



## LONG ISLAND LIGHTING COMPANY

SHOREHAM NUCLEAR POWER STATION

P.O. BOX 618, NORTH COUNTRY ROAD • WADING RIVER, N.Y. 11792

June 6, 1979

SNRC-397

Mr. Boyce Grier, Director  
Office of Inspection & Enforcement  
Region 1  
U. S. Nuclear Regulatory Commission  
631 Park Avenue  
King of Prussia, Pennsylvania 19406

I&E BULLETIN 79-07  
LONG ISLAND LIGHTING COMPANY  
SHOREHAM NUCLEAR POWER STATION - UNIT 1  
DOCKET NO. 50-322

Dear Mr. Grier:

IE Bulletin 79-07 requested certain information concerning seismic analysis of safety-related piping. The following is our response to this Bulletin.

FOR PIPING ANALYSES DONE BY STONE & WEBSTER ENGINEERING CORPORATION:

In response to Items 1, 2 and 4, no computer codes have been identified by Stone & Webster (S&W) which used any of the methods described in Item 1 of the Bulletin.

In response to Item 3, the following computer program was used in the seismic stress analysis of safety-related piping for Shoreham Unit 1.

NUPIPE 00/03 through 03/10

Verification of computer program NUPIPE 03/10 used by S&W is being addressed in response to the April 2nd Addendum to the March 13th Order to Show Cause for Surry Units 1 and 2, Beaver Valley Unit 1, and the FitzPatrick and Main Yankee Units. Stone & Webster's in-house benchmarking links all major versions of NUPIPE to Version 03/10.

FOR PIPING ANALYSES DONE BY GENERAL ELECTRIC COMPANY:

In response to Items 1, 2 and 4, none of the computer codes used for the seismic analysis of GE piping systems important to safety

employed techniques identified in Item 1 of the bulletin.

In response to Item 3, for the main steam system analysis and the recirculation system analysis, the SAP/PISYS computer programs were used for seismic piping analysis performed by GE. A description of these programs and the verification procedure is presented below.

#### SAP4G Verification

##### Program Description

SAP4G, a version of SAP, was originally developed for General Electric by F. A. Peterson and K. J. Bathe of the Engineering Analysis Corporation at Berkeley. The SAP program is a general purpose structure program used to perform static and dynamic analysis of mechanical and piping components by the finite element method.

##### Verification

All GE production versions of SAP are verified using a special benchmark problem that exercises all the important features of the program. The benchmark problem has been analyzed for the effects of constraint of free end, distributed forces, and is dynamically analyzed to determine mode shapes and natural frequencies using Swanson System's ANSYS program. ANSYS was also used to predict dynamic response of the benchmark problem using the response spectra and time history integration methods. The predicted frequencies, mode shapes, and loads were compared to the corresponding SAP predictions. The SAP program prediction had to be consistent with those of ANSYS before SAP was qualified for production use. In order to test unique features of SAP that cannot be compared to the results of another program, a special problem is devised which has an equivalent computer or manually calculated solution. Before any new version of SAP is verified, for production application, the benchmark problem is reanalyzed to verify that the program changes have not changed predictions or reduced their accuracy.

#### PISYS Verification

##### Program Description

PISYS is a computer program specialized for analysis of piping systems. The PISYS program provides a highly flexible user oriented input format for piping system modeling. The analysis modules of PISYS are taken directly from the SAP4G program.

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### Verification

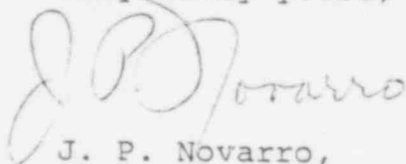
Since PISYS analysis modules are identical to SAP4G, a SAP analysis of a typical BWR steam piping system is used as a benchmark problem for PISYS verification. The steam line is analyzed for thermal expansion, dead weight, and a variety of dynamic loads in order to exercise all the features of PISYS. PISYS was not verified as a production program until the predictions of SAP and PISYS were shown to be identical for practical purposes.

Before any new version of PISYS is verified for production application, the benchmark problem is reanalyzed to verify that the program changes have not changed the predictions or reduced their accuracy.

Five NRC benchmark problems will also be analyzed as a further verification of the PISYS code. This analysis is expected to be completed and submitted to the Commission for review by July 13, 1979.

We trust that the above has been responsive to your request. Should you desire additional information, please do not hesitate to contact us.

Very truly yours,



J. P. Novarro,  
Project Manager  
Shoreham Nuclear Power Station

MHM/cl

cc: Mr. John G. Davis, Director  
Office of Inspection & Enforcement  
U. S. Nuclear Regulatory Commission  
Washington, D. C. 20555

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