May 8, 2006

Mr. Christopher M. Crane
President and Chief Nuclear Officer
Exelon Nuclear
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: CLINTON POWER STATION
NRC INTEGRATED INSPECTION REPORT 05000461/2006002

Dear Mr. Crane:

On March 31, 2006, the U.S. Nuclear Regulatory Commission (NRC) completed an integrated inspection at your Clinton Power Station. The enclosed report documents the inspection findings which were discussed on April 13, 2006, with Mr. R. Bement and other members of your staff.

This inspection examined activities conducted under your license as they relate to safety and to compliance with the Commission's rules and regulations and with the conditions of your license. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

Based on the results of this inspection, three NRC-identified findings of very low safety significance (Green) were identified. Two of these findings involved violations of NRC requirements. However, because these findings were of very low safety significance and because these violations were entered into your corrective action program, the NRC is treating these issues as Non-Cited Violations (NCVs) consistent with Section VI.A of the NRC Enforcement Policy.

If you contest any NCV in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the US Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with a copy to the Regional Administrator, U.S. Nuclear Regulatory Commission - Region III, 2443 Warrenville Road, Suite 210, Lisle, IL 60532-4352; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; and the Resident Inspector Office at Clinton Power Station facility.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS), accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

Mark A. Ring, Chief
Branch 1
Division of Reactor Projects

Docket No. 50-461
License No. NPF-62

Enclosure: Inspection Report No. 05000461/2006002
w/Attachment: Supplemental Information

cc w/encl: Site Vice President - Clinton Power Station
Plant Manager - Clinton Power Station
Regulatory Assurance Manager - Clinton Power Station
Chief Operating Officer
Senior Vice President - Nuclear Services
Vice President - Operations Support
Vice President - Licensing and Regulatory Affairs
Manager Licensing - Clinton Power Station
Senior Counsel, Nuclear, Mid-West Regional Operating Group
Document Control Desk - Licensing
Assistant Attorney General
Illinois Emergency Management Agency
State Liaison Officer, State of Illinois
Chairman, Illinois Commerce Commission

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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket No:	50-461
License No:	NPF-62
Report No:	05000461/2006002
Licensee:	AmerGen Energy Company, LLC
Facility:	Clinton Power Station
Location:	Route 54 West Clinton, IL 61727
Dates:	January 1 through March 31, 2006
Inspectors:	B. C. Dickson, Senior Resident Inspector D. Tharp, Resident Inspector D. Melendez-Colon, Reactor Engineer M. Sheikh, Resident Inspector T. Bilik, Reactor Inspector W. Slawinski, Senior Radiation Specialist M. Jordan, Contract Reactor Inspector T. Ploski, Senior Emergency Preparedness Analyst D. Schrum, Reactor Inspector B. Metrow, Illinois Emergency Management Agency (IEMA) Inspector C. Matthews, Illinois Emergency Management Agency Inspector
Approved by:	Mark Ring, Chief Branch 1 Division of Reactor Projects

Enclosure

SUMMARY OF FINDINGS

IR 05000461/2006002; AmerGen Energy Company LLC, 01/01/2006-03/31/2006; Clinton Power Station; Permanent Plant Modifications, Surveillance Testing, and ALARA Planning and Controls.

This report covers a 3-month period of baseline resident inspection and announced baseline inspections on inservice inspection, radiation protection, heat sink performance, and emergency preparedness. The inspection was conducted by Region III inspectors and the resident inspectors. Three Green findings, two with associated Non-Cited Violations (NCVs) were identified. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP). Findings for which the SDP does not apply may be "Green" or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 3, dated July 2000.

A. Inspector-Identified and Self Revealing Findings

Cornerstone: Mitigating Systems

- Green. In February 2006, a finding of very low safety significance involving a Non-Cited Violation of 10 CFR 50, Appendix B, Criteria III, "Design Control," was identified. During a review of Engineering Change Package 356820, "Shutdown Cooling Header Leak-off line," the inspectors identified that the design change, as installed, would adversely impact the functionality of both the Division 2 residual heat removal system's water leg (keep-fill) pump and the C residual heat removal pump. This adverse condition would be caused by the introduction of high temperature water on the suction side of both pumps. The design change was being installed to prevent pressurization of the shutdown cooling header due to leakage through the reactor coolant system pressure isolation valves.

  This issue was more than minor because the finding affected the Mitigating Systems cornerstone objective of ensuring the availability of mitigating systems to prevent undesirable consequences (Design Control attributes). The finding was of very low safety significance because, with the expected operator actions, this condition would not result in a loss of operability. This conclusion was made based on the flow limiting characteristics of the leak-off line orifice with the suction cooling header volume at saturated conditions in conjunction with the subsequent operator alarm response requirements. Corrective actions by the licensee included procedure revisions and local monitoring of the C residual heat removal suction line temperature once the leak-off line was placed in service. (Section 1R17)

- Green. On February 2, 2006, the inspectors identified a finding involving a Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion XI, "Test Controls." During a review of the licensee's surveillance test to determine the operability of the shutdown service water system, the inspectors identified that the system's

leakage could exceed both the administrative and operability limits established by design basis documents, without the test detecting the actual leak rate. This condition was caused by an inadequate test connection.

This issue was more than minor because the finding affected the Mitigating Systems cornerstone objective of ensuring the availability of mitigating systems to prevent undesirable consequences. An adverse condition would have been masked by leakage that exceeded both administrative and operability limits, and would not have been identified under testing conditions mandated by the licensee's testing program. The finding was of very low safety significance because the actual measured leakage was well below the capability of accurately being measured, and this issue did not result in a system operability concern. As part of the corrective actions, the licensee planned to performed an extent of condition review to ensure that no other system leakage tests were affected by this issue. (Section 1R22)

Cornerstone: Occupational Radiation Safety

- Green. An inspector-identified finding of very low safety significance was identified for the failure to maintain the collective dose As-Low-As-Is-Reasonably-Achievable (ALARA) for refuel floor non-cavity work that was conducted during the February 2006 refueling outage. The additional, unintended dose was attributable to deficiencies in both work planning and work execution. The actual collective dose for this work activity was approximately 14 person-rem compared to the licensee's initial dose estimate of 4.4 person-rem. A revised dose estimate of about 7 person-rem was determined by the inspectors based on reasonably unexpected changes in radiological conditions and equipment problems. Consequently, the collective dose for this work exceeded 5 rem and exceeded the revised dose projection by more than 50 percent.

  The issue was more than minor because it was associated with the Program/Process (ALARA planning) attribute of the Occupational Radiation Safety cornerstone and affected the cornerstone objective to ensure adequate protection of worker health and safety from exposure to radiation. This issue represents a finding of very low safety significance because it involved ALARA planning; however, the Clinton plant's current 3-year rolling average collective dose does not exceed 240 person-rem. The licensee entered this radiological work planning/dose performance problem into its outage lessons learned database to allow the development of measures to better plan and execute refuel floor work during future refueling outages. (Section 2OS2.2)

B. Licensee-Identified Violations

No findings of significance were identified.

REPORT DETAILS

Summary of Plant Status

The plant was operating at 94 percent rated thermal power (maintaining 100 percent electrical output) at the beginning of the inspection period. On January 14, 2006, operators reduced power to 73 percent to perform post maintenance testing on the motor driven reactor feed pump. Following testing, plant operators returned reactor power to approximately 94 percent on January 15, 2006. On January 29, 2006, the plant was shutdown to begin a scheduled refueling outage. At the completion of the outage, operators started up the plant on February 25, 2006, and slowly increased reactor power until it reached 95 percent on March 3, 2006. Shortly after achieving full power on March 3, operators quickly reduced reactor power to about 25 percent in response to lowering main condenser vacuum. The loss of vacuum was due to overloading of the steam jet air ejector as a result of excessive condenser in-leakage through the condenser boot seal. Following repairs, operators restored reactor power to 95 percent on March 7, 2006. On March 9, 2006, power was reduced briefly to 79 percent for a control rod pattern adjustment and then returned to 95 percent. On March 13, 2006, operators reduced power to 87 percent at the request of the load dispatcher to help stabilize the grid following severe storms in the area. Later on March 13, the transmission operator requested a further reduction of power to 79 percent due to frequency concerns on the grid. Reactor power was returned to 95.9 percent by plant operators on March 17, 2006. On March 20, 2006, Clinton experienced a reactor scram as the result of a loose connection on one phase of a current transformer that powers generator protective relays. Operators restarted the reactor on March 21, and held power near 17 percent during troubleshooting and repairs of the current transformer. On March 22, 2006, the generator was restored and power increased, reaching 96 percent on March 23. On March 26, 2006, power was reduced briefly again to 80 percent for another control rod pattern adjustment, and returned to approximately 96 percent where it remained through the end of the inspection period.

1. REACTOR SAFETY

Cornerstone: Initiating Events, Mitigating Systems, Barrier Integrity, and Emergency Preparedness

1R01 Adverse Weather (71111.01)

a. Inspection Scope

The inspectors verified that the licensee had completed preparations for adverse weather in a timely manner before the weather actually presented a challenge. The inspectors reviewed the risk significant equipment and ensured that the equipment was in a condition to meet the requirements of Technical Specifications (TS), the Operations Requirements Manual (ORM), and the Updated Safety Analysis Report (USAR) with respect to protection from adverse weather. The inspectors verified that minor issues identified during the inspection were entered into the licensee's corrective action system by reviewing the associated condition reports (CRs).

On March 13, 2006, the inspectors completed one inspection sample by reviewing licensee procedures CPS 4302.01, "High Winds and Tornado Off Normals," and CPS 1019.05, "Transient Equipment/Material," and performing a walkdown of licensee's protected and owner controlled areas to ensure compliance with the applicable procedures.

b. Findings

No findings of significance were identified.

1R04 Equipment Alignments (71111.04Q)

a. Inspection Scope

The inspectors performed partial walkdowns of accessible portions of divisions of risk significant mitigating systems equipment during times when the divisions were of increased importance due to the redundant divisions or other related equipment being unavailable. The inspectors utilized the valve and electric breaker checklists listed at the end of this report to verify that the components were properly positioned and that support systems were lined up as needed. The inspectors also examined the material condition of the components and observed operating parameters of equipment to verify that there were no obvious deficiencies. The inspectors reviewed outstanding work orders and issue reports (IRs) associated with the divisions to verify that those documents did not reveal issues that could affect division function. The inspectors used the information in the appropriate sections of the USAR to determine the functional requirements of the systems. The documents listed at the end of this report were also used by the inspectors to evaluate this area.

The inspectors performed three samples by verifying the alignment of the following divisions:

- Residual heat removal C, while low pressure core spray was unavailable for surveillance testing;
- Residual heat removal A, while residual heat removal B was lined up for shutdown cooling; and
- High pressure core spray system.

b. Findings

No findings of significance were identified.

1R05 Fire Protection (71111.05Q)

a. Inspection Scope

The inspectors conducted fire protection walkdowns which were focused on availability, accessibility, and the condition of fire fighting equipment, the control of transient combustibles and ignition sources, and on the condition and operation status of installed fire barriers. The inspectors selected fire areas for inspection based on their overall

contribution to internal fire risk, as documented in the individual plant examination of external events with later additional insights, their potential to impact equipment which could cause a plant transient, or their impact on the licensee's ability to respond to a security event. The inspectors used the documents listed at the end of this report to verify that fire hoses and extinguishers were in their designated locations and available for immediate use, that fire detectors and sprinklers were not obstructed, the transient material loading was within the analyzed limits, and that fire doors, dampers, and penetration seals appeared to be in satisfactory condition. The inspectors verified that minor issues identified during the inspection were entered into the licensee's corrective action program.

The inspectors reviewed portions of the licensee's fire protection evaluation report and the USAR to verify consistency in the documented analysis with installed fire protection equipment at the station.

