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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

DEC 07 1976

Docket Nos: 50-322, 50-352 & 50-353, 50-358, 50-367, 50-373 & 50-374, 50-387 & 50-388, 50-397, 50-410

FACILITIES: Shoreham Nuclear Power Station Unit No. 1, Limerick Generating Station Units No. 1 and No. 2, William H. Zimmer Nuclear Power Station, Unit 1, Bailly Generating Station Nuclear No. 1, LaSalle County Station Units No. 1 and No. 2, Susquehanna Steam Electric Station Units No. 1 and No. 2, WPPSS Nuclear Project No. 2, Nine Mile Point Nuclear Station Unit No. 2.

APPLICANTS: Long Island Lighting Co., Philadelphia Electric, Cincinnati Gas and Electric Co., Northern Indiana Public Service Co., Commonwealth Edison, Pennsylvania Power and Light Co., Washington Public Power Supply System and Niagara Mohawk Power Corporation

SUMMARY OF MEETING HELD ON OCTOBER 27-28, 1976 TO DISCUSS THE MARK II CONTAINMENT POOL DYNAMIC LOAD PROGRAM

A meeting was held on October 27 and 28, 1976 between representatives of the Mark II owners, the General Electric Co., (GE) and the NRC Staff and our consultants, Brookhaven National Lab. The purpose of the meeting was to discuss, with the Mark II owners and GE, the areas of concern developed during our review of topical reports submitted by General Electric for the Mark II owner group on the Pool Dynamic Loads Analytical Model and Test Program. Draft questions developed from our review of the reports were used as the bases for the discussion. In addition the EPRI LOCA blowdown tests were described and results obtained to date were discussed. Movies of the EPRI tests were viewed. The lists of attendees and copies of some of the slides given to the attendees at the meetings are enclosed. The remainder of the slides are available in my office. The following is a summary of the major topics discussed during the meeting.

A. Pool Swell Model

The staff identified a number of deficiencies in the pool swell model. GE provided a summary of the model assumptions (Table 1) along with a comparison of 4T test results with pool swell model predictions using both realistic and conservative DFFR assumptions (Fig. 1 & 2). The model predictions bracketed the test data. On this basis

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General Electric concluded that the DFFR model using conservative assumptions is adequately conservative. The staff was unable to conclude on the adequacy of the DFFR model due to the limited nature of the model/test comparison. General Electric stated that the complete evaluation of the DFFR pool swell velocity/breakthrough model originally due in November will now be submitted in January 1977.

General Electric presented their reason for not including air test in the Mark II supporting program (See Table 2). The staff stated a requirement for air tests to confirm the DFFR pool swell velocity and breakthrough model in addition to the 4T steam tests. Air tests form the basis for pool swell velocity and breakthrough prediction in the Mark I and III load evaluation program. Tests conducted as a part of the Mark III containment study showed that there were significant differences in pool swell related phenomena between steam tests and air tests. The staff therefore requested that Mark II pool swell air tests be conducted.

B. Impact Loads for Mark II

To define Mark II impact loads, GE is utilizing the time history information from the Large Scale Mark III Air (PSTF) tests and peak pressure from the 1/3 scale impact. GE indicated that no additional work is contemplated. The staff specified potential deficiencies in the DFFR method used to apply PSTF impact data to structures in Mark II containments. In addition, the staff requested that the applicability of the PSTF impact test data in the Mark II containments be discussed in the DFFR. GE indicated that our concerns would be addressed in their response to our questions.

C. Steam Loads

The staff requested that multi-vent steam tests be conducted to verify steam loads (chugging loads) on the containment boundary and the downcomers. The owners group indicated that they were developing a steam loads program including milti-vent tests which will be defined by the end of the year. The test program to be conducted as part of the program is expected to be defined by the first of the year. Conduct of the testing will take 4 to 6 months. No definitive test program or schedule was presented.

D. SRI/EPRI Tests

Air blowdown tests were conducted by Stanford Research Institute (SRI) and Electric Power Research Institute (EPRI) on a 1/13.3 scale model of a 90° sector of the Susquehanna Mark II containment, wetwell and downcomers. The objectives of the test are outlined on Table 3. The model was fabricated from Lucite to permit visual recording.

