TESTIMONY OF FAUST ROSA

Diablo Canyon Testimony
of John Knox and Faust Rosa
Seismic Qualification of
Class 1E Equipment

Introduction

A detailed description of our evaluation of the seismic qualification of Class 1E equipment for Diablo Canyon is contained in Section 3.10 of the Safety Evaluation Report and its Supplements 7 and 8. This description includes identification of the Class 1E equipment and the applicable seismic criteria, and a discussion of how these criteria were applied in evaluating the seismic qualification that was performed. This testimony will augment this description with emphasis on the electrical aspects of the seismic evaluation, particularly the areas identified in the Intervenor's Response to Applicant's Interrogatories Dated September 27, 1978. A summary status of the seismic evaluation of Class 1E equipment as of December 1, 1978 is also included.

General

As stated in Section 3.10.2 of SER Supplement 7, the majority of the safety-related electrical instrumentation and control equipment was qualified by testing. The balance was qualified by analysis, or a combination of test and analysis. This equipment was previously qualified in accordance with IEEE Standard 344-1971, "IEEE Guide for Seismic Qualification of Class I Electrical Equipment for Nuclear Power Generating Stations," to the level of the double design earthquake approved for the construction permit or higher. Where the original

qualification level does not envelope the required seismic inputs to equipment for the Hosgri event, we have required the applicant to requalify the equipment for the Hosgri required response spectra. This has been done,principally by retesting using the required response spectra.

In the requalification process the applicant employed seismic qualification methods that conform to our current criteria (Regulatory Guide 1.100, Revision 1, "Seismic Qualification of Electrical Equipment for Nuclear Power Plants," August 1977, and IEEE Standard 344-1975, "IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations").

This updating to current criteria applies to the seismic qualification methods including shake testing methods and the type and severity of shaking employed. It did not, however, include the sequential aging requirements and other general environmental requalification recommendations that are reflected in our current positions for new plants and are referenced in Regulatory Guide 1.100. That is, the sequential aging requirement prior to seismic testing is not included in the qualification criteria for plants of the Diablo Canyon vintage. Our current criteria for environmental qualification for new plants are described in Regulatory Guide 1.89, "Qualification of Class 1E Equipment for Nuclear Power Plants," November 1974, and IEEE Standard 323-1974, "IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations," February 1974.

Seismic Evaluation Summary

For Diablo Canyon, the seismic qualification of Class IE equipment must (1) demonstrate that the equipment can withstand the effects of five Operating Basis Earthquakes, and following this, (2) demonstrate the equipment's ability to perform its required function during and after the time it is subjected to the forces resulting from one Safe Shutdown Earthquake.

Our evaluation includes review of test data and other supporting analyses and documentation to ascertain the adequacy of the required demonstration of seismic capability. More specifically, since qualification of most equipment is based on seismic (shake) testing, our review has or will establish that the equipment performance monitoring performed during testing provides a valid demonstration of functionability during and following a seismic (Hosgri) event.

The following tabulation provides a summary of the seismic qualification including: (1) a list of the Class 1E equipment, (2) the location of the corresponding seismic documentation, and (3) the basis for acceptability and present status of our evaluation. A detailed description of our evaluation for specific equipments is contained in Supplements 7 and 8 of the Safety Evaluation Report.

Basis and Status Category of Seismic Qualification of Class 1E Equipment

A. Original qualification per IEEE Std 344-1971 enveloped the Hosgri event and is acceptable.

B. Requalification was required to envelope Hosgri event. This was performed per Regulatory Guide 1.100, Rev. 1 and IEEE Std 344-1975 (except aging), and was found acceptable.

C. Requalification to envelope Hosgri was required and performed. This was found acceptable subject to submission of additional confirmatory justification or test results.

D. Requalification to envelope Hosgri was required and performed. Additional testing required to confirm electrical functionability will be performed. Found acceptable subject to successful confirmatory testing.

E. Further seismic evaluation is required; if evaluation of the qualification performed is not acceptable, then additional testing, additional justification, design modifications, or replacement of equipment will be required.