The inspectors completed eight samples by inspection of the following areas:

- Fire Zones CB-1b, Elevation 702' general access area, CB-1c, elevation 719' general access and HVAC area, CB-1e, elevation 737' and 751' general access area, and CB-1f, elevation 762' general access area;
- Fire Zones D-6a and b, Division 2 diesel generator room and day tank;
- Fire Zone CB-3a, Auxiliary electric equipment room;
- Fire Zone A-2b - Elevation 707' 6" and 737', Residual Heal Removal (RHR) A equipment room;
- Fire Zone A-3b - Elevation 707' 6", RHR 'C' pump room;
- Fire Zone C-2 - Elevation 828' 3", Containment;
- Fire Zone A-2f Main steam and pipe tunnel - elevation 727' - 0" and 755' 0"; and
- Fire Zone D-6 Diesel generator room fire doors operability verifications.

b. Findings

No findings of significance were identified.

1R07 Heat Sink Performance (71111.07B)

.1 Biennial Review of Heat Sink Performance

a. Inspection Scope

From March 27 through 31, 2006, specialist inspectors performed the biennial assessment of heat sink performance by reviewing documents associated with the Division I and II DG Jacket Water Heat Exchangers. The DG Jacket Water Heat Exchangers were chosen based on their high risk ranking in the licensee's probabilistic risk assessment. The review of these heat exchangers (HX) constituted three samples.

While on-site, the inspectors reviewed completed surveillance tests and associated procedures for the selected heat exchangers. The inspectors reviewed this documentation to confirm that the inspection or performance testing methodology was consistent with accepted industry and scientific practices such as Electrical Power

Research Institute standard NP-7552, "Heat Exchanger Performance Monitoring Guidelines." The inspectors reviewed HX performance testing documentation to verify that acceptance criteria were consistent with design basis values, as outlined in the Updated Final Safety Analysis Report, the Technical Specification requirements, and as provided in the licensee's Generic Letter 89-13 program documentation and that instrument uncertainty was appropriately considered. The inspectors reviewed documentation to verify performance of the ultimate heat sink (UHS). Specifically, the inspectors reviewed the availability of the UHS with bio-fouling conditions. In addition, the inspectors verified the ultimate heat sink capacity. This was done through review of licensee procedures and completed surveillance tests, or interviews with licensee engineers. These reviews were done to confirm that a program had been established and implemented consistent with licensee commitments to Generic Letter (GL) 89-13, "Service Water System Problems Affecting Safety-Related Equipment."

The inspectors reviewed condition reports associated with the selected heat exchangers or those related to the UHS to verify that the licensee had an appropriate threshold for identifying issues. The inspectors also evaluated the effectiveness of the corrective actions for identified issues, including design changes and engineering justifications for operability. These reviews were done to ensure compliance with 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," requirements.

The documents that were reviewed are included at the end of the report.

b. Findings

No findings of significance were identified.

1R08 Inservice Inspection Activities (71111.08)

.1 Piping Systems ISI

a. Inspection Scope

From January 30, 2006, to February 9, 2006, the inspectors conducted a review of the implementation of the licensee's In-Service Inspection (ISI) program for monitoring degradation of the reactor coolant system boundary, and the risk significant piping system boundaries. The inspectors selected the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code Section XI required examinations and code components in order of risk priority as identified in Section 71111.08-03 of IP 71111.08, "Inservice Inspection Activities," based upon the ISI activities available for review during the onsite inspection period.

The inspectors observed or performed a record review of the following non-destructive examination activities to evaluate compliance with the ASME Boiler and Pressure Vessel Code requirements and to verify that indications and defects were dispositioned in accordance with the ASME Code.

The inspectors observed the following ultrasonic nondestructive examination activity:

- Ultrasonic Examination (UT) of a feedwater pipe-to-elbow weld, weld #1-FW-1-4-2.

The inspectors performed a record review of the following examination:

- Magnetic Particle Examination (MT) of the head-to-flange weld, weld number CH-C-2.

There were no examinations from the previous outage with recordable indications that were accepted by the licensee for or since continued service. The inspector reviewed a pressure boundary weld repair for the replacement of a relief valve and associated inlet and discharge piping (Class 2) to determine if the welding acceptance and pre-service examinations (e.g., pressure testing, visual, dye penetrant, and weld procedure qualification tensile tests and bend tests) were performed in accordance with ASME Code Sections III, V, IX, and XI requirements. Specifically, the inspectors reviewed the Class 2 pressure boundary weld repair conducted last outage to replace relief valve 1C41-F029A (Standby Liquid Control System), and associated piping.

The inspectors performed a review of ISI related problems that were identified by the licensee and entered into the corrective action program, conducted interviews with licensee staff, and reviewed licensee corrective action records to determine if the licensee had:

- described the scope of the ISI related problems;
- established an appropriate threshold for identifying issues;
- evaluated industry generic issues related to ISI and pressure boundary integrity; and
- implemented appropriate corrective actions.

The inspectors performed these reviews to ensure compliance with 10 CFR Part 50, Appendix B, Criterion XVI, “Corrective Action,” requirements. The corrective action documents reviewed by the inspectors are listed in the attachment to this report.

The reviews as discussed above counted as one inspection sample.

b. Findings

No findings of significance were identified.

1R12 Maintenance Effectiveness (71111.12Q)

The inspectors reviewed the effectiveness of the licensee’s maintenance efforts in implementing the Maintenance Rule (MR) requirements, including a review of scoping, goal-setting, performance monitoring, short and long-term corrective actions, and current equipment performance problems. Systems were selected based on their designation as risk significant under the maintenance rule, or being in the increased monitoring (MR category (a) (1)) group. In addition, the inspectors interviewed the

system engineers and maintenance rule coordinator. The inspectors also reviewed condition reports and associated documents for appropriate identification of problems, entry into the corrective action system, and appropriateness of planned or completed actions. The documents reviewed are listed at the end of the report. The inspectors completed one inspection sample by reviewing the following system:

- Shutdown service water.

b. Findings

No findings of significance were identified.

1R13 Maintenance Risk Assessment (71111.13)

The inspectors observed the licensee's risk assessment processes and considerations used to plan and schedule maintenance activities on safety-related structures, systems, and components, particularly to ensure that maintenance risk and emergent work contingencies had been identified and resolved. The inspectors completed seven samples by assessing the effectiveness of risk management activities for the following work activities or work weeks:

- Down power activities and operation's plan for feedwater temperature reduction issues;
- CPS 9052.02 Low pressure core spray (LPCS) valve operability checks and CPS 9052.01 LPCS, RHR 'A', and LPCS/RHR 'A' water leg pump operability, completed under work orders 880569-01 and 881442-01;
- On-line risk analysis for maintenance and testing completed during power ascension activities following the refueling outage;
- Operations' handling of Division 2 diesel generator outage for examination of fuse blocks and the plan for Division 3 diesel generator;
- CPS 9030.01C014 to set B21-N668A(E) and relief valve reactor pressure B21-N669A(E) channel functional Division 1;
- WO 791106, Summer readiness functional test of reserve auxiliary transformer cooling system fans and oil pumps; and
- Work week activities for the week of January 9, 2005, specifically, operations posting of protected pathways.

b. Findings

No findings of significance were identified.

1R14 Non-routine Evolutions (71111.14)

The inspectors reviewed personnel performance during planned and unplanned plant evolutions and selected licensee event reports focusing on those involving personnel response to non-routine conditions. The review was performed to ascertain that operator responses were in accordance with the required procedures. In particular, the

inspectors completed two inspection samples by reviewing personnel performance during the following plant events:

- Operators response and troubleshooting to a reactor scram caused by a turbine trip on March 20, 2006, and subsequent startup and grid synchronization; and
- Main control room operators' response to lowering condenser vacuum, including troubleshooting of the off-gas system, lowering speed and shifting of reactor recirculation pumps, and shifting of main feed pumps.

b. Findings

No findings of significance were identified.

1R15 Operability Evaluations (71111.15)

The inspectors reviewed the following operability determinations and evaluations affecting mitigating systems to determine whether operability was properly justified and the component or system remained available such that no unrecognized risk increase had occurred. The inspectors completed four samples of operability determinations and evaluations by reviewing the following:

- IR 466363, High pressure core spray relief valve leaks;
- IR 472259, Reactor water level set-point calculations cause inaccurate automated trip module set-points;
- IR 463524, Potential loss of all rod position indication; and
- Operability Determination 448363, Excess flow check valve 1CM066 failure to meet the acceptance criteria of CPS 9864.01.

b. Findings

No findings of significance identified.

1R17 Permanent Plant Modifications (71111.17A)

a. Inspection Scope

The inspectors verified that modifications performed during increased risk significant configurations did not place the plant in an unsafe condition and that the performance capability of risk significant Structures, Systems and Components (SSCs) was not degraded through modifications by reviewing appropriate engineering change and implementation documents. The inspectors completed two samples by reviewing the following modifications:

- EC 356820, Contingent modification to address RHR shutdown cooling header pressurization; and
- EC 347940, Leak detection - drywell equipment drain flow instrumentation.

b. Findings

Introduction: The inspectors identified a finding involving a Non-Cited Violation of 10 CFR 50, Appendix B, Criteria III, "Design Control." During a review of Engineering Change Package 356820, "Shutdown Cooling Header Leak-off line," the inspectors identified that the design change, as installed, would adversely impact the functionality of both the Division 2 residual heat removal system's water leg (keep-fill) pump and the C residual heat removal pump. This adverse condition would be caused by the introduction of high temperature water on the suction side of both pumps. The design change was being installed to prevent pressurization of the shutdown cooling header due to leakage through the reactor coolant system pressure isolation valves.

Description: The inspectors reviewed Engineering Change (EC) Package 356820. The EC described a permanent plant modification that installed a leak-off line from the residual heat removal shutdown cooling header to the Division 2 residual heat removal system's water leg pump minimum flow line. This leak-off line was being installed to prevent small leakage past reactor coolant system pressure boundary isolation valves (1E12F008 &1E12F009) from pressurizing the shutdown cooling header and causing a high pressure alarm in the main control room.

The inspectors noted that the leak-off line was sized to handle a 2 gpm leak past the shutdown cooling pressure isolation valves. Based on observations of operators manually venting this line, this allowable leak rate concerned the inspectors. Specifically, while observing operators manually venting the shutdown cooling header during the previous operating cycle, the inspectors noted a water-steam vapor mix issuing from the vent line. At that time, licensee engineering staff determined that leakage rates were less than 0.02 gpm.

The inspectors questioned the effects of continuously allowing up to 2 gpm (modification design limit) of very hot fluid to be discharged into the minimum flow line of the Division 2 residual heat removal system's keep-fill system. The inspectors noted that, if water from the shutdown cooling header was at or near saturated conditions when the leak-off line isolation valve was open, there would be a possibility of steam flashing in the leak-off line. This flashing steam could create thermal-hydraulic pressure transients or high temperature conditions in the keep-fill system, such that the keep-fill pump could be rendered inoperable due to low suction pressure.

In the 10 CFR 50.59 screening comments included in the EC package, the licensee concluded that the addition of the leak-off line would not adversely impact the function of the emergency core cooling system discharge line fill system. The screening comments explained that water leg pump and the keep-fill system performance were analyzed to be maintained with installation of the leak-off line in calculation IP-0562, Rev 0B.

The inspectors reviewed IP-0562 and questioned the assumption on page 1-5 which stated: "120E F water temperature is assumed in this analysis..." The licensee's engineering staff could not support this assumption. The inspectors were concerned that based on past observation of system water temperature at significantly lesser leak rates, the 120E F assumption may not be valid. The licensee performed a cursory

analysis to determine if the residual heat removal shutdown cooling header temperature would remain less than 120E F. This analysis showed that the assumption of 120E F water was not valid. The licensee agreed to perform further analysis to determine what effects 2 gallons per minute leakage through valve 1E12D008 at a higher temperature and pressure would have on the orifice and the minimum flow line for the water leg pump (IR 00453933).

