4 Kv motors), related to the specific application are included in the work package.

To ensure work is done in accordance with maintenance instructions prior to declaring equipment **OPERABLE**:

- craft supervision will do an in-field review of the job to determine and indicate which items of the Equipment Inspection Checklist are applicable (see Note 1 below),
- a quality control inspector (see Note 1 below) and craftsman will complete the post-maintenance checklist,
- craft supervision will review the post-maintenance checklist, and
- a EQDE or QEQR will review the post-maintenance checklist and the work packages to ensure that the work performed complies with E-406, the applicable QMRS section, and the EQ files.

NOTE (1): These requirements may be waived if in the judgment of the General Supervisor-Operations or Manager-Nuclear Operations, ALARA considerations outweigh the benefit of these additional checks.

ENCLOSURE (2)

**EQUIPMENT INSPECTED DURING
BALTIMORE GAS & ELECTRIC COMPANY'S
REVIEW OF UNIT 1**

The below 10 CFR 50.49 equipment received a comprehensive inspection. These inspections included use of checksheets developed by engineering personnel. An engineer performed the post-maintenance inspection of all reworked splices and the rework of other selected components. Typical post-maintenance and operational testing for this equipment is indicated in the below Notes. If maintenance was associated with the Engineered Safety Features Actuation System, proper response will be tested prior to entering the Mode of Operation for which the equipment is required to be operable in accordance with the Technical Specifications. CCI-104 (Surveillance Test Program) and Operational Administration Procedures provide guidance for operational retests.

<u>EQUIPMENT</u>	<u>TOTAL NUMBER INSTALLED</u>	<u>TOTAL NUMBER INSPECTED</u>
Solenoid Valves and Position Switches (Note 2)	106	106
Motor-Operated Valves (Note 2)	42	42
480V Motors (Note 3)	24	24
Penetrations (inside/outside containment) (Note 4)	76	76
Instrumentation (Note 5)	108	108
Motor-Operated Dampers (Note 6)	3	3
In-Line Junction Boxes (Note 7)	16	16
4 Kv Motors (Notes 1 and 4)	7	7
Handswitches (Note 8)	23	23
Indicating-Type Relay (Note 8)	1	1
Hydrogen Recombiners and Controllers (Note 9)	2	2
Disconnect Switches (Notes 8 and 10)	8	8
Switchgear (Notes 8 and 10)	3	3
Motor Control Centers (Notes 8 and 10)	5	5
RTD Cap Splice Terminations (Notes 11 and 12)	16	3

ENCLOSURE (2)

EQUIPMENT INSPECTED DURING
BALTIMORE GAS & ELECTRIC COMPANY'S
REVIEW OF UNIT 1

- NOTE (1): See Item 4 of Enclosure (1).
- NOTE (2): The valve is stroked (including timing and flow verification as necessary) and proper position indication is verified.
- NOTE (3): The motor is meggered, phase rotation checked, and run tested.
- NOTE (4): The applicable post-maintenance and operational testing for the specific equipment is performed after a visual inspection of work completed.
- NOTE (5): Loop currents are measured. Channel checks are performed when parameters reach normal ranges.
- NOTE (6): The damper is stroked to verify proper operation.
- NOTE (7): Visual Inspection
- NOTE (8): No maintenance was performed.
- NOTE (9): After meggering, a test run is performed.
- NOTE (10): See Item 10 of Enclosure (1).
- NOTE (11): See Item 11 of Enclosure (1).
- NOTE (12): Reference resistance measurements were taken.

ENCLOSURE (3)

ADDITIONS TO THE UNIT ONE 10 CFR 50.49 LIST

<u>Component No.</u>	<u>Description</u>
0-HS-2103A	D/G 11 4kV Bus Feeder Bkr Control Transfer Handswitch
0-HS-2103B	D/G 11 4kV Bus Feeder Bkr Local Control Handswitch
0-HS-2106A	D/G 12 4kV Bus Feeder Bkr Control Transfer Handswitch
0-HS-2106B	D/G 12 4kV Bus Feeder Bkr Local Control Handswitch
1-NA-103	Disconnect Switch from D/G 11 to 4kV Bus 11
1-NA-106	Disconnect Switch from D/G 12 to 4kV Bus 11
1-HS-5470	#11 AFW Pp Rm Exhaust Fan Handswitch
1-HS-5471	#12 AFW Pp Rm Exhaust Fan Handswitch
1-NB-102 (Note 1)	#11 Containment Cooler Controller
1-NB-114 (Note 1)	#12 Containment Cooler Controller
1-NB-402 (Note 1)	#13 Containment Cooler Controller
1-NB-414 (Note 1)	#14 Containment Cooler Controller
1-PS-5405 (Note 2)	#12 ECCS Pp Rm Cooling Fan Pressure Switch
1-PY-5405 (Note 2)	#12 ECCS Pp Rm Cooling Fan Relay
1-SV-1645 (Note 2)	SRW to #12 D/G - Unit 1 Solenoid Valve
1-SV-1646 (Note 2)	SRW from #12 D/G - Unit 1 Solenoid Valve
1-SV-5170 (Note 2)	ECCS Pp Rm Cooler 11 SW Inlet Solenoid Valve
1-SV-5171 (Note 2)	ECCS Pp Rm Cooler 11 SW Outlet Solenoid Valve
1-SV-5173 (Note 2)	ECCS Pp Rm Cooler 12 SW Inlet Solenoid Valve
1-SV-5174 (Note 2)	ECCS Pp Rm Cooler 12 SW Normal Outlet Solenoid Valve
1-SV-5175 (Note 2)	ECCS Pp Rm Cooler 12 SW Normal B/U Outlet Solenoid Valve
1-SV-5177 (Note 2)	ECCS Pp Rm Cooler 12 SW Aux Outlet Solenoid Valve
1-SV-5178 (Note 2)	ECCS Pp Room Cooler 12 SW Aux. B/U Outlet Solenoid Valve
1-ZS-5170A (Note 2)	ECCS Pp Rm Cooler 11 SW Inlet Open Position Indication
1-ZS-5170B (Note 2)	ECCS Pp Rm Cooler 11 SW Inlet Close Position Indication
1-ZS-5171A (Note 2)	ECCS Pp Rm Cooler 11 SW Outlet Open Position Indication
1-ZS-5171B (Note 2)	ECCS Pp Rm Cooler 11 SW Outlet Close Position Indication
1-ZS-5173A (Note 2)	ECCS Pp Rm Cooler 12 SW Inlet Open Position Indication
1-ZS-5173B (Note 2)	ECCS Pp Rm Cooler 12 SW Inlet Close Position Indication

