1.0 INTRODUCTION AND GENERAL DESCRIPTION OF PLANT

1.1 INTRODUCTION

The Westinghouse Electric Corporation (hereinafter referred to as Westinghouse) has developed this Reference Safety Analysis Report (RESAR-SP/90) for the Westinghouse Advanced Pressurized Water Reactor (WAPWR) as part of its continuing efforts toward design and licensing standardization of nuclear power plants. RESAR-SP/90 is a standard safety analysis report submitted initially for Preliminary Design Approval (PDA) in accordance with Appendix O, "Standardization of Design; Staff Review of Standard Designs," to Part 50 of Title 10 of the Code of Federal Regulations (hereinafter referred to as 10CFR). The ultimate objective is to obtain a Final Design Approval (FDA) of RESAR-SP/90 followed by a rulemaking proceeding and design certification.

1.2 GENERAL PLANT DESCRIPTION

1.2.2 Principal Design Criteria

RESAR-SP/90 is designed to comply with 10CFR Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants." The specific applications of General Design Criteria to RESAR-SP/90 are discussed in Section 3.1 of RESAR-SP/90 PDA Module 7, "Structural/Equipment Design."

1.2.3 Plant Description

1.2.3.6 Plant Instrumentation and Control Systems

The plant instrumentation and control systems are described in detail in Chapter 7. The following is a summary of these systems.

1.2.3.6.1 Integrated Control System

The purpose of the WAPWR integrated control system is to regulate and maintain the plant operating conditions within prescribed limits over the entire operating range. Those parameters which are monitored and controlled include RCS temperature, neutron power distribution, RCS pressure, pressurizer water level, steam generator water level, and nuclear-thermal power mismatch.

The integrated control system is comprised of the following systems which perform control functions in order to maintain safe conditions during startup, operation, and shutdown:

- <u>Advanced Power Control System (APCS)</u>

  The advanced power control system provides an integrated control of these systems such that the core axial power distribution and other parameters are maintained automatically. Rather than controlling just a single mechanism such as boron concentration or control rod position, this control system will provide an integrated response to reactivity control using the following subsystems:

Rod Control System

The rod control system is designed to maintain nuclear power and reactor coolant temperature, without challenging the protection systems, during normal operating transients. To maintain temperature within a desired control band, neutron absorbing control rods are inserted or withdrawn from the core.

Boron Control System

The boron control system maintains the reactor coolant boron concentration either automatically as directed by the APCS or by the operator in such a manner that the axial nuclear power distribution and other operating conditions are maintained.

Gray Rod Control System

The gray rod assemblies are used in conjunction with control rods and other mechan' ur controlling reactivity. They are either fully inserted or withdrawn under automatic control.

- <u>Pressurizer Pressure Control</u>

  The pressurizer pressure control system acts to maintain or restore the pressurizer pressure to the nominal operating value during normal operation or following transients.

- <u>Pressurizer Water Level Control</u>

  The pressurizer water level control system regulates and maintains or restores pressurizer water level to its required value.

o <u>Steam Generator Water Level Control System</u>

The steam generator water level control system maintains the steam generator water level within operating limits during steady state operation, and during normal transients. The water level control system also restores normal water level following a plant trip.

o <u>Steam Dump Control</u>

The steam dump control system controls an intentional release of steam bypassing the turbine to prevent a reactor trip following a sudden loss of electrical load. The system ensures that stored energy and residual heat are removed following a reactor trip so that the plant can be brought to equilibrium no-load conditions without actuation of the steam generator safety valves. The steam dump control system is also used for maintaining the plant at no-load or low load conditions and to facilitate controlled cooldown of the plant.

1.2.3.6.2 Integrated Protection System (IPS)

During normal operation, administrative procedures and the plant control systems serve to maintain the reactor in a safe state, and in the case of a fault serve to prevent damage to the three barriers (fuel clad, reactor coolant system and reactor containment building) to avoid a release of radioactive material. Certain accident conditions may occur which can cause one or more of the three barriers to be threatened. The integrated protection system (IPS) monitors plant parameters and automatically initiates various protective functions to maintain the integrity of any of the three barriers. The IPS performs its functions by monitoring the plant parameters using a variety of sensors, performing calculations, comparisons and logic based on those sensor inputs and actuating a variety of equipment if parameter setpoints are exceeded.