The licensee's engineering staff informed the inspectors that the analysis showed that with 0.6 gpm leakage through valves 1E12F008 and F009, portions of the shutdown cooling header would reach saturated conditions (365E F). Based on this information, the inspectors concluded that because both the leakage into and out of the shutdown cooling header would be continuous, the leakage would eventually result in the fluid being transmitted through the leak-off line also reaching saturation conditions. As a result of this new information, the licensee changed the 50.59 review screening sheet adding, "Further analysis for Revision 1 has shown that the leakage from the shutdown cooling volume can be hotter than originally anticipated. The length of piping from the source at the reactor recirculation system is insufficient to dissipate all the heat supplied with a leak smaller than 2 gpm. This creates a possibility that high temperature water may enter the water leg pump minimum flow line through the orifice. This may heat-up the RHR 'C' suction header beyond design values. To prevent this impact, the temperature of the RHR 'C' suction, or in the water leg pump suction, must be monitored on a periodic frequency to ensure that the temperature remains below the design value of 185E F whenever the leak-off line is placed into service. If steam or flashing occurs at the orifice, the orifice flow will decrease causing the pressure annunciator to trip at a lower rate."

In a summary statement from the screening comments the licensee concluded that this EC would not affect the residual heat removal system's ability to operate in low pressure cooling injection mode. The residual heat removal pump's net positive suction head and the head/flow characteristics of the pumps would not be impacted based on implementing a periodic monitoring program to verify water leg pump or residual heat removal pump C suction temperature is below 185E F when the leak-off line is in service.

Analysis: Failure to perform a design change evaluation that identifies an adverse condition created by the change is a performance deficiency. This issue was more than minor because the finding affected the Mitigating Systems cornerstone objective of ensuring the availability of mitigating systems to prevent undesirable consequences (Attribute - Design Control). With the modification installed as designed, without operator compensatory actions, the Division 2 residual heat removal system's keep-fill system and residual heat removal pump C may have been adversely impacted, due to low suction pressure.

The inspectors completed a Phase 1 significance determination of this issue using IMC 0609, "Significance Determination Process," Appendix A, Attachment 1, dated November 22, 2005. The inspectors selected the Mitigating Systems Cornerstone.

In response to this issue, the licensee informed the inspectors that further analysis showed that, with saturated conditions, flow through the flow limiting orifice would be less than 2 gpm. The licensee stated that prior to the leakage into the shutdown cooling header reaching 2 gpm (~0.6 gpm) the shutdown cooling header would re-pressurize to above the annunciator alarm set point, prompting the operators to isolate the leak-off line. This analysis indicated that 0.6 gpm leak-off line leakage would add 45,000 BTU/hr to the residual heat removal C suction line. The uninsulated pipe of the residual heat removal C suction can dissipate 50,000 BTU/hr at 185 F. The piping was designed for this temperature. The inspectors agreed that the licensee's conclusions appeared reasonable. Hence, when addressing question 1 under the Phase 1 worksheet the inspectors concluded that this issue would not result in a loss of operability. The inspectors answered "no" to the other four questions. Therefore, the inspectors concluded that this issue was a finding of very low safety significance (Green).

Enforcement: 10 CFR 50, Appendix B, Criteria III, "Design Control," states in part, that measures shall be established for the review for suitability...of processes that are essential to the safety related functions of the structures, systems, and components. Design changes, including field changes, shall be subject to design control measures commensurate with those applied to the original design. Contrary to the above, on February 14, 2006, the inspectors identified that, as installed, the design change implemented by EC 356820 was unsuitable for the safety related functions of the residual heat removal system, in that, the change could potentially cause the Division 2 residual heat removal system's keep-fill system to become inoperable. This was a violation. Corrective actions by the licensee included procedure revisions and local monitoring for the residual heat removal C suction line temperature once the leak off line was placed in service. Because this violation was of very low safety significance and it was entered into the licensee's corrective action program (IR 00453933), this violation is being treated as a Non-Cited Violation, consistent with Section VI.A.1 of the NRC Enforcement Policy. **(NCV 05000461/2006-02-01(DRP))**

1R19 Post Maintenance Testing (71111.19)

a. Inspection Scope

The inspectors reviewed the post maintenance testing activities associated with maintenance or modification of important mitigating, barrier integrity, and support systems that were identified as risk significant in the licensee's risk analysis. The inspectors reviewed these activities to verify that the post maintenance testing was performed adequately, demonstrated that the maintenance was successful, and that operability was restored. During this inspection activity, the inspectors interviewed maintenance and engineering department personnel and reviewed the completed post maintenance testing documentation. The inspectors used the appropriate sections of the TS and USAR, as well as the documents listed at the end of this report, to evaluate this area.

Testing subsequent to the following activities was observed and evaluated to complete six inspection samples:

- CPS 9431.06, Reactor protection system turbine control valve fast closure, completed under WOs 665793, 665791, 665790 and 665792;
- Work activities under WO 470023; electrical seals for 1UAY-CM504;
- Replacement of standby gas treatment relays 1UAYVS514E, D, C, B, A and 1UAYVG508L associated with WOs 416927-02, 416928-02, 416929-02, 416930-02, 416931-02 and 416958-02;
- WO 524751; CPS 3506.01P003 Division 3 diesel generator operations following restoration of 05-010AP-1C1 and 05-01-SX-1CA;
- High Pressure Core Spray (HPCS) high pressure water test for 1E22F005 and 1E22F004 and the line up to 1E22F036;
- CPS 9054.02, Reactor core isolation cooling valve operability checks under WO 669324-01, RCIC valve operability cold shutdown, WO 676922-06 (1E51-F064) and WO 520825-05 (1E51-F076).

b. Findings

No findings of significance were identified.

1R20 Refueling and Outage Activities (71111.20)

a. Inspection Scope

The inspectors evaluated the licensee's conduct of refueling outage activities to assess the licensee's control of plant configuration and management of shutdown risk. The inspectors reviewed configuration management to verify that the licensee maintained defense-in-depth commensurate with the shutdown risk plan; reviewed major outage work activities to ensure that correct system lineups were maintained for key mitigating systems; and observed refueling activities to verify that fuel handling operations were performed in accordance with the TS and approved procedures. Specific outage activities evaluated included the licensee's control of plant shutdown and cooldown, initial drywell walkdown, surveillance and post maintenance testing (as recorded in other sections of this report), refueling operations, clearance and tagging activities, control and availability of electrical power, decay heat removal operations, reactivity control, radiological controls, drywell final closeout, plant heat up and startup. These activities completed one inspection sample.

b. Findings

No findings of significance were identified.

1R22 Surveillance Testing (71111.22)

a. Inspection Scope

The inspectors witnessed selected surveillance testing and/or reviewed test data to verify that the equipment tested using the surveillance procedures met the TS, the ORM, the USAR, and licensee procedural requirements, and demonstrated that the equipment was capable of performing its intended safety functions. The activities were selected based on their importance in verifying mitigating systems capability and barrier integrity. The inspectors used the documents listed at the end of this report to verify that the testing met the frequency requirements; that the tests were conducted in accordance with the procedures, including establishing the proper plant conditions and prerequisites; that the test acceptance criteria were met; and that the results of the tests were properly reviewed and recorded. In addition, the inspectors interviewed operations, maintenance and engineering department personnel regarding the tests and test results.

The inspectors completed nine samples by evaluating the following surveillance tests:

- CPS 9861.04, Main steam isolation valve local leak rate testing;
- CPS 9843.01, Leak rate testing of low pressure coolant injection A;
- CPS 9080.01, Diesel generator 1A and fuse block testing;
- CPS 9333.40, Division 3, 4.16 KV bus undervoltage relay (Degraded Voltage) functional test;
- CPS 9080.23, Diesel generator 1C - ECCS integrated test;
- CPS 9080.21, Diesel generator 1A - ECCS integrated test;
- CPS 9031.14, Intermediate range nuclear instrument channel functional test (Shutdown);
- CPS 9861.09, Shutdown service water operability test (IST); and
- CPS 9843.01, Local leak rate testing, RHR shutdown cooling suction valves (1E12F008 and 1E12F009).

b. Findings

Introduction: The inspectors identified a finding involving a Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion XI, “Test Controls.” During a review of the licensee’s surveillance test to determine the operability of the shutdown service water system, the inspectors identified that the system’s leakage could exceed both the administrative and operability limits established by design basis documents, without the test detecting the actual leak rate. This condition was caused by an inadequate test connection.

Description: On February 2, 2006, the inspectors reviewed the results of the shutdown service water system leakage test as documented in CPS 9861.09, “Shutdown Service Water Operability Test.” This procedure provided directions for performing leak rate testing for shutdown service water system boundary valves. This test was completed to assist the licensee in the operability determination of the ultimate heat sink and shutdown service water system. The inspectors reviewed the results of the leak test for the Division 1 shutdown service water/service water crosstie valve (1SX014A) and the

Division 1 and Division 2 cross-tie valves (1SX011A and 1SX011B). The instructions for testing these valves were detailed in CPS 9861.09D003 and 9861.09D009.

Section 6.2 of CPS 9861.09 stated that if administrative limits in the data sheets are exceeded, then total leakage shall be quantified and an evaluation performed by engineering prior to declaring the shutdown service water system boundary valve inoperable. The procedure also stated that total system leakage shall not exceed (operability limit) 300 gpm for either Division 1 or 2. Nine valves per division were leak tested to determine each division's total system leakage.

According to the surveillance test instructions, the administrative leakage limit through 1SX14A was 55 gallons (operability limit is 100 gpm) and the administrative leakage limit through 1SX11A and 1SX11B was 100 gpm at a collection point. During this test, the leakage from 1SX14A was established, then the total leakage through 1SX14A and both 1SX11A and 1SX11B were established. The procedure then instructed the licensee to subtract the leakage at 1SX14A from the total leakage documented for 1SX14A and 1SX11A or 1SX11B to determine the leakage at 1SX 11A or 11B. Based on the administrative limits contained in the surveillance test instructions, the inspectors concluded that combined leak rates through either 1SX14A and 1SX11A or 1SX14A and 1SX11B could approach 155 gpm.

During the inspectors' walkdown and review of the system piping and instrumentation drawings, the inspectors noted that the test collection point was a 2.5 inch drain line. This drain was for a 16 inch pipe. Because the test instructions required the licensee to time the leakage through the drain line, the inspectors questioned whether the collection point would be able to give an accurate reading if the combined leakage was close to 155 gpm, or if some of this leakage would be flowing by the drain and into the system, and not being accounted for.

To address the inspectors' concern the licensee provided calculation IP-563 "Determination of Allowable Leak Rates and Loss of UHS Volume from Shutdown Service Water (SX) Boundary Valves." During the review of this analysis, the inspectors noted that Table 1, on page 14 of the analysis, included the following statement under remarks: "...Operability limit should normally be considered to be 100 gpm. However, since the test connection (1SX078A) is a 2 ½ inch valve, approximately 55 gpm can be measured without interference from test equipment..." The inspectors determined that the statement implied that the maximum flow from 1SX14A and 1SX11A and 1SX11B should be no more than 55 gpm. Leakage greater than 55 gpm would not be detected based on the restriction of the test connection. The licensee staff agreed with the inspectors' conclusion. The licensee generated issue report (IR) 00449266 to address this issue.

Analysis: Failure of the licensee's approved surveillance test procedure to adequately determine the shutdown service water system boundary valve leakage was a performance deficiency. This issue was more than minor because the finding affected the Mitigating Systems Cornerstone objective of ensuring the availability of mitigating systems to prevent undesirable consequences. Leakage that exceeded both administrative and operability limits, established by design analysis, would not have

been identified under testing conditions mandated by the licensee's testing program. An adverse condition would have been masked.

The recorded leakage rate on February 1, 2006, through valve 1SX014A was 0.2 gpm and the leakage through 1SX011A was 0.3 gpm. Thus, the maximum total leakage through the 2 ½ " drain line was 0.5 gpm, well under the recommended allowable leakage of 55 gpm from Table 1 of the analysis. The leakage through 1SX011B was 1.3 gpm, well below the capability of measuring the leakage accurately. Because the actual measured leakage values were 0.2 gpm for 1SX014A, 0.3 gpm for 1SX011A and 1.3 gpm for 1SX011B, all well below the capability of accurately being measured through the 2 ½ " line, this issue did not result in a system operability concern for the inspectors. The inspectors completed a Phase 1 significance determination of this issue using IMC 0609, "Significance Determination Process," Appendix A, Attachment 1, dated November 22, 2005. The inspectors selected the Mitigating Systems Cornerstone. Using the actual test results the inspectors answered "no" to all five questions in the Phase 1 significance determination analysis. Therefore, this issue was a finding of very low safety significance (Green).

