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

Report Nos.: 50-280/92-06 and 50-281/92-06

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 24-28 and March 16-19, 1992

Inspectors: McKenzie Thomas 4-27-92
M. Thomas Date Signed

for L. King F. Jape 4/27-92
Date Signed

Accompanying Personnel: F. Jape
T. Farnholtz

Approved by: Frank Jape 4/27/92
F. Jape, Chief Date Signed
Test Programs Section
Engineering Branch
Division of Reactor Safety

SUMMARY


Scope:

This routine announced inspection was conducted in the areas of Design Changes and Modifications and engineering/technical support activities.

Results:

In the areas inspected, violations or deviations were not identified. Modifications reviewed by the inspectors were considered to be technically adequate. Engineering has developed a prioritization process to prioritize design change work assigned to engineering. This was considered a positive effort which should improve engineering's ability to provide timely support to the plant. Engineering has generally provided adequate and timely resolutions for deviation reports and potential problem reports assigned to engineering. However, the inspector noted one example with a deviation report involving the low head safety injection pump where the resolution provided by engineering was considered to be less than adequate. Station engineering was actively involved and provided good support to the plant during efforts to resolve problems with

the number one switchyard station service transformer. Licensee management has been active in their efforts to enhance engineering support by performing self assessments of selected engineering activities and identifying areas which need improvement. The self assessment program was considered a strength.

## REPORT DETAILS

1. Persons Contacted

   Licensee Employees

   D. Benson, Manager, Nuclear Engineering
   Δ#*W. Benthall, Supervisor, Licensing
   Δ*R. Bilyeu, Licensing Engineer
   #J. Erb, System Engineer, Nuclear Analysis
   A. Fletcher, Assistant Superintendent, Station Engineering
   B. Foster, Supervisor, Mechanical Design, Station Engineering
   *E. Grecheck, Manager, ISI/NDE and Engineering Programs
   Δ*D. Hart, Supervisor, Quality (Audits)
   #*M. Kansler, Station Manager
   P. Knutsen, Supervisor, Nuclear Engineering Programs
   Δ#R. McManus, Nuclear Specialist
   *F. Moore, Vice President, Nuclear Engineering Services
   *R. Morgan, Staff Quality Specialist
   #J. O'Hanlon, Vice President, Nuclear Operations
   Δ#J. Price, Assistant Station Manager, Nuclear Safety and Licensing
   B. Rodill, Senior Staff Engineer, Nuclear Engineering Program
   K. Sawyer, Design Control Engineer, Station Engineering
   #P. Skopic, Staff Engineer, Station Engineering
   Δ#T. Sowers, Superintendent, Station Engineering
   #D. Sommers, Supervisor, Surry Corporate Licensing
   B. Stanley, Supervisor, Systems Engineering (Primary), Station Engineering
   R. Tolbert, Design Control Engineer, Station Engineering
   E. Turko, Supervisor, Testing, Station Engineering
   M. Whitt, Supervisor, Civil Design and Drawing Update, Station Engineering

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

   Other Organizations

   P. Liakos, Engineer, Stone and Webster Engineering Corporation

   NRC Personnel

   #B. Buckley, Licensing Project Manager, NRC/NRR
   #P. Fredrickson, Chief, Projects Section 2A, NRC/Region II
   #E. Merschoff, Deputy Director, Division of Reactor Safety, NRC/Region II
   #F. Orr, Engineer, Reactor Systems Branch, NRC/NRR
   #F. Jape, Chief, Test Programs Section, NRC/Region II

NRC Resident Inspectors

#M. Branch, Senior Resident Inspector
J. York, Resident Inspector

*Attended exit interview on February 28, 1992
#Participated in conference call on March 18, 1992
ΔAttended exit interview on March 19, 1992

2. Design, Design Changes and Modifications (37700)

The inspectors reviewed the design change packages (DCPs) and engineering work requests (EWRs) listed below to determine the adequacy of the evaluations performed to meet 10 CFR 50.59 requirements; verify that the design changes were prepared and installed in accordance with licensee administrative procedures and applicable industry codes and standards; verify that changes were reviewed and approved in accordance with administrative controls; verify that applicable operating documents were revised to reflect the subject design changes; and verify that post modification test requirements were adequately specified. The following modifications were reviewed.

