



UNITED STATES
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Report Nos.: 50-280/94-04 and 50-281/94-04

Licensee: Virginia Electric and Power Company
 Glen Allen, VA 23060

Docket Nos.: 50-280 and 50-281

License Nos.: DPR-32 and DPR-37

Facility Name: Surry 1 and 2

Inspection Conducted: February 7-11, 1994 and February 22-25, 1994

Inspector: *[Signature]* 3-10-94
S. L. Coley Jr. Date Signed

Approved by: *[Signature]* 3/10/94
J. J. Blake Date Signed
 J. J. Blake, Chief
 Materials and Processes Section
 Engineering Branch
 Division of Reactor Safety

SUMMARY

Scope:

This routine, announced inspection was conducted in the areas of inservice inspection (ISI) - Observation of Westinghouse's work activities associated with the second ten-year interval inspection of the Unit 1 reactor vessel, review of ultrasonic data and evaluations of recorded indications (Unit 1 reactor vessel), observation of manual ultrasonic examinations activities, and observation of liquid penetrant examinations activities. In addition radiographic film for welds in piping modifications were reviewed.

Results:

In the areas inspected, violations or deviations were not identified. Reactor vessel examination activities and evaluation of the ultrasonic data was effectively performed by Westinghouse. Other ISI activities observed or reviewed by the inspector were performed satisfactorily by examiners from Virginia Corporation of Richmond and the licensee. One weakness was observed in that, a radiographer had indicated on the "Radiographic Inspection Reports"

that the radiographic sensitivity for the radiographs reviewed by the inspector was 4T in lieu of the required 2T (see paragraph 3 for details). One strength was also noted in that the licensee had assigned a health Physics inspector with each NDE team when the examinations were performed in high radiation areas. This arrangement worked very effectively in reducing personnel dose and improved job coordination.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

- *W. Benthall, Supervisor, Licensing
- *D. Grady, Supervisor, Nondestructive Examination (NDE)
- *T. Huber, Supervisor, ISI, NDE, and Engineering Programs
- *M. Kansler, Station Manager
- *J. Kilmer, Licensing
- *D. Miller, Radiation Protection
- *J. Price, Assistant Station Manager
- *E. Smith Jr., Manager, Quality Assurance (QA)
- *T. Sowers, Engineer
- *D. Woodyard Jr., Senior Inspector, NDE

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

Other Organization

- R. Keck, Project Manager, Westinghouse Nuclear Applications Technical Division (Reactor Vessel Inspection Activities)

NRC Resident Inspectors

- *S. Tingen, Resident Inspector
- M. Branch, Senior Resident Inspector

*Attended Exit Interview

Acronyms and initialisms used throughout this report are listed in the last paragraph.

2. Inservice Inspection - Unit 1 (73753) (73755)

Surry Unit 1 is presently in the last outage of the third period for the second ten-year inspection interval. In addition the licensee was performing some first period, third ten-year interval examinations this outage since the effective dates for the third ten-year interval was November 14, 1993, through November 14, 2003. The applicable code for the second interval ISI examinations which included the reactor vessel examinations was the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, Sections V and XI, 1980 Edition through Winter 1980 addenda.

The third interval examinations were performed to the 1989 Edition of Sections V & XI of the ASME Code. The reactor vessel outlet nozzle to vessel welds, nozzle to inside radius sections and the outlet to pipe welds were performed using the 1989 Edition of the ASME Code since they had been examined previously in the first period of the second interval.

The licensee had contracted Westinghouse's Nuclear Applications Technical Division to perform reactor vessel examinations and the "B" steam generator eddy current examinations. Westinghouse used their Dyna-Pulser ultrasonic system to perform the ten-year interval examinations of the reactor vessel and their UDRPS data acquisition and imaging system to process the data. Other ISI activities were performed by the licensee and Virginia Corporation of Richmond.

A. Review of Westinghouse ISI Reactor Vessel Examination Program Activities (73753)

The inspector reviewed the Westinghouse program for the examination of the reactor vessel. The review verified the following: (1) proper transducer size, angle, sound mode, and arrangement on the scanning fixture to insure coverage for each weld configuration, (2) approved procedures were available and specified the NDE equipment used, (3) personnel qualification and certification records indicated that the examination personnel were properly certified for the automated ultrasonic method and knowledgeable of the examination process, and (4) equipment certification records indicated that the system would function within its design parameters.

