



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION**

REGION III  
2443 WARRENVILLE ROAD, SUITE 210  
LISLE, IL 60532-4352

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: BRAIDWOOD STATION UNITS 1 AND 2 – NRC TEMPORARY  
INSTRUCTION 2515/183 INSPECTION REPORT 05000456/2011011;  
05000457/2011011

Dear Mr. Pacilio:

On April 21, 2011, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Braidwood Station, Units 1 and 2, 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 April 21, 2011, with Mr. D. Enright and other members of your staff.

The objective of this inspection was to promptly assess the capabilities of Braidwood 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 a separate report. You are not required to respond to this letter.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be made available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of the 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/**

Eric R. Duncan, Chief  
Branch 3  
Division of Reactor Projects

Docket Nos. 50-456; 50-457  
License Nos. NPF-72; NPF-77

Enclosure: Inspection Report 05000456/2011011; 05000457/2011011  
w/Attachment: Supplemental Information

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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket Nos: 50-456; 50-457  
License Nos: NPF-72; NPF-77

Report Nos: 05000456/2011011; 05000457/2011011

Licensee: Exelon Generation Company, LLC

Facility: Braidwood Station, Units 1 and 2

Location: Braceville, IL

Dates: April 1, 2011, through April 21, 2011

Inspectors: J. Benjamin, Senior Resident Inspector  
D. Betancourt-Roldan, Acting Resident Inspector  
M. Perry, IEMA Inspector

Approved by: E. Duncan, Chief  
Branch 3  
Division of Reactor Projects

Enclosure

## **SUMMARY OF FINDINGS**

IR 05000456/2011011, IR 05000457/2011011; 04/01/2011 – 04/21/2011; Braidwood Station, Units 1 and 2, 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 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 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 a separate 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 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>Licensee actions included the transport and testing of the portable pump that is utilized within the applicable licensing basis. The pump was tested in accordance with a predefined preventative maintenance work instruction. In addition to the pump, the licensee performed hydrostatic testing of the fire hoses that would be utilized with this pump to ensure adequate equipment performance. Permanently installed equipment such as emergency diesel generators and emergency core cooling water pumps were not specifically tested as a result of this effort since this equipment was routinely tested and checked on daily operator rounds.</p> <p>The licensee performed an inventory inspection of equipment staged in the B.5.b pump warehouse in accordance with station procedures. Additionally, the licensee performed a walkdown within the plant for equipment utilized within the Severe Accident Management Guidelines (SAMGs). The licensee conducted this review to ensure that equipment used in SAMG strategies was available and accessible for use.</p> <p>The licensee reviewed the materials and equipment storage locations to determine if the specific locations provided adequate shelter from postulated security-related or natural phenomena events.</p>

