



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION**

REGION III  
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May 13, 2011

Mr. Michael J. Pacilio  
Senior Vice President, Exelon Generation Company, LLC  
President and Chief Nuclear Officer (CNO), Exelon Nuclear  
4300 Winfield Road  
Warrenville, IL 60555

**SUBJECT: CLINTON POWER STATION - NRC TEMPORARY INSTRUCTION 2515/183  
INSPECTION REPORT 05000461/2011-011**

Dear Mr. Pacilio:

On April 29, 2011, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Clinton Power Station, using Temporary Instruction (TI) 2515/183, "Followup to the Fukushima Daiichi Nuclear Station Fuel Damage Event." The enclosed inspection report documents the inspection results, which were discussed on May 4, 2011, with Mr. F. Kearney and other members of your staff.

The objective of this inspection was to promptly assess the capabilities of Clinton Power Station to respond to extraordinary consequences similar to those that have recently occurred at the Japanese Fukushima Daiichi Nuclear Station. The results from this inspection, along with the results from this inspection performed at other operating commercial nuclear plants in the United States, will be used to evaluate the U.S. nuclear industry's readiness to safely respond to similar events. These results will also help the NRC to determine if additional regulatory actions are warranted.

All of the potential issues and observations identified by this inspection are contained in this report. The NRC's Reactor Oversight Process will further evaluate any issues to determine if they are regulatory findings or violations. Any resulting findings or violations will be documented by the NRC in the next quarterly report. You are not required to respond to this letter.

M. Pacilio

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Sincerely,

**/RA/**

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

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

Enclosure: Inspection Report 05000461/2011-011

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U. S. NUCLEAR REGULATORY COMMISSION

REGION III

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

Report No: 05000461/2011-011

Licensee: Exelon Generation Company, LLC

Facility: Clinton Power Station, Unit 1

Location: Clinton, IL

Dates: March 23 through April 29, 2011

Inspectors: B. Kemker, Senior Resident Inspector  
D. Lords, Resident Inspector  
S. Mischke, Resident Inspector, Illinois Emergency  
Management Agency

Approved by: M. Ring, Chief  
Branch 1  
Division of Reactor Projects

Enclosure

## **SUMMARY OF FINDINGS**

IR 0500005000461/2011-011, 03/23/2011 – 04/29/2011; Clinton Power Station Temporary Instruction 2515/183 - Followup to the Fukushima Daiichi Nuclear Station Fuel Damage Event.

This report covers an announced Temporary Instruction inspection. The inspection was conducted by Resident and Region III inspectors. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 4, dated December 2006.

### **INSPECTION SCOPE**

The intent of the TI (Temporary Instruction) is to provide a broad overview of the industry's preparedness for events that may exceed the current design basis for a plant. The focus of the TI was on (1) assessing the licensee's capability to mitigate consequences from large fires or explosions on site, (2) assessing the licensee's capability to mitigate station blackout (SBO) conditions, (3) assessing the licensee's capability to mitigate internal and external flooding events accounted for by the station's design, and (4) assessing the thoroughness of the licensee's walk downs and inspections of important equipment needed to mitigate fire and flood events to identify the potential that the equipment's function could be lost during seismic events possible for the site. If necessary, a more specific follow-up inspection will be performed at a later date.

### **INSPECTION RESULTS**

All of the potential issues and observations identified by this inspection are contained in this report. The NRC's Reactor Oversight Process will further evaluate any issues to determine if they are regulatory findings or violations. Any resulting findings or violations will be documented by the NRC in the next quarterly report.

03.01 Assess the licensee’s capability to mitigate conditions that result from beyond design basis events, typically bounded by security threats, committed to as part of NRC Security Order Section B.5.b issued February 25, 2002, and severe accident management guidelines, and as required by Title 10 of the Code of Federal Regulations (10 CFR) 50.54(hh). Use Inspection Procedure (IP) 71111.05T, “Fire Protection (Triennial),” Section 02.03 and 03.03 as a guideline. If IP 71111.05T was recently performed at the facility, the inspector should review the inspection results and findings to identify any other potential areas of inspection. Particular emphasis should be placed on strategies related to the spent fuel pool. The inspection should include, but not be limited to, an assessment of any licensee actions to:

<b>Licensee Action</b>	<b>Describe what the licensee did to test or inspect the equipment.</b>
<p>a. Verify through test or inspection that equipment is available and functional. Active equipment shall be tested and passive equipment shall be walked down and inspected. It is not expected that permanently installed equipment that is tested under an existing regulatory testing program be retested.</p> <p>This review should be done for a reasonable sample of mitigating strategies/equipment.</p>	<p>The licensee’s actions included identification of equipment (active and passive) utilized for implementation of Section B.5.b actions and any additional equipment used in Severe Accident Management Guidelines (SAMGs). The scope of the equipment was defined as that equipment specifically designated for B.5.b or SAMG mitigation (e.g., special hoses, fittings, pumps, cables, tools, etc.). Permanent plant equipment (i.e., in situ equipment) was generally not considered in the scope, since it is normally in service, subjected to planned maintenance, and/or checked on operator rounds. However, the horizontal fire pump (0FP03P), which is permanently installed equipment available for use by the licensee’s response procedures, was specifically tested. The licensee walked down the mitigation procedures referenced below in Section 03.01.b to verify that any equipment needed to perform required actions was available and functional, was identified in the referenced procedures, and the location was tracked and periodically checked. The current condition of the contingency and portable equipment was verified. The licensee then identified surveillances/tests and performance frequencies for the identified equipment, and reviewed the results of recent tests. Active equipment within the scope defined above that did not have recent test results was tested. Passive equipment within the scope was walked down and inspected.</p> <p><b>Describe the inspectors’ actions taken to confirm equipment readiness (e.g., observed a test, reviewed test results, discussed actions, reviewed records, etc.).</b></p> <p>Most of the licensee’s actions discussed above were completed prior to the issuance of NRC Temporary Instruction (TI) 2515/183. The inspectors assessed the licensee’s capabilities by conducting a review of the results from the licensee’s walk down activities.</p>

