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

JUN 28 1988

Report Nos.: 50-280/88-16 and 50-281/88-16

Licensee: Virginia Electric and Power Company
Richmond, VA 23261

Docket Nos.: 50-280 and 50-281 License Nos.: DPR-32 and DPR-37

Facility Name: Surry 1 and 2

Inspection Conducted: May 2-6, 1988

Inspector: C. H. Bassett for 6/8/88
Date Signed

Accompanying Personnel: R. B. Shortridge

Approved by: for C. M. Hosey, Section Chief 6/8/88
Division of Radiation Safety and Safeguards
Date Signed

SUMMARY

Scope: This routine, unannounced inspection was conducted in the area of the radiation protection aspects of the Unit 1 outage including: organization and management controls; training and qualifications; external exposure control and dosimetry; internal exposure control and assessment; control of radioactive materials and contamination, surveys and monitoring; the program to maintain exposure as low as reasonably achievable (ALARA) and followup on open items and IE Notices.

Results: Four violations were identified - 1) failure to provide radiation monitoring devices for entry into high radiation areas, 2) failure to perform adequate surveys to evaluate the extent of airborne radioactive material present, 3) failure to follow radiological procedures and 4) failure to adequately label containers/items of radioactive material.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

W. Cook, Operations Supervisor, Health Physics
D. Densmore, Assistant Supervisor, Health Physics
C. Early, ALARA Coordinator, Health Physics
C. Foltz, ALARA Coordinator, Health Physics
B. Garber, Technical Supervisor, Health Physics
*W. Grady, Supervisor, Non-Destructive Examination (NDE)
*E. Grecheck, Assistant Station Manager, Nuclear Safety and Licensing
*A. McNeil, Supervisor, Inservice Inspection and Testing
*G. Miller, Licensing Coordinator
*J. Price, Manager, Quality Assurance
*S. Sarver, Superintendent, Health Physics, Surry
*A. Stafford, Superintendent, Health Physics, North Anna
*D. Wagner, Lead ALARA Coordinator, Corporate

Other licensee employees contacted included engineers, technicians, mechanics, security force members, and office personnel.

Nuclear Regulatory Commission

*W. Holland, Senior Resident Inspector

*Attended exit interview

2. Exit Interview

The inspection scope and findings were summarized on May 6, 1988, with those persons indicated in Paragraph 1 above. The inspector described the areas inspected and discussed in detail the inspection findings including four apparent violations: 1) failure to provide radiation monitoring devices for entry into high radiation areas (Paragraph 4.C), 2) failure to perform adequate surveys to evaluate the extent of airborne radioactive material present (Paragraph 4.d), 3) failure to adhere to radiological control procedures (Paragraph 4.d), and 4) failure to adequately label containers/items of radioactive material (Paragraph 4.e). The inspector also discussed the licensee's program for developing and implementing revised health physics procedures.

No dissenting comments were received from the licensee. The licensee did not identify as proprietary any of the materials provided to or reviewed by the inspector during this inspection.

3. Licensee Action on Previous Enforcement Matters

This subject was not addressed in the inspection.

4. Occupational Exposure During Extended Outages

a. Organization and Management Controls (83722)

(1) Planning and Preparation

The present Health Physics (HP) organization, staffing levels and lines of authority as related to outage radiation protection activities were discussed with licensee representatives. The organizational responsibility and control of the contractor HP technicians used during the outage was also discussed. After training had been completed and verified, contractor HP technicians were integrated into the licensee's work force and were assigned jobs commensurate with their experience and qualifications. Licensee personnel were placed in supervisory roles over the contract foremen and technicians to assure compliance with established procedures and quality of work. A total of 82 contractor health physics technicians (HP techs) and 65 decontamination personnel (deconners) had been recruited for the outage.

(2) Health Physics Procedures

During the inspection, numerous licensee HP procedures were reviewed. The inspector noted several instances where there appeared to be inconsistencies or contradictions in the guidance or requirements in the procedures. These items were discussed with licensee representatives. The licensee indicated that they were aware of the apparent inadequacies of the HP procedures and had therefore established a program to upgrade and improve the procedures. The program to upgrade and improve procedures resulted from an outside review by two different contractors of the Station Health Physics Program in 1983. As a result of the contractors' evaluation, the licensee decided to revise HP procedures to improve the program and to have a corporate document to describe functions and responsibilities and define utility radiation protection policies. Therefore in 1984, the licensee drafted the Radiation Protection Plan (RPP). In August of 1984, a transition plan was issued by corporate HP that estabilshed a schedule for the development and implementation of station procedures that would reflect the policies and requirements in the RPP. The first transition plan called for implementation of 240 procedures, divided into 9 major groups, by 1985. The RPP was formally approved in April of 1985, by the Vice President of Nuclear Operations, and status report #2 of the transition plan indicated that the scheduled implementation of procedures would be complete in 1986.