	<p><b>Describe inspector actions taken to confirm equipment readiness (e.g., observed a test, reviewed test results, discussed actions, reviewed records, etc.).</b></p> <p>The inspectors reviewed the licensee’s assessment related to this area to ensure that the licensee’s review was consistent with the expectations provided in the operating experience. Additionally, the inspectors reviewed the issues, and observations identified by the licensee and by the inspectors to ensure that they were entered into the corrective action program.</p> <p>The inspectors conducted independent reviews and walkdowns to ensure that the B.5.b pump and ancillary equipment was available and capable for use consistent with the licensing basis. The inspectors observed the licensee’s testing of the B.5.b portable pump and reviewed the completed preventative maintenance testing activities to ensure that the pump would function as required. The inspectors performed a walkdown of the B.5.b equipment warehouse to ensure B.5.b equipment was properly staged and available. The inspectors verified that equipment utilized to transport the B.5.b pump was both available and capable. Additionally, the inspectors conducted plant walkdowns for the station auxiliary feedwater, fire protection, and hydrogen recombiner systems to ensure that this equipment was accessible and available for use in implementing the station’s SAMGs.</p> <p><b>Discuss general results including corrective actions by licensee.</b></p> <p>The inspectors identified that the licensee would have encountered several unplanned challenges in implementing various B.5.b mitigating strategies. These issues were identified by both the inspectors and by the licensee. These challenges include several examples in which prior opportunities for identification by the licensee existed. For example, the starting of the B.5.b pump was delayed after an issue with a support system required to start the pump was identified (IR 118926). Other delays identified by the licensee and/or the inspectors included:</p> <ul style="list-style-type: none"> <li>• Flanges required to support B.5.b strategies were made of steel and were very heavy, making transport and installation of the equipment difficult with the resources that may be available (IR 1190517);</li> <li>• Difficulty in obtaining access to a fire protection valve needed to implement B.5.b strategies due to the specific location (IR 1190203);</li> <li>• Miscellaneous B.5.b equipment was not labeled (IR 1195986, IR 1190292);</li> <li>• A weld must be removed to open a hatch to gain access to a refueling water storage tank (RWST) area used to implement B.5.b strategies (IR 1190588); and</li> <li>• The B.5.b procedure lacked required steps to install fire pump hoses at multiple locations (IR 1194736).</li> </ul>
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	<p>Both the inspectors and the licensee identified that the B.5.b pump annual preventative maintenance test did not contain clear acceptance criteria that ensured the pump would be capable of supplying rated flow. Additionally, the testing of this pump was currently treated as a preventative maintenance activity rather than a testing activity. As such, the structure of the acceptance criteria was embedded in the work instruction as compared to clearly identifiable acceptance criteria more commonly found in a surveillance activity. The inspectors did not identify a violation associated with these observations since the B.5.b pump was not safety-related or of augmented quality. Additionally, the licensee informed the inspectors that it was typical for the vendor to observe the annual pump performance test and that flow was monitored. The licensee captured the inspector's observations in the corrective action program (IR 1204857).</p> <p>The licensee identified that the make-up demineralizer project abandoned the non-essential service water (WM) supply to the fire protection cross-tie, which was identified as a potential water source for B.5.b equipment. The licensee entered this issue into their corrective action program (IR 1190186).</p> <p>Additional issues identified by the inspectors included:</p> <ul style="list-style-type: none"><li>• The licensee did not understand how long the B.5.b pump would run under rated load (i.e., did not understand the size of the fuel oil tank and pump rated fuel oil usage). Additionally, the inspectors identified that the B.5.b pump and pump skid did not have a fuel oil gage that would provide operators an indication of how much fuel oil remained in the fuel oil tank;</li><li>• The station did not utilize a fuel oil additive to ensure that the fuel oil remained useable during extremely cold weather conditions (IR 1204477).</li></ul> <p>The licensee identified that the B.5.b pump warehouse was not seismically qualified, and was not required to be seismically qualified. The licensee entered this observation in the station's corrective action program (IR 1190212). The inspectors observed that the B.5.b warehouse had no fire protection detection or suppression.</p>
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Licensee Action	Describe the licensee's actions to verify that procedures are in place and can be executed (e.g. walkdowns, demonstrations, tests, etc.)
<p>b. Verify through walkdowns 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 reviewed the B.5.b strategies and applicable Severe Accident Management Strategies to ensure that the implementing procedures were available at their required locations. The licensee performed system walkdowns of selected procedures to verify that the equipment was accessible, adequately labeled, and that the procedure could be executed as written.</p>
	<p><b>Describe inspector actions and the sample strategies reviewed. Assess whether procedures were in place and could be used as intended.</b></p>
	<p>The inspectors reviewed the licensee's assessment related to this area to ensure that the licensee's review was consistent with the expectations provided in the operating experience. Additionally, the inspectors reviewed the issues and observations identified by the licensee and by the inspectors to ensure that they were entered into the corrective action program.</p> <p>The inspectors independently verified that the procedures were available at a sample of the assumed locations and were the correction revision. The inspectors conducted independent walkdowns at the B.5.b building and within the station to verify that equipment utilized in the Extensive Damage Mitigation Guidelines (EDMGs) and SAMGs was available for use.</p>
	<p><b>Discuss general results including corrective actions by licensee.</b></p> <p>Procedures were properly staged and of the correct revision. The station identified numerous issues with delays with implementing the B.5.b mitigation strategies, issues with equipment labeling, and one issue which may have resulted in the removal of a credited B.5.b water source. Additionally, the station's Nuclear Oversight Department (NOS) identified that previously scheduled actions to label B.5.b equipment in response to a December 2009 NOS evaluation had not yet been completed (IR 1195986).</p> <p>As a result of the operating experience review, the licensee placed an administrative hold on removing the station's hydrogen recombiners from the SAMGs. This system had previously been removed from the station's licensing basis and considered abandoned in place. Although the system was abandoned in place, the system was physically installed and may be available for use in beyond design basis accident conditions. As a part of this review, the station was re-evaluating the status of this system (IR 1190228).</p>