(a) Review of vessel scan plans for weld coverage

The inspector's review of ISI scan plans for transducer coverage revealed that the licensee only intended to utilize two 45 degree shear-wave transducers for the examination of the outlet nozzle to safe-end welds even though the scanning fixture had two additional 45 degree refracted longitudinal wave transducers mounted. Refracted longitudinal wave transducers are generally used on dissimilar metal welds because of their ability to penetrate difficult materials. The ultrasonic examination of the nozzle to safe-end weld is performed on the entire thickness of the weld since the licensee has requested relief from the Code surface examination requirements on the outside nozzle and safe-end weld surface due to high radiation dose rates. The inspector held discussions with the licensee and Westinghouse concerning their selection of transducers for the examination of this weld. In reply the licensee stated that the metals involved in the outlet nozzles did not include inconel or centrifugally cast stainless steel and demonstrations on a mockup block of the same materials revealed that the shear wave transducer adequately detected a five percent notch in each of the materials of the mockup. The licensee stated that shear and longitudinal wave transducers were used on the inlet nozzles because one of the materials was centrifugally cast stainless steel. The licensee also stated that the only reason they did not use the refracted longitudinal wave transducers was in order save computer disk space. The inspector expressed concern

that it is not unusual to encounter different acoustical properties from nozzle to nozzle when examining 309 weld butter, 308 weld metal, and 316 forged safe-end materials. Subsequent to the initial discussions the licensee informed the inspector that they had decided to use both the shear wave and the refracted longitudinal wave transducers on the outlet nozzles and to compare the data taken to insure that the best method would be used to evaluate the weld.

The inspector's review of completed ultrasonic data for both transducers did not reveal any indications in the outlet nozzles. The examinations performed with the refracted longitudinal wave transducers were more sensitive. One adverse effect noted in using the refracted longitudinal wave transducers was when the surface was uneven, a redirected signal was observed. This phenomena required skilled examiners to interpret the examination results.

The inspector's review of the Westinghouse reactor vessel program did not reveal any other weld coverage, or transducer selection, concerns.

(b) Review of examination procedures

The inspector reviewed the Virginia Power examination procedures listed below to determine whether the procedures were approved, technically sound, and specified the NDE equipment used by Westinghouse to conduct the vessel examinations.

<u>Procedure No.</u>	<u>Procedure Title</u>
0-VPA-ISI-54, Rev.0	Manual Ultrasonic Examination for the Reactor Vessel Upper Shell to Flange Weld
0-VPA-ISI-55, Rev.0	Manual Ultrasonic Examination of the Reactor Vessel Threads in Flange
0-VPA-ISI-254, Rev.0	Remote Inservice Examination of the Reactor Pressure Vessel

The procedures had been approved by the licensee and Westinghouse, met minimum Code requirements, and delineated the equipment used to conduct the Unit 1 reactor vessel examinations.

(c) Review of Westinghouse examiner certification records

The inspector reviewed certification and qualification records for the examiners listed below to determine whether the examiners were properly qualified, certified, and knowledgeable of the NDE method.

<u>Examiner</u>	<u>Level of Certification</u>
J.R.D.	Level II Visual Examiner
S.A.S.	Level III Limited UT Examiner
D.A.M.	Level III Limited UT Examiner
A.W.M.	Level II Limited UT Examiner
J.J.H.	Level III Limited UT Examiner
J.T.F.	Level II Limited UT Examiner

The qualification and certification records showed that the examiners were adequately qualified to perform the reactor vessel examinations.

(d) Review of equipment certification records

The inspector reviewed certification records for the following NDE equipment:

<u>Equipment</u>	<u>Serial No.</u>
Dynapulser	09747
Dynapulser	10791
Dynapulser	09746
RTD Transducer	89-190
RTD Transducer	89-183
RTD Transducer	89-105
RTD Transducer	89-187
RTD Transducer	89-740
RTD Transducer	89-741
RTD Transducer	89-191
RTD Transducer	89-606
RTD Transducer	89-585
RTD Transducer	89-592

The above equipment met or exceeded ASME Code requirements.

B. Review of Reactor Vessel Automated Data and Evaluation of Indications - (73755)

The inspector reviewed the automated data for the reactor vessel and verified that the evaluation of indications was performed satisfactorily, examination limitations were identified, and required documentation was available, complete and satisfactory. Examination records for the following welds were reviewed:

<u>Weld Nos.</u>	<u>Weld Description</u>	<u>Comments</u>
Weld No. 1	Upper Shell to Flange	Perform from Vessel ID
Weld No. 2	Intermediate Shell to Upper Shell	(2) Indications Recorded
Weld No. 3	Intermediate Shell to Lower Shell	(3) Indications Recorded
Weld No. 4	Bottom Head to Lower Shell	(4) Indications Recorded
Weld No. 5	Bottom Head	No Indications Recorded
Weld No. 6	Intermediate Shell Longitudinal	No Indications Recorded
Weld No. 7	Intermediate Shell Longitudinal	No Indications Recorded
Weld No. 8	Lower Shell Longitudinal	(1) Indication Recorded
Weld No. 9	Lower Shell Longitudinal	No Indications Recorded
Weld No. 10	Vessel Shell to Outlet Nozzle	(3) Indications Recorded
Weld No. 12	Vessel Shell to Outlet Nozzle	(6) Indications Recorded
Weld No. 14	Vessel Shell to Outlet Nozzle	(1) Indication Recorded
Welds Nos. 11 13 and 15	Vessel Shell to Inlet Nozzles	No Indications Recorded
Welds Nos. 100-AZ-1, 1-17DM 101-AZ-1, 1-17DM 102-AZ-1, 1-17DM	Inlet Nozzle to Safe-end	No Indications Recorded Nozzles # 11, 13, and 15
Welds Nos. 100-AZ-1, 1-01DM 101-AZ-1, 1-01DM 102-AZ-1, 1-01DM	Outlet Nozzle to Safe-end	No Indications Recorded Nozzles # 10, 12, and 14

The ISI data for the Unit 1 reactor vessel was complete and within established ASME Code acceptance criteria.

C. Observation of Manual ISI Ultrasonic Examinations (73753)

The inspector observed examiners from Virginia Corporation of Richmond performing manual ultrasonic examinations of the welds listed below. The welds were examined and evaluated in accordance with Virginia Power's Ultrasonic Examination Procedure No. NDE-UT-201, Rev. 3. The examinations were observed to determine whether the examination personnel were knowledgeable of procedural requirements, the examination method, operation of the test equipment, and properly evaluated the indications in accordance with the appropriate procedural acceptance criteria. The following welds were examined:

<u>Drawing No. and Weld No.</u>	<u>Pipe Configuration</u>
11448-WMKS-1103A3, Rev.1 Weld No. 1.02	8" Diameter Reactor Coolant Elbow to Pipe
11448-WMKS-1103A3, Rev.1 Weld No. 1.03	8" Diameter Reactor Coolant Elbow to Pipe
11448-WMLS-0101G1 Weld No. 1-01	16" Diameter Feedwater Nozzle to Reducer (Loop B) Bulletin 79-13 Weld

The inspector's verification of the above examinations revealed that the examination procedure was being followed, examination personnel were knowledgeable of the examination method and operation of the test equipment, and examination results and evaluation of the results were properly documented. Certification records for the examiners and equipment involved in the above examinations were also verified to be satisfactory by the inspector.

An interesting observation was made by the inspector during the examination of the 16" diameter feedwater nozzle to reducer weld (Weld No. 1-01). In 1980, the licensee replaced the Steam Generator tube bundles. During the replacement activities the licensee elected to redesign the piping to improve the mix of the fluids in the auxiliary feedwater and the feedwater line. The replacement piping run has the shape of an inverted U.

The ultrasonic examinations of the feedwater weld and the associated fittings conducted this outage and witnessed by the inspector revealed that no cracking is presently detectable in the weld or fittings. The ultrasonic examinations made this determination when scanning at an enhance sensitivity. The results of the ultrasonic examinations indicated to the inspector

that the licensee's piping modification has achieved its designed function of mixing the fluids in the auxiliary feedwater and feedwater system.

D. Observation of Liquid Penetrant Examinations for ISI Welds (73753)

The inspector observed Virginia Power and Virginia Corporation of Richmond examiners performing liquid penetrant examinations of the ISI welds listed below. These examinations were performed using Virginia Power's Liquid Penetrant Examination Procedure No. NDE-PT-201, Rev. 2. The inspector observed the liquid penetrant examinations to determine whether the examination procedure was being followed, whether examination personnel were properly certified and knowledgeable of the NDE method, whether the examinations were performed satisfactorily, and whether the examiners properly evaluated and documented the test results. The following weld examinations were observed by the inspector:

<u>Drawing and Weld No.</u>	<u>Piping Configuration</u>
11448-WMKS-012762 Weld No. 1-AMF	8" Diameter Pipe to Valve High Head Safety Injection
11448-WMKS-012762 Weld No. 1-AKF	8" Diameter Elbow to Elbow High Head Safety Injection
11448-WMKS-012762 Weld No. 53	8" Diameter Elbow to Pipe High Head Safety Injection
11448-WMKS-012762 Weld No. 1-AWF	8" Diameter Tee to Pipe High Head Safety Injection
11448-WMKS-012762 Weld No. CEF	8" Diameter Elbow to Pipe High Head Safety Injection
11448-WMKS-1103A3 Weld No. 1-02	8" Diameter Elbow to Pipe Reactor Coolant Bypass Line
11448-WMKS-1103A3 Weld No. 1-03	8" Diameter Elbow to Pipe Reactor Coolant Bypass Line

The inspector concluded that the above liquid penetrant examinations were successfully performed in accordance with the licensee's approved procedure by qualified and knowledgeable examiners. Certification records for the 5 applicable liquid penetrant examiners and the liquid penetrant test materials were also verified by the inspector.