a. DCP 91-031, Flood Mitigating Modifications (Units 1 and 2)

This modification involved installation of flow limiting spray shields on the expansion joints down stream of the motor operated isolation valves that supply service water to the bearing and component cooling heat exchangers. The licensee's corporate Nuclear Analysis and Fuels group performed an independent plant examination (IPE) for Surry. The IPE analysis concluded that the expansion joints were vulnerable to a rupture resulting from a valve closure induced water hammer. This design change decreases the vulnerability of Surry Units 1 and 2 to a flooding event.

b. DCP 88-10, Regulatory Guide 1.97 Additions

During review of this DCP the inspectors noted that one of the field changes (field change 5) essentially changed the entire DCP due to problems identified in the field with running cables through fire walls and other obstructions. The inspectors questioned whether an adequate field walkdown had been done prior to preparing the DCP. It appeared that some of the problems encountered could have been avoided if an adequate walkdown had been done prior to DCP preparation.

c. DCP 87-31, Letdown Isolation Valve Replacement

During review of this DCP the inspectors noted some administrative discrepancies. The modification was implemented and the system placed into service before the applicable document reviews were completed. In addition, the items identified on the QA punch list were not cleared in a timely fashion.

d. EWR 90-212, Containment Ventilation (Units 1 and 2)

This EWR involved various repairs made to the containment air cooling system. Other repairs have been made to the system since 1988 under other EWRs. Implementation of EWR 90-212 in conjunction with work done in accordance with EWR 89-768 will attempt to bring the system to full design operating effectiveness. EWR 90-212 is being implemented over several refueling outages. Since this modification was being implemented over several outages the inspectors verified that the licensee had evaluated the work scope and provided pre-determined stopping points which allow for system operation when Units 1 and 2 are operating and for continuation of work during future outages.

e. EWR 91-080, Charging Pump Lubrication Oil (LO) System Piping Replacement (Units 1 and 2)

This EWR involved replacing the charging pump LO system carbon steel piping and threaded fittings with stainless steel tubing and swagelok fittings. Maintenance foot rests were also being installed to protect the LO tubing during pump maintenance activities. The EWR stated that experience had shown that the threaded fittings developed leaks due to vibration and alignment of the piping to the speed increaser gear after pump maintenance. The leakage of LO from the charging pump LO system had become a maintenance, safety, and ALARA concern.

During review of this EWR, the inspectors noted that the EWR was being implemented for charging pump 1-CH-P-1A. The inspectors noted that several problems had been encountered during implementation which resulted in deviation reports. Licensee actions to address the problems appeared to be adequate.

During review of the modifications discussed above the inspectors verified that selected design inputs were considered and adequately addressed in the applicable modification packages. These included but were not limited to seismic, Appendix R requirements, electrical load change review, piping stress analysis, temperature and pressure requirements, etc.

The inspectors noted minor administrative discrepancies during review of the modifications. However, none of the discrepancies affected the technical content of the modifications. During discussions with corporate and site engineering management, the inspectors discussed the discrepancies. Engineering management acknowledged the discrepancies and stated that the new station administrative procedure VPAP-0301, Design Change Process, will address these discrepancies as well as others identified during performance of the self assessments. A draft of the procedure was in the review and approval cycle. Violations or deviations were not identified in the areas inspected.

3. Engineering and Technical Support

The inspectors reviewed various activities of Station Engineering in an effort to assess the timeliness and effectiveness of the support provided to the plant operations and maintenance staffs for day-to-day plant activities. These activities included involvement in deviation reports (DRs), minor modifications (EWRs), work prioritization, and self assessments.

The inspectors concluded from reviewing these activities that, in general, Station Engineering provides timely and effective support. There were examples where the support was considered very good and there were examples where the support was considered less than adequate. Some of these examples will be discussed in greater detail.

a. Problem Identification and Resolution

The inspectors assessed Engineering and Technical Support involvement in problem identification and resolution activities. Involvement was assessed by review of DR and Potential Problem Report (PPR) programs, and trending activities associated with DR's. Deficiency reporting documentation assigned to engineering was reviewed as far back as January 1991. Resolution of identified deficiencies was generally adequate.