Enforcement: 10 CFR Part 50, Appendix B, Criterion XI, "Test Controls," requires, in part, that a test program shall be established to assure that all testing required to demonstrate that structures, systems, and components will perform satisfactorily in service...and performed in accordance with written procedures, which incorporate the requirements and acceptable limits contained in applicable design documents. Contrary to the above, on February 2, 2006, the inspectors identified that using test controls established by CPS procedures CPS 9861.09D003 and CPS 9861.09D009, the acceptance criteria established by design analysis, IP- 0565, could not be achieved. This was a violation. The licensee documented this issue in IR 00449266. The licensee planned to perform an extent of condition review to ensure that no other system leakage tests were affected by this issue. Because this violation was of very low safety significance and it was entered into the licensee's corrective action program (IR 00449266), this violation is being treated as a Non-Cited Violation, consistent with Section VI.A.1 of the NRC Enforcement Policy. **(NCV 05000461/2006-02-02(DRP))**

1R23 Temporary Plant Modifications (71111.23)

a. Inspection Scope

The inspectors reviewed and evaluated the following temporary plant modification on risk significant equipment to verify that the instructions were consistent with applicable design modification documents and that the modifications did not adversely impact system operability or availability. The inspectors interviewed operations, engineering and maintenance personnel as appropriate and reviewed the design modification documents and the 10 CFR 50.59 evaluations against the applicable portions of the USAR. The documents listed at the end of this report were also used by the inspectors to evaluate this area. The inspectors reviewed the issues that the licensee entered into its corrective action program to verify that identified temporary modification problems were being entered into the program with the appropriate characterization and significance. The inspectors also reviewed the licensee's corrective actions for

temporary modification related issues documented in selected condition reports. The condition reports are specified in the List of Documents Reviewed.

The inspectors completed two inspection samples by reviewing the following temporary modifications:

- TSP 2006-36 and 37, CIR10 drywell temporary shielding package for 767' DW line 1HP02D-10" and 1HP02B-10"; and
- TSP 2006-15, CIR10 Drywell temporary shielding package for 767' drywell line 1LP02B-10".

b. Findings

No findings of significance were identified.

1EP2 Alert and Notification System (ANS) Testing (71114.02)

a. Inspection Scope

The inspectors reviewed and discussed with corporate Emergency Preparedness (EP) staff records on the operation, maintenance and testing of the ANS in the Clinton Station's Emergency Planning Zone, to verify that the ANS equipment was adequately maintained and tested during 2004 and 2005, in accordance with emergency plan commitments and procedures. The inspectors reviewed a random sample of records of 2004 and 2005 non-scheduled maintenance activities, to determine whether equipment examinations and repairs were initiated in a timely manner, following identification of apparent malfunctions. The inspectors also reviewed records of ANS tests conducted in July 2005 through December 2005.

These activities completed one inspection sample.

b. Findings

No findings of significance were identified.

1EP3 Emergency Response Organization (ERO) Augmentation Testing (71114.03)

a. Inspection Scope

The inspectors reviewed and discussed implementing procedures that contained details on the primary and alternate means of initiating an ERO activation to augment the on-shift ERO. The inspectors also discussed administrative provisions for maintaining the Clinton Station's ERO roster and ERO members' contact information. The inspectors reviewed records of monthly unannounced off-hours augmentation drills, which were conducted between April 2004 and December 2005, to determine the adequacy of the drills' critiques and associated use of the corrective action program. The inspectors reviewed and discussed a program implemented in 2005 that trended each station ERO member's participation in the off-hours augmentation drills. The inspectors also reviewed training records of a random sample of 70 station and

corporate office ERO members, who were assigned to key and support positions, to verify that they were currently trained for their assigned positions. The inspectors also reviewed the Clinton Station's and corporate office's ERO rosters, to verify that more than four persons were assigned to each key and support position with very few exceptions.

These activities completed one inspection sample.

b. Findings

No findings of significance were identified.

1EP4 Emergency Action Level (EAL) and Emergency Plan Changes (71114.04)

a. Inspection Scope

The inspectors reviewed site-specific letters of agreement with local off-site support organizations listed in Appendix 2 of Revision 8 of the Clinton Station Annex of Exelon's Standardized Emergency Plan to verify that these agreements were adequately detailed and in effect through at least December 2006. The inspectors also reviewed contracts or letters of agreement with the off-site support organizations, which were listed in Appendix 3 of Revision 16, of the Standardized Emergency Plan, and associated with most or all of the licensee's Illinois nuclear stations, to verify that these support arrangements were adequately detailed and in effect through at least 2007.

These activities completed one inspection sample.

b. Findings

No findings of significance were identified.

1EP5 Correction of Emergency Preparedness Weaknesses and Deficiencies (71114.05)

a. Inspection Scope

The inspectors reviewed Nuclear Oversight (NOS) staff's 2005 audits of the licensee's EP program to verify that these independent assessments met the requirements of 10 CFR 50.54(t). The inspectors reviewed records of EP drills, and exercises conducted during 2004 and 2005, to verify that the licensee fulfilled its drill and exercise commitments. The inspectors also reviewed records to verify that representatives of State and county agencies, and other off-site support organizations, were provided the opportunity to obtain NOS staff's assessment of the adequacy of the licensee's interfaces with these organizations. Samples of corrective action program records, and completed corrective actions, were reviewed to determine whether NOS-identified concerns, drill and exercise critique concerns, and other EP program concerns, were adequately addressed.

These activities completed one inspection sample.

b. Findings

No findings of significance were identified.

2. RADIATION SAFETY

Cornerstone: Occupational Radiation Safety

2OS1 Access Control to Radiologically Significant Areas (71121.01)

.1 Plant Walkdowns/Boundary Verifications and Radiation Work Permit Reviews

a. Inspection Scope

The inspectors identified work being performed within high and locked high radiation areas of the plant and other potentially exposure significant work activities and selectively reviewed radiation work permit (RWP) packages and radiation surveys for these areas. The inspectors evaluated the radiological controls to determine if these controls, including postings and access control barriers, were adequate.

The inspectors walked down radiologically significant area boundaries and other radiological areas in the Containment, Turbine and Radwaste Buildings to determine if the prescribed radiological access controls were in place, if licensee postings were complete and accurate, and if physical barricades/barriers were adequate. During the walkdowns, the inspectors challenged access control boundaries to determine if high radiation area and locked high radiation area (LHRA) access was controlled in compliance with the licensee's procedures, Technical Specifications, the requirements of 10 CFR 20.1601, and were consistent with Regulatory Guide 8.38, "Control of Access to High and Very High Radiation Areas in Nuclear Power Plants."

The inspectors selectively reviewed RWP packages for ongoing outage work to determine if barrier integrity and engineering controls performance (e.g., filtered ventilation system operation) were adequate and to determine if there was a potential for individual worker internal exposures of greater than 50 millirem committed effective dose equivalent. The inspectors reviewed the licensee's methods for the assessment of internal dose as required by 10 CFR 20.1204, to ensure the methodology was technically sound and included assessment of the impact of hard to detect radionuclides such as pure beta and alpha emitters, as applicable. The inspectors reviewed internal dose assessment results and associated calculations for selected workers that had intakes during the first half of the February 2006 refueling outage. No worker internal exposures greater than 50 millirem committed effective dose equivalent occurred for the period reviewed by the inspectors.

These reviews represented four inspection samples.

b. Findings

No findings of significance were identified.

.2 Problem Identification and Resolution

a. Inspection Scope

The inspectors reviewed the results of radiation protection (RP) self-assessments related to the radiological access control program, nuclear oversight department audit reports related to the RP program, and the assignment report (AR) database along with individual ARs related to the radiological access and exposure control programs to determine if identified problems were entered into the corrective action program for resolution. In particular, the inspectors reviewed radiological problems which occurred over the 3-month period that preceded the February 2006 outage and for the first half of the outage including the review of any high radiation area (HRA) radiological incidents (non-performance indicator occurrences identified by the licensee in high and locked high radiation areas) to determine if follow-up activities were conducted in an effective and timely manner commensurate with their importance to safety and risk based on the following:

- Initial problem identification, characterization, and tracking;
- Disposition of operability/reportability issues;
- Evaluation of safety significance/risk and priority for resolution;
- Identification of repetitive problems;
- Identification of contributing causes; and
- Identification and implementation of corrective actions.

The inspectors evaluated the licensee's process for problem identification, characterization and prioritization, and determined if problems were entered into the corrective action program and were being resolved in a timely manner.

These reviews represented two inspection samples.

b. Findings

No findings of significance were identified.

.3 Job-In-Progress Reviews and Review of Work Practices in Radiologically Significant Areas

a. Inspection Scope

The inspectors observed a variety of radiologically significant or potentially radiologically significant work activities being performed during the outage including the three listed below:

- Containment Building Reactor Water Cleanup System Work (flange inspection and disassembly in steam tunnel); RWP 10005349;
- Drywell Bioshield In-Service Inspection (ISI); RWP 10005294; and

- Drywell Reactor Recirculation System and Pump Work; RWPs 10005286/87. Radiation survey information to support these work activities was reviewed and the radiological job requirements and the access control provisions for these areas were assessed for conformity with Technical Specifications. The inspectors attended the pre-job briefings for some of these activities to assess the adequacy of the information exchanged.

Job performance was observed to determine if radiological conditions in the work area were adequately communicated to workers through the pre-job briefings and area postings. The inspectors also evaluated the adequacy of the oversight provided by the radiation protection staff including the completion of radiological surveys, the work oversight provided by the radiation protection technicians (RPTs), and the administrative and physical controls used over ingress/egress into these areas, as applicable.

These reviews represented two inspection samples.

b. Findings

No findings of significance were identified.

.4 Radiation Worker Performance

a. Inspection Scope

During job performance observations, the inspectors evaluated radiation worker performance for conformity with radiation protection work requirements and to determine whether workers were aware of the radiological conditions, the RWP controls and limits in place, and that their performance had accounted for the level of radiological hazards present.

These reviews represented one inspection sample.

b. Findings

No findings of significance were identified.

.5 Radiation Protection Technician (RPT) Proficiency

a. Inspection Scope

During job performance observations and general plant walkdowns, the inspectors evaluated RPT performance with respect to radiation protection work requirements, conformance with procedures and those requirements specified in the RWP, and assessed overall proficiency with respect to radiation protection requirements, station procedures and radiological practices.

These reviews represented one inspection sample.

b. Findings

No findings of significance were identified.

2OS2 As-Low-As-Is-Reasonably-Achievable (ALARA) Planning and Controls (71121.02)

.1 Inspection Planning

a. Inspection Scope

The inspectors reviewed plant collective refueling outage exposure history, current exposure trends for the February 2006 refueling outage (C1R10) and ongoing outage activities in order to assess current dose performance and exposure challenges. This included determining the plant's current 3-year rolling average for collective exposure in order to provide a perspective of significance for any resulting inspection finding assessment.

The inspectors reviewed C1R10 work and the associated exposure (dose) projections, time/labor estimates and historical dose data for the following eight work activities which were likely to result in the highest personnel collective exposures or were otherwise radiologically significant activities:

- Refuel Floor Non-Cavity Work (RWP 10005356);
- Drywell ISI Inside Bioshield (RWP 10005294);
- Drywell Shielding (RWP 10005303);
- Drywell Under-Vessel Preparation/Restoration Work (RWP 10005311);
- Auxiliary Building/Containment Building Scaffolding (RWP 10005352);
- Diving - Dryer Modifications (RWP 10005358);
- Moisture Separator Upgrade (RWP 10005328); and
- Drywell ISI Outside Bioshield (RWP 10005293)

The inspectors reviewed site specific trends in collective dose, based on plant historical exposure and source term data including historical Boiling Water Reactor Assessment and Control (BRAC) dose rate data. The inspectors reviewed procedures associated with maintaining occupational exposures ALARA and evaluated those processes used for C1R10 to develop dose projections, including time/labor estimates, and to track work activity specific exposures.

