UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	Docket 50-344
PORTLAND GENERAL ELECTRIC COMPANY, et al	)	(Control Building Proceeding)
	)	
(Trojan Nuclear Plant)	)	

TESTIMONY OF S. R. CHRISTENSEN

My name is Sam R. Christensen. My title is Manager, Generation Engineering. A statement of my qualifications is attached. In this testimony, I describe the seismic instrumentation at Trojan and engineering investigations which would be conducted following an earthquake.

Trojan Plant Seismic Instrumentation

Three independent seismic instrumentation systems are presently in service at Trojan. These systems were included in the original Plant design and are in conformance with Regulatory Guide 1.12 (Rev. 0, 3/10/71) requirements. The operability of these systems has always been required by the Technical Specifications of the Trojan Operating License. One of the systems provides visual alarms in the control room to alert the operators in the event of either an Operating Basis Earthquake (OBE) or a Safe Shutdown Earthquake (SSE). The three systems automatically collect the data required for evaluation of the effects of an earthquake on Plant structures and systems.

The seismic instrumentation systems are:

System 1 - A triaxial multi-element response spectrum recorder with peak shock annunciator

System 2 - Five triaxial time-history recording accelerographs

System 3 - Seven triaxial peak recording accelerographs.

The function of the triaxial multi-element response spectrum recorder (System 1) is to provide a permanent record of peak response accelerations (north-south, east-west and vertically) resulting from measurable earthquake ground motion and to provide instantaneous control room indication in the event of ground motion in excess of the OBE levels. The response spectrum recorder is a mechanical device which is physically attached to the Containment base slab. The recorder is coupled with the peak shock annunciator, which provides alarm light annunciation in the control room. As a result of the NRC order of May 26, 1978, the control room OBE alarm light annunciation levels have been reset to correspond to response accelerations for an OBE having a peak horizontal ground acceleration of 0.11g.

The triaxial time-history recording accelerographs (System 2) are installed at appropriate locations in the Plant to provide data on the frequency, amplitude, and mode shapes of the seismic response of the Containment and other Seismic Category I [1/] structures. These instruments are actuated by a seismic trigger which is set to initiate system recording at a peak horizontal ground acceleration of 0.01g. Data collected would be used to evaluate the effects of an earthquake on the structures.

The five triaxial acceleration sensors are located in the following Plant areas:

1) Containment base slab

2) Containment wall approximately 160 ft directly above the base slab sensor

3) Fuel Building at Elevation 93 ft

1/ "Seismic Category I" identifies those structures and equipment required to remain functional following an SSE.

4) Control Building cable spreading room

5) Yard area southeast of the Containment (free field).

The triaxial peak acceleration recorders (System 3) are also used to provide additional data for the evaluation of the effects of an earthquake on structures and equipment. Peak recording accelerographs are located as follows:

1) Emergency diesel generator room

2) Component cooling water heat exchanger room

3) Control Building roof structure

4) Fuel Building at Elevation 93 ft

5) Top of the Intake Structure

6) Top of Containment

7) Bottom of Containment.

Each of the seismic instrumentation systems is routinely checked for calibration and functionally tested in accordance with Trojan Technical Specification requirements to assure proper operability.

Post-Earthquake Engineering Investigations

If an earthquake producing measurable ground motion at Trojan were to occur (0.01g), the ground motion and representative structure and equipment response motion data would be automatically recorded by the Trojan seismic instrumentation systems. The testimony of Mr. Withers describes procedures that would be followed to shut down the Plant if an OBE were to occur and initial inspections that would be performed after the Plant is shut down.

In addition to inspections and tests performed by Plant operators following Plant shutdown after an OBE, engineering investigations would be conducted in two basic areas: 1) inspection of Plant structures and inspection and testing of mechanical and electrical systems; and 2) evaluation of seismic instrumentation data obtained for comparison with seismic design bases and analytically predicted performance of structures and equipment. The primary objectives of these investigations would be to identify any observable indications of physical effects due to the earthquake and any differences in performance characteristics from design criteria or outside of Technical Specification limits.

Reporting of the investigation results to regulatory agencies would be done in accordance with regulatory requirements, and if peak horizontal ground acceleration exceeded 0.11g, Plant operations would not resume without the prior approval of the NRC.

NAME: S. R. Christensen

TITLE AND DUTIES: Manager of Generation Engineering Department - Supervises the work of the mechanical, civil, and electrical sections. Responsible for handling all PGE mechanical, civil, and electrical matters pertaining to generating plants; including review and approval of all generation design concepts and layouts, technical specifications for procurement, for either construction or owner-furnished equipment and materials contracts. Reviews all supplies and contractors' proposals with recommendations for award. Reviews design changes and technical content of Safety Analysis Reports, Environmental Reports and other documents pertaining to mechanical, civil, and electrical aspects of generating facilities. Also acts as consultant to the resident engineers of the appropriate site locations in the mechanical, civil, and electrical fields.

EDUCATION: OSU - BS in Business Administration (1952); OSU - BS in CE (1955); Comprehensive Nuclear Course - Gulf General Atomics Corp. (1967); Nuclear Fundamentals Course - OSU (1968); Introduction to Nuclear Power Course - NUS (1969); Design Review Course - Westinghouse (1969).

PROFESSIONAL AFFILIATIONS: PE - Oregon; ASCE; ANS.

EXPERIENCE: Portland General Electric Company - Civil Engineer, design and review of civil and mechanical engineering projects (1956-1961); General Design Supervisor, supervised the preparation of the design, drawings, review and specifications for all civil and mechanical projects accomplished within PGE. Responsible for the coordination of studies and review for the PSAR of Trojan pertaining to civil and mechanical engineering (1961-1971); Chief, Civil-Mechanical Branch (1971-1974); Manager of Generation Engineering (1974-).