Deviation Reports

The latest deviation trend report available for inspection was for the third quarter of 1991. From this report it was noted that a maximum of 1172 open DR's existed in November 1990, and that number was reduced to 215 by August 1991 (the last month covered by this report). The number of backlog DR's, defined as DR's open greater than 60 days, was reduced from a peak of 1055 in November 1990 to 96 in August 1991. Four-hundred and three routine DR's were generated during the third quarter of 1991, of which 115 were assigned to engineering. The trending data indicates that adequate attention was being given to DR's and that a good effort has been made to reduce the high number of open and backlog DR's that were seen at the end of 1990. Several DR's were selected by the inspectors for review which demonstrated engineering involvement in problem identification and resolution.

Deviation Report S-91-0748 was generated by Quality Assurance (QA) because of a failure to update drawings on Unit 2 which required changes after major modifications had been made to cables in the area of the reactor vessel head. Engineering reviewed this problem and agreed to revise the drawings prior to the next Unit 2 refueling outage.

Deviation Report S-91-1536 concerned the Unit 1 emergency service water (ESW) pump (1-SW-P-1A) modifications and return to service. In this case the ESW pump was replaced by maintenance under a maintenance work request with a non-identical pump. This created the need to perform modifications to the new pump which were not anticipated. Due to time constraints and miscommunications the modifications were started prior to an Engineering Work Request being issued. Also the pump was returned to service before a Technical Review was performed. During discussions with station engineering personnel, the inspectors were told that engineering became aware that an EWR was needed to implement the modification after maintenance had started to replace the pump and found that the pump was not a like-for-like replacement. Engineering further stated that, although the EWR was not issued before the work was started, and the pump was returned to service before the technical review was performed, the work scope was reviewed and approved by the Station Nuclear Safety Operating Committee before the pump was returned to service. The Engineering response to this DR was generally adequate and complete, once they were assigned the DR and became aware of the problem. Additional input from Maintenance was still pending.

Deviation report S-91-0787 was written as a result of a failure on April 18, 1991 of 2-PT-18.3D "Refueling Test of the Low Head S.I. Check Valves to the Cold Legs" Rev. 1. During the test the Unit 2 low pressure safety injection pump did not achieve the required 3400 GPM for the low head injection flow (LHSI).

The primary purpose of the test was to assure check valve operability in the cold legs. The deviation was forwarded to corporate engineering and a response was received which said that 3250 GPM was acceptable. The deviation report was closed based on this response.

The inspectors reviewed previous periodic tests and noticed that inconsistencies existed in at least one case where flow increased when the RWST level decreased. This was contrary to the expected decrease in flow as a result of the reduced RWST level.

The inspectors questioned both the fact that instrument error had not been used to correct flow and the bases for changing the acceptance criteria from 3400 to 3250 GPM.

The inspectors requested calculations to show what flow rates had been used for the ECCS analysis. The licensee forwarded a response to the inspectors' concerns after engineering had reviewed the LHSI pump test data. The licensee restated the fact that the surveillance test was not an ISI pump test designed to ASME Section XI standards to monitor pump or system performance. The inconsistencies in flow measurements were attributed to several factors which were not apparent in the test. Specifically, the test did not record cavity level during the SI injection phase and although level was monitored during the injection phase, these data were not used to adjust the recorded SI injection flow rates. These data were also recorded from the control room vertical board flow indicator which is marked in 100 GPM graduations. The recorded data did not account for the recirculation flow. Licensee engineering reexamined the recorded data and forwarded it to the corporate engineering staff who stated that the value of LHSI flow is expected to meet the 10 CFR 50.46 peak clad temperature limit.

The licensee responded that the reduction in flow rate from 3400 to 3250 GPM was acceptable because the UFSAR defines the flow rate as 3250 GPM with a head of 225 feet.

The inspectors contacted the licensee by phone after reviewing the response and were told that deviation report S-92-0371 was written on March 6, 1992 stating that the test did not demonstrate the flow required by the Nuclear Safety Analysis Group in their May 10, 1991 memo. Actual test results were inconclusive in providing valid SI injection flow to the cold legs but that the minimum estimated flow based on 2-PT-18.3D test results is greater than the value of LHSI injected flow that is needed to meet the 10 CFR 50.46 peak clad temperature limit.

