

<i>HISTORICAL INFORMATION</i>

1.5 REQUIREMENTS FOR FURTHER TECHNICAL INFORMATION

1.5.1 DEVELOPMENT OF BWR TECHNOLOGY

1.5.1.1 Current Development Programs

Vibration testing for reactor internals has been performed on virtually all GE-BWR plants. At the time of issue of NRC Regulatory Guide 1.20, test programs for compliance were instituted. The first BWR 4 plant of this size, Browns Ferry 1, is considered a prototype design and was instrumented and subjected to both cold and hot, two-phase flow testing to demonstrate that flow-induced vibrations similar to those expected during operation will not cause damage. Subsequent plants which have internals similar to those of the prototypes will be tested in compliance to the requirements of Regulatory Guide 1.20 to confirm the adequacy of the design with respect to vibration. In addition, the General Electric Company has entered a long-term program for the purposes of development of a vibration monitoring system for light water reactors. The objective of the program is the development of a system requiring sensors on only the outside surface of the reactor pressure vessel to provide continual monitoring for the impact and vibration of loose parts during reactor operation.

1.5.1.1.1 Core Spray Distribution

Due to slight changes in core dimensions and core spray sparger geometry, the core spray flow distribution header was tested to assure that each fuel assembly in the reactor core would receive adequate cooling water in the event of a LOCA. (Preoperational Test P51.1)

The test demonstrated that each fuel assembly receives adequate cooling water flow for any spray system flow rate between the rated flow and the runout flow condition.

1.5.1.1.2 Core Spray and Core Flooding Heat Transfer Effectiveness

Due to the incorporation of an 8 x 8 fuel rod array with unheated "water rods," tests have been conducted to demonstrate the effectiveness of ECCS in the new geometry.

These tests are regarded as confirmatory only, since the geometry change is very slight and the "water rods" provide an additional heat sink in the inside of the bundle which improves heat transfer effectiveness.

<i>HISTORICAL INFORMATION</i>

HISTORICAL INFORMATION

There are two distinct programs involving the core spray. Testing of the core spray distribution has been accomplished, and the Licensing Topical Report NEDO-10846, "BWR Core Spray Distribution," April, 1973, has been submitted. The other program concerns the testing of core spray and core flooding heat transfer effectiveness. The results of testing with stainless steel cladding were reported in the Licensing Topical Report NEDO-10801, "Modeling the BWR/6 Loss-of-Coolant Accident: Core Spray and Bottom Flooding Heat Transfer Effectiveness," March, 1973. The results of testing using Zircaloy cladding were reported in the Licensing Topical Report, NEDO-20231, "Emergency Core Cooling Tests of an Internally Pressurized, Zircaloy Clad, 8x8 Simulated BWR Fuel Bundle," December, 1973.

1.5.1.1.3 Verification of Pressure Suppression Design

The Mark II Pressure Suppression Test Program was initiated in the fall of 1975 to investigate suppression pool dynamic phenomena. Phase I blowdown tests were completed late in 1975. These tests utilized a single 24-inch diameter (590 mm ID) downcomer which vented into a 7 ft (2.13 meter) inside diameter tank, representative of a single downcomer/pool cell in a typical Mark II suppression pool. The objective of this phase of testing was to quantify pool dynamics phenomena, particularly the effect of wetwell pressurization on pool swell, and the load associated with the low mass flux steam condensation, or chugging. Primary variables were simulated break size, initial vent submergence and wetwell air space configuration, i.e., vented or closed wetwell.

The Phase II tests were generally similar to the Phase I tests, except a 20-inch diameter (489 mm ID) downcomer was used. The Phase I and II tests thus bound the range of vent to pool area ratios of all Mark II containments. Although the test objectives were similar during Phases I and II, some changes were made in the Phase II test matrix after review of the Phase I data. For example, since the Phase I test had shown that wetwell configuration was the variable which had the most pronounced affect on pool dynamics, the decision was made to concentrate the testing effort on the closed wetwell configuration, which is characteristic of the Mark II containment.

In place of the open wetwell tests, additional blowdowns were included in the Phase II test matrix in order to investigate the effect of saturated liquid vs. saturated steam breaks and the effect of downcomer bracing configuration.

As was the case for the Phase I tests, the primary Phase II variables were simulated break size and initial vent submergence.

The Phase III tests investigated the pool temperature sensitivity of pool swell and of the load associated with the chugging phenomenon. Only a single break size and vent

HISTORICAL INFORMATION

HISTORICAL INFORMATION

submergence were tested, with pool temperature alone being a variable. A significant number of blowdowns were performed to yield a statistically significant data set.

The results of the analysis and related testing is described in the Licensing Topical Report, NEDO-13468; NEDE-13468P, "Mark II Pressure Suppression Test Program Phase II and III Tests," March, 1977.

1.5.1.1.4 Critical Heat Flux Testing

A program for Critical Heat Flux testing was established and was to be similar to that described in the report APED-5286, "Design Basis for Critical Heat Flux Condition in Boiling Water Reactors," September 1966. Since that time, however, a new analysis has been performed and the GETAB program initiated. The results of that analysis and related testing is described in the approved Licensing Topical Report, NEDO-10958-A, "General Electric BWR Thermal Analysis Basis (GETAB): Data, Correlation and Design Application," January 1977.

1.5.1.1.5 Fuel Assembly Structural Testing

Although tests are being conducted to determine the effects of vibration on fuel assembly spacers and to determine the forces to which the assemblies are subjected during shipment, there is no special program at present concentrating on structural testing, and no topical report is anticipated.

1.5.2 PROGRAMS CONDUCTED DURING OPERATIONS PHASE

The acceptability of changes to plant design or modes of operation is assured by PP&L design and procedural controls established in the PP&L Operational Quality Assurance Program. Refer to FSAR Section 17.2.

HISTORICAL INFORMATION
