WCAP 8587

"Equipment Qualification Data Packages"

Supplement 1

EQDP-ESE-18

Instrument Bus Power Supply (Static Inverter)

Revision 5

Instruction Sheet

The following instructional information and checklist is being furnished to help insert the following into WCAP-8587 Supplement 1 EQDP-ESE-18 Class 3 (Non-Proprietary). Discard the old sheet and insert the new sheets as listed below. Revised information is indicated by a bar and number 5 on the outside margin of the page.

Remove (Front/Back)	Insert (Front/Back)
Cover sheet/--	Cover sheet/--
--/--	NRC Letter/NRC Letter
--/--	Table 1/Table 1
page 2/3	page 2/3
12/13	12/13
14/15	14/15

EQUIPMENT QUALIFICATION DATA PACKAGE

This document contains information, relative to the qualification of the equipment identified below, in accordance with the methodology of WCAP-8587. The Specification section (Section 1) defines the assumed limits for the equipment qualification and constitute interface requirements to the user.

Instrument Bus Power Supply (Static Inverter)

**** THIS DOCUMENT HAS BEEN REVIEWED AND ACCEPTED BY THE NRC IN ACCORDANCE WITH WCAP 8587 "METHODOLOGY", REVISION 6 ****

APPROVED: _____
for E. P. Rahe, Manager
Nuclear Safety Department

WESTINGHOUSE ELECTRIC CORPORATION
NUCLEAR ENERGY SYSTEMS
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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

NOV 10 1983

Mr. E. P. Rahe, Jr., Manager
Nuclear Safety Department
Westinghouse Electric Corporation
P. O. Box 355
Pittsburgh, Pennsylvania 15230

Dear Mr. Rahe:

Subject: Acceptance for Referencing of Licensing Topical Reports WCAP-8587, Revision 6 (NP), "Methodology for Qualifying Westinghouse WRD Supplied NSSS Safety Related Electrical Equipment," and WCAP-9714 (P)/9750 (NP), "Methodology for the Seismic Qualification of Westinghouse WRD Supplied Equipment"

We have completed our review of the subject topical reports submitted by Westinghouse Electric Corporation. We find these reports are acceptable for referencing in license applications to the extent specified and under the limitations described in the attached Safety Evaluation Report (SER). The SER defines the bases for acceptance of these reports.

The topical reports accepted for referencing are WCAP-8587, Revision 6 (NP). "Methodology for Qualifying Westinghouse WRD Supplied NSSS Safety Related Electrical Equipment" and WCAP-9714 (P)/9750 (NP), "Methodology for the Seismic Qualification of Westinghouse WRD Supplied Equipment." In addition, numerous equipment-specific non-proprietary Equipment Qualification Data Packages (EQDPs) and proprietary Equipment Qualification Test Reports (EQTRs) have been reviewed and accepted. Table 1 gives a complete list of all of the reports reviewed and accepted and their submittal dates.

The EQDPs and EQTRs have been reviewed and accepted by the staff according to the methodologies in WCAP-8587, Revision 6 (NP) and WCAP-9714 (P), respectively. The EQDPs and EQTRs have unique equipment-specific alphanumeric numbering systems. In order to differentiate the accepted EQDPs and EQTRs from those under review, Westinghouse is requested to mark the cover sheet of the accepted EQDPs and EQTRs with the statement "Accepted for Referencing in Licensing Actions Based on Conformance with WCAP-8587, Revision 6-A (NP), and WCAP-9714 A (P)/9750 A (NP).

The accepted EQDPs go into Supplement 1 of WCAP-8587 which is the receptacle for non-proprietary data packages, and the accepted EQTRs go into Supplement 2 of WCAP-8687. (The Westinghouse Topical Report identification number WCAP-8687 is designated as a receptacle for the proprietary accepted EQTRs).

Since the Westinghouse qualification program is an expansive program, additional reviews of equipment-specific documents will be necessary in the future. Due to the physical size of the SERs related to these reviews, it is not practical to incorporate the SER in the front of each of the EQTRs and EQDPs. Therefore, Westinghouse is requested to publish Supplement 2 to WCAP-8587, which will be the receptical for NRC acceptance letters, associated Safety Evaluation Reports, and lists of accepted documents. A copy of this acceptance letter should be published and incorporated within the first few pages of each accepted EQDP and EQTR.