<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 review included the identification of operator training and qualification requirements for the implementation of actions needed to mitigate B.5.b related events, and for the implementation of the SAMGs. The licensee reviewed the station's learning management training system records to verify that the required Maintenance first line supervisors and Operations personnel met the B.5.b and SAMG training qualification requirements. In addition, the licensee identified the training qualification requirements for applicable emergency response organization (ERO) command and support staff for the implementation of actions needed to mitigate a B.5.b related event, and for the implementation of actions for the SAMGs. The licensee ensured that a sample of the ERO command and support staff training requirements were current.</p>
	<p><b>Describe inspector actions and the sample strategies reviewed to assess training and qualifications of operators and support staff.</b></p>
	<p>The inspectors reviewed the licensee's assessment related to this area to ensure that the licensee review was consistent with the expectations provided in the operating experience.</p> <p>The inspectors independently reviewed records from the station's learning management system and independently sampled a population of ERO command and support staff SAMG training records to ensure that the staff's training was up to date. Additionally, the inspectors reviewed a sample of the training material for SAMGs and B.5.b to understand the type of training that was provided.</p>
	<p><b>Discuss general results including corrective actions by licensee.</b></p>
<p>The licensee did not identify any issues. The inspectors did not identify any issues.</p>	
<b>Licensee Action</b>	<b>Describe the licensee's actions and conclusions regarding applicable agreements and contracts are in place.</b>
<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>The licensee conducted a review of the Braidwood B.5.b and severe accident management strategies to identify any applicable off-site agreements and contracts necessary to support implementation. These contracts and agreements involved the local fire department, hospitals, law enforcement, and diesel fuel oil vendor, as well as contracts with engineering vendors. Additionally, the licensee verified that these contracts were adequate to meet the intent for which they were comprised.</p>

<p>This review should be done for a reasonable sample of mitigating strategies/equipment.</p>	<p><b>For a sample of mitigating strategies involving contracts or agreements with offsite entities, describe inspector 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 inspectors reviewed the licensee’s assessment related to this area to ensure that the licensee’s review was consistent with the expectations provided in the operating experience. Additionally, the inspectors verified that issues, observations, and enhancements were entered into the station’s corrective action program as appropriate.</p>
	<p>The licensee did not identify any issues with the final review. The inspectors did not identify any issues with the off-site agreements from a current licensing basis perspective, however one observation was identified that was outside the scope of the current licensing basis.</p>
	<p>The inspectors reviewed the licensee’s state National Pollutant Discharge Elimination System (NPDES) permit as it pertained to the ability to replenish the station’s cooling water lake from a nearby water source, (i.e. Monster Lake and adjacent flooded coal strip mine bodies of water). This permit allowed the licensee to transfer water from these bodies of water if the normal Kankakee River make-up water sources was experiencing low flow. This allowance could be used by the licensee to maintain power generation capability. The inspectors identified that this permit would not apply to a beyond licensing basis situation in which the ultimate heat sink became depleted. As stated, these sources of water were physically available for use. The inspectors reviewed the licensing basis and did not identify any regulatory issues since the licensing basis assumed that the ultimate heat sink was available following a design basis earthquake and assumed that the ultimate heat sink supply was capable of removing decay heat loads for 30 days following a design basis reactor event.</p>
	<p><b>Discuss general results including corrective actions by licensee.</b></p>
<p>The licensee determined that the off-site contractual agreements would be adequate for events pertaining to B.5.b and applicable SAMGs. The licensee entered the NRC inspectors’ observation into their corrective action program for review (IR 1202017).</p>	

<p style="text-align: center;"><b>Licensee Action</b></p>	<p><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></p>
<p>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.</p>	<p>Corrective Action Program issue report numbers are listed in the attachment to this report.</p> <p>The inspectors reviewed each of the IRs for potential impact to the licensee’s B.5.b mitigating strategies. Any findings and/or violations identified as a result of this inspection will be documented in a separate inspection report.</p>
<p>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 whether 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:</p>	
<p style="text-align: center;"><b>Licensee Action</b></p>	<p><b>Describe the licensee’s actions to verify the adequacy of equipment needed to mitigate an SBO event.</b></p>
<p>a. Verify through walkdowns and inspection that all required materials are adequate and properly staged, tested, and maintained.</p>	<p>The licensee performed walkdowns and inspections of contingency and portable equipment relative to mitigating a station blackout event in accordance with the station’s quarterly surveillance procedure (0BwOS OALS-Q1). Additionally, the licensee utilized the operator daily shift round checks performed on the emergency power sources credited during a station blackout event.</p> <p><b>Describe inspector actions to verify equipment is available and useable.</b></p> <p>The inspectors reviewed the licensee’s assessment related to this area to ensure that the licensee’s review was consistent with the expectations provided in the operating experience. Additionally, the inspectors verified that issues, observations, and enhancements were entered into the station’s corrective action program as appropriate.</p> <p>The inspectors verified that a sample of equipment maintained in the station’s quarterly surveillance checklist was available and properly staged. Additionally, the inspectors performed a walkdown of all the station’s emergency diesel generators to identify any apparent issues that could affect operability. The inspectors reviewed the licensee’s corrective action program for any known issues that could challenge the functionality of the equipment to ensure that the licensee had performed an adequate assessment and corrective actions were in place.</p>

