UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30323

Report No.: 50-261/92-14

Licensee: Carolina Power and Light Company
P. O. Box 1551
Raleigh, NC 27602

Docket No.: 50-261 License No.: DPR-23

Facility Name: H. B. Robinson

Inspection Conducted: May 11-15, 1992

Inspector: J. L. Coley Jr. 6-8-92
J. L. Coley Jr. Date Signed

Approved by: 6/9/92
J. J. Blake, Chief Date Signed
Materials and Processes Section
Engineering Branch
Division of Reactor Safety

SUMMARY

Scope:

This routine unannounced inspection was conducted in the areas of inservice inspection (ISI) - observation of work activities, review of completed records, review of augmented inspections, and review of radiographic film for plant modifications.

Results:

In the areas inspected violations or deviations were not identified. During this inspection the licensee aggressively addressed concerns raised by the inspector on the ultrasonic examination or feedwater system piping to the steam generator nozzle/reducer welds (NRC Bulletin 79-13). Actions taken by the licensee included re-radiographing weld 1 on loop C; conducting ultrasonic examinations on the nozzle to reducer weld and the reducer to elbow weld for all three loops; and

performing several ultrasonic re-examinations on the loop "C" weld 1 using different angles and wave mode transducers. CP&L also had sizing instructors from the Electric Power Research Institute (EPRI) Nondestructive Examination (NDE) Center in Charlotte N. C. examine the weld using crack tip techniques which they teach on a daily basis at the NDE Center. CP&L senior management committed to re-examine the feedwater reducer welds on all three loops next outage so that any changes in recorded data can be determined. The inspector considered the actions taken by the licensee to be conservative and appropriate for the situation, since the welds and base material in question have a history (NRC Bulletin 79-13) of thermal fatigue cracking.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*R. L. Barnett, Manager, Outages and Modifications
*R. S. Beverage, Manager, Quality Control
*W. M. Biggs, Supervisor, Nuclear Engineering Department
*S. A. Biggings, Technical Aide, Regulatory Compliance
*R. H. Chambers, Plant General Manager
*R. M. Coats, Manager, Technical Services
*R. D. Crook, Senior Specialist, Regulatory Compliance
*C. R. Dietz, Vice President, Robinson Nuclear Plant
*J. M. Hewett, Engineer, Nuclear Assessment Department
*M. F. Page, Manager, Technical Support
*D. C. Stadler, Engineer, Onsite Licensing
*M. D. Veron, Manager, NDE Services
*R. B. Weber, Programs Engineer, Technical Support

Other licensee employees contacted during this inspection included engineers, technicians, and administrative personnel.

NRC Resident Inspector

*L. Garner, Senior Resident Inspector
C. Ogle, Resident Inspector

*Attended Exit Interview

2. Inservice Inspection (ISI) Unit 2 (73753 & 73755)

The inspector reviewed CP&L,s third inspection interval program, correspondence between NRR and the licensee concerning the submitted program and relief requests, the outage plan, completed ISI records and evaluations, completed augmented inspections, and observed ISI ultrasonic work activities involving the examination of the feedwater nozzle to reducer weld and reducer to elbow weld on the "C" Steam Generator. The inspector also conducted independent ultrasonic examination of areas of interest on the loop "C" Steam Generator Nozzle to reducer weld and base material. The applicable code for the third inspection interval is the 1986 Edition of Section XI to the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code.

a. Observation of Work and Work activities (73753)

Recently cracking of piping in steam generator feedwater nozzle to transition welds were identified in a Westinghouse PWR plant. The cracking was attributed to thermally induced fatigue caused by introducing relatively cold auxiliary feedwater into the main feedwater pipe upstream of the steam generator. This cracking problem was identified in 1979 and NRC Bulletin 79-13 was issued to require inspection and replacement of defective feedwater piping components.

The inspector reviewed documentation of weld inspections performed by CP&L since their steam generator replacement in 1984 (see NRC Inspection Report 50-261/92-13). The licensee had performed augmented ultrasonic examinations on the welds which attached the nozzle to a 18"x16" reducer and the weld which attached the reducer to a 90 degree elbow in 1984 (base line examination), 1986, and 1990 on all three steam generators. In 1986 the examinations revealed a low amplitude (40%DAC) signal which had been identified as geometry on the loop "C" nozzle to reducer weld. Because of the currently identified cracking at another utility, and concerns raised by the inspector, the licensee re-examined the nozzle to reducer weld on loop "C". This examination however, did not record any reflectors because none were above the 50% minimum recording criteria required by the ASME Code.

During a subsequent in-office review (NRC Region II) of the 1986 data several concerns were identified that required additional information to insure that the indication had been evaluated properly and that adequate examination coverage had been obtained to bound the area where cracking may occur.

On May 11, 1992, this inspector arrived at the Robinson facility and held discussions with the cognizant CP&L personnel concerning this issue. Specifically the inspector's concerns were: (1) The indication had been evaluated as geometry however, the W measurement (distance from the center of the weld to the indication) was listed on the 1986 examination report as 1.8 inches. A W measurement of this length should have placed the indication far away from the root and the counterbore region and in an area where cracking has been found but not geometry. (2) CP&L's examination reports indicated that only 1/2 inch of base metal was examined on each side of the weld as required by Code. However, Bulletin 79-13 required that base metal for 2 pipe wall thicknesses be examined on each side of the weld. As

a result of the bulletin examinations one licensee with a reducer similar to Robinson's discovered significant cracking in the base metal, 3 inches from the weld.