When an accepted document appears as a reference in license applications, we do not intend to repeat our review of the matters described therein and found acceptable except to assure that the material presented is applicable to the specific plant involved. Our acceptance applies only to the matters described in each accepted report.

In accordance with procedures established in NUREG-0390, it is requested that Westinghouse publish accepted versions of these reports, proprietary and non-proprietary as outlined below and within three months of receipt of this letter.

The accepted versions of WCAP-8587 (NP), Revision 6 and WCAP-9714 (P)/9750 (NP) should incorporate this letter between the title page and the abstract. The accepted versions of the above mentioned WCAPs shall include a -A (designating accepted) following the report identification symbol.

Should our criteria or regulations change such that our conclusions as to the acceptability are invalidated, Westinghouse and/or the applicants referencing the subject documents will be expected to revise and resubmit their respective documentation, or submit justification for the continued effective applicability of the documents without revision of their respective documentation.

Sincerely,

Cecil O. Thomas

Cecil O. Thomas, Chief
Standardization & Special
Projects Branch
Division of Licensing

Enclosures:
1. List of Accepted Documents
2. Safety Evaluation Report

TABLE 1

Equipment Description	Reports Accepted by NRC	
WCAP-8587, Methodology	Methodology for Qualifying Westinghouse WRD Supplied NSSS Safety Related Electrical Equipment, Revision 6	
WCAP-9714/9750	Methodology for the Seismic Qualification of Westinghouse WRD Supplied Equipment, May 1980	
Medium Pump Motors	EQDP-AE-1	Revision 4
	EQTR-A01A	Revision 2
Large Motors	EQDP-AE-2	Revision 5
	EQTR-A02A	Revision 2
Canned Motors	EQDP-AE-3	Revision 5
	EQTR-A03A	Revision 3
Pressure Transmitters Group A	EQDP-ESE-1A	Revision 4 (Barton)
	EQTR-E01A	Revision 2 (Barton)
	EQDP-ESE-1B	Revision 1 (Veritrak)
	EQTR-E01B	Revision 1 (Veritrak)
Pressure Transmitters Group B	EQDP-ESE-2	Revision 5
	EQTR-E02A	Revision 2 (Barton)
	EQTR-E02B	Revision 2 (Veritrak)
DP Transmitters Group A	EQDP-ESE-3A	Revision 4 (Barton)
	EQTR-E03A	Revision 2 (Barton)
	EQDP-ESE-3B	Revision 1 (Veritrak)
	EQTR-E03B	Revision 1 (Veritrak)
DP Transmitters Group B	EQDP-ESE-4	Revision 6
	EQTR-E04A	Revision 2 (Barton)
	EQTR-E04B	Revision 3 (Veritrak)
RTD's-RCS Bypass Manifold	EQDP-ESE-5	Revision 4
	EQTR-E05A	Revision 2
RTD's Well Mounted	EQDP-ESE-6	Revision 5
	EQTR-E06A	Revision 3
RTD's - Fast Response	EQDP-ESE-7	Revision 5
	EQTR-E07A	Revision 3
Nuclear Instrumentation	EQDP-ESE-10	Revision 5
	EQTR-E10A	Revision 2
Indicators	EQDP-ESE-14	Revision 4
	EQTR-E14A	Revision 2
Recorders	EQDP-ESE-15	Revision 4
	EQTR-E15A	Revision 1

TABLE 1 (Cont'd)

Equipment Description	NRC Revision Accepted	
Solid State Protection System	EQDP-ESE-16	Revision 5
	EQTR-E16A	Revision 2
	EQTR-E16B	Revision 2
	EQTR-E16C	Revision 0
SSPS - 3 Train	EQDP-ESE-17	Revision 3
	EQTR-E17A	Revision 0
	EQTR-E17B	Revision 0
Static Inverter	EQDP-ESE-18	Revision 5
	EQTR-E18A	Revision 1
Instrument Bus Distribution Panels	EQDP-ESE19	Revision 4
	EQTR-E19A	Revision 1
Pressu'e Sensor	EQDP-ESE-21	Revision 4
	EQTR-E21A	Revision 2
Power Range 4-Section Excore Detector	EQDP-ESE-22	Revision 4
	EQTR-E22A	Revision 2
Solenoid Valves (One Report)	EQDP-HE2/HE5	Revision 4
	EQTR-H02A/H05A	Revision 2
Limit Switch (One Report)	EQDP-HE3/HE6	Revision 4
	EQTR-H03A/H06A	Revision 2
Motor Operators	EQDP-HE4	Revision 4
	EQTR-H04A	Revision 2