	<p><b>Discuss general results including corrective actions by licensee.</b></p>
	<p>The licensee identified a number of minor issues and enhancement opportunities.</p> <p>The inspectors did not identify any issues and determined that the issues identified by the licensee were minor in nature. However, the inspectors identified one observation.</p> <p>The inspectors observed that there is no direct indication of the station's spent fuel pool level or temperature available in the control room. The inspectors did not identify a regulatory issue with this observation. Additionally, the inspectors observed that the station does not calculate a spent fuel pool time to boil when the units are operating at power. In the case that spent fuel pool cooling is lost, the station has a bounding analysis for the onset of spent fuel pool boiling.</p>
<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 walkdowns that procedures for response to an SBO are executable.</p>	<p>The licensee verified that implementing procedure's for the station blackout strategies were up to date and available at their required locations. The licensee performed walkdowns of these strategies to verify that areas were accessible, procedures could be executed, and equipment labeling was correct.</p> <p><b>Describe inspector actions to assess whether procedures were in place and could be used as intended.</b></p> <p>The inspectors reviewed the licensee's assessment related to this area to ensure that the licensee's review was consistent with the expectations provided in the operating experience. Additionally, the inspectors verified that issues, observations, and enhancements were entered into the station's corrective action program as appropriate.</p> <p>The inspectors reviewed a sample of the station procedures that would be utilized during a station blackout event. The inspectors discussed these procedures with a Braidwood senior reactor operator to understand how these procedures would be utilized from a command and control perspective. The inspectors conducted equipment walkdowns of the emergency diesel generators and auxiliary feedwater systems to identify any apparent issues or challenges in implementing the procedures. Additionally, the inspectors specifically reviewed the capability for the Units to share aspects of their auxiliary feedwater system through a common cross-tie piping connection.</p>

	<p><b>Discuss general results including corrective actions by licensee.</b></p> <p>The license identified a number of issues which were entered into the station's corrective action program. The inspectors reviewed these issues and did not identify any findings of significance.</p>
<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 walkdowns and inspections that all required materials and equipment are adequate and properly staged. These walkdowns and inspections shall include verification that accessible doors, barriers, and penetration seals are functional.</p>	
<p><b>Licensee Action</b></p> <p>a. Verify through walkdowns and inspection that all required materials are adequate and properly staged, tested, and maintained.</p>	<p><b>Describe the licensee's actions to verify the capability to mitigate existing design basis flooding events.</b></p> <p>The licensee identified the flooding procedures that would be utilized for both internally and externally generated flooding events. These procedures were verified to be approved and in place. The licensee performed walkdowns to verify that all equipment identified in plant procedures conformed to the licensing requirements and was staged appropriately. Doors, barriers, penetration seals, and curbs that were utilized for flooding mitigation were inspected to identify deficiencies and to ensure that they would provide a sufficient barrier.</p> <p>Additionally, the licensee reviewed outstanding work orders and corrective action assignments to evaluate if any vulnerability existed. Identified issues were re-evaluated to ensure compliance with the current licensing basis or evaluated if the issue posed a beyond design basis risk to the plant.</p> <p><b>Describe inspector 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 reviewed the licensee's assessment related to this area to ensure that the licensee's review was consistent with the expectations provided in the operating experience. Additionally, the inspectors verified that issues, observations, and enhancements were entered into the station's corrective action program as appropriate.</p> <p>With regard to external flooding, the inspectors review included checking for deviations from the descriptions provided in the Updated Final Safety Analysis Report (UFSAR) for features intended to mitigate the potential for flooding from external factors. The inspectors checked for obstructions that could prevent draining, checked that the roofs did not contain obvious loose items that could clog drains in the event of heavy precipitation, and determined whether barriers required to mitigate a flooding event were in place and operable.</p>

	<p>Additionally, the inspectors performed a walkdown of the protected area to identify any modification to the site which would inhibit site drainage during a probable maximum precipitation event or allow water ingress past a barrier. The inspectors also reviewed the abnormal operating procedure for mitigating the design basis flood to ensure it could be implemented as written.</p> <p>With regard to internal flooding, the inspectors reviewed selected risk-important plant design features and licensee procedures intended to protect the plant and its safety-related equipment from internal flooding events. The inspectors reviewed flooding analyses and design documents, including the UFSAR; engineering calculations; and abnormal operating procedures, to identify licensee commitments. In addition, the inspectors conducted plant system walkdowns to identify areas and equipment that