ENCLOSURE (3)

ADDITIONS TO THE UNIT ONE 10 CFR 50.49 LIST

<u>Component No.</u>	<u>Description</u>
1-ZS-5174A (Note 2)	ECCS Pp Rm Cooler 12 SW Normal Outlet Open Position Indication
1-ZS-5174B (Note 2)	ECCS Pp Rm Cooler 12 SW Normal Outlet Close Position Indication
1-ZS-5175A (Note 2)	ECCS Pp Rm Cooler 12 SW Normal B/U Outlet Open Position Indication
1-ZS-5175B (Note 2)	ECCS Pp Rm Cooler 12 SW Normal B/U Outlet Close Position Indication
1-ZS-5177A (Note 2)	ECCS Pp Rm Cooler 12 SW Aux Outlet Open Position Indication
1-ZS-5177B (Note 2)	ECCS Pp Rm Cooler 12 SW Aux Outlet Close Position Indication
1-ZS-5178A (Note 2)	ECCS Pp Rm Cooler 12 SW Aux B/U Outlet Open Position Indication
1-ZS-5178B (Note 2)	ECCS Pp Rm Cooler 12 SW Aux B/U Outlet Close Position Indication

Note (1): This equipment is included under the heading Motor Control Centers in Enclosure (2).

Note (2): This equipment has a justification for continued operation written in accordance with Generic Letter 86-15, "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants," September 22, 1986

ENCLOSURE (4)

ADDITIONAL ACTIONS
THE BALTIMORE GAS & ELECTRIC COMPANY
WILL TAKE SUBSEQUENT TO
START-UP OF UNIT 1

1. Selected EQ files will be reviewed by an EQ consultant. (July 1987)
2. An independent evaluation will be performed on the EQ program by a team which includes expertise in EQ. (August 1987)
3. The issue regarding inconsistencies in E-406 documented in Non-Conformance Report No. 3890 and subsequent memos will be resolved. (July 1987)

May 22, 1987

SUMMARY OF CALVERT CLIFFS UNIT ONE'S JUSTIFICATION FOR CONTINUED OPERATION

A review of the present configuration of the ECCS Pump Room Cooler solenoid valves, position switches, pressure switches and relay (Table 1 below) has been performed. A preliminary assessment has shown the above equipment is qualifiable for this radiation only harsh environment (maximum 3.8×10^6 rads).

A step has been included early in the LOCA Emergency Operating Procedure to have the operator remotely open (de-energize) the solenoid valves using existing handswitches in the control room. The operators will be instructed on this change to EOP-5 prior to entering **MODE 4**. This will open the ECCS pump room cooler control valves, turn on the cooler motors, and remove the temperature control loop (comprised partially of the pressure switches and relays) from the electrical circuit. Therefore, a subsequent failure of the temperature control loop cannot affect the operability of the coolers or mislead the operator. This step provides assurance that flow will be established and valve position verified. This equipment will be operated before it is exposed to the harsh radiation environment.

Qualification of all equipment involved will be completed by July 31, 1987. This will include a review to ensure proper electrical separation. If rerouting is required, engineering for the rerouting will be issued to the field by August 31, 1987, and the work completed at the next outage of sufficient duration.

TABLE 1

<u>IDENTIFICATION #</u>	<u>MANUFACTURER</u>	<u>MODEL #</u>	<u>LOCATION</u>
1-SV-5170	ASCO	HPX 8320A26	A228
1-SV-5171	ASCO	HPX 8320A26	A228
1-SV-5173	ASCO	HPX 8320A26	A228
1-SV-5174	ASCO	HPT 8320A26	A228
1-SV-5175	ASCO	HPX 8320A26	A228
1-SV-5177	ASCO	HPX 8320A26	A228
1-SV-5178	ASCO	NP 8320A185E	A228
All Position Switches	Magnetrol	496-2	A228
All Pressure Switches	Johnson	P7221	A118/119
1-PT-5405	Square D	8501	A423