The inspectors independently walked down and inspected all major B.5.b contingency response equipment staged throughout the site with the licensee. The inspectors observed the licensee test the horizontal fire pump, portable (i.e., trailer mounted) B.5.b fire pump, and portable floating fire pump. In addition, the inspectors performed independent walk downs of seven of the B.5.b extensive damage mitigation procedures and four of the SAMG implementation procedures with licensed and non-licensed operators. In general, the results of the inspectors' independent equipment and procedure walk downs confirmed the results obtained by the licensee. The inspectors reviewed and discussed the results of the recently performed IP 71111.05T inspection (NRC Inspection Report 05000461/2011009) with the inspection team leader. There were no significant issues related to B.5.b extensive damage mitigation actions during the IP 71111.05T inspection.

**Discuss general results including corrective actions by the licensee.**

In general, all equipment (active and passive) designated for B.5.b was verified to be located in appropriate storage locations and contained in applicable procedures. All passive equipment was walked down and verified to be in place and ready for use. Passive equipment that had surveillance and/or preventative maintenance tasks had those activities performed to verify readiness for use. All active equipment located at the site was verified in place and tested by the licensee. Several equipment staging and labeling enhancements were identified by the licensee and entered into its corrective action program.

The licensee identified the following deficiencies:

- (1) Action Request (AR) 01191284 was written to identify that functional testing of two Rosemount direct current (DC) voltage sources and a handheld tachometer identified dead batteries. The tachometer was replaced with a functioning tachometer and the associated procedures were revised to allow use of alternate DC sources and a standard multi-meter for monitoring transmitter output. Additional actions to revise the quarterly inventory procedure to include functional testing of these devices are being tracked by the licensee.
- (2) AR 01196176 was written to identify that the fuel in the portable B.5.b fire pump has not been replaced within the past year, as required by recently issued procedure OP-AA-201-010-1001, "B.5.b Mitigating Strategies Equipment Expectations."

The licensee is evaluating the most appropriate approach to ensuring high quality fuel is maintained for this pump.

- (3) AR 01191290 was written to identify that CPS 4303.01F001, "Extensive Mitigation Guide Flowchart," directs arranging for fuel deliveries, consideration for obtaining a trailer mounted 4160 volt alternating current (VAC) diesel generator, obtaining an offsite air supply, arranging for supplies of food, drinking water, personal necessities, and portable toilets. Although no Memorandums of Understanding (MOUs) were located specifically addressing these items, these are items that would be obtained as part of the normal Emergency Response Organization (ERO) functions. These are not equipment that would be required in order to implement any mitigating strategy prior to staffing the ERO. The licensee is evaluating whether MOUs would be appropriate for this activity.

The inspectors noted the following issue:

- (1) Material condition of the diesel-driven horizontal fire pump was generally poor and the licensee has not focused appropriate attention to maintaining the pump. During a test run observed by the inspectors on April 6, 2011, the pump's inboard and outboard shaft packing glands overheated and failed. The operator had to shut down the pump early during the test run. ARs 01198618 and 01203214 were written to address the pump shaft packing problem. During the past year, there have been several material condition issues identified by the licensee affecting the horizontal fire pump including problems with the pump shaft packing glands, bearings, battery, and battery charger. No specific commitments were found during this review for the licensee to maintain this pump to implement the strategies associated with B.5.b and 10 CFR 50.54(hh).

Licensee Action	Describe the licensee's actions to verify that procedures are in place and can be executed (e.g. , walk downs, demonstrations, tests, etc.).
<p>b. Verify through walk downs or demonstration that procedures to implement the strategies associated with B.5.b and 10 CFR 50.54(hh) are in place and are executable. Licensees may choose not to connect or operate permanently installed equipment during this verification.</p> <p>This review should be done for a reasonable sample of mitigating strategies/equipment.</p>	<p>The licensee's verification actions included identification of those procedures utilized to implement the strategies associated with B.5.b and SAMGs. The licensee then compiled verification documentation for procedure validations and identified any procedures not issued or validated and any with open change requests. Open change requests were reviewed for potential impacts on procedure functionality. The licensee walked down all applicable procedures containing B.5.b and SAMG implementation strategies to validate that the strategies were in place and executable. In addition, associated support/referenced procedures were reviewed to identify any use of any temporary or specially fabricated equipment. Current revisions of approved procedures were validated to be located in the designated emergency use locations (i.e., Main Control Room, Technical Support Center, Operations Support Center, Remote Shutdown Panel, and Radwaste Operations Center).</p>
	<p><b>Describe the inspectors' actions and the sample strategies reviewed. Assess whether procedures were in place and could be used as intended.</b></p>
	<p>As discussed above, most of the licensee's actions were completed prior to the issuance of NRC TI 2515/183. The inspectors assessed the licensee's capabilities by conducting an independent review of the licensee's procedures and walk down activities. In addition, the inspectors performed independent walk downs of seven of the B.5.b extensive damage mitigation procedures and four of the SAMG implementation procedures, as discussed above, with licensed and non-licensed operators. In general, the results of the inspectors' independent procedure walk downs confirmed the results obtained by the licensee. As discussed below, the inspectors identified some procedure issues during their walk downs.</p>
	<p><b>Discuss general results including corrective actions by the licensee.</b></p>
<p>The licensee reviewed and walked down procedures utilized to implement the strategies associated with B.5.b and SAMGs and did not identify any significant issues. Refer to Section 03.01.a for the discussion of deficiencies identified with the availability and functionality of temporary equipment required to implement these strategies. Open procedure change requests were reviewed by the licensee to verify that no immediate</p>	

procedure changes were required. Numerous procedure enhancements were identified by the licensee and entered into its corrective action program; however, no significant deficiencies were identified in this area.