E. Status of Steam Generator "B" Eddy Current Examinations

The eddy current examination of "B" Steam Generator tubes had been completed prior to the reactor vessel examination, so discussions were held with Westinghouse to determine the scope of the examinations and the condition of the tubes. This outage Westinghouse had eddy current examined 100 percent (3338 tubes) of the "B" Steam Generator tubes. As a result of the examinations the licensee had elected to plug the 4 tubes listed below. Plugging the 4 tubes however, was a conservative decision by the licensee since the examinations revealed that all of the tubes met the Technical Specification requirements for wear. The 4 tubes plugged were located in the anti-vibration region of the steam generator tube bundle.

The following tubes were plugged this outage:

STEAM GENERATOR TUBES PLUGGED THIS OUTAGE

<u>Row No.</u>	<u>Column No.</u>	<u>Percent Wear</u>
34	17	24
34	19	22
39	23	20
43	31	21

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

3. Review of Radiographic Film for Piping Modification Welds - Unit 1 (57090)

The inspector examined the radiographic film and associated records for the welds listed below to determine whether they had been processed, examined, evaluated, dispositioned, and maintained in accordance with the licensee's approved Radiographic Procedure No. NDE-RT-101, Rev.3. Acceptance criteria for the welds listed below was the American National Standard Institute B31.1 Standard, 1989 Edition. The following welds were fabricated in accordance with Design Change Plan (DCP-92-43) and worked on Job Order No. 94-095.

<u>Drawing and Weld No.</u>	<u>Configuration</u>	<u>Size</u>
Dwg. No. E-101 Weld 4	Pipe to Elbow	3/4" Dia. X .219" Thk.
Dwg. No. E-101 Weld 12	Pipe to Elbow	1" Dia. X .250" Thk.
Dwg. No. E-101 Weld 11	Pipe to Elbow	1" Dia. X .250" Thk.
Dwg. No. E-101 Weld 13	Pipe to Elbow	1" Dia. X .250" Thk.
Dwg. No. E-101 Weld 8	Pipe to Elbow	3/4" Dia. X .219" Thk.
Dwg. No. E-101 Weld 9	Pipe to Tee	3/4" Dia. X .219" Thk.
Dwg. No. E-101 Weld 6	Pipe to Elbow	3/4" Dia. X .219" Thk.
Dwg. No. E-101 Weld 3	Pipe to Elbow	3/4" Dia. X .219" Thk.
Dwg. No. E-101 Weld 5	Pipe to Elbow	3/4" Dia. X .219" Thk.

As a result of the above review one weakness was observed; a radiographer had indicated on the "Radiographic Inspection Reports" that the radiographic sensitivity for the radiographs reviewed by the inspector was 4T in lieu of the required 2T. The radiographic film quality however had obtained the required 2T sensitivity and an interview with the licensee's film interpreter revealed they had been evaluated to the 2T sensitivity. The radiographer had not been aware that a recent revision to the procedure had changed the sensitivity from 4T to 2T. No other film had been exposed since the procedure was revised. The radiographic film reviewed met minimum Code requirements.

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

4. Exit Interview

The inspection scope and results were summarized on February 25, 1994, with those persons indicated in paragraph 1. The inspector described the areas inspected and discussed in detail the inspection results. Although reviewed during this inspection proprietary information is not contained in this report. Dissenting comments were not received from the licensee.

5. Acronyms and Initialisms

ASME	-	American Society of Mechanical Engineers
B&PV	-	Boiler and Pressure Vessel
DCP	-	Design Change Plan
Dia.	-	Diameter
ISI	-	Inservice Inspection
NDE	-	Nondestructive Examination
No.	-	Number
Nos.	-	Numbers
QA	-	Quality Assurance
Rev.	-	Revision
Thk.	-	Thickness
UDRPS	-	Ultrasonic Data Recording and Processing System
UT	-	Ultrasonic Testing
"	-	inch