50-304

Commonwealth Edison Company

ONE FIRST NATIONAL PLAZA ★ CHICAGO, ILLINOIS

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March 10, 1971

Dr. Peter A. Morris, Director
Division of Reactor Licensing
U.S. Atomic Energy Commission
Washington, D.C. 20545

Subject: Additional information concerning containment spray testing at Zion Units 1 and 2

Dear Dr. Morris:

The Advisory Committee on Reactor Safeguards, in its July 24, 1968 letter on Zion Station Units 1 and 2, made the following statement:

> "Committee recommends that the applicant give further consideration to testing the containment spray systems with full flow to the spray nozzles at least once at an appropriate time during construction."

Commonwealth Edison has given consideration to this subject and has performed containment spray tests on Zion Units 1 and 2.

The purpose of this letter is to provide you with a summary report (attached as Exhibit 1) on the results of these tests. If you have any further questions or would care to discuss this further with us, please let us know.

Very truly yours,

Wayne L. Stiede

Wayne L. Stiede
Nuclear Licensing Administrator

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EXHIBIT 1

ZION UNITS 1 & 2
CONTAINMENT SPRAY SYSTEMS FULL FLOW RING HEADER TESTS

SCOPE:

These tests constituted full flow construction testing of the spray system vertical risers, ring headers, and spray nozzles inside the Units 1 and 2 containments.

PURPOSE:

The purpose of the tests can be stated as follows:

1 - Provide flow and pressure drop data for future use, in combination with spray pump test data, in verifying overall system design.

2 - Provide verification that the required flow can be passed through the ring headers and nozzles.

3 - Verify the integrity of the ring headers and supports under spray flow forces.

4 - Verify spray coverage within the containments.

TEST METHOD:

The tests were conducted using two temporary pumps delivering water to the vertical risers feeding the spray ring headers. The temporary pumping arrangement is shown on Figure 1 (attached). The test pumps used were capable of matching the design flow rate of one spray pump. The test system was instrumented as shown on Figure 1 for flow and pressure drop. The valving permitted test operations duplicating all combinations of 2 out of 3 spray pumps operating.

Spray ring header and support integrity was verified visually after each test run.

Spray coverage was established by measuring the water depth in 17 pans, each divided into 6 compartments, after each test run.

The test consisted of three runs of five minutes each at full flow. Each run simulated one of the 3 possible 2 out of 3 spray pump combinations.

DISCUSSION:

The tests were recorded on movie film for historical purposes. The films clearly verify an observation made by test personnel during the test runs to the effect that considerable turbulence existed in the

containments during the runs. Bearing in mind that the containments were sealed during the tests it follows that the turbulence was induced by the spray itself.

The expected depth of water in each pan for the Unit 1 test was analytically estimated based on a nominal 5 minute full flow run and design valves for the spray patterns from each nozzle under steady (i.e., zero turbulence) conditions. This approach provides some basis for comparison with the measured pan depths.

RESULTS:

The flow and pressure drop data collected will be combined at a later date with spray pump and system data to verify system design.

The ring headers and vertical risers remained intact and evidenced no discernable movement when subjected to spray flow forces.

The Unit 1 calculated pan mean depth was slightly higher than the measured mean pan depth. The difference was well within the error estimate for the calculation (± 10% without consideration of turbulence or variation in time at full flow). The measured mean depth for all pan compartments for all runs was 2.39 inches. The calculated mean was 2.60 inches. It is expected that residual flow after pump shutoff and variations in time at full flow account for a significant portion of the difference.

Uniformity of spray coverage determined from the measured depths has been shown to be significantly better (by a factor of 1.7) than the uniformity determined from the calculated depths. The basis for this comparison is the probable deviation from the mean.

CONCLUSIONS:

All test objectives were met to Commonwealth Edison's complete satisfaction. The flow and pressure drop data obtained will permit correlation with data to be gathered at a later date for system design verification. The required flows were passed through the system. The ring headers and vertical risers withstood the imposed spray flow forces. Spray coverage was complete and more uniform than calculated under test conditions more closely approximating a post accident environment than the situations employed for distribution calculations.