The licensee identified the following issue:

- (1) AR 01192277 was written to identify multiple issues and enhancements to the B.5.b procedures and equipment. One noteworthy example was that the licensee's review of CPS 4303.01P019, "Hydrogen Igniter Operation With External AC Power," identified that with the current dedicated B.5.b portable generator rated at 5500 Watts, sufficient power would not be available to energize all of the hydrogen igniters. The Division 1 hydrogen igniters would require 6720 Watts and the Division 2 hydrogen igniters would require 7080 Watts. Depending upon the number of igniter circuits (each division contains five separate circuits) powered by the portable generator, there would be very limited capacity to perform any additional external electrical supply support functions (e.g., powering the safety relief valves).

The inspectors noted the following issues:

- (1) CPS 4303.01P026, "Emergency Containment Spray Makeup From Fire Protection," Section 1.1, "Containment Spray Using RHR [Residual Heat Removal] Flush Lines," Step 1.1.1.7 to align a 480 VAC source to valve 1E12-F028A(B) lacks sufficiently detailed instructions to connect temporary power from Turbine Building outage power panels 0OP64E and 0OP65E. (AR 01211906)
- (2) CPS 4303.01P002, "Spent Fuel Pool Makeup From Containment Pool," Section 1.1, "Spent Fuel Pool Makeup Using IFTS [Inclined Fuel Transfer System]," Step 1.1.3 to open valve 1F42-F004 from the Fuel Building hydraulic power unit lacks sufficiently detailed instructions for all but a few plant staff with additional specific knowledge of the system to open the valve. (AR 01210365)
- (3) The licensee had not initially reviewed open change requests for potential impacts on procedure functionality, but completed the review in response to the inspectors' questions. No significant impacts were identified during the review.

<b>Licensee Action</b>	<b>Describe the licensee's actions and conclusions regarding training and qualifications of operators and support staff.</b>
<p>c. Verify the training and qualifications of operators and the support staff needed to implement the procedures and work instructions are current for activities related to Security Order Section B.5.b and severe accident management guidelines as required by 10 CFR 50.54 (hh).</p>	<p>The licensee's actions included the identification of training/qualification requirements for licensed and non-licensed operators for implementing actions needed to mitigate a B.5.b related event and for implementing the SAMGs. In addition, the licensee identified the training/qualification requirements for applicable ERO command and support staff for implementing actions needed to mitigate a B.5.b related event and for implementing the SAMGs. The licensee documented that all training requirements were current.</p>
	<p><b>Describe the inspectors' actions and the sample strategies reviewed to assess training and qualifications of operators and support staff.</b></p>
	<p>The licensee's actions discussed above were completed prior to the issuance of NRC TI 2515/183. The inspectors assessed the licensee's training and qualification activities by conducting a review of the training and qualification materials and records related to B.5.b and SAMG event response. In general, the results of the inspectors' review confirmed the results obtained by the licensee.</p>
	<p><b>Discuss general results including corrective actions by the licensee.</b></p>
<p>The training/qualification requirements for licensed and non-licensed operators, as well as ERO command and support staff for the implementation of B.5.b event response and SAMGs, were verified current by the licensee. The inspectors identified no discrepancies with the licensee's training materials or records.</p> <p>The inspectors noted the following issue:</p> <p>(1) Adequate training is lacking for implementation of CPS 4303.01, "Extensive Damage Mitigation Guide," and CPS 4303.01P018, "ERO Activation During Extreme Damage Event," to enable non-licensed plant staff (e.g., non-licensed operators and security staff) on shift to initiate communications and activate the ERO in accordance with the procedures. In particular, non-licensed operators and security staff were unfamiliar with these procedures and have had no specific training on them. (AR 01211906)</p>	

Licensee Action	Describe the licensee's actions and conclusions regarding applicable agreements and contracts in place.
<p>d. Verify that any applicable agreements and contracts are in place and are capable of meeting the conditions needed to mitigate the consequences of these events.</p> <p>This review should be done for a reasonable sample of mitigating strategies/equipment.</p>	<p>The licensee's actions included the identification of all applicable contracts and agreements committed to be in place for the mitigation of a B.5.b related event. The licensee verified that the contracts and agreements were current, and documented whether or not the contracts/agreements were capable of meeting the mitigation strategy. MOUs to support fire response, security response, medical response, and ERO support were reviewed and organizations contacted to validate that they are capable of meeting the conditions needed to support the associated MOU. Local law enforcement involvement related to B.5.b and SAMG events is limited to controlling access and directing traffic. These functions are addressed in the associated MOUs.</p>
	<p><b>For a sample of mitigating strategies involving contracts or agreements with offsite entities, describe the inspectors' actions to confirm agreements and contracts are in place and current (e.g., confirm that offsite fire assistance agreement is in place and current).</b></p>
	<p>The licensee's actions discussed above were completed prior to the issuance of NRC TI 2515/183. The inspectors assessed the licensee's capabilities by reviewing the existing agreements to verify that they were current and that appropriate support needs were addressed by the agreements. The results of the inspectors' review confirmed the results obtained by the licensee.</p>
	<p><b>Discuss general results including corrective actions by the licensee.</b></p>
	<p>Existing agreements were current and were capable of meeting the mitigation strategies.</p> <p>The licensee identified the following issue during its review:</p> <p>(1) AR 01191290 was written to identify that CPS 4303.01F001, "Extensive Mitigation Guide Flowchart," directs arranging for fuel deliveries, obtaining a trailer mounted 4160 VAC diesel generator, obtaining an offsite air supply, arranging for supplies of food, drinking water, personal necessities and portable toilets. Although no MOUs exist specifically addressing these items, they would not be required to implement any mitigating strategy prior to staffing the ERO.</p>