As a result of the discussions with the licensee, the inspector and a licensee contractor Level III examiner re-examined both reducer welds on loop "C" with a 45 degree shear wave transducer. The inspector and examiner also axially examined all of the base material from 2 1/2 inches upstream of the reducer to elbow weld to 2 1/2 inches downstream of the nozzle to reducer weld both in the upstream and downstream directions. The 45 degree shear wave examination revealed a 45% DAC circumferential indication, starting at sixteen inches from the 12 o'clock position on the pipe and running to 32 inches from the reference point. Plots of the indication revealed that at maximum amplitude the indication was located at the top edge of the counter bore. When the examiner positioned the transducer to 50% maximum amplitude in the forward direction the soundpath measurement indicated upward/vertical extension of the indication. The examiner then examined the indication with a WSY-70, which is a 70 degree refracted longitudinal wave transducer that will also display two other shear wave signals at other angles if the geometry of the part has parallel surfaces. One of the shear wave signals has a component that is commonly referred to as a bottom creeping wave. This signal is good for discriminating whether a reflector is from a counterbore or crack, since vertical extension of an indication is needed to see this signal. The examination with this transducer did not reveal a crack tip signal, but the creeping wave signal was displayed clearly. The examiner then tried a RTD transducer which is also a 70 degree refracted longitudinal wave with associated shear wave components. This transducer produced a crack tip signal at .450 inch from the outside surface. However, a signal at this depth is normally considered outside the sizing range for this transducer.

In summary the above examinations revealed conflicting information concerning whether there was a crack in the reducer or erroneous signals caused by the geometry of the reducer. Other factors that tended to discredit the signal as originating from a crack during this examination were: (1) At 12 dbs above reference level the indication could only be seen when scanning in the direction of flow or towards the nozzle which is unusual for a fatigue crack because of its normal straight vertical extension, and (2) The fact that the signal was low amplitude and was not as responsive as would normally be expected. However, the inspector felt that this was in part caused by the fact that when scanned from the nozzle side the sound had to go through

the weld metal which would impede the sound and when scanned from the reducer side there was not a perpendicular corner reflector because of the angled surface of the counterbore.

In order to resolve the problem the licensee elected to radiograph the reducer to nozzle weld and to have CP&L's sizing examiners re-examine the weld using different angle and wave mode transducers. Radiographs of the area of interest revealed that the counterbore cutting tool had cut a shallow groove in the top edge of the counterbore and on the bevel of the counterbore. These grooves could also be clearly seen in the radiographs taken in 1984 when the steam generators had their tube bundles replaced. The radiographs also confirmed that if there was a crack propagating from the groove in the counterbore it did not have significant depth since the radiographic technique had not detected any cracking. Subsequent ultrasonic examination by CP&L with numerous supplemental angles and wave mode transducers could not detect an indication in the area where the RTD transducer was producing a crack tip signal.

During the exit meeting senior CP&L management informed the inspector that EPRI had been notified and that sizing instructors from the EPRI NDE Center in Charlotte N.C. were presently in route to Robinson. In addition the licensee stated that if EPRI concluded that the signal was an erroneous reflection, it was their intention to re-examine the nozzle to reducer welds on all three loops during the next refueling outage. These inspections will be conducted in order to verify that no changes occur in the ultrasonic data obtain this outage. On May 19, 1992, the licensee notified the inspector that EPRI had completed their inspection and evaluation of the reflectors on the "C" loop feedwater nozzle and had concluded that the signals obtain with the WSY-70 and the 70 degree RTD transducer were the result of geometry. The inspector considered the actions taken by the licensee and those planned for next outage to be conservative and appropriate.

b. Review of Completed Records, ISI Program, Augmented Inspections and Evaluations.

The inspector reviewed the ISI Plan and reviewed all of the completed visual examination records for supports. This review included verification that examiner findings had been properly evaluated and dispositioned. In addition the inspector reviewed the licensee's 3rd Interval inspection program. This program is also presently under review by NRR. Correspondence relating to the NRR review was also reviewed by the inspector. The inspector also reviewed the licensee's

completed records for specific augmented inspections applicable to the Robinson Plant and conducted by the licensee during the 2nd ISI Inspection Interval. The inspector noted that the 3rd Inspection Interval Program had not addressed augmented inspections. During the exit meeting the licensee also committed to address augmented inspections that would be applicable to the Robinson Plant in their program.

Within the areas examined, no violation or deviation was identified.

3. Review of Radiographic Film (57090)

The inspector reviewed radiographic film for three electrical penetrations. This work had been performed in accordance with Plant Modification No. 1074 and Conax Drawing No. 7EE-60000. The Radiography had been performed and evaluated in accordance with CP&L's Radiographic Procedure No. 101, Revision 14. Radiographs for Welds No. C-1, C-2, and C-9 were reviewed and found to be of good quality and properly evaluated.

Within the areas examined, no violation or deviation was identified.

4. Exit Interview

The inspection scope and results were summarized on May 15, 1992, with those persons indicated in paragraph 1. The inspector described the areas inspected and discussed in detail the inspection results. Proprietary information is not contained in this report. Dissenting comments were not received from the licensee.