These reviews represented four inspection samples.

b. Findings

No findings of significance were identified.

.2 Radiological Work Planning

a. Inspection Scope

The inspectors obtained the licensee's list of C1R10 refueling outage work ranked by estimated exposure and reviewed the radiologically significant outage work activities listed in Section 2OS2.1 above.

For each of these eight activities, the inspectors reviewed the RWP, the ALARA Plan including specific task plan time/labor estimates and associated total effective dose equivalent (TEDE) ALARA evaluations (i.e., respirator evaluations), as applicable. The reviews were performed in order to verify that the licensee had established radiological engineering controls and dose mitigation criteria that were based on sound radiation protection principles in order to achieve occupational exposures that were ALARA. This also involved determining that the licensee had reasonably grouped the radiological work into activities that were based on historical precedence, industry norms, and/or special circumstances.

The inspectors compared the exposure results achieved for the 28-day refueling outage including the dose rate reductions and person-rem expended with the doses projected in the licensee's ALARA planning for the above listed work activities and for other selected outage activities. Reasons for inconsistencies between intended (projected) and actual work activity doses as well as time/labor differences were examined to determine if the activities were planned reasonably well and to ensure the licensee was cognizant of and evaluated any work planning deficiencies.

The interfaces between the radiation protection and maintenance organizations were reviewed to identify potential interface problems. The integration of ALARA requirements into work procedures and RWP documents was also evaluated to verify that the licensee's radiological job planning would reduce dose.

The inspectors compared the person-hour estimates provided by maintenance planning or other craft groups to the radiation protection ALARA staff with the actual work activity time expenditures in order to evaluate the accuracy of these time estimates.

Work-In-Progress ALARA Reports were reviewed by the inspectors for those outage jobs that approached their respective dose estimates or that were otherwise generated to document problems, to identify changes in work scope or to document variances in estimated versus actual doses. These reports were reviewed to assess whether the licensee could identify problems and address them as work progressed.

These reviews represented six inspection samples.

b. Findings

Introduction: An inspector-identified finding of very low safety significance was identified for the failure to maintain the collective dose ALARA for those work activities governed by RWP No. 10005356, "Refuel Floor Non-Cavity Work," conducted during the licensee's C1R10 refueling outage in February 2006.

Description: During review of the licensee's outage dose performance and RWP packages including the associated ALARA Plans and Work-In-Progress Reviews, the inspectors identified that the licensee's actual collective dose significantly exceeded the original dose estimated for those work activities performed under RWP No. 10005356. For that RWP, work included reactor vessel disassembly/reassembly and various support activities, scaffolding, and underwater vacuuming. The licensee developed its initial dose estimate for the activities conducted under this RWP based on the work scope, comparison to historical outage exposures for similar work and based on crew size and time estimates provided by the Reactor Services and RP groups. The licensee's initial estimate for work under this RWP was 4.437 person-rem and 2687 person-hours.

About 6 days into the outage, a work-in-progress (WIP) review documented that only about 30 percent of the work was complete yet 94 percent of the dose and over 200 percent of the person-hours that were estimated for the work had been expended. The WIP review indicated that nearly 1.5 rem had been expended for supervisory activities associated with this RWP during the first 5 days of the outage which the inspectors noted was not factored into the original dose projection. Radiation protection staff informed the inspectors that crew size control on the refuel floor was problematic, and coupled with the small size of the refuel floor contributed to additional worker dose. Inspector observations mid-way through the 28 day outage confirmed this problem. Despite this information, the licensee did not fully recognize the flaws in its original dose projection, nor did the licensee maintain crew size on the refuel floor at a minimum throughout the outage. Following that initial WIP review, the dose estimate was revised by the licensee to approximately 9.5 rem and work continued.

As the work progressed beyond the 5th day of the outage, the licensee's outage dose tracking for non-cavity refuel floor work showed each day that the dose was trending upward at a rate much greater than projected; however, timely and effective actions were not implemented to address that trend. About 22 days into the outage, a second WIP review was performed when the collective dose reached 9.5 person-rem while the work was only about 65 percent complete. That WIP documented some actions for crew size minimization and more effective use of low dose waiting areas and called for expanded use of remote monitoring video equipment for the pending reactor reassembly. The licensee then revised its dose estimate to 11.6 person-rem based on the remaining work scheduled. On day 25 of the approximate 28 day outage, another WIP review was performed for this RWP at which time about 11.7 person-rem and nearly 15,000 person-hours (more than 5 times the originally projected labor expenditure) were expended. That WIP review documented ALARA planning deficiencies including examples of dose incurred by various work groups which supported refuel floor work that were not factored into the initial dose projections. The dose estimate was then revised again to 13.5 person-rem.

The final actual collective dose for RWP No. 10005356 was just over 14 rem with 16,500 hours expended. These final values exceed the original dose projection more than three-fold and exceed the originally projected labor hours more than six-fold. The inspectors determined that no changes in work scope occurred for this work activity; however, reasonably unexpected changes in the radiological conditions (increased cavity area dose rates) were identified which the licensee attempted to address through

enhanced filtration and additional vacuuming consistent with its ALARA Plan. The licensee also experienced unexpected tooling and equipment problems at various times throughout the work which also contributed to additional dose. As a result of these unexpected issues and given the licensee's reasonable attempts to rectify these specific problems, the inspectors concluded that an additional 2.5 person-rem of "intended" dose should be added to the original 4.437 person-rem dose projected for this work activity. Therefore, the intended ALARA dose for non-cavity refuel floor work as determined by the inspectors was about 7 person-rem.

Applying the revised "intended" dose estimate compared to the actual dose incurred, the inspectors concluded that the actual collective dose for this work exceeded 5 person-rem (i.e., 14 person-rem), and exceeded the intended 7 person-rem ALARA dose by more than 50 percent (i.e., 100 percent). As defined by the NRC in Inspection Manual Chapter (IMC) 0308, Appendix C, "Technical Basis for Occupational Radiation Safety Significance Determination Process," unplanned, unintended occupational collective dose is the total sum of the occupational radiation dose for a work activity in excess of that collective dose planned or intended and determined to be ALARA for that work activity. Since the "intended" dose for non-cavity refuel floor work under RWP No. 10005356 was approximately 7 person-rem, the additional 7 person-rem accrued for the work activity was unintended and consequently not ALARA. The inspectors determined that the unintended dose was due to both work planning and work execution deficiencies given that: (1) the licensee's initial dose estimates failed to account for refuel floor supervisory dose, worker transitory dose and dose for some refuel floor support activities; and (2) workers were not effectively managed to ensure crew size was minimized and that low dose waiting areas and remote video monitoring technologies were utilized more extensively.

Analysis: The failure to maintain collective doses ALARA is a performance deficiency. The issue was determined to be more than minor because it was associated with the occupational radiation safety cornerstone program/process (ALARA planning) attribute and affected the cornerstone objective to ensure adequate protection of worker health and safety from exposure to radiation. Consequently, the issue was determined to represent a finding of greater than minor safety significance which was evaluated using the Significance Determination Process (SDP).

The inspectors determined, utilizing IMC 0609, Appendix C, "Occupational Radiation Safety SDP," that the finding involved ALARA planning/work controls, and the licensee's current 3-year rolling average collective dose was not greater than 240 person-rem. Therefore, the inspectors concluded that the SDP assessment for this finding was of very low safety significance (Green).

Enforcement: Although the failure to maintain collective dose ALARA for RWP No. 10005356 was a performance deficiency, no violation of regulatory requirements occurred. This issue was considered a finding of very low safety significance **(FIN 05000461/2006-02-03)**. The problems associated with this finding were documented in the licensee's corrective action program as AR No.00455995. The licensee entered this radiological work planning and dose performance problem

into its outage lessons learned database to allow the development of measures to better plan and execute refuel floor work during future refueling outages.

.3 Verification of Dose Estimates and Exposure Tracking Systems

a. Inspection Scope

The inspectors reviewed the licensee's assumptions and basis for its collective refueling outage exposure estimate and for individual outage job estimates and evaluated the methodology and practices for projecting work activity specific exposures. This included evaluating both dose rate and time/labor estimates for adequacy compared to historical station specific or industry data.

The inspectors reviewed the licensee's process for adjusting outage exposure estimates when unexpected changes in scope, emergent work or other unanticipated problems were encountered which could significantly impact worker exposures. This included determining that adjustments to estimated exposure (intended dose) were based on sound radiation protection and ALARA principles and not adjusted to account for failures to effectively plan or control the work. The frequency and scope of these adjustments were also reviewed to evaluate the adequacy of the original ALARA planning.

The licensee's exposure tracking system was examined to determine whether the level of exposure tracking detail, exposure report timeliness, and exposure report distribution were sufficient to support control of outage work exposures. Radiation work permits were reviewed to determine if they covered an excessive number of work activities to ensure they allowed work activity specific exposure trends to be detected and controlled. During the conduct of exposure significant work, the inspectors evaluated if licensee management was aware of the exposure status of the work and would intervene if exposure trends increased significantly beyond exposure estimates.

These reviews represented three inspection samples.

b. Findings

No findings of significance were identified.

.4 Job Site Inspections and ALARA Controls

a. Inspection Scope

The inspectors observed those work activities identified in Section 2OS1.3 as well as other radiological work activities conducted during the refueling outage. The licensee's use of ALARA controls for these work activities was evaluated to determine whether:

- The licensee developed and effectively used engineering controls to achieve dose reductions and to verify that the controls were consistent with the licensee's ALARA reviews; and

- Workers were cognizant of work area radiological conditions, utilized low dose waiting areas and that radiological oversight of work was adequate.

These reviews represented two inspection samples.

b. Findings

No findings of significance were identified.

.5 Radiation Worker and Radiation Protection Technician Performance

a. Inspection Scope

Radiation worker and RPT performance was observed by the inspectors during work activities being performed in radiation areas and high radiation areas focusing on work activities in the drywell and the steam tunnel. The inspectors determined whether workers demonstrated the ALARA philosophy in practice by being familiar with the work activity scope, the tools to be used for the job, by utilizing low dose waiting areas and had knowledge of the radiological conditions and adhered to the ALARA requirements for the work activity. Job support and the communications provided by the RP staff were also evaluated by the inspectors.

This review represented one inspection sample.

b. Findings

No findings of significance were identified.

.6 Identification and Resolution of Problems

a Inspection Scope

The inspectors reviewed the results of two outage readiness self-assessments and the results of Nuclear Oversight Department audits of the RP program to assess the licensee's ability to identify and correct problems.

The inspectors verified that identified problems were entered into the corrective action program for resolution and that they had been properly characterized, prioritized, and were being addressed. This included ALARA program critique items and lessons learned from the licensee's previous refueling outage completed in February 2004.

Assignment reports (ARs) generated over the 3-month period that preceded the inspection that were related to the RP program were selectively reviewed by the inspectors, and licensee staff members were interviewed to verify that follow-up activities were being conducted in a timely manner commensurate with their importance to safety and risk using the following criteria:

- Initial problem identification, characterization, and tracking;
- Disposition of operability/reportability issues;

- Evaluation of safety significance/risk and priority for resolution;
- Identification of repetitive problems;
- Identification of contributing causes; and
- Identification and implementation of effective corrective actions.

The licensee's corrective action program was also reviewed to determine if repetitive deficiencies in problem identification and resolution had been addressed, as applicable.

These reviews represented three inspection samples.

b. Findings

No findings of significance were identified.

4 OTHER ACTIVITIES (OA)

4OA1 Performance Indicator (PI) Verification (71151)

Cornerstone: Emergency Preparedness

Emergency Preparedness Strategic Areas

a. Inspection Scope

The inspectors reviewed the licensee's records associated with the three EP PIs listed below. The inspectors verified that the licensee accurately reported these indicators, in accordance with relevant procedures and Nuclear Energy Institute guidance endorsed by NRC. Specifically, the inspectors reviewed licensee records associated with PI data reported to the NRC for the period of July 2005 through December 2005. Reviewed records included: procedural guidance on assessing opportunities for the three PIs; assessments of PI opportunities during pre-designated Control Room Simulator training sessions, the 2005 biennial exercise, and integrated emergency response facility drills; revisions of the roster of personnel assigned to key ERO positions; and results of ANS operability tests. The following PIs were reviewed:

- ANS;
- ERO Drill Participation; and
- Drill and Exercise Performance.