<b>Licensee Action</b>	<b>Document the corrective action report number and briefly summarize problems noted by the licensee that have significant potential to prevent the success of any existing mitigating strategy.</b>
e. Review any open corrective action documents to assess problems with mitigating strategy implementation identified by the licensee. Assess the impact of the problem on the mitigating capability and the remaining capability that is not impacted.	The inspectors reviewed action requests initiated by the licensee for potential impact to the licensee’s mitigation strategies. Noteworthy issues identified by the licensee and the inspectors were discussed above in Sections 03.01.a through 03.01.d. Numerous procedure enhancements were identified by the licensee and entered into its corrective action program; however, no significant deficiencies were identified in this area.

03.02 Assess the licensee’s capability to mitigate station blackout (SBO) conditions, as required by 10 CFR 50.63, “Loss of All Alternating Current Power,” and station design, is functional and valid. Refer to TI 2515/120, “Inspection of Implementation of Station Blackout Rule Multi-Plant Action Item A-22,” as a guideline. It is not intended that TI 2515/120 be completely re-inspected. The inspection should include, but not be limited to, an assessment of any licensee actions to:	
<b>Licensee Action</b>	<b>Describe the licensee’s actions to verify the adequacy of equipment needed to mitigate an SBO event.</b>
a. Verify through walk downs and inspection that all required materials are adequate and properly staged, tested, and maintained.	The licensee’s actions included the identification of equipment (both active and passive) utilized/required for mitigation of a SBO. The licensee tested active equipment to verify that it was functional and conducted walk downs of staged equipment to ensure it was adequate and available.

**Describe the inspectors' actions to verify equipment is available and useable.**

Many of the licensee's actions discussed above were completed prior to the issuance of NRC TI 2515/183. The inspectors assessed the licensee's capability to mitigate SBO conditions by reviewing the licensee's testing and walk down activities. In addition, the inspectors selected a sample of equipment utilized/required for mitigation of a SBO and conducted independent walk downs of that equipment to verify that the equipment was properly aligned and staged. In addition, the inspectors performed a walk down of one of the SBO mitigation procedures with a licensed operator. The results of the inspectors' independent equipment and procedure walk downs confirmed the results obtained by the licensee.

**Discuss general results including corrective actions by the licensee.**

In general, all equipment designated for SBO mitigation was verified to be located in appropriate storage locations and was contained in applicable procedures. All passive equipment was walked down and verified to be in place and ready for use. All active equipment located at the site was verified in place and tested by the licensee.

The licensee identified the following deficiencies:

- (1) AR 116032 was written on January 24, 2011, to track repairs to gasoline-powered Main Control Room (MCR) cooling fan 0VC28CA that failed to start during functional testing. Troubleshooting determined that the engine had no spark. Since the backup MCR Cooling fan (0VC28CB) operated properly when tested on March 28, 2011, the SBO MCR cooling strategy was maintained. The 0VC28CA fan was restored to service on April 1, 2011. The licensee has a regularly scheduled preventive maintenance program, including testing of the gasoline-powered MCR fans.
- (2) During SBO procedure walk downs, the resistance temperature detector (RTD) precision resistor bridge specified by CPS 4200.01C003, "Monitoring CNMT [Containment] Temperatures During a SBO," for monitoring containment, drywell, and suppression pool temperatures was found in the licensee's on-site calibration lab with a dead battery. Alternate instrumentation (digital multi-meter) was functional and available in several maintenance and testing equipment issue areas, including the MCR. However, a correlation to utilize an alternate instrument had not been validated.

	<p>AR 01194055 was written to identify the unavailability of the RTD precision resistor bridge, evaluate the use of more readily available test equipment to perform this verification, and to identify the lack of periodic inventory verification for this instrumentation. Functionality of the RTD precision resistor bridge was restored on March 29, 2011.</p>
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<p><b>Licensee Action</b></p>	<p><b>Describe the licensee's actions to verify the capability to mitigate an SBO event.</b></p>
<p>b. Demonstrate through walk downs that procedures for response to an SBO are executable.</p>	<p>The licensee's actions included the identification of procedures required for response to a SBO, along with verification that the identified procedures were current and that no critical revision requests were in place. The licensee then verified that the mitigating procedures had been properly validated. The procedures provide coping strategies in the event of a SBO to maintain reactor water level. The procedures dictate load shedding actions to be completed within one hour, remote monitoring of critical plant parameters, manual containment isolation actions, and actions to attempt to restore electrical power.</p>
	<p><b>Describe the inspector's actions to assess whether procedures were in place and could be used as intended.</b></p>
	<p>Most of the licensee's actions discussed above were completed prior to the issuance of NRC TI 2515/183. The inspectors assessed the licensee's capabilities by conducting a review of the results from the licensee's walk down activities. In addition, the inspectors performed a walk down of one of the SBO mitigation procedures with a licensed operator.</p>
	<p><b>Discuss general results including corrective actions by the licensee.</b></p>
	<p>The licensee walked down the SBO response procedures and verified them to be executable. The results of the inspectors' review and independent equipment and procedure walk downs confirmed the results obtained by the licensee. The licensee had not initially reviewed open change requests for potential impacts on procedure functionality, but completed the review in response to the inspectors' questions. No significant impacts were identified during the review.</p>