SECTION 1 - SPECIFICATIONS

1.0 PERFORMANCE SPECIFICATIONS

1.1 Electrical Requirements

1.1.1 Voltage: 125 VDC Nom (105-140 VDC); 460 VAC (420-500 VAC) 30.

1.1.2 Frequency: 60 Hz ± 1 Hz.

1.1.3 Load: 7.5 KVA Max.

1.1.4 Electromagnetic Interference: N/A.

1.1.5 Other: The electrical requirements are described in detail in E-Spec G676573 Revision 5. 3

1.2 Installation Requirements: W Dwg 7241D97 Revision 4,

1.3 Auxiliary Devices: None.

1.4 Preventative Maintenance Schedule: As a result of the completion of the Westinghouse Aging Evaluation Program (Phase 1, Short Term Aging described in WCAP-8587 and discussed in WCAP-8687 Supplement 2, Appendix A1 (Component Aging) Reference 11 and Appendix A2 (Materials Aging) Reference 12 Proprietary, no preventive maintenance is required to support the equipment qualified life. 3
This does not preclude development of a preventive maintenance program designed to enhance equipment performance and identify unanticipated equipment degradation as long as this program does not compromise the qualification status of the equipment. 5
Surveillance activities may also be considered to support the basis for/and a possible extension of the qualified life.

1.5 Design Life: 40 year.

1.6 Operating Cycles (Expected number of cycles during design life, including test): Continuous duty.

5197A

1.7 Performance Requirements for [b]: All Safety Related Functions

	Parameter	Normal Conditions	Abnormal Conditions	Containment Test Conditions	DBE Conditions[a] FLB/SLB	DBE Conditions[a] LOCA	DBE Conditions[a] Seismic	Post DBE Conditions[a] FLB/SLB	Post DBE Conditions[a] LOCA	Post DBE Conditions[a] Seismic
1.7.1	Time requirement	Continuous	12 hours	N/A	Event duration	Event duration	Event duration	Continuous	Continuous	Continuous
1.7.2	Performance requirement	Note c	As normal		As normal	As normal	As normal	As normal	As normal	As normal

1.8 Environmental Conditions for Same Function[b]

1.8.1	Temperature (^{o}F)	60 - 104	Note d		Ambient Conditions	Ambient Conditions	Ambient	Ambient Conditions	Ambient Conditions	Ambient Conditions
1.8.2	pressure (psig)	0	0				0			
1.8.3	Humidity (% RH)	20 - 70	Note d				Ambient			
1.8.4	Radiation (R)	< 400	None				None			
1.8.5	Chemicals	None	None				None			
1.8.6	Vibration	None	None				None			
1.8.7	Acceleration (g)	None	None				See Section 2.10.3.2			

Notes: a: DBE is the Design Basis Event.
b: Margin is not included in the parameters of this section.
c: Output 118 VAC ±2%, 60 Hz ± 1.0 Hz, 5% Harmonic Distortion to 2/3 full rated load. Full load power factor 0.8.
d: Figure 1, Envelope 3. However, for plants having Class 1E HVAC for the area in which the inverters are located, the abnormal extremes are the same as the normal specified above.

of the Static Inverter to meet the safety-related performance requirements specified in EQDP Section 1.7 when exposed to the variations in temperature, humidity, voltage and frequency specified by EQDP Figure 2. The testing successfully demonstrated the specified safety-related requirements. Additional margin was, furthermore, included in this test by submitting the equipment to a double cycle of electrical and environmental extremes as described by EQDP Figure 2. This test is considered to satisfactorily demonstrate the Static Inverter capability to meet its safety-related functional requirements when exposed to the specified normal and abnormal environments (EQDP Section 1.7) and the permitted range of frequency and voltage variations (EQDP Section 1.1) in accordance with IEEE 323-1974 Section 6.3.2(2) and (3). 5 5