These activities completed three inspection samples.

b. Findings

No findings of significance were identified.

4OA2 Identification and Resolution of Problems (71152)

.1 Routine Review and Identification of Problems

a. Inspection Scope

As discussed in previous sections of this report, the inspectors routinely reviewed issues during baseline inspection activities and plant status reviews to verify that they were being entered into the licensee's corrective action system at an appropriate threshold, that adequate attention was being given to timely corrective actions, and that adverse trends were identified and addressed. Minor issues entered into the licensee's corrective action system as a result of inspectors' observations are generally denoted in the report.

b. Findings

No findings of significance were identified.

.2 Human Error Cause Summary and Analysis (Annual Sample)

Introduction

Human error is a factor in work practices that can result from a variety of causes. Some of these causes can be indicators of the strength of the licensee's safety culture. The focus of this inspection sample was to evaluate the licensee's identification of issues with respect to safety culture work practices by analyzing the types of human performance errors documented in the licensee's corrective action program and the underlying causes identified for these errors. The inspectors began with a search of the licensee's corrective action program to identify issue reports generated in 2005 that listed human error as the cause of the issue. To narrow the search and focus this review to the issues the licensee considered most significant, the inspectors selected the human error deficiencies where the licensee conducted a quick human performance investigation (QHPI). Next the inspectors reviewed each QHPI and recorded the identified error precursors, pre-job brief effectiveness, flawed defenses, latent organizational weaknesses, and corrective actions in a table. The inspectors then analyzed the results from the table to quantify and group the most frequently identified error precursors and flawed defenses. Based on the summary of this data, the inspectors were able to conclude that there are some weaknesses in the licensee's work practices. Some of these weaknesses had been previously identified by the licensee and corrective actions were assigned. For one area of weakness identified by the inspectors, no corrective action existed in the licensee's corrective action system and a new issue report was generated.

a. Inspection Scope

The inspectors reviewed IRs and QHPIs issued in 2005 that resulted from human performance errors. The inspectors narrowed the scope to 30 QHPIs based on the consequences or actual effects the issues had on plant equipment or maintenance operations. The inspectors used the data contained in these corrective action program

documents to assess the strength of the licensee's safety culture in the area of work practices and the effectiveness of the licensee's corrective action program in addressing any issues related to weaknesses identified. To do this, the inspectors conclusions were compared to the licensee's results of several common cause evaluations addressing human performance errors; specifically CCA 367021, maintenance clock resets; CCA 356758, site cross-cutting error precursor complacency and overconfidence; and CCA 379119, review the number of various fundamental management system reports from January 2005 through September 28, 2005. This review represents one inspection sample. A list of documents reviewed is located in the attachment at the end of this report.

b. Issues

Summary of Data Reviewed:

For the 30 QHPIs reviewed, the most commonly identified error precursors were inaccurate risk perception (8), complacency/overconfidence (7), mind set/intentions (6), and assumptions (6). Other identified error precursors, at much lower frequencies, were new techniques, imprecise communications, time pressures, and distractions/interruptions. The inspectors determined from the reports that pre-job briefs were effective in just 5 of the 30 cases reviewed. The most commonly identified flawed defense mechanism was questioning attitude. This defense was identified in 11 of the reports reviewed. Other flawed defenses identified were self check/STAR, procedure adherence, management/supervision, and verification practices. Only 13 of the 30 reports reviewed identified latent organizational weaknesses. The remaining 17 stated they were caused by an individual human error or were isolated incidences. The two most common organizational weaknesses identified were basic work practices or procedure use and STAR, and work planning and execution.

Data Analysis:

Error precursors: The inspectors considered the top four identified error precursors, inaccurate risk perception, complacency/overconfidence, mind set (intentions), and assumptions to be related directly to the licensee's work practice component of safety culture, and in general, are influenced by individual internal thoughts or perceptions. The remaining identified error precursors are affected more by external factors. In each of the events described in the QHPIs, the licensee had procedures or processes in place to perform the assigned tasks, but human errors resulted in unexpected results for the activities.

Pre-job brief effectiveness: The inspectors determined that pre-job briefs were effective for only 5 of the 30 issues reviewed. This determination was based on whether or not there was a pre-job brief performed, the error precursors identified by the QHPI were identified in the brief, and defenses to prevent the error precursors identified were discussed. Five of the issues had no pre-job brief performed due to being unplanned or resulting from decisions made in the field to take an action that led to the incident. The other 20 were evaluated as ineffective because these briefs did not include the error precursors or flawed defenses that were later identified in the QHPIs.

Flawed defenses: Similar to the error precursor analysis, the inspectors observed the highest rates of identified flawed defenses in the area of human error prevention tools. These tools were developed for individuals to consider the probable and possible outcomes of actions they are about to take. These tools must be internalized and exercised by individuals to be effective, and the level of effectiveness can also be considered an indicator of the licensee's safety culture. Specifically, questioning attitude was the most frequently identified flawed defense, with 11 occurrences, and self check/STAR was next with 7 occurrences.

Inspector Conclusions:

The inspectors identified two areas of weakness that resulted in human performance errors in 2005. The first area is a low level of effectiveness in pre-job briefs. The licensee had also identified this as an area of weakness. A common cause analysis (IR 356758) was conducted on the error precursor complacency and overconfidence. The corrective action identified in that CCA was to create and utilize a pre-job brief database to ensure adequate organizational or task-specific knowledge is available and provided to the worker, at the exact time it is needed, to sufficiently guide the behaviors being applied to a task. The second weakness identified by the inspectors was the tendency of workers to proceed with confidence even when uncertainties arose. Many of the issues reviewed were the result of inappropriate actions taken when an unexpected condition was encountered. Instead of raising a question and getting clarification, workers made decisions in the field without a proper brief and without a complete understanding of the situation. The inspectors concluded that when an effective brief was conducted and conditions were well understood, workers performed tasks generally without error. However, the majority of human performance errors occurred when an inadequate briefing was performed or an unexpected condition was encountered and the worker did not seek clarification prior to proceeding. The inspectors provided these observations to the licensee and the licensee generated IR 469926, "Need to address culture of workforce overconfidence."

4OA5 Other Activities

.1 Implementation of Temporary Instruction (TI) 2515/165 - Operational Readiness of Offsite Power and Impact on Plant Risk

a. Inspection Scope

The objective of TI 2515/165, "Operational Readiness of Offsite Power and Impact on Plant Risk," was to confirm, through inspections and interviews, the operational readiness of offsite power systems in accordance with NRC requirements. On March 14 through 17, 2006, the inspectors reviewed licensee procedures and discussed the attributes identified in TI 2515/165 with licensee personnel. In accordance with the requirements of TI 2515/165, the inspectors evaluated the licensee's operating procedures used to assure the functionality/operability of the offsite power system, as well as, the risk assessment, emergent work, and/or grid reliability procedures used to assess the operability and readiness of the offsite power system.

The information gathered while completing this Temporary Instruction was forwarded to the Office of Nuclear Reactor Regulation for further review and evaluation.

b. Findings

No findings of significance were identified.

4OA6 Meetings

.1 Exit Meeting

The inspectors presented the inspection results to Mr. R Bement and other members of licensee management at the conclusion of the inspection on April 13, 2006. The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

.2 Interim Exit Meetings

Interim exit meetings were conducted for:

- Inservice Inspection (IP 71111.08), with Mr. R. Bement and other members of licensee management at the conclusion of the inspection on February 9, 2006. The licensee confirmed that none of the potential report input discussed was considered proprietary.
- Occupational radiation safety radiological access control and ALARA inspection with Mr. R. Bement and other licensee staff on February 17, 2006, followed by a telephone discussion with Mr. Davis on March 1, 2006, to discuss the Green finding associated with the ALARA program.
- Emergency Preparedness inspection with Mr. R. Bement on March 23, 2006.
- The results of the heat sink performance biennial inspection were presented to licensee management at the conclusion of the inspection on March 31, 2006.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee
R. Bement, Site Vice President
M. McDowell, Plant Manager
J. Cunningham, Work Management Director
R. Davis, Radiation Protection Director
R. Frantz, Regulatory Assurance Representative
M. Hiter, Access Control Supervisor
W. Iliff, Regulatory Assurance Director
C. Vandenburg, Nuclear Oversight Manager
J. Domitrovich, Maintenance Director
D. Schavey, Operations Director
J. Madden, Chemistry Manager
J. Lindsey, Training Manager
C. Williamson, Security Manager
R. Peak, Site Engineering Director
W. Carsky, Shift Operations Superintendent
J. Peterson, Regulatory Assurance
H. Do, Corporate ISI Engineer, Cantera

LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

Opened and Closed

05000461/2006002-01 NCV	Inadequate design control during review of Engineering Change Package 356820 “Shutdown Cooling Header Leak-off line”.
05000461/2006002-02 NCV	Inadequate test control during the review of the licensee’s surveillance test to determine operability of the shutdown service water system.
05000461/2006002-03 FIN	Failure to Maintain Collective Radiation Dose to Occupational Workers Involved in Refuel Floor Work ALARA (Section 2OS2).

Discussed

None

LIST OF DOCUMENTS REVIEWED

The following is a list of documents reviewed during the inspection. Inclusion on this list does not imply that the NRC inspectors reviewed the documents in their entirety but rather that selected sections of portions of the documents were evaluated as part of the overall inspection effort. Inclusion of a document on this list does not imply NRC acceptance of the document or any part of it, unless this is stated in the body of the inspection report.

1R01 Adverse Weather

Calculation 8.9.1-5 “Clinton Power Station - Tornado Missile Hazard Analysis of Wall Penetrations”

Issue Report 465884, Large Loose debris Identified in Lot North of Switchyard

1R04 Equipment Alignments

CPS 3312.01V001; “Residual Heat Removal Valve Lineup,” Revision 15e

CPS 3312.01E001; “Residual Heat Removal Electrical Lineup,” Revision 14

CPS 3312.01V002; “Residual Heat Removal Instrument Valve Lineup,” Revision 9

Clinton Power Station (CPS) Updated Safety Analysis Report (USAR)

CPS 3312.01v001, “Residual Heat Removal Valve Lineup,” Revision 16

CPS3312.01E001, “Residual Heat Removal Electrical Lineup,” Revision 14

CPS9053.01, “RHR B / RHR C Discharge Header Filled And Flow Path Verification,” Revision 28

Pipe and Instrumentation Diagram (P&ID) for Residual Heat Removal System

1R05 Fire Protection

USAR Appendix E, Sections 3.4.1.2, 3.4.1.3, 3.4.1.5, 3.4.1.6; Revision 11

USAR Appendix E Section 3.5.6, Fire Area D-6, Revision 11

USAR Appendix E Section 3.1.2.2.9, Fire Doors, Revision 11

USAR Appendix E Section 3.4.3.1, Fire Zone CB-3a; Revision 11

Figure FP-10b, Fire Protection Features Control and Diesel Generator Building Grade Floor Plan EL 737'-0", Revision 9

Figure FP-13a, Fire Zone Boundaries Control Building Floor Plan EL. 781'-0", Revision 8

CPS 1893.01, Fire Protection Impairment Reporting, Page 42 of 43; Revision 15e

CPS 9277.11C001, Hose Replacement Checklist, Pages 5 & 6, Revision 24a

Issue Report 00449128, Fire Door 1SD1-61 Missing UL Label for 3-HR Rating, dated February 2, 2006

Clinton Power Station (CPS) Updated Safety Analysis Report (USAR) Appendix E, "Fire Protection Evaluation Report"

1R07 Heat Sink Performance

Calculation 01DG11; Division I and II HX Tube Plugging and Division III HX Tube Plugging; Revision 5

Division II Diesel Generator Jacket Water Cooler Data and Performance Evaluation 1DG11AB 12 Cylinder; dated August 9, 2001

CPS 2700.16; Division 1 Diesel Generator (16 Cylinder) Jacket Water Cooler (1DG12AA) Heat Exchanger Performance Covered by NRC Generic Letter 89-13; Revision 5