CLASS 1E EQUIPMENT	FSAR AMENDMENT 50 SECTION NO.	SEISMIC QUALIFICATION BASIS AND STATUS
Nuclear Steam Supply System Equipment		
1. Auxiliary Safeguards Cabinet	10.3.2	A
2. Static Inverter	10.3.10	A
3. Nuclear Instrumentation System	10.3.16	A
4. Pressure and Differential Pressure Transmitters	10.3.17	E
5. Process Control and Protection Equipment	10.3.19	A
6. Reactor Trip Switchgear	10.3.20	A
7. Solid State Protection System	10.3.22	A
8. Resistance Temperature Detectors	10.3.27	E
9. Safeguards Test Cabinet	10.3.28	A
10. Fan Cooler Motor	3.10.2.16 (FSAR)	A
Balance of Plant Equipment		
1. Battery Charger	10.3.3	D
2. Station Battery	10.3.4	C
3. DC 125/250 VDC Motor Control Center	10.3.5.1	D
4. 125 VDC Distribution Panel	10.3.5.2	D
5. Diesel Generator Excitation Cubicle	10.3.6	D

CLASS 1E EQUIPMENT	FSAR AMENDMENT 50 SECTION NO.	SEISMIC QUALIFICATION BASIS AND STATUS
Balance of Plant Equipment		
6. Diesel Generator Control Cabinet and Subpanel	10.3.6	D
7. Fire Pump Controller	10.3.7	D
8. Emergency Light Battery Pack	Later	B
9. Hot shutdown panel	10.3.9	
(a) Indicating Meters		C
(b) Switches		B
(c) Fisher Controller		B
10. Instrumentation Power AC Panelboards	10.3.11	E
11. Instrument Panels PIA, PIB and PIC	10.3.12	A
12. Local Instrument Panels	10.3.13	A
13. Local starters	10.3.14	E
14. Main Control Board		
(a) Indicating Meters		C
(b) Switches		B
15. Pressure and Differential Pressure transmitters	10.3.18	A
16. Safeguards Relay Board	10.3.21	C
17. Ventilating Control Logic Cabinet	10.3.23	E
18. Ventilating Control Relay Cabinet	10.3.24	E
19. Vital Load Centers	10.3.25	E
20. Vital Load Center Auxiliary Relay Panel	10.3.25A	E
21. Fan Cooler Motor Controller	10.3.25B	E
22. 4160-volt Switchgear	10.3.26	D
23. Limotorque Valve Operator with Gear and Stem Mounted Limit Switches	10.3.30	C
24. Diesel Generators	10.3.6	A
25. Cable Trays	10.3.29	A
26. Penetrations	10.3.7	A

The seismic qualification of the equipment in status categories A and B has been found acceptable on the basis indicated. The equipment in categories C and D are also considered to be acceptably qualified; however, additional justification or testing is required to resolve any questionable monitoring of functionalability during prior testing. We will review the additional justification and confirmatory testing to verify the adequacy of qualification in this regard. Our evaluation of the qualification of the equipment in status Category E is incomplete; we will require that this equipment be acceptably qualified by the methods indicated prior to completion of our review.

Non Inclusion of Aging in Seismic Qualification

As stated above the acceptance criteria for the qualification of Class 1E equipment for plants of the Diablo Canyon vintage did not include the aging consideration specified in IEEE-Standard 323-1974 and Regulatory Guide 1.89 (which endorses IEEE-323-1974).

In 1974, during the deliberations of the NRC's Regulatory Requirements Review Committee on the implementation of Regulatory Guide 1.89, consideration was given to the incremental improvements to safety it afforded in comparison of the then current staff review practice. The Committee recommended that the guide be applied only to future CP applications; i.e., it should not be backfitted. The decision was based on the Staff's judgment that the incremental improvements were not significant to safety and that full implementation of IEEE-323-1974 required the further development of other ancillary standards to provide guidance on specific safety-related equipment and components.

Subsequent public comments and review by the ACRS did not alter the recommendation concerning implementation of Regulatory Guide 1.89.

We recognize that additional guidance is needed in the area of accelerated aging techniques used to establish a qualified life for electrical equipment and assemblies Our Category A technical activity on equipment qualification (Task Action Plan A-24) and an NRC extensive research program being carried out at Sandia Laboratires are intended to provide additional guidance for the development of test methods and licensing review procedures on aging. These programs will also allow us to make informal judgements regarding the effects of aging. In addition, as part of the Staff's Systematic Evaluation Program (SEPO, the Staff is assessing the surveillance and maintenance records of the eleven SEP plants for equipment inside and outside of containment. Since this equipment has been effectively "aged", the assessment of these records should provide additional information on the effects of aging.