03.03 Assess the licensee’s capability to mitigate internal and external flooding events required by station design. Refer to IP 71111.01, “Adverse Weather Protection,” Section 02.04, “Evaluate Readiness to Cope with External Flooding,” as a guideline. The inspection should include, but not be limited to, an assessment of any licensee actions to verify through walk downs and inspections that all required materials and equipment are adequate and properly staged. These walk downs and inspections shall include verification that accessible doors, barriers, and penetration seals are functional.

<b>Licensee Action</b>	<b>Describe the licensee’s actions to verify the capability to mitigate existing design basis flooding events.</b>
<p>a. Verify through walk downs and inspection that all required materials are adequate and properly staged, tested, and maintained.</p>	<p>The licensee’s actions included the identification of equipment, barriers, and penetration seals utilized/required for mitigation of internal and external flooding. The licensee then conducted walk downs of equipment to ensure it was adequate and properly staged. Doors, barriers, and penetration seals that were utilized for mitigation of flooding were identified, and checked to see if they were routinely inspected to ensure functionality. Where routine inspections were not performed or could not be relied upon to ensure functionality, the licensee performed walk downs and inspections to ensure that the components and flood barriers were functional. The internal and external flooding mitigation procedures (CPS 4303.02, “Abnormal Lake Level,” and CPS 4304.01, “Flooding”) were walked down to validate that flood mitigation strategies were in place and executable and required materials and equipment were adequate and properly staged. In addition, associated support/referenced procedures were reviewed by the licensee to identify any use of any temporary equipment.</p>
	<p><b>Describe the inspectors’ actions to verify equipment is available and useable. Assess whether procedures were in place and could be used as intended.</b></p>
	<p>The inspectors assessed the licensee’s capabilities to mitigate flooding by conducting a review of the licensee’s walk down activities. In several instances, these reviews involved the inspectors accompanying licensee operations and engineering personnel during their in-field walk downs. In addition, the inspectors conducted independent walk downs of selected flood mitigation equipment to contribute to the overall assessment of the licensee’s flood mitigating capabilities. Licensee flood mitigation procedures were reviewed to verify usability. In general, the inspectors’ conclusions aligned with the results obtained by the licensee.</p>

**Discuss general results including corrective actions by the licensee.**

The licensee reviewed and walked down procedures and equipment/materials utilized to implement the strategies associated with internal and external flooding and did not identify any significant issues. Doors, barriers, and seal penetrations credited with flood propagation control were determined from the site's flooding analyses. The licensee's reviews confirmed that all flood doors were inspected as part of a routine maintenance program. Flood barriers and penetrations that also serve as fire barriers were determined by the licensee to have been inspected on a routine basis as part of the site's fire protection program. However, the barriers and penetrations that were not part of the fire protection program were identified as not being routinely inspected. The licensee entered this issue into its corrective action program as noted below. Where accessible, the licensee walked down these flood barriers and penetrations. However, the licensee noted that many plant locations were not readily accessible due to high dose rates. Numerous procedure enhancements were identified by the licensee and entered into its corrective action program; however, no significant deficiencies were identified in this area.

The licensee identified the following issues:

- (1) AR 01197979 was written to identify that most flood penetration seals were not routinely inspected. No preventive maintenance program or procedural acceptance criteria existed. The licensee completed walk downs of plant areas with flood penetration seals and observed accessible seals. The licensee's long term resolution will be to develop a preventive maintenance program to inspect seals on a periodic basis.
- (2) AR 01197981 was written to identify that temporary/portable pumps referenced in the licensee's flooding response procedures were not staged or identified for specific use. The licensee's planned resolution is to determine the necessary materials and ways to control inventory or stage the pumps. The pumps are normally stocked in general plant tooling inventory. In addition, the licensee plans to evaluate and develop a testing periodicity for the temporary/portable pumps.

- (3) AR 01197984 was written to identify that a sufficient number of sandbags were not staged to support both the main dam and the Lake Screen House. Sand is staged near the maintenance shed for the Screen House and also at the dam. The licensee's planned actions include validating the staged volumes of sand and increasing the number of sand bags in stores.
- (4) AR 01197992 was written to identify that the flooding response procedures reviewed contained several temporary equipment requirements. However, this equipment was not inspected or inventoried on a routine basis. The licensee's planned actions are to establish inventory, preventive maintenance, and testing for the temporary equipment.
- (5) AR 01197991 was written to identify that during review of each valve used to mitigate internal floods in CPS 4304.01, operators determined that valve 1FP132 was not accessible to use for isolation. The licensee's planned action is to identify a different valve further back on the ring header for isolation.
- (6) AR 01197988 was written to identify that the necessary inventory fuses for reinstalls called out in CPS 4304.01 for restoration activities was unknown. These fuses may be available in general populations such as remote-shutdown supplies, but were not set aside or staged to support timely restoration activities. The licensee's planned actions are to segregate and ensure the necessary inventory of fuses.
- (7) Transport equipment (i.e., loader or back-hoe, pick-up truck, and shovels) needed to fill/transport sandbags for the main dam and Lake Screen House and to place rip-rap at the dam may not be sufficient. However, this would only be for a beyond design basis flooding event. This was documented in AR 01201621.