A preliminary evaluation of the data from these tests with the 4T tests data showed approximate agreement. However, the test comparison did not involve an in depth comparison of the test results under the same initial and boundary conditions. In addition, neither the 4T or the EPRI tests included an error analysis. Documentation of the EPRI tests, including a second phase of tests where the drywell volume scaling and vent flow resistance were corrected, will not be supplied until February 1977. Plans were discussed by EPRI to conduct 1/13 scale single downcomer tests to aid in the comparison of the 1/13 scale 3D Mark II tests and the single vent 4T tests. Still not clarified to the staff is what roll the SRI/EPRI tests will play in the Mark II evaluation.

The staff has required air tests, 3D tests, tests to decouple submergence/backpressure effects, and tests to investigate assymetric vent flow. We have also stated that data from these tests be used to confirm the DFFR pool swell model. The Mark II owners have not indicated how these requirements will be met.

In summary we noted the following deficiencies in the Mark II pool dynamic load program.

1. The support program for Mark II pool dynamic loads is unacceptable since it does not include a number of test and analysis programs considered necessary by the staff. In addition, the Mark II owners group have not specified how our requirements will be met.

2. The schedule for a number of items identified in the load support program has slipped.

3. A program to define steam loads for Mark II containments is under development by the Mark II owners group. The plans for this program will not be presented to the staff until January 1977.

4. The role of the EPRI 3D 1/13 scale Mark II tests in the Mark II pool dynamic load evaluation program has not been identified.

We stated that we would not be able to find the DFFR pool dynamic loads acceptable without model confirmation with an adequate test data base. The lack of program definition in several areas and the delays in supplying us with documentation originally identified in the program support plan will impact on our generic review of Mark II pool dynamic loads and our plant unique review of specific Mark II plants.