Following completion of these ongoing activities -- the Task Action Plan A-24, the NRC research program, and the SEP effort -- we will reconsider our position on the need for backfitting the aging requirements. At that time, should we deem it necessary, we will take appropriate steps to ensure that aging effects are considered in assessing the adequacy of Class 1E equipment used in the Diablo Canyon plant. It is our judgment that the natural aging that the Class 1E equipment will undergo in the period prior to this reassessment will have little effect on its seismic capability.

Installation of Seismically Tested Equipment

Some of the Class 1E equipment which has been shake tested to seismically qualify it for the Hosgri event will be installed in the plant. In all such cases only one of a redundant set of equipment will have been tested. The tested equipment will have demonstrated electrical functionability during and following the testing; and it will be carefully inspected after testing to assure that its structural and electrical integrity has not been impaired, and that it remains fully capable of withstanding a Hosgri event. Therefore, we conclude that the installation of tested equipment is acceptable.

FAUST ROSA

PROFESSIONAL QUALIFICATIONS

POWER SYSTEMS BRANCH

DIVISION OF SYSTEMS SAFETY

I have been employed by the Nuclear Regulatory Commission since January 1971. From January 1977 to the present time, I have been Chief, Power Systems Branch, Division of Systems Safety. Prior to my present assignment I served as a Section Chief in the Electrical, Instrumentation and Control Systems Branch, Division of Systems Safety, and in the Plant Systems Branch, Division of Operating Reactors. I have participated in the review of instrumentation, control and electrical systems of numerous nuclear power stations and in the formulation of related standards and Regulatory Guides.

The Power Systems Branch performs an in-depth technical review of the design, fabrication, qualification and operation of nuclear power plant electrical power systems important to safety and the related instrumentation and controls. The area of branch review responsibility also includes that portion of the steam system downstream of the main steam isolation valves. This review includes a comprehensive assessment of these systems for all power reactors for adherence to appropriate codes and standards and encompasses complete evaluation of applicant's safety analysis reports, generic reports, and other related system design information. Further, the Branch develops the bases for Regulatory acceptance criteria for electrical power systems designs; evaluates experience obtained during the construction and operation

of nuclear power plants and relates this information to future evaluations and acceptance criteria; and participates in the development of Regulatory Guides and regulations pertaining to electrical power systems and other systems in the branch area of responsibility.

I hold a Bachelor of Electrical Engineering degree from the University of Pittsburgh, Pittsburgh, Pennsylvania. In addition, I have taken courses in Mathematics, Theoretical Physics, Nuclear Physics and Engineering, and Radiation Shielding at the University of Pittsburgh and at the Reactor School of the Bettis Atomic Power Laboratory, Westinghouse Electric Corporation.

My nuclear engineering experience background derives from my employment at the Bettis Atomic Power Laboratory of Westinghouse Electric Corporation, West Mifflin, Pennsylvania, from May 1955 to September 1962; and from my employment at the Bechtel Corporation, Vernon, California, from September 1969 to January 1971. At Bettis Laboratory I was a lead engineer in the nuclear submarine power plant group with technical responsibility for nuclear instrumentation, rod control, and reactor protection systems. Work involved component and system design, installation, testing, modification and documentation. I also served as Bettis representative during full-scale tests conducted by the Navy. At Bechtel I conducted engineering studies and prepared reports and specifications relating to the design and construction of the Rancho Seco Nuclear Power Station. This work was primarily in the areas of safety-related electrical power, instrumentation and control systems.

My non-nuclear engineering background derives primarily from my employment in the Construction Engineering Department of the National Tube Company, United States Steel Corporation, Lorain, Ohio, from June 1947 to April 1955; and from my employment at the Rocketdyne Division of North American Rockwell Corporation, Canoga Park, California, from October 1962 to March 1968. At National Tube I served as a Senior Engineer engaged in design and development of electrical power and control systems for new pipe mills from conceptual design through detail design, procurement, installation, and initial operation. This work extended through completion of two major pipe mill construction projects. At Rocketdyne I was a Research Specialist engaged in design and development of controls and instrumentation for a dual turbo-pump liquid hydrogen feed system for a nuclear rocket engine. My primary responsibility was for control system integration extending from conceptual design through procurement, installation, and completion of the test program.

I am a member of the Institute of Electrical and Electronic Engineers and have participated in the nuclear standards development work of this organization since 1972.