In addition, the inspectors identified the following issue:

- (1) In July 2010, the inspectors identified that one of three redundant level switches (1LS-TF001B) in the main condenser pit had failed to actuate while testing during the last refueling outage. This is one of three level switches that provides for closure of motor-operated valve 1TF013 to isolate the condenser pit from the Turbine Building floor drain sump in the event of flooding in the main condenser pit. AR 01023891 was written on January 31, 2010, to document the level switch failure; however, the nonconforming

	<p>condition was not corrected prior to startup from the refueling outage and no evaluation (functionality assessment or nonconformance evaluation) was performed. Operators signed off the functional test as satisfactory even though one of the level switches had failed. AR 01092206 was written on July 19, 2010, to evaluate the condition and AR 01093181 was written to repair the level switch. The inspectors concluded at that time that the issue was of minor safety significance.</p>
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03.04 Assess the thoroughness of the licensee’s walk downs and inspections of important equipment needed to mitigate fire and flood events to identify the potential that the equipment’s function could be lost during seismic events possible for the site. Assess the licensee’s development of any new mitigating strategies for identified vulnerabilities (e.g., entered it in to the corrective action program and any immediate actions taken). As a minimum, the licensee should have performed walk downs and inspections of important equipment (permanent and temporary), such as storage tanks, plant water intake structures, and fire and flood response equipment; and developed mitigating strategies to cope with the loss of that important function. Use IP 71111.21, “Component Design Basis Inspection,” Appendix 3, “Component Walkdown Considerations,” as a guideline to assess the thoroughness of the licensee’s walk downs and inspections.

<b>Licensee Action</b>	<b>Describe the licensee’s actions to assess the potential impact of seismic events on the availability of equipment used in fire and flooding mitigation strategies.</b>
<p>a. Verify through walk downs that all required materials are adequate and properly staged, tested, and maintained.</p>	<p>The licensee’s actions included the identification of equipment utilized/required for mitigation of fire and flooding events. Engineering guidelines were developed by the licensee for assessing fire suppression and flooding mitigation capabilities. The guidelines included criteria for conducting walk downs and inspections of the equipment, both permanent and temporary. Licensee engineering personnel determined if the equipment was seismically qualified, or assessed whether it would be possible to evaluate the equipment as being seismically rugged. Seismic vulnerabilities, including storage locations, were identified, along with mitigating strategies for equipment that was not seismically qualified.</p>

	<p><b>Describe the inspectors' actions to verify equipment is available and useable. Assess whether procedures were in place and could be used as intended.</b></p> <p>The inspectors conducted multiple walk downs, both independently and in conjunction with licensee personnel, of important equipment needed to mitigate fire and flooding events to identify the potential that the equipment's function could be lost during a seismic event. This equipment included, but was not limited to:</p> <ul style="list-style-type: none"> <li>• all major B.5.b and SAMG contingency response equipment staged throughout the site;</li> <li>• installed fire suppression equipment in several areas of the power plant;</li> <li>• the installed diesel fire pumps and their controls; and</li> <li>• watertight doors, roof hatches, and floor plugs at the Lake Screen House.</li> </ul> <p>The licensee's flooding and fire mitigation procedures were reviewed to verify usability. The results of the inspectors' reviews aligned with the licensee's conclusions.</p> <p><b>Discuss general results including corrective actions by the licensee. Briefly summarize any new mitigating strategies identified by the licensee as a result of its reviews.</b></p> <p>The licensee reviewed and walked down procedures and structures/equipment/materials utilized to mitigate fire and flooding events to identify where the potential existed for the function of important equipment could be lost during seismic events possible for the site. Where accessible, the licensee walked down areas of the plant to evaluate survivability of important equipment/materials following a credible seismic event. However, the licensee noted that many plant locations were not readily accessible due to high dose rates.</p> <p>The licensee's reviews for this issue determined that non-safety related equipment and structures, in general, were not considered to be either seismically qualified or seismically rugged due to a wide variety of issues. Many of the room flooding mitigation sump pumps and flooding detectors were not designed as seismically qualified. Similarly, the vast majority of the fire protection (FP) system, including the installed fire pumps and the structures that house them, were not designed as seismically qualified and cannot be considered seismically rugged. Firefighting equipment staged to respond to B.5.b events (e.g., portable trailer mounted fire pump, special hoses, fittings, temporary pumps, cables,</p>
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tools, etc.) was not stowed in seismically qualified buildings, as a seismic event and B.5.b event have never been assumed to occur coincidentally. However, this could affect the licensee's ability to access this equipment if it were needed for firefighting actions following a seismic event.

The licensee's reviews identified instances where response capability could be enhanced. These included improving procedural guidance, reviewing the locations of portable equipment, and reviewing the need for supplemental portable equipment to compensate for the possible loss of the fire pumps and much of the FP system piping.

Further, reviews by the licensee identified that in the event of a postulated earthquake equipment may not function properly due to loss of essential power or being subjected to physical displacement. Numerous survivability enhancements were identified by the licensee as well as some minor material condition issues. No significant deficiencies were identified in this area.

The licensee identified the following issues:

- (1) The FP system, in general, is not seismically qualified. The system, including both water and carbon dioxide suppression, was not designed to be seismically qualified. The FP system services non-seismically qualified buildings, including administrative buildings. Damage to these buildings during a seismic event could impact the FP system ring header. Several plant locations were found to have FP system piping in contact with or in close proximity to other support steel. Although permitted by current design requirements, the FP system piping could be damaged in a seismic event. Two installed hose stations in the plant were found to have abnormally long unsupported runs. These were identified as unique compared to all other hose station installations in the plant. The licensee also identified that a large scale break in a FP header could also impact some fire barriers such as 2-hour masonry walls. In addition, the licensee identified that penetration seals are non-seismically qualified. These seals could fail and leak after a seismic event (particularly those with pipes or conduits in them). They are installed per design, but this is in general a long-term vulnerability with respect to flooding following a seismic event. That said, most plant piping is anchored near the penetration, thus the likelihood for survivability is higher. AR 01201621 was written to track the licensee's evaluation of these and other FP system vulnerabilities that are beyond the plant's design basis.