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ENCLOSURE NO. 1

TABLE 1

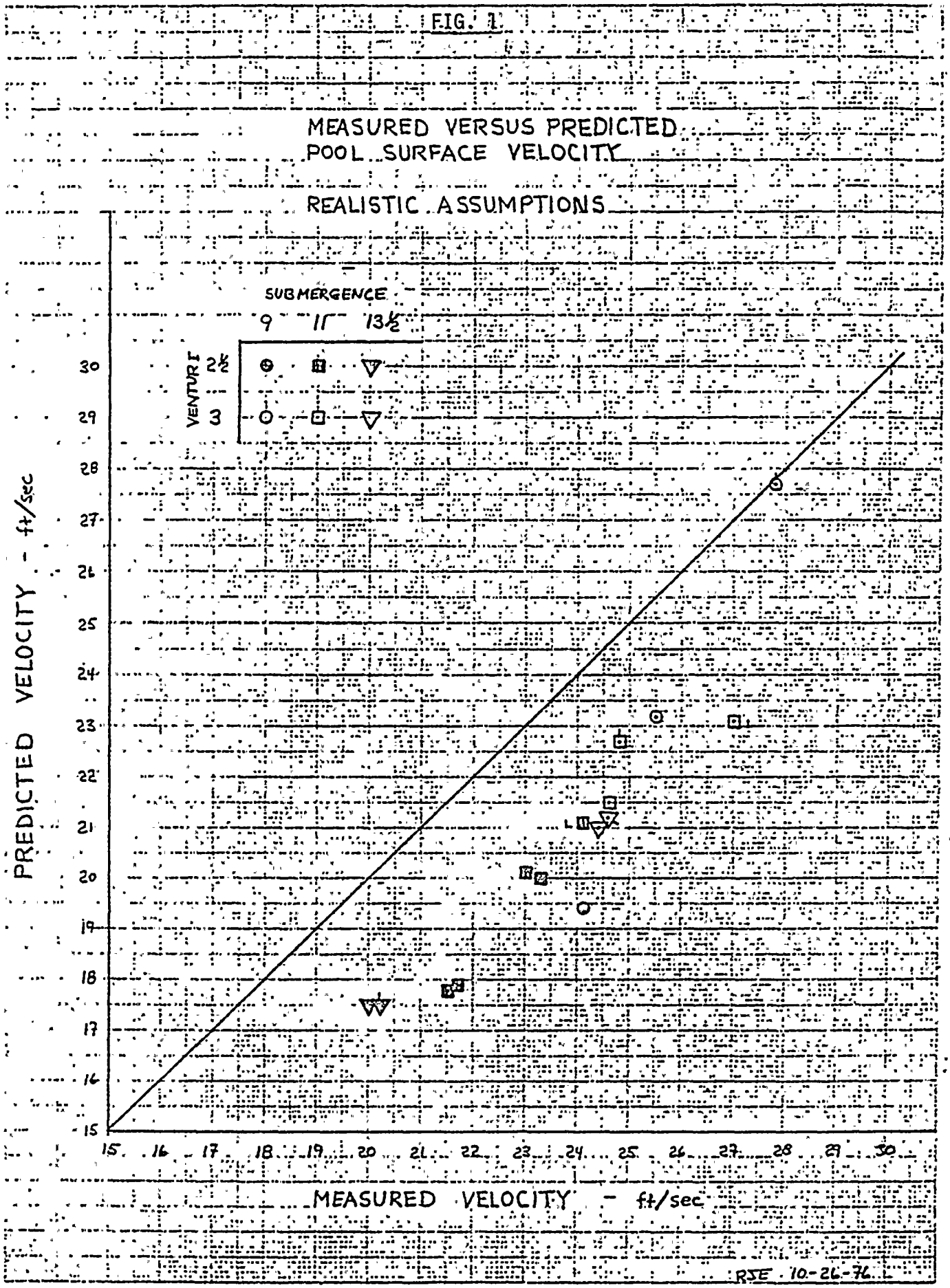
MODEL ASSUMPTIONS FOR DATA/MODEL COMPARISON

1. AIR BEHAVES AS AN IDEAL GAS
2. VENT FLOWRATE BASED ON ADIABATIC FLOW WITH FRICTION
3. VENT FLOW IS AIR THEN MIX AND PURGE
4. DRYWELL AIR IS ISENTROPICALLY COMPRESSED
5. NEGLIGIBLE VELOCITY IN THE DRYWELL
6. POOL WATER ACCELERATES AS A SLUG OF CONSTANT THICKNESS
7. VISCOUS FORCES ARE NEGLIGIBLE
8. CONTAINMENT AIR IS ISENTROPICALLY COMPRESSED
9. BUBBLE TEMPERATURE IS CONSTANT