CPS 2700.15; Division 1 Diesel Generator (12 Cylinder) Jacket Water Cooler (1DG11AA) Heat Exchanger Performance Covered by NRC Generic Letter 89-13; Revision 5

CPS 2700.12; Division 1 SX System Flow Balance Verification; Revision 5a

CPS 8130.01; Heat Exchanger Maintenance/Repairs; Revision 1a

Analysis No. 065-017; Summary Report Clinton GL 89-13 Program Report; Revision 3

ER-AA-340-1001; GL 89-13 Program Implementation Instructional Guide; Revision 4

EC 0000332066; Division II DG Jacket Water HX Performance Evaluation for GL 89-13; August 9, 2001

Calculation No. 01DG11; Calculation for Diesel Generator Tube Plugging; Revision 5

Calculation No. IP-M0486; Clinton RHR Pump Seal Cooler Service Water Cooling Flow Requirements; Revision 6C

EPRI NP-7552; Heat Exchanger Performance Monitoring Guidelines; dated December 1991

Thermal Analysis of "CPK" Heat Exchanger #17084; dated August 2, 1990

AR 00079350; Trending CR for Biological Growth in Raw Water Systems; dated October 18, 2001

AR 00170685; Untimely Implementation of SR 19348; dated August 7, 2003

AR 00270124; Operability Impact Predefine Scheduled Outside RH System Outage Window; dated November 4, 2004

AR 00334644; West End Bell Leak During Filling Heat Exchanger with Water; dated May 12, 2005

Analysis No. IP-0486; Shutdown Service Water System Hydraulic Analysis Model and Flow Balance Acceptance Criteria; dated January 29, 2003

AR 00473517; 1DG11AA DG HX Testing Issue Identified During UHS Inspection; dated March 31, 2006

1R08 Inservice Inspection Activities (IP 71111.08)

AR00451692; GE UT PDI Examiner Entered Incorrect Setting During Exam; dated February 8, 2006

AR00452040; Alternate Illumination Verification Method of ER-AA-335-014; dated February 9, 2006

AR00263917; Required Information not Provided for R/R Plans; dated October 15, 2004

AR00263888; Procedure Requirements not Met in Documenting VT-3; dated October 15, 2004

AR00261171; Inadequate PMT Specified for WO 461140; dated October 7, 2004

AR00304354; Inconsistency Between NDE Procedure and RI-ISI Requirements; dated February 22, 2005

AR00278113; Inspection Required for Diesel Fuel Oil Storage Tanks; dated December 1, 2004

AR00203352; Leaking CRDM 32-49 (Within Spec); dated February 23, 2004

AR00200725; UT Examination Volume Coverage in C1R08 (2002) for R-ISI; dated February 10, 2004

AR00200733; UT Records in C1R08, Risk ISI Category Not Identified; dated February 10, 2004

GE-UT-209; Procedure for Automated Ultrasonic Examination of Dissimilar Metal Welds, and Nozzle to Safe End Welds; Revision 18

GE-ADM-1062; Procedure for Determining and Documenting Examination for Risk-Informed Inservice Inspections; Revision 0

GE-PDI-UT-1; PDI Generic Procedure for the Ultrasonic Examination of Ferritic Pipe Welds; Revision 4

GE-UT-605; Procedure for the Performance of Straight Beam Examinations; Revision 2

GE-MT-100; Procedure for Magnetic Particle Examination (Dry Particle, Color Contrast or Wet Particle); Revision 6

GE-MT-100; Procedure for Magnetic Particle Examination (Dry Particle, Color Contrast or Wet Particle); Revision 5

GE-VT-101; Procedure for VT-1 Examination; Revision 2

ER-AA-335-014; VT-1 Visual Examination; Revision 2

WO448086-04; Replace Relief Valve 1C41F029A; dated January 20, 2004

M05-1004; FW-02-01; Revision 1

06-062; Magnetic Particle Examination Report; dated February 6, 2006

ER-AA-355-025; Oversight of Vendor NDE Activities; Revision 2

1R15 Operability Evaluations

IR 467749; 1E22F035 New relief valve leaks, March 15, 2006

Op Eval 467749-02; 1E22F035 New relief valve leaks, March 22, 2006

USAR section 6.2; Containment systems, table 6.2-47, Isolation valve summary for line penetrating containment, Rev 11

USAR Fig 6.2-144; High pressure core spray P&ID showing outside of containment boundary, Rev 11

DWG M05-1074; P&ID High pressure core spray, Rev AG

1R17 Permanent Plant Modifications

EC 356820, C1R10 Contingent Mod to Address RHR SDC HDR Pressurization, Revision 0

Analysis No IP-M-0562, Water Leg Pump Piping Hydraulic Analysis for RHR B/RHR C, Revision 0B

AR 0453933, Error Discovered in Mod EC 356820,RHR Shutdown Cooling Header

EC 347940, Rev. 2, “Leak Detection - Drywell Equipment Drain Flow Instrumentation”

IR 227195, “Leak Detection System to Maintenance Rule Status (A) (1)”

IR 288494, “Pool Swell Qualification of Containment Instrument Panels”

IR 295243, “Passport Equip Parameters for Drywell Sump Flow RG 1.97"

CC-AA-107, Rev. 4 “Configuration Change Acceptance Testing Criteria”

CPS 9443.01, Rev. 38, “Drywell Equipment Drain Sump Flow E31-N766 Channel Cal”

CPS 9543.01, Rev. 35, “Drywell Equipment Drain Sump Flow 1E31-N766 Channel Functional”

Clinton Power Station (CPS) Updated Safety Analysis Report (USAR)

Clinton Power Station Technical Specifications (TS)

1R19 Post Maintenance Testing

1R22 Surveillance Testing

Dwg M05-1002, P&ID Main Steam; Revision T

CPS 1305.01F002, Type C local leak rate summary sheet; Revision 4

CPS 9861.04, MSIV local leak rate test; Revision 26

CPS 9861.04D001, MSIV A LLRT data sheet; Revision 25c

CPS 9861.04D002, MSIV B LLRT data sheet; Revision 25c

CPS 9861.04D003, MSIV C LLRT data sheet; Revision 25c

CPS 9861.04D004, MSIV D LLRT data sheet; Revision 25c

IR 448776, 2000 sccm packing leak on 1B21-F026D affects MSIV LLRT; February 1, 2006

CPS 2761.02, Leak Rate Testing Equipment Operation, Revision 5a

CPS 9080.23, Diesel Generator 1C ECCS Integrated Test, Revision 28b

CPS 9080.23D001, DG1C ECCS Integrated Data Sheet, Revision 24b

CPS 9080.23E001, DG1C ECCS Integrated Electrical Lineup, Revision 21b

CPS 9861.09D008; Leakage Test on Valve 1SX014A, Revision 0d

CPS 9843.01D002; Category A Valve Leak Test Via Flowmeter (1E12F009 and 1E12F008), dated February 10, 2006

CPS 9861.09D003, Leak Rate Testing for SX Valve 1SX0011A, Revision 0a

CPS 9861.09D009, Leakage Test on Valve 1SX011B, Revision 0a

CPS 3211.01, Shutdown Service Water (SX), Revision 24d

CPS 9861.09, Shutdown Service Water Boundary Valve Leak Testing, Revision 0f

CPS 9843.01, ISI Category A Valve Leak Rate Test, Revision 34c

CPS 9843.01V006, Leak Rate Testing of RHR Shutdown Suction, Revision 23a

Drawing No. M05-1052, P&ID Shutdown Service Water (SX), Revision AT

Drawing No. M05-1075, P&ID Residual Heat Removal (RH) Clinton Power Station Unit 1; Sheet 1 Revision AW and Sheet 2 Revision AL

Technical Specification Surveillance Requirements:

SR 3.5.1.5, Amendment No. 169

SR 3.5.2.6, Amendment No. 169

SR 3.6.1.3.7, Amendment No. 169

SR 3.8.1.2, Amendment No 122

SR 3.8.1.3, SR 3.8.1.4, SR 3.8.1.5, SR 3.8.1.6 Amendment No 118

SR 3.8.1.8, SR 3.8.1.11, SR 3.8.1.12, SR 3.8.1.13, SR 3.8.1.16

SR 3.8.1.17, SR 3.8.1.19, Amendment No. 169

SR 3.8.3.1, SR 3.8.3.2, SR 3.8.3.4, SR 3.8.3.5, Amendment No. 95

Technical Specification Bases:

SR 3.5.1.5, Revision No 10-7

SR 3.5.2.6, Revision No 4-6

SR 3.8.3.1, SR 3.8.3.2, Revision No. 7-7

SR 3.8.3.4, SR 3.8.3.5, Revision No 4-6

SR 3.8.1.2, Revision No 4-1

SR 3.8.1.3, Revision 4-6

SR 3.8.1.4, Revision 7-7

SR 3.8.1.5, SR 3.8.1.6, Revision 4-6

SR 3.8.1.8, SR 3.8.1.11, SR 3.8.1.12, SR 3.8.1.13, SR 3.8.1.16, SR 3.8.1.17, SR 3.8.1.19, Revision 10-7

Issue 00449266; NRC Inspector Questions Regarding SX Boundary Valve Testing, dated February 2, 2006

Issue 00453793; Add 1E12F002 to 9843.01V006 Lineup, dated February 14, 2006

1EP2 Alert and Notification System (ANS) Testing

Clinton Station Off-site Siren Test Plan; Revision 1

Clinton Power Station Warning System Preventive Maintenance and Operational Report August 16 - August 19, 2004

Clinton Power Station Warning System Preventive Maintenance and Operational Report July 11 - July 19, 2005

Exelon Semi-Annual Siren Maintenance Reports; January 2004 through December 2005

IR 00260747; Semi-Annual Review of First Half 2004 Siren Maintenance Data - One Clinton Station Siren Had Three Non-Scheduled Maintenance Calls

IR 00322323; Semi-Annual Review of Second Half 2004 Siren Maintenance Data - Two Clinton Station Sirens Had Three Non-Scheduled Maintenance Calls

1EP3 Emergency Response Organization (ERO) Augmentation Testing

EP-AA-112; Emergency Response Organization and Emergency Response Facility Activation and Operation; Revision 10

EP-AA-112-100; Control Room Operations; Revision 7

TQ-AA-113; ERO Training and Qualification; Revision 7

Records of Unannounced, Off-Hours, Onsite ERO Augmentation Drills; April 2004 through December 2005

Internal Memorandum; September 16, 2004 Station and Corporate ERO Drive-In Augmentation Drill Results; dated October 18, 2004

Sample of Corrective Action Program Records Associated With Critiques of Monthly Off-Hours ERO Augmentation Drills Conducted Between April 2004 and December 2005

Random Sample of 36 Clinton Station ERO Members' EP Training Records

Random Sample of 34 Corporate Office ERO Members' EP Training Records

March 2006 Roster of Clinton Station ERO Members

March 2006 Roster of Corporate Office ERO Members

Clinton Station Augmentation Drill ERO Member Participation Tracking Record for February 2005 through December 2005

1EP4 Emergency Action Level (EAL) and Emergency Plan Changes

Letters of Agreement with Site-Specific Off-site Support Organizations

Letters of Agreement or Contracts with Off-site Support Organizations for Exelon Illinois Nuclear Stations

Clinton Station Annex to Exelon Standardized Emergency Plan; Appendix 2; Revision 8

Exelon Standardized Emergency Plan; Appendix 3, Revision 16

1EP5 Correction of Emergency Preparedness Weaknesses and Deficiencies

Exelon Emergency Plan; Section N - Drill and Exercise Program; Revision 16

EP-AA-122-1001; Drill and Exercise Scheduling, Development, and Conduct; Revision 5

Internal Memorandum; Clinton 2004 Off-Year Exercise Findings and Observation Report; dated November 12, 2004

Internal Memorandum; Clinton 2005 Pre-Exercise Findings and Observation Report; dated September 23, 2005

Internal Memorandum; Clinton 2005 Exercise Findings and Observation Report; dated November 4, 2005