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|  | <p>(2) AR 01200782 was written to identify that general staging and storage practices around FP system equipment primarily in non-safety related areas of the plant does not have appropriate sensitivity toward the FP equipment. While storage of some materials near FP equipment may restrict access to it, some storage of larger items could result in displacement and contact with FP equipment causing damage during a seismic event.</p> <p>(3) AR 01200783 was written to identify abandoned penetration sleeves are laying on FP piping in the vicinity of unfinished walls. These sleeves were previously evaluated as acceptable through analysis, however marginally acceptable. Although tied to general survivability of FP piping during a seismic event, these are unique and easily corrected.</p> |
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## Meetings

### .1 Exit Meeting

The inspectors presented the inspection results to Mr. F. Kearney, and other members of licensee management, at the conclusion of the inspection on May 4, 2011. The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

## SUPPLEMENTAL INFORMATION

### KEY POINTS OF CONTACT

#### Licensee

M. Bensen, Operations  
T. Chalmers, Operations Director  
J. Cunningham, Security Manager  
A. Darelus, Emergency Preparedness Manager  
B. Davis, Regulatory Assurance Manager  
R. Frantz, Regulatory Assurance  
M. Heger, Mechanical/Structural Design Engineering Manager  
F. Kearney, Site Vice President  
N. Keen, Mechanical/Structural Design Engineering  
A. Khanifar, Engineering Director  
S. Kuntz, Operations  
S. Lakebrink, Mechanical/Structural Design Engineering  
J. Lizewski, Operations  
E. Rodriguez-Ramos, Plant Systems Engineering  
J. Ruth, Operations Training Manager  
D. Shelton, Operations Services Manager  
J. Ufert, Fire Marshall  
S. Wilson, Design Engineering Response  
J. Wrage, Operations

## 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 or 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.

Documents Reviewed for TI 2515/183:

<u>Number</u>	<u>Description or Title</u>	<u>Date or Revision</u>
CPS 1893.04	Fire Fighting	12c
CPS 4200.01	Loss of AC Power	19a
CPS 4200.01C001	MCR Cooling During a SBO	4b
CPS 4200.01C002	DC Load Shedding During a SBO	
CPS 4200.01C003	Monitoring CNMT Temperatures During a SBO	1
CPS 4200.01C004	Manual CNMT Isolation During a SBO	3
CPS 4301.01	Earthquake	14a
CPS 4302.01	Tornado/High Winds	19a
CPS 4303.01	Extensive Damage Mitigation Guide	3e
CPS 4303.01P001	Containment Venting Without AC Power Available	2d
CPS 4303.01P002	Spent Fuel Pool Makeup From Containment Pool	1a
CPS 4303.01P003	Spent Fuel Pool Makeup From Suppression Pool	1
CPS 4303.01P004	SRV Operation With External DC Power	2b
CPS 4303.01P007	Emergency RPV Makeup From Fire Protection	2
CPS 4303.01P009	Aligning External Power for CY and MC Pump Operation	1a
CPS 4303.01P010	Emergency Makeup To The CY Tank	1a
CPS 4303.01P011	Spray Scrubbing and Control of Radioactive Material Runoff	1
CPS 4303.01P012	Emergency Hotwell Makeup	1
CPS 4303.01P013	RCIC Manual Operation Without DC Control Power	0c
CPS 4303.01P015	Emergency RPV Level and Pressure Determination	0a
CPS 4303.01P016	Emergency RCIC Tank makeup From Fire Protection	0
CPS 4303.01P017	Spent Fuel Pool Makeup From Fire Protection	2
CPS 4303.01P018	ERO Activation During Extreme Damage Event	0
CPS 4303.01P019	Hydrogen Igniter Operation With External AC Power	1
CPS 4303.01P020	Emergency Confirmation of Reactor Scram	0a
CPS 4303.01P021	Invocation of 50.54(x) During an Extreme Damage Event	0
CPS 4303.01P022	DC Power Strategies	0
CPS 4303.01P023	Cross-Connecting Div 3 To Div 1(2) ECCS Electrical Busses	0a
CPS 4303.01P024	Manual Start of an Emergency DG with Loss of DC Power	0
CPS 4303.01P025	Emergency DG Operation with Alternate Cooling	0
CPS 4303.01P029	Additional Extensive Damage Mitigating Strategies	0a
CPS 4303.01P030	Portable John Deere B.5.b. Diesel Fire Pump Operation	0g
CPS 4303.01P031	Portable Floating Fire Pump Operation	0