R.J.E.
10/26/76

ENCLOSURE NO. 2

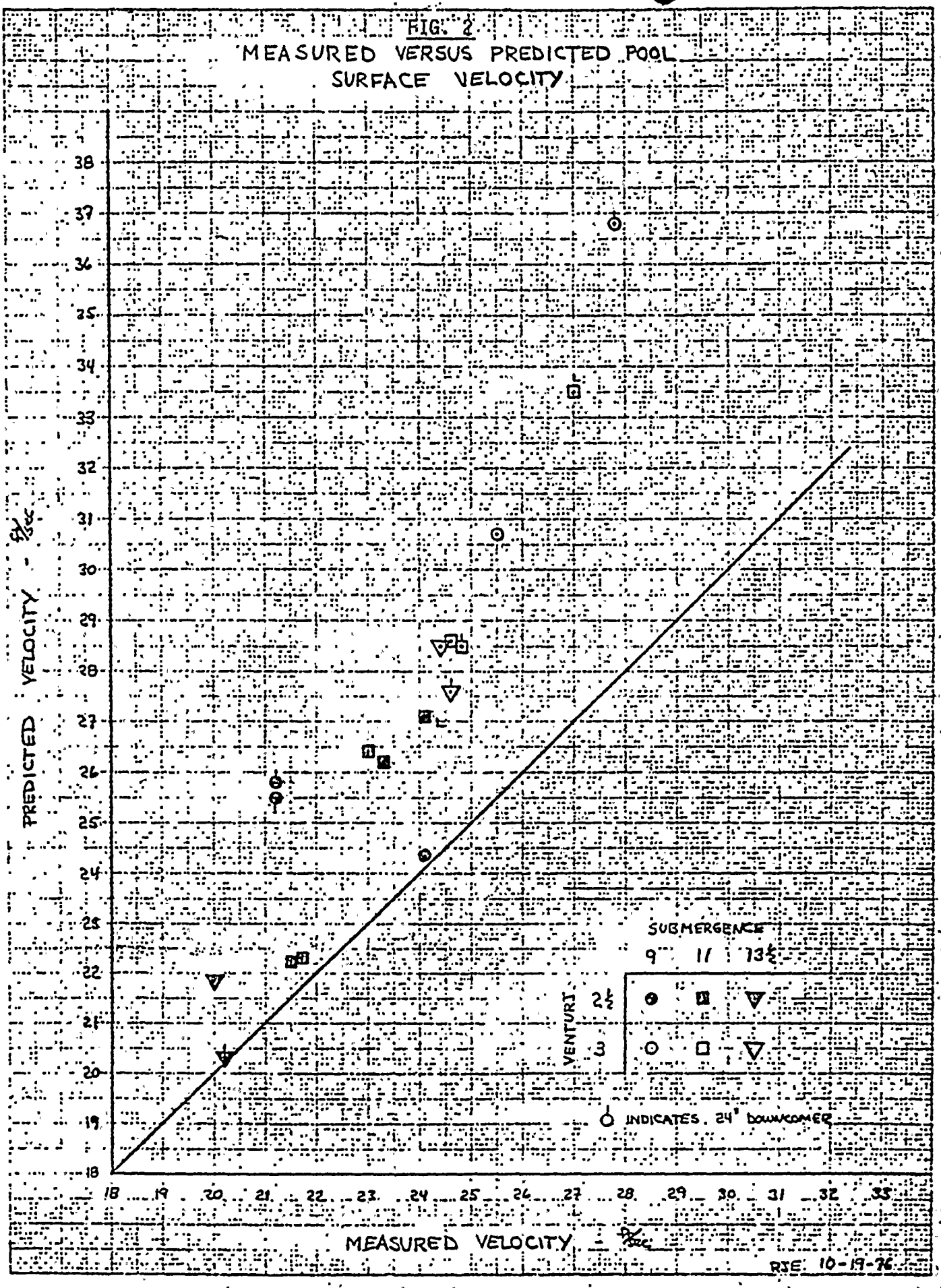
FIG. 1



ENCLOSURE NO. 3

FIG. 2

MEASURED VERSUS PREDICTED POOL SURFACE VELOCITY



27 Oct. 76

ENCLOSURE NO. 4

TABLE 2

MARK II PRESSURE SUPPRESSION CONTAINMENT SYSTEM

4T AIR TESTS:

- MARK I AND MARK III PROGRAMS RELY ON EMPIRICAL DEFINITION OF POOL SWELL CHARACTERISTICS, THUS AIR TESTS HIGHLY DESIRABLE

- MARK II PROGRAM USING ANALYTICAL DEFINITION OF SWELL VELOCITY (USING 100% AIR VENT FLOW)

- 4T SWELL DATA IS BEING USED FOR MODEL VERIFICATION PURPOSES, NOT FOR SWELL VELOCITY DEFINITION

- 4T VENT LINE CONTAINS ~70% OF FLOW REQUIRED DURING THE ACCELERATION PHASE OF SWELL

- MARK III DATA SHOWS LITTLE DIFFERENCE BETWEEN AIR AND STEAM TESTS

- MARK II INVESTIGATIONS SHOW LESS THAN 5% INCREASE IN PEAK VELOCITY IF CONTINUOUS AIR FLOW ASSUMED

CONCLUSION:

4T AIR TESTS NOT REQUIRED.

A.J.J.

10/27/76

ENCLOSURE NO. 5

TABLE 3

I OBJECTIVES

Acquisition of the following information:

(1) Pressure history in the wetwell free space

(2) Height and velocity of pool swell

(3) Nature of fluid impact on wetwell ceiling (qualitative)

(4) Dynamic behavior of bubbles (qualitative).

ENCLOSURE NO. 6

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ENCLOSURE NO. 8

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