The licensee performed a test on March 17, 1992 with a revised version of 1-PT-18.3D. The acceptance criteria in this test was based on a letter from corporate mechanical engineering to the systems engineer. The letter stated that the LHSI flow rates used in the current LOCA analysis came from a Stone and Webster calculation which does not consider recirculation in the LHSI flow model. Mechanical Engineering used the flow model equations from the Stone and Webster calculations to determine the required LHSI flow rates for the RWST and RCS conditions for level in the RWST between 22 percent and 80 percent and pressurizer level less than or equal to 80 percent.

Mechanical Engineering calculations showed that the cavitating venturis control the LHSI flow rate. A graph of required flow versus RWST level was provided with the letter and was used as the acceptance criteria for the test. When instrument error of 1.8 percent was taken into account the flows did not meet the acceptance criteria for the test. The measured flows for 1-SI-P-1A at 46 percent in the RWST was 3165 GPM and the flow for 1-SI-P-1B at 50 percent in the RWST was 3181 GPM. The licensee then assumed a 1.8 percent instrument error which caused the flows to fall below the acceptance criteria.

A conference call was held on March 18, 1992, between the licensee and NRC management to discuss operability of Unit 2 LHSI pumps. The licensee indicated that they had performed sensitivity studies which indicated that the fuel temperature would increase approximately ten degrees F as a result of the reduced flow. Licensee personnel stated that, although calculations showed that the fuel temperature would increase due to the lower LHSI flow, there was still adequate margin below the 10 CFR 50.46 peak clad temperature value of 2200 degrees F. This would add to the allowable stackup of 50 degrees F before making a 30 day report. The licensee has not reached the reporting level.

The inspectors also reviewed the results of the Utah Research Laboratory tests done on the cavitating venturies and noted that the actual flow through the venturi was between four percent and six percent lower than that indicated by the manufacturer. The original testing done on the installed venturis was not available for review but a Stone and Webster letter indicated that there was a 5.5 percent overflow on the installed test. The licensee is presently reviewing all documentation and will prepare a letter with their final position.

Potential Problem Reporting (PPR) System

The inspectors held discussions with licensee corporate engineering personnel concerning the PPR System. PPRs are handled in accordance with Nuclear Design Control Manual (NDCM) Procedure 6.1, Problem Reporting System.

The PPR System is not a corrective action or commitment tracking system. It is intended to provide a means to analyze and review complex technical concerns that may be possible station deviation reports. Corrective actions and commitment tracking are handled by other programs.

The inspectors reviewed documentation relative to PPRs for 1990, 1991, and 1992. Licensee records showed that there were 41 PPRs initiated in 1990, with 11 PPRs resulting in deviation reports. There were 53 PPRs initiated in 1991, with 11 resulting in deviation reports. To date in 1992 there have been six PPRs, with two resulting in deviation reports. There were two PPRs (91-032 and 92-004) which required modification work to resolve the concern. All of the PPRs initiated in 1990-1992 have been closed except for three, which are currently being worked.

Current Transformer Replacement

During this inspection the inspectors observed licensee efforts to resolve a problem that developed in the electrical power system. An oil leak developed on the current transformer for "Phase C" of the number one switchyard station service transformer in Surry's 34.5kV distribution system which supplies Bus number 5. Licensee personnel concluded that the continuing oil leak would eventually lead to failure of the current transformer and the potential loss of the number 5 Bus. Bus number 5 powers reserve station service transformers A and B which supply Unit 1 and Unit 2 4160 V emergency buses 1J and 2H respectively.

The inspectors noted site engineering's immediate involvement in the efforts to resolve this problem as they evaluated the safety implications of various options discussed for replacing the leaking transformer. Once the appropriate option was decided on, engineering was also actively involved in developing the justification and compensatory measures for replacement of the transformer. The NRC verbally granted the licensee a temporary waiver of compliance from Technical Specifications 3.0.1. time requirements to allow replacement of the current transformer. However, because the work was thoroughly planned and scoped, minimal time was used for the work. The licensee did not need the waiver because the transformer was replaced within the Technical Specification 3.0.1 time frame. This issue is discussed in greater detail in NRC Inspection Report 50-280,281/92-04.