1.6 MATERIAL INCORPORATED BY REFERENCE

The WAPWR Instrumentation and Control/Electric Power module incorporates, by reference, certain topical reports. The topical reports, listed in Table 1.6-1, have been filed previously in support of other Westinghouse applications.

The legend for the review status code letter follows:

A - U.S. Nuclear Regulatory Commission review complete; USNRC acceptance letter issued.

AE - U.S. Nuclear Regulatory Commission accepted as part of the Westinghouse emergency core cooling system (ECCS) evaluation model only; does not constitute acceptance for any purpose other than for ECCS analyses.

B - Submitted to USNRC as background information; not undergoing formal USNRC review.

O - On file with USNRC; older generation report with current validity; not actively under formal USNRC review.

U - Actively under formal USNRC review.

TABLE 1.6-1
MATERIAL INCORPORATED BY REFERENCE

Westinghouse Topical Report No.	Title	Revision Number	SAR Section Reference	Submitted to the NRC	Review Status
WCAP 7907-P-A	LOFTRAN Code Description	Rev 0	15.0	10/11/72	A
WCAP 7908	FACTRAN - A FORTRAN-IV Code for Thermal Transients in a UO_2 Fuel Rod	Rev 0	15.0	9/20/72	U
WCAP 7979-P-A(P) WCAP 8028-A	TWINKLE - A Multidimensional Neutron Kinetics Computer Code	Rev 0	15.0	1/7/75	A
WCAP 8301(P) WCAP 8305	LOCA-IV Program: Loss-of-Coolant Transient Analysis	Rev 0	15.0	7/12/74	AE
WCAP 8302(P) WCAP 8306	SATAN-IV Program: Comprehensive Space-Time Dependent Analysis of Loss-of-Coolant	Rev 0	15.0	7/12/74	AE
WCAP 8370	Westinghouse Water Reactor Divisions Quality Assurance Plan	Rev 9A	17.1	11/14/77	A
WCAP 8567-P(P) WCAP 8568	Improved Thermal Design Procedure	Rev 0	15.0	7/75	A
WCAP 8846-A	Hybrid B_4C Absorber Control Rod Evaluation Report	Rev 0	15.0	10/77	A
WCAP 8897 WCAP 8898	Bypass Logic for the Westinghouse Integrated Protection System	Rev 1	7.1	10/77	0
WCAP-8899 WCAP 8900	Model 414 Control System Signal Selection Device	Rev 0	7.1	5/77	0
WCAP 9153 WCAP 9154	414 Integrated Protection Prototype Verification Program	Rev 0	7.1	8/77	0

1.7 DRAWINGS AND OTHER DETAILED INFORMATION

1.7.1 Electrical, Instrumentation, and Control Drawings

Table 1.7-1 lists electrical, instrumentation, and control drawings that are considered to be necessary to evaluate the safety-related features pertaining to the WAPWR.

TABLE 1.7-1
ELECTRICAL, INSTRUMENTATION AND CONTROL DRAWINGS

Figure No.	Title
7.2-1 (14 sheets)	WAPWR Functional Diagrams
8.3-1 (2 sheets)	WAPWR AC Main Single Line Diagram
8.3-2	WAPWR DC and 120 VAC Oneline Diagram

1.8 CONFORMANCE WITH STANDARD REVIEW PLAN

In accordance with 10CFR50.34(g), Table 1.8-1 of each PDA module identifies and evaluates deviations from the acceptance criteria of those sections of the NRC Standard Review Plan (NUREG-0800) pertinent to the subject module. Table 1.8-1 provides this list for the "Instrumentation and Control/Electric Power" module.

TABLE 1.8-1
STANDARD REVIEW PLAN DEVIATIONS

SRP Acceptance Criteria	Deviation	Section

(During the licensing process, certain deviations with respect to the SRP acceptance criteria applicable to the Instrumentation and Control System and the Electric Power System will be listed here as appropriate).