<b><u>Number</u></b>	<b><u>Description or Title</u></b>	<b><u>Date or Revision</u></b>
CPS 4303.01P006	Emergency RPV Makeup From Makeup Condensate System	2a
CPS 4303.01P014	Emergency Drywell Flooding From Fire Protection	0c
CPS 4303.01P026	Emergency Containment Spray Makeup From Fire Protection	0
CPS 4303.01F001	Extensive Damage Mitigation Guide Flowchart	
CPS 4303.02	Abnormal Lake Level	10
CPS 4304.01	Flooding	5a
CPS 4411.06	Emergency Containment Venting, Purging, And Vacuum Relief	4b
CPS 4003.01	Remote Shutdown (RS)	15d
Cycle 07-04	LORT/NLORT Cycle Development Assignments	
Cycle 08-03	LORT/NLORT Cycle Development Assignments	
Cycle 09-03	LORT/NLORT Cycle Development Assignments	
Cycle 10-03	LORT/NLORT Cycle Development Assignments	
Cycle 11-03	LORT/EO-C Cycle Development Assignments	
M05-1059	P&ID Floor & Equip. Drains Screen House (DM), Sheet 3	L
A22-1032	Circulating Water Screen House Main Floor Plan Area-12 – El. 699'0"	K
TQ-AA-113	ERO Training And Qualification	18
TQ-AA-150	Critical Security Group Training and NRC B.5.b.	5
TQ-CL-150-1001	Clinton Site Specific Initial Equipment Operator Training Program	10/12/10
TQ-CL-150-1003	Clinton Site Specific Initial License Training Program Scope of Revision	02/08/11
Memorandum 5B.101	June 15 <sup>th</sup> , 2005 DAPAR and CDAM Focus Area Drill Observation Report	06/15/05
Training Module # NRC-B5B-P1	NRC B.5.B – EP Actions	04-14-2010
Training Module # LP87601	Severe Accident Guidelines SAG-1	05/01/03
Training Module # LP87602	Severe Accident Guidelines SAG-2	07/23/10
Training Module # LP87603	SAMG Technical Support Guidelines (TSG)	12/04/06
Training Module # LP87604	SAMG Introduction	01/13/03
Training Guide # DB430301	DBIG – Extensive Damage Mitigation Guide	4/22/07
Training Guide # PB430401	Flooding	01/16/02
Training Guide # DBIG-SY-AA-103-510	Critical Group Security Requirements	08/25/05
Training Guide # DB471101	RPV Venting During Containment Flooding	10/12/04

<u>Number</u>	<u>Description or Title</u>	<u>Date or Revision</u>
	Clinton Nuclear Station 2009 NEI 06-04 Hostile Action Full Scale Exercise, October 7, 2009 After Action Report Improvement Plan	11/06/2009
SE-AOP-37	Clinton Power Station Licensed Operator Training Simulator Exercise Guide	06/16/08
SE-LOR-05	Clinton Power Station Licensed Operator Training Simulator Exercise Guide	03/07/11
SE-LOR-67	Clinton Power Station Licensed Operator Training Simulator Exercise Guide	5/13/10
SE-LOR-109	Clinton Power Station Licensed Operator Training Simulator Exercise Guide	06/07/10
AR 01197979	Flood Seals Do Not Have Periodic Inspection Program	
AR 01198009	Some Plant Locations Inaccessible For Walkdowns	
AR 01200785	Some Plant Locations Inaccessible For Walkdowns	
AR 01202146	Inaccessible Area Walk Down Plan Lacks Specificity	
AR 01207382	Evaluate Schedule of FP WOS	
AR 01197981	Temporary Pumps Not Identified In Support OF 4303.02	
AR 01196176	B.5.B Pump Fuel Oil Is Not Changed Annually	
AR 01205788	0FP003 Valve Increase Leakage	
AR 01203214	Horizontal Fire Pump Packing Hot During Maintenance Run	
AR 01198630	0FP003 Fire Pump Discharge Packing Leakage Increased	
AR 01198618	0FP03P(Horizontal FP) INDB/OUTBD Packing Smoking	
AR 01205147	Charger "B" Voltmeter Failed High 30 VDC (0FP03P)	
AR 01200782	Fire Protection Sensitivity For Staging Other Equipment	
AR 01200783	Residual Penetration Sleeves Need Revisited	
AR 01197329	Walkdown Observation For Fire Extinguisher Mount	
AR 01197992	Temporary Materials For Flood Mitigation Not Routinely	
AR 01197991	Valve Used In Internal Flood Mitigation Not Accessible	
AR 01197988	Fuses Called Out In CPS 4304.01 Are Not Segregated	
AR 01197987	Hatches On SX Roof For Flood Access Procedure Weakness	
AR 01196294	NRC Senior Resident Identified Need To Improve Leak Berm	
AR 01194055	No Periodic Check For 4200.01C003	
AR 01201621	Recommendation 4 Identified Vulnerabilities	
AR 01092206	Functionality Review of Condenser Pit Level Switch	
AR 01023891	1LSTF001B Failed to Actuate Per 3813.01	
AR 01192277	CPS B.5.B Walkdown Actions	
AR 0121906	Additional NRC Observations During Inspection	
AR 01210365	Additional Enhancements to 4303.01 Procedures	
AR 01191284	B5.B Equipment Deficiency	
AR 01191290	B.5.B – No MOUs for Non-Fire Offsite Support	

## LIST OF ACRONYMS USED

ADAMS	Agencywide Documents Access and Management System
AR	Action Request
CFR	Code of Federal Regulations
CNO	Chief Nuclear Officer
CPS	Clinton Power Station
DC	Direct Current
ERO	Emergency Response Organization
FP	Fire Protection
IFTS	Inclined Fuel Transfer System
IP	Inspection Procedure
MCR	Main Control Room
MOU	Memorandum of Understanding
NRC	U.S. Nuclear Regulatory Commission
PARS	Publicly Available Records System
RTD	Resistance Temperature Detector
SAMG	Severe Accident Management Guideline
SBO	Station Blackout
TI	Temporary Instruction
VAC	Volt Alternating Current

M. Pacilio

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Sincerely,

**/RA/**

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

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