During licensee efforts to resolve this issue the inspectors noted that engineering's interface and communication with the various station groups involved in trying to resolve this issue was good. The inspectors considered this to be a good example of engineering providing effective and timely support to the plant to resolve a problem.

b. Work Prioritization

Station Engineering has developed procedure SSES-2.09, Controlling Procedure for Prioritizing Site Engineering Work. The purpose of the procedure is to establish requirements and guidelines for prioritizing design change work assigned to Nuclear Engineering Services (NES) groups at Surry Power Station.

The priority evaluation process utilizes six categories that are considered when assessing an EWR request. Design Control Engineering is responsible for ensuring that a completed EWR request evaluation form is attached to all EWR requests prior to submission to the Modification Management Review Team. The six categories that are utilized are regulatory, nuclear safety, personnel safety, unit capacity/availability, operational improvement, and emergency. A weight factor or category multiplier is used to denote the relative importance of one category to the others.

The inspectors noted that Station Engineering is in the process of reviewing the backlog of EWRs and DCPs and prioritizing the items in accordance with procedure SSES-2.09. The number of EWRs and DCPs in the backlog is nearly 550. Licensee personnel stated that the review and prioritization is scheduled to be completed by June 1992. Engineering personnel stated that they plan to apply the prioritization process to other work activities assigned to Station Engineering. The inspectors considered the licensee's efforts to review and prioritize DCPs and EWRs (including all those that are contained in the backlog) as a positive action by the licensee to ensure that modifications were being implemented appropriately.

c. Self Assessments and QA Audits

Licensee management has been active in their efforts to enhance engineering support by performing assessments of selected engineering activities and identifying areas which need improvement. Licensee management decided which activities received an assessment. The assessments were performed by teams which consisted of quality assurance and engineering personnel. The inspectors reviewed assessments performed for activities involving engineering change control, environmental qualification program, post modification testing, and a maintenance follow-up assessment. The assessments were thorough and detailed and identified areas of strength and weakness. The inspectors held discussions with corporate and site engineering management concerning actions which have been taken or proposed to address the findings identified in the applicable assessments.

In addition to reviewing the assessments and associated corrective actions, the inspectors also reviewed actions taken by engineering to address findings identified in site QA audit S-90-12. This audit reviewed the design control program. Discussions with QA audit personnel and review of QA followup documentation indicated that engineering provided a good response and corrective actions to the QA findings.

During review of this area and discussions with engineering management, the inspectors noted that engineering management was actively involved and supportive of the self assessment efforts. The inspectors consider corporate and site engineering's role in the self assessment program to be a positive indication of the licensee's commitment to provide quality and timely engineering support to the plant. The licensee's self assessment program was considered to be a strength.

4. Exit Interview

The inspection scope and results were summarized on February 28 and March 19, 1992, with those persons indicated in paragraph 1. The inspectors 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.

A conference call was held on March 18, 1992 between NRC (Region II and NRR) management and Virginia Power management to discuss questions concerning operability of the Unit 2 low head safety injection pumps after the Unit 1 pumps were tested and did not meet the design basis flow rate of 3250 GPM stated in the UFSAR. The questions raised by the NRC were resolved during the telephone conference call.

5. Acronyms and Initialisms

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| ALARA | As Low As Reasonably Achievable |
| ASME | American Society of Mechanical Engineers |
| CFR | Code of Federal Regulations |
| DCP | Design Change Package |
| DR | Deviation Report |
| ECCS | Emergency Core Cooling System |
| ESW | Emergency Service Water |
| EWR | Engineering Work Request |
| F | Fahrenheit |
| GPM | Gallons Per Minute |
| IPE | Independent Plant Examination |
| ISI | Inservice Inspection |
| kV | kilo Volts |
| LHSI | Low Head Safety Injection |
| LO | Lubricating Oil |
| LOCA | Loss of Coolant Accident |
| NDCM | Nuclear Design Control Manual |
| NES | Nuclear Engineering Services |
| NRC | Nuclear Regulatory Commission |
| NRR | Office of Nuclear Reactor Regulation |
| PPR | Potential Problem Report |
| QA | Quality Assurance |
| RCS | Reactor Coolant System |
| RWST | Refueling Water Storage Tank |
| SI | Safety Injection |
| UFSAR | Updated Final Safety Analysis Report |
| V | Volts |
| VPAP | Virginia Power Administrative Procedure |