The latest transition plan status report #14 estimated total plan implementation by 1989. While many of the procedues have been developed, only 2 of the 9 major groups of procedures have been implemented. The licensee's reasons for delays in full implementation of the HP procedures were that the approval process

required that both stations, Surry and North Anna, approve the procedures, the procedures receive Quality Assurance concurrence, and the station administrative procedures require that many of the HP procedure formats be restructured. The inspector informed the licensee that progress in development and implementation of the revised HP procedures would be an open item and would be reviewed during subsequent inspections (50-280, 281/88-16-01).

b. Training and Qualifications

Contractor Health Physics Technician Training

The licensee is required by 10 CFR 19.12 to provide radiation protection training to workers including contractors. Regulatory Guides 8.13, 8.27, and 8.29 outline topics that should be included in such training. Chapters 12 and 13 of the Final Safety Analysis Report (FSAR) also contain further commitments regarding training.

The inspector discussed training of contractor health physics technicians with the licensee's training staff. Contract health physics technicians receive approximately one week of training prior to assignment to in-plant radiological operations. To successfully complete the training phase they must score 70 or better on three tests. The first test is given on the first day of arrival to ascertain their knowledge of regulatory requirements. The test contains questions regarding Title 10, Code of Federal Regulations, Part 20, Standards for Protection Against Radiation. If the technicians successfully complete the test they attend two days of General Employee Training (GET) that includes a practical factors session where they must demonstrate their knowledge of elementary radiological techniques. Upon completion of GET, the contract technicians receive two days of site specific training that includes instruction on detection and handling hot particles. The site specific training is designed to ensure that the technicians, upon successful completion of the test, are thoroughly familiar with Surry radiological procedural requirements and radiological work practices. The inspector reviewed selected lesson plans and tests and determined that the level of difficulty was sufficient to make an adequate determination of the candidates' knowledge and ability in radiological protection commensurate with their duties. The contract technicians also must successfully pass 13 job performance measures to show their proficiency in standard duties that plant health physics technicians perform.

No violations or deviations were identified.

c. External Occupational Exposure Control and Dosimetry

(1) The licensee is required by 10 CFR 20.101, 20.102, 20.201(b), 20.202, 20.401 and 20.407 to maintain workers' doses below specified levels and to keep records of the exposure.

During tours of the Auxiliary Building and Unit 1 containment, the inspector observed the use of thermoluminescent dosimeters (TLDs) and self-reading dosimeters (SRDs). Individuals wearing protective clothing (PCs) routinely placed their TLD in a pocket on the inside of the PCs; while the SRD was placed in a plastic bag and worn outside the PCs so that radiation exposure could be monitored periodically. Extremity monitoring or multi-badging was also used in areas where large dose rate gradients existed or when individuals were required to work in close proximity to items with high radiation dose rate. The placement of such dosimetry was specified and supervised by Health Physics personnel and the dosimetry was typically worn in a whirl pack taped on the outside of the PCs.

The inspector reviewed the computer printout of personnel exposures generated for the station. One individual was noted to have exposure in excess of the station administrative control level of 750 millirem per quarter and that exposure had occurred during the first quarter of 1988. The licensee was still assessing exposure that occurred during that incident and further dose assignments will be forthcoming.

The inspector also reviewed selected exposure records of permanent station, as well as temporary contractor personnel and verified that a Form NRC-4 or equivalent was properly filed before an individual was authorized to exceed the 1.25 rem per quarter limit. No individuals had received exposures in excess of the 10 CFR 20.101(b) limits during the first quarter of 1988 or to date through the second quarter of 1988.

No violations or deviations were identified.

(2) Control of Radiation Areas, Posting and Labeling

10 CFR 20.203 specifies the posting, labeling and control requirements for radiation areas, high radiation areas, airborne radioactivity areas and radioactive materials.

During tours of the plant, the inspector reviewed the licensee's posting and control of radiation areas, high radiation areas, airborne radioactivity areas, contamination areas, and radioactive materials storage areas. The inspector performed independent radiation surveys throughout the facility using NRC equipment and verified that radiation fields measured were consistent with area postings.

No violations or deviations were identified.

(3) High Radiation Area Control

Technical Specification 6.4.B.1.e requires that any individual or group of individuals permitted to enter a high radiation area (in which the intensity of radiation is greater than 100 mR/hr but less than 1000 mR/hr) shall be provided with a radiation monitoring device which continuously indicates the radiation dose rate in the area.

Health Physics Procedure HP-2.13, Locked High Radiation Area Access Control, dated April 19, 1984, states in Section 2.1 that a dose rate meter is required for all entries into high radiation areas (i.e., greater than 100 mR/hr) and is required to be turned on continuously while in such areas.

Prior to each entry into Unit 1 containment, the inspector requested and was issued a radiation monitoring device by the licensee. The instrument was used to verify dose rates in various areas throughout containment and to enter high radiation areas. During tours on May 3 and May 4, 1988, the inspector entered the high radiation area (HRA) on the 18 foot elevation in the "C" Reactor Coolant Pump (RCP) cubicle and on the -27 foot elevation which included the entire lower level of containment. Generally occupied areas in these HRAs had dose rates that varied from 10-40 mR/hr and work area general dose rates that varied from 10-600 mR/hr.

On the morning of May 4, 1988, at approximately 10:30 a.m. two workers were observed entering the -27 foot elevation from the elevator and crossing the barrier posted as a high radiation area. The workers were not carrying a dose rate meter but reported to a contract HP technician assigned to that elevation. When questioned about this practice, the HP technician indicated that it was standard practice for people entering containment on the 47 foot elevation to check with HP there and the HP technician would then call the HP rover on the elevation the workers were assigned to work on. The workers were then allowed to go to the -27 foot elevation by way of the elevator or the stairs and enter the HRA without having a radiation monitoring device as long as they reported to the HP rover upon initial entry.

The inspector discussed this practice with the licensee representatives and was informed that this was not station policy. The licensee indicated that every individual or group was to have a monitoring device in their possession to enter a HRA. During the afternoon of May 4, 1988, between approximately 4:00 and 6:00 p.m. two other groups of individuals were observed entering the HRA on the -27 foot elevation, one group from the elevator and one group from the stairway. No one in either group had a dose rate meter but both groups did report to the HP rover for the -27 foot elevation prior to starting work.

Failure to provide each individual or groups of individuals permitted to enter a high radiation area with a radiation monitoring device was identified as an apparent violation of Technical Specification 6.4.B.1.e (50-280, 281/88-16-02).

d. Internal Exposure Control and Assessment

(1) Engineering Controls

10 CFR 20.103(b)(1) requires that the licensee use process or other engineering controls to the extent practicable to limit concentrations of radioactive materials in the air to levels below those which delimit an airborne radioactivity as defined in 20.103(d)(1)(ii).

The Surry Respiratory Protection Manual Policy Letter requires that, to meet the primary objective of limiting the inhalation of airborne radioactivity, station management must ensure that available engineering controls are being utilized to the fullest extent possible.

During tours of the Fuel Handling Building, the use of engineering controls in the form of two large tents constructed to facilitate work on two reactor coolant pumps was observed. The tents were equipped with ventilation ducting and associated high efficiency particulate air (HEPA) filters to limit spread of contamination and reduce airborne radioactivity. However, the use of engineering controls in other areas of the station, including Unit 1 containment, with general area contamination levels from 5,000 to 200,000 disintegrations per minute per 100 square centimeters (dpm/100 cm^2), was not as apparent and the extensive use of respiratory protection was noted inside containment. The inspector observed many jobs which involved welding, grinding or drilling on what was reported to be "clean" areas or items by the HP techs covering the work. The workers, however, were still required to wear respiratory protection. Reasons given for using respirators during work on "clean" items or in clean areas included: 1) the workers "liked" to wear respirators, 2) the HP techs required them because the workers were using contaminated equipment, i.e., drills, grinders and so forth, and 3) the workers felt that wearing a respirator would help prevent a skin contamination event.

In discussions with the licensee, the use of engineering controls and respiratory protection, as well as the contamination levels inside Unit 1 containment, was addressed. The licensee indicated that engineering controls in the form of decontamination of work areas had been used prior to allowing jobs to be worked. It was also noted that, although the use of respirators in areas or on systems that were "clean" was a very conservative practice, it was preferable to not requiring it.

The inspector noted that there was possibly a more basic problem of high general area contamination levels which would lead to this conservatism, even after local, work area decontamination had been performed. Licensee representatives indicated that they were cognizant of that possibility and were considering an extensive decontamination of the entire Unit 1 containment to reduce contamination levels, as well as help prevent or limit the number of personnel contamination events.

No violations or deviations were identified.

(2) Air Sampling

The licensee is required by 10 CFR 20.201(b) to make or cause to be made such surveys as (1) may be necessary to comply with the regulations and (2) are reasonable under the circumstances to evaluate the extent of radiation hazards that may be present.

10 CFR 20.103 establishes the limits for exposure of individuals to concentrations of radioactive materials in air in restricted areas. Section 20.103 also requires that suitable measurements of concentrations of radioactive material in air be performed to detect and evaluate the airborne radioactivity in restricted areas and that appropriate bioassays be performed to detect and assess individual intakes of radioactivity.

Health Physics Procedure HP-3.3.2, Health Physics Survey - Airborne Radioactivity, dated November 20, 1984, requires in Section 3.1.4 that all air samples taken to assess airborne hazards to personnel be collected as near the anticipated breathing zones as possible.

Health Physics Procedure HP-3.7.2, Health Physics Survey - Station, dated November 5, 1985, requires in Section 3.4.2 that general area grab samples be representative of the worker's breathing zone.

During tours of the Unit 1 Containment on May 3, 1988, the inspector observed HP techs taking air samples in support of various jobs in progress. In three instances, it was noted that, the air sample being taken was not representative of the workers breathing zone. An air sample taken in the area of the "A" Recirculation Spray Heat Exchanger on the -27 foot elevation in support of flapping operations on the inlet pipe under Radiation Work Permit (RWP) 88-1298, was taken in an area approximately 15 feet from the worker, at knee level. Another air sample taken in the Pressurizer Cubicle on the 18 foot elevation to support grinding operations under RWP 88-1306, was taken at the airborne radioactivity barrier approximately 10 feet from the workers and was taken as the job was terminated. Another air sample was taken in an area near the grinnel valves

on the -27 foot elevation under RWP 88-1441, and approximately seven feet away from the workers replacing valve diaphragms. Failure to evaluate adequately the radiation hazards that may have been present was identified as an apparent violation of 10 CFR 20.201(b) (50-280,281/88-16-03).

(3) Area Posting

Technical Specification 6.4.D requires that radiation control procedures be followed.

Health Physics Procedure H.P.3.7.1, Radiological Area Designation, Posting and Control, dated November 5, 1985, requires in Section 4.2.8.3.C that areas be posted "Respiratory Protection Required for Entry" when respirators are required by Health Physics and/or by the Radiation Work Permit.

While observing jobs in progress inside Unit 1 containment on May 3, 1988, the inspector observed workers on the 47 foot elevation of Unit 1 containment removing highly contaminated scaffolding (greater than 100,000 dpm/100cm^2) from a storage van container while wearing respiratory protection. The workers were inside an area posted "Respiratory Protection Required for Entry," and were transferring the scaffolding to workers on the -27 foot elevation. The workers on the lower level were also wearing respiratory protection but the area was not barricaded or posted as respiratory protection required and people not in respirators passed near by or through the area during the operation.

During work on the Recirculation Spray Heat Exchanger on the -27 foot elevation on May 3, 1988, the inspector observed an individual lapping the contaminated inlet pipe of the heat exchanger with pre-work contamination levels of 5,000 to 200,000 dpm/100 cm^2. The individual was required to wear a respirator but the area was not barricaded or posted "Respiratory Protection Required for Entry." The HP tech covering the work indicated that the lapping work was being done on a decontaminated area of the pipe but did not indicate the reason for the lack of a barrier or posting. Failure to post areas where respiratory protection was required to be worn with the precautionary sign indicating "Respiratory Protection Required for Entry" was identified as an apparent violation of Technical Specification 6.4 (50-280,281/88-16-04).

e. Control of Radioactive Material and Contamination, Surveys, and Monitoring

The licensee is required by 10 CFR 20.201(b), 20.401, 20.403 to perform surveys and to maintain records of such surveys necessary to

show compliance with regulatory limits. Survey methods and instrumentation are outlined in the FSAR, Chapter 12.

(1) Contamination Surveys

While touring the facility, the inspector observed workers exiting the radiation control area (RCA) and the movement of material from the RCA to clean areas to determine if adequate surveys were being performed by workers and if adequate direct and smearable contamination surveys were performed on materials. All personnel and material surveys appeared to be adequate. The inspector also reviewed records of personnel contamination events for the current outage. During the first week of the outage the number of personnel contaminations was from two to nine per day. As the work scope increased and more personnel became involved in the outage, the number of contamination events rose to a maximum of 21 in one day. In an effort to reduce the number of personnel contaminations, the licensee stopped all work briefly to assess the problem. A major decontamination effort was initiated in the work areas and workers were required to wear paper coveralls and extra paper booties in addition to their regular protective clothing. These measures reduced the number of contamination events to the number experienced prior to the work scope increase.

(2) Survey Results

During plant tours, the inspector examined radiation level and contamination survey results posted outside selected areas and rooms. The inspector performed independent radiation level surveys of selected areas using NRC equipment and compared them with licensee survey results. The inspector also examined licensee radiation protection instrumentation and verified that the calibration stickers were current.

(3) 10 CFR 20.203(f)(1) requires that each container of licensed material shall bear durable, clearly visible label identifying the radioactive contents. (2) States that a label shall bear the radiation caution symbol and the words "CAUTION, RADIOACTIVE MATERIAL" and that it shall provide sufficient information (such as radiation levels) to permit individuals handling or using the containers, or working in the vicinity thereof, to take precautions to avoid or minimize exposures.

Health Physics Procedure HP-2.3, Contaminated Equipment and Component Control, dated February 2, 1987, requires in Section B.3 that all unattended radioactive material within the Restricted Controlled Area shall have as a minimum, the words "CAUTION, RADIOACTIVE MATERIAL" accompanied by a radiation symbol and the highest dose rate mR/hr affixed in a readily visible location.

During tours of the yard area surrounding the reactor, auxiliary and fuel handling buildings, the inspector observed the posting and control of radiation and radioactive material areas and the labeling of radioactive material stored in these areas. In one large radioactive material area the licensee had stored numerous B-25 metal boxes containing radioactive material, typically waste. It was noted that several of the B-25 boxes had been recently filled with waste from the current outage as indicated by writing on red duct tape on the boxes and, at least two of the B-25 metal boxes had been stored in the area during day shift, on May 3, 1988. The inspector noted that these two boxes, one of which had a radiation level of 48 millirem per hour (mr/hr) at contact and 5 mr/hr at 18 inches, had no label bearing the radiation caution symbol nor the words, "CAUTION, RADIOACTIVE MATERIAL." It was further noted that the writing on the red duct tape affixed to the boxes bore the current date, indicated that radioactive waste was contained therein and that the contamination levels were less than 1000 disintegrations per minute per 100 square centimeters (1000 dpm/100cm^2) on the exterior but there were no radiation levels given. When the licensee was notified, the boxes were immediately surveyed and proper labeling was applied to each box along with the radiation levels.

The inspector also noted a Containment Airlock, refurbished reactor coolant pump, and three other B-25 boxes that did not have radiation levels indicated on the labels. The items were located within posted radioactive material areas. The airlock was located near the Unit 1 containment equipment hatch. The refurbished RCP was located on a flatbed, low-boy trailer near the east roll-up door of the Fuel Handling Building and the three B-25 boxes were located near the main entrance/exit to the yard area from the Personnel Decontamination Area (PDA). The boxes and the other two items had labels affixed on the exterior surface which bore the radiation caution symbol and the proper precautionary words but none of the labels indicated radiation levels.

Failure to provide sufficient information on a label in a clearly visible location in order to identify the radioactive contents of containers/items was identified as an apparent violation of 10 CFR 20.203(f) (50-280,281/88-16-05).

f. Program for Maintaining Exposures As Low As Reasonably Achievable (ALARA)

10 CFR 20.1(c) states that persons engaged in activities under licenses issued by the NRC should make every reasonable effort to maintain radiation exposure ALARA. The recommended elements of an ALARA program are contained in Regulatory Guide 8.8, Information Relevant to Ensuring that Occupational Radiation Exposure at Nuclear

Stations will be ALARA, and 8.10 Operating Philosophy for Maintaining Occupational Radiation Exposures ALARA.