2.10.3.2 Seismic Tests

The single design basis event capable of producing an adverse environment at the equipment location is a seismic event. The previously completed seismic testing reported in Reference 2,3,4,5,6,7 and 8 was completed on new equipment at differing seismic levels employing single axis sine-beat testing in accordance with IEEE 344-1971. This original testing, together with the demonstration requested by the NRC employing multi-axis multi frequency inputs as reported in Reference 9, demonstrate the capability of the Static Inverter to perform prespecified safety-related functions during and after seismic events up to and including those required for plants in areas of high seismic activity (Ref. 5,6,7,8) in accordance with the procedures recommended by Reg. Guide 1.100 (IEEE 344-1975). The seismic testing which has been performed and demonstrates the transition from 4

4 IEEE-344-71 testing to IEEE-344-75 requirements is reported in Reference 13. The generic seismic test level contains significant margin with respect to any single plant application referencing this program.(1)

2.10.3.3 Aging Evaluation

3 Subprogram C of the Westinghouse Aging Evaluation Program (Appendix B, WCAP 8587) has incorporated a representative sample of components from the Static Inverter. This program is completed and reported in WCAP-8687, Supplement 2, Appendix A1 (Proprietary). The objective of Subprogram C is to demonstrate that during the qualified life there are no in-service aging mechanisms capable of reducing the capability of the Static Inverter to perform during or after a seismic event. As a consequence, the seismic testing on the Static Inverter described above, is not prejudiced by any in-service aging mechanism.

2.10.4 Conclusion

3 The currently demonstrated qualified life of the Static Inverter is 5 years. Westinghouse is planning an extension of Subprogram C of the Westinghouse Aging Evaluation Program to increase the demonstrated qualified life. The results of the aging program, together with the seismic and environmental testing described herein, demonstrate the qualification of the Static Inverter employing the practises recommended by Reg. Guide 1.89 and 1.100.

2.11 Part 2 Notes

(1) The generic tests completed by Westinghouse employ parameters designed to envelope a number of plant applications. Margin is a plant specific parameter and will be established by the applicant.

2.12 References

1. Yalich, M., "Equipment Qualification Test Report Instrument Bus Power Supply (Static Inverter) (Normal and Abnormal Temperature and Humidity Testing)" WCAP-8687 Supplement 2 E-18A (Proprietary).

2. Vogeding, E. L., "Seismic Testing of Eiectrical and Control Equipment" WCAP-7397-L (Proprietary), January 1970, WCAP-7817 (Non-Proprietary), December 1971. 5

3. Potochnik, L. M., "Seismic Testing of Electrical and Control Equipment (Low Seismic Plants)", WCAP-7817 Supplement 2 (Non-Proprietary) December 1971.

4. Vogeding, E. L., "Seismic Testing of Electrical and Control Equipment for Low Seismic Plants", WCAP-7817 Supplement 7 (Non-Proprietary), September 1976.

5. Potochnik, L. M., "Seismic Testing of Electrical and Control Equipment (High Seismic Plants)" WCAP-7536-L (Proprietary) November 1970, WCAP-7821 (Non-Proprietary) December 1971.

6. Potochnik, L. M., "Seismic Testing of Elecltrical and Control Equipment (High Seismic Plants)" WCAP-7821 Supplement 2 (Non-Proprietary) December 1971.

7. Figenbaum, E. K., "Seismic Testing of Electrical and Control Equipment Static Inverter and Instrument Bus Distribution Panel" WCAP7821 Supplement 2 Addendum 1 (Non-Proprietary), October 1975.

8. Vogeding, E. L., "Seismic Testing of Elecltrical and Control Equipment for High Seismic Plants," WCAP-7821 Supplement 5 (Non-Proprietary), September 1976.

9. Jarecki, S. D., E. L. Vogeding, "Multi-Frequency and Direction Seismic Testing of Relays" WCAP-8673 (Proprietary), WCAP-8674 (Non-Proprietary) December 1975.

10. Damerow, F. W., "Effects of Gamma Radiation Doses Below 104 Rads on Mechanical Properties of Materials." Appendix C WCAP-8587 (Non-Proprietary).

11. Jabs, D., Parello, J., Huang, J., Yalich, M., "Equipment Qualification Test Report Short Term Component Aging Test Program," WCAP-8687, Supplement 2, Appendix A1 (Proprietary).

12. "Equipment Qualification Test Report Materials Aging Analyses", WCAP-8687, Supplement 2, Appendix A2 (Proprietary).

13. Chang, S. M., "Seismic Evaluation of the Single Frequency Sine-Beat Inputs Employed During 1971 Qualification Testing," ST-STA-218 (Proprietary) In Progress.