Internal Memorandum; Four Focused Area Drills for Dose Assessment and Core Damage Assessment; dated June 10, 2004

Internal Memorandum; Two May 2005 Dose Assessment and Core Damage Focus Area Drills Observation Report; dated June 20, 2005

Internal Memorandum; June 2005 Dose Assessment and Core Damage Focus Area Drill Observation Report; undated

Internal Memorandum; October 2005 Dose Assessment and Core Damage Focus Area Drill Observation Report; dated October 31, 2005

Internal Memorandum; Clinton Power Station 2004 Assembly and Accountability Drill; dated January 19, 2005

Internal Memorandum; Clinton Power Station 2005 Assembly and Accountability Drill; dated December 22, 2005

Internal Memorandum; Second Half 2005 Semi-Annual Health Physics Drill; dated November 7, 2005

Internal Memorandum; Clinton 2004 Medical and Health Physics Drill Findings and Observations Report; dated May 28, 2004

Internal Memorandum; Clinton 2005 Medical and Health Physics Drill Findings and Observations Report; dated July 23, 2005

Internal Memorandum; 2005 Environmental Monitoring Drill Critique; dated December 29, 2005

NOSA-CPS-05-04; Clinton Power Station 2005 Emergency Preparedness 50.54(t) and Meteorology Audit Report; dated April 12, 2005

Excerpts of NOS Quarterly Surveillance Reports Relevant to Station's EP Program; April 2004 through December 2005

Records of October 2005 Annual Emergency Preparedness Meeting with State and County Officials and Off-site Support Organizations' Representatives

Exelon Stations' EP Programs Monthly Health Reports for December 2005 and January 2006

Late 2005 Revision to Core Damage Assessment Lesson Plan

IR 00272975; TSC Performance Concerns in 2004 Off-Year Exercise

IR 00272985; OSC Performance Concerns in 2004 Off-Year Exercise

IR 00321761; NOS-Identified Equipment Storage Concerns During 2005 Medical Drill

IR 00322343; NOS-Identified Emergency Operating Procedure and Emergency Action Level Linkage Concern

IR 00360091; Equipment Enhancements Identified During 2005 Medical Drill

IR 00366825; TSC Performance Concerns in 2005 Pre-Exercise Drill

IR 00366829; OSC Performance Concerns in 2005 Pre-Exercise Drill

IR 00366831; EOF Failed Performance Objective in 2005 Pre-Exercise Drill - Coordination on Off-Site Survey Teams' Equipment Problems

IR 00375621; TSC Failed Demonstration Criteria in 2005 Pre-Exercise Drill - Onsite Protective Action Decision Making and Coordination on Off-Site Survey Teams' Equipment Problems

IR 00375645; Failed Demonstration Criterion in 2005 pre-Exercise Drill - Off-Site Survey Teams Were Not Given Simulated Exposure Limits

IR 00394102; Facility and Equipment Issues Identified During 2005 Exercise

IR 00394131; Communications, Coordination, and Simulated Exposure Control Issues for a Team Deployed within Protected and Owner Controlled Areas in 2005 Exercise

IR 00394140; TSC Performance Issues in 2005 Exercise

IR 00432984; Owner Controlled Area Notification System Concerns Identified During 2005 Assembly Drill

IR 00432990; Plant Public Address System Audibility Concerns Identified Within Protected Area During 2005 Assembly Drill

2OS1 Access Control to Radiologically Significant Areas

RP-AA-222; Methods for Estimating Internal Exposure From In-Vivo and In-Vitro Bioassay Data; Revision 1

RWP 10005349; Auxiliary Building/Containment Building RWCU System Work; Revision 1

RWP 10005294; Drywell Bioshield ISI; Revision 2

RWP 10005286/87; Reactor Recirc Pump and System Work; Revision 2

Prompt Investigation Report for AR 448354; Entry Into Drywell on Incorrect RWP; dated February 2, 2006

2OS2 ALARA Planning and Controls

RP-AA-400; ALARA Program; Revision 3

RP-AA-401; Operational ALARA Planning and Controls; Revision 5

RP-AA-441; Evaluation & Selection Process for Radiological Respirator Use; Revision 2

RWP 10005356 (Revision 1); Associated ALARA Plan and TEDE ALARA Evaluation; C1R10 Refuel Floor Work (No Cavity)

Work In Progress Reviews for RWP 10005356; dated February 13, 20, and 23, 2006

RWP 10005357 (Revision 0); Associated ALARA Plan and TEDE ALARA Evaluation; C1R10 Fuel Movement

RWP 10005294 (Revision 2); Associated ALARA Plan and TEDE ALARA Evaluations; C1R10 Drywell Inside Bioshield ISI

RWP 10005303 (Revision 0); Associated ALARA Plan and TEDE ALARA Evaluations; C1R10 Drywell Shielding

Work In Progress Review for RWP 10005303; dated February 7, 2006

RWP 10005311 (Revision 0); Associated ALARA Plan and TEDE ALARA Evaluations; C1R10 Drywell Under-vessel Preparation/Restoration Work

RWP 10005352 (Revision 0); Associated ALARA Plan and TEDE ALARA Evaluations; C1R10 Auxiliary Building/Containment Building Scaffolding

RWP 10005358 (Revision 0); Associated ALARA Plan and TEDE ALARA Evaluations; C1R10 Dryer Modifications - Diving Activities

RWP 10005328 (Revision 1); Associated ALARA Plan and TEDE ALARA Evaluations; C1R10 MSR Upgrade

Work In Progress Review for RWP 10005294; dated February 12, 2006, and Associated Radiation Surveys for Various Dates in February 2006

Work In Progress Review for RWP 10005328; dated February 9, 2006

C1R10 Exposure Reports; February 13 - 17 and February 24, 2006

C1R10 Refueling Outage Dose Estimate Validation Report and Historical BRAC Data; February 2006

AR 00429649; Task Planning and Scheduling; dated November 28, 2006

AR 00444783; Potential Trend - Dose Control; dated January 23, 2006

AR 00445474; C1R10 Dose Savings by Eliminating Flow Accelerated Corrosion Inspections; dated January 24, 2006

AR 00448695; Emergent Dose Due to Delays in Reactor Cavity Work; dated January 31, 2006

AR 00450283; Nuclear Oversight Identified Trend in Radiological Controls; dated February 5, 2006

AR 00449365; Dose Rates Higher Inside Moisture Separator Reheaters Than Estimated; dated February 2, 2006

C1R10 Refuel Outage Readiness Self-Assessments; Attachment 1 to RP-AA-4002, undated, and Corporate Outage Management Assessment of Radiation Protection Readiness, dated December 2, 2005

Nuclear Oversight Health Physics Functional Area Assessment Report; dated July 20, 2005

Nuclear Oversight Corporate Comparative Audit Report of 2005 Health Physics Program; NOSA-COMP-05-06; undated

4OA1 Performance Indicator Verification

4OA2 Identification and Resolution of Problems

QHPI 289643, Failed to properly retest logic during 9432.60; January 11, 2005

QHPI 295609, VP B chiller not returned to standby in a timely manner; January 29, 2005

QHPI 300137, Clearance improper for work order requirements; February 10, 2005

QHPI 306180, Hydrogen leak from generator seals during SO system start-up; February 28, 2005

QHPI 306252, Vehicle backed into cathodic protection junction box; February 28, 2005

QHPI 308135, Wrong channel selected during 9030.01C022; March 3, 2005

QHPI 309281, MSIV inboard B solenoids found de-energized; March 6, 2005

QHPI 314170, Missed surveillance during startup from C1F45; March 17, 2005

QHPI 316323, Clearance not revised when schedule changed; March 23, 2005

QHPI 321431, 1CC01T: Abnormal level decrease on CC expansion tank; April 5, 2005

QHPI 323064, 1CP01DG: Manway on G polisher spraying out water; April 10, 2005

QHPI 325177, Turbidity analyzer A isolation valve found open; April 15, 2005

QHPI 336920, Drywell pressure abnormal trend due to leak on 1E31-P002; May 20, 2005

QHPI 337266, Exam material not password protected on LAN; May 20, 2005

QHPI 345232, ESOMS not updated prior to clearance activity; Jun 27, 2005

QHPI 350198, Lost allen pack in containment; July 5, 2005

QHPI 350386, 0VW01A - Stage #4 heater bank failed PMT; July 5, 2005

QHPI 352228, PMT failure on 0SA01D orifice not replaced after disassembly; July 12, 2005

QHPI 355104, Durability monitor not in expected lineup; July 20, 2005

QHPI 358076, Valve manipulated without operations approval; July 29, 2005

QHPI 364143, Lower than expected sample vacuum and activity; August 18, 2005

QHPI 364666, Clearanced equipment not in expected configuration; August 19, 2005

QHPI 362908, Fire pump test data taken at wrong spot; September 1, 2005

QHPI 374457, 1N66N012A - Unexpected alarm 5130-6E OG A analyzer; September 16, 2005

QHPI 389346, Flow controller for 1CD066B at 1PA05J found not in auto; October 24, 2005

QHPI 395901, Location for 1FC138A is inadequate unnecessary dose (ALARA); November 7, 2005

QHPI 397397, SLC valves found unlocked; November 10, 2005

QHPI 427257, 6948.02, Surveillance not initiated prior to monitor swap; November 23, 2005

QHPI 430185, Human error - Technician removed wrong connector; December 3, 2005

QHPI 435373, Issues identified during startup of raw water pump; December19, 2005

CCA 356758, Perform a common cause on the site cross-cutting error precursor - complacency and overconfidence issue; August 26, 2005

CCA 367021, Perform common cause analysis (CCA) on maintenance clock resets, by department and individual group, from 01/01/2005 through 8/31/2005; September 29, 2005

CCA 379119; Complete common cause analysis (CCA)

EP-AA-125-1001; Emergency Preparedness PI Guidance; Revision 3

LS-AA-2110; Monthly PI Data Elements for ERO Drill Participation; July 2005 through December 2005; Revision 6

LS-AA-2120; Monthly PI Data Elements for Drill/Exercise Performance; July 2005 through December 2005; Revision 4

Clinton Station Emergency Planning Zone Daily and Monthly Siren Operability Reports; July 2005 through December 2005

Internal Memorandum; October 2005 Dose Assessment and Core Damage Assessment Drill Observation Report; dated October 31, 2005

Internal Memorandum; Fourth Quarter 2005 PI Drills Observation Report; dated January 5, 2006

Four Mini-Scenarios Used in Fourth Quarter 2005 Protective Action Decision Making and Notification Drills

IR 00439063; Two Unsuccessful Protective Action Recommendation Opportunities During Fourth Quarter 2005 PI Drills

LIST OF ACRONYMS USED

ADAMS	Agency wide Documents Access and Management System
ALARA	As-Low-As-Reasonably-Achievable
AR	Assignment Report
ASME	American Society of Mechanical Engineers
BRAC	Boiling Water Reactor Assessment & Control
CR	Condition Report
CFR	Code of Federal Regulations
EC	Engineering Change
EP	Emergency Preparedness
ERO	Emergency Response Organization
HPCS	High Pressure Core Spray
HRA	High Radiation Area
IEMA	Illinois Energy Management Agency
IMC	Inspection Manual Chapter
IR	Issue Report
IP	Inspection Procedure
ISI	In-Service-Inspection
LHRA	Locked High Radiation Area
LPCS	Low Pressure Core Spray
MR	Maintenance Rule
MT	Magnetic Particle Examination
NCV	Non-Cited Violation
NDE	Nondestructive Examination
NOS	Nuclear Oversight
NRC	Nuclear Regulatory Commission
OPC	Operational Support Center
ORM	Operations Requirements Manual
PARS	Publicly Available Records
PI	Performance Indicator
QHPI	Quick Human Performance Investigation
RHR	Residual Heat Removal
RP	Radiation Protection
RPT	Radiation Protection Technician
RWP	Radiation Work Permit
SDP	Significance Determination Process
SSCs	Structures, Systems and Components
SX	Shutdown Service Water
USAR	Updated Safety Analysis Report
TEDE	Total Effective Dose Equivalent
TS	Technical Specifications
UT	Ultrasonic Examination
WIP	Work In Progress