The inspector discussed the ALARA Program with licensee representatives. The collective radiation exposure goal for 1988, which included two scheduled refueling outages, was 1,421 man-rem. The refueling outage goal for Unit 1 (11.795 man-rem per day for 55 days) was 648.725 man-rem. However, during the inspection, the schedule was increased to 62 days and the man-rem goal per outage day projection was adjusted to 9.413. On May 5, 1988, day 25 of the outage, the average daily collective exposure expended was 6.291 man-rem and the performance was 66 percent of the projected collective exposure.

Outage activities have been divided into: 1) replacement of four recirculation spray heat exchangers, 2) eddy current testing of 900 steam generator tubes and 3) normal refueling activities. A significant number of outage tasks were to be performed by a major nuclear steam system supplier as part of an integrated servicing program for the utility. To reduce exposure to the maximum extent possible both the vendor and licensee performed ALARA Reviews on jobs greater than one man-rem using the same historical data, when available. The licensee then placed a reduction factor of 15 percent on the tasks to represent their committed annual exposure reduction. This number and the man-rem resulting from the vendor ALARA reviews were compared and the lowest estimate was chosen. The projected man-rem for collective exposure for the job was factored into the service contract as an incentive for exposure reduction performance. As an example, five major tasks were reviewed for exposure reduction: refueling operations, primary steam generator work, secondary steam generator work, reactor coolant pump work, and miscellaneous work tours. The vendor estimated 109.887 man-rem for the tasks. The licensee estimated 63.428 man-rem which was the man-rem projection placed in the contract.

In mid-April of this year NRC region and headquarters based personnel performed an assessment of Surry's ALARA program. One result of the assessment was a finding concerning Surry's primary method of managing exposure by goals. Prior to this outage Surry's Department managers relied on a collective exposure goal based on a daily average man-rem acquired in previous outages to manage personnel radiation exposure. The daily exposure for outage or non-outage days was based on the average exposure from preceding years divided by the number of scheduled outage and non-outage days for that year.

Previously the daily man-rem goal had been exceeded so frequently that the goal became an ineffective management tool. Starting with this outage a daily health physics status report was implemented. The report gives the status of jobs relative to the projected man-rem provided by job-specific ALARA reviews. Problems and methods to achieve ALARA for the job are discussed by management and supervision

at the plan of the day meeting. The method of managing exposure by specific job in lieu of by daily goal appears to have increased the awareness and participation of station management and supervision in exposure reduction.

During the inspection, the inspector observed the unloading and staging of contaminated scaffolding to support outage operations. A storage van with highly contaminated scaffolding was unloaded at the equipment hatch and the scaffolding was then transferred by crane to the -27 foot elevation for decontamination. Initial decontamination of the scaffolding was performed in a high radiation area. Based on comments by the inspector, decontamination was secured and later performed in a radiation area of 30 to 40 mR/hr. This operation was discussed with health physics and pointed out to station management as a poor radiological work practice and not ALARA. The licensee acknowledged this as a poor practice and indicated that better planning would have prevented it.

No violations or deviations were identified.

5. Licensee Actions On Previously Identified Inspection Findings (92701)

(Closed) Inspector Followup item (IFI) 280/87-35-04, Review License Procedures for Dropped, Offscale and Lost Self-Reading Dosimeters

The inspector verified that a procedure had been written and implemented covering SRDs that had been dropped, were offscale or had been lost. The procedure was implemented April 30, 1988.

6. Followup On IE Information Notice (92717)

The inspector determined that the following Information Notices had been received by the licensee, reviewed for applicability, distributed to appropriate personnel and that action, as appropriate, was taken or scheduled.

IEN 87-19: Perforation and Cracking of Rod Cluster Control Assemblies (Specifically for all Westinghouse PWRs)

IEN 87-28: Air Systems Problems at U.S. Light Water Reactors

IEN 87-31: Blocking, Bracing and Securing of Radioactive Materials Packages in Transportation

IEN 87-39: Control of Hot Particle Contamination at Nuclear Power Plans

IEN 87-44: Thimble Tube Thinning in Westinghouse Reactors (For PWRs with Westinghouse nuclear steam supply system (NSSS))

IEN 87-46: Undetected Loss of Reactor Coolant (For all PWRs)

IEN 88-08: Chemical Reactions with Radioactive Waste Solidification Agents