March 3, 1972

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REVIEW OF "INCIDENT REPORT, TURKEY POINT UNIT 3, VALVE HEADERS," DATED DECEMBER, 1971, BY FLORIDA POWER AND LIGHT COMPANY AND EVALUATION OF REVISED HEADER DESIGN.

Reference: AEC Contract (AT-11-1)-1658-A
PAR: 11-72-a
Assignment No. DC-94

Introduction

A report on the above subject DC-94-A, is being prepared by Parameters, Inc. to supplement the earlier preliminary report AEC-94 which dealt with the initial Header Failure investigation. It will be submitted to the Division of Compliance about March 7. This memorandum is intended as an advance summary of the salient determination of the report. They are listed below essentially as will be contained in the summary of findings section of the report. An evaluation of the metallurgical studies conducted by Battelle-Columbus, Appendix 5-A, will not be included in Parameters' report.

1. The Florida Power and Light Incident Report does not provide enough detailed information for a thorough independent review of the stresses reported for the original or revised header designs. To provide a relative assessment of both designs, Attachments 1, 2 and 3, to Report DC-94a, in which arbitrary loading conditions have been used for comparison purposes, have been prepared. These analyses also provide a basis for evaluating the relative strength of the main steamline with the header as the branch connection. The findings 2, 3, 4, and 5 below result from the analyses.

2. The maximum principle stress determined by the analysis of Attachment 1 was found to be 38% higher than the 145,000 psi reported in Table 4.3-2 of the FPL incident report. This stress occurs at the point of failure.

3. Assuming an exhaust stack configuration identical to the original design (24 inches offset), the revised header assemblies would meet allowable stress limits for the discharge condition as evaluated by ASME Section III methods using Section VIII allowable stresses. It appears that the horizontal extension and outboard supports for the exhaust pipe would not have been needed on this basis. Such a design could not be proved out however, on the basis of Section I or Section VIII only.

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4. Upon discharge, the safety valves will experience a momentarily unbalanced horizontal reaction before the steam reaches the vertical stack. The magnitude of this reaction is unknown. In the analysis of Attachment 2, stresses at the header shell of the revised design were calculated for the horizontal reaction load of 20,000 pounds. Stresses are within allowables when evaluated by Section III methods using Section VIII allowables. It should be noted that the revised design is restrained from horizontal translation only by the header to steamline attachment for this condition.

5. Attachment 3 to report DC-94a analyzes the stresses in the main steamline and at the header to weldolet juncture for the reaction described in finding number 4 above. Both valves in one header branch are assumed to discharge simultaneously. Stresses are within limits as evaluated by Section III methods using Section VIII and B31.1 allowables.

6. The incident report (Section 3.2) records the discharge of one or possibly two safety valves in the 3C steam header on November 23, 1971. It is probable that the very high stresses that have been established to be associated with valve discharge, resulted in some permanent deformation or material damage to the header. The results of detailed nondestructive examinations and dimensional measurements of this header would have been an appropriate matter for presentation in FPL's incident report.

7. The safety valve manufacturer (Dresser-Consolidated) recommends that a horizontal offset of no more than 24 inches be used in attaching a vertical discharge pipe, the prime consideration being stresses in the valve neck under the discharge condition. The revised design of the exhaust pipe for Turkey Point 3 has a five foot horizontal run which is externally supported to prevent the discharge reaction from acting on the valve body and header. This extra pipe length could, however, affect the capacity of the safety valve. The valve manufacturer's approval of the installation should be recorded as part of the redesign documentation.

8. The FPL report Section (4.3) indicates that the original header support was designed for gross steamline motion under normal plant operating conditions. The design did not provide for the motion realized during hot functional tests when the main steam isolation valves were closed. In addition to a statement that the new design accepts steamline motion during all modes of operation, it would be logical to also provide assurance that the steamlines can accept the relative motion realized when one or another loop is inoperative.

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9. In view of the fact that the design analysis work on the original and revised header configuration was not attached to the FPL report, it would have been appropriate to identify the authors and organizations (presumably Bechtel) who performed the engineering analysis of the original and revised designs and to reference the report which contained detailed work.

10. The FPL incident report essentially agrees with the findings contained DC-94a, the Parameter, Inc., preliminary report to the Division of Compliance.

11. A more meaningful review of the analysis of the incident and header redesign in terms of applicable codes and design bases could be made if the detailed engineering works performed for FPL were available. It is not expected that such a review would change the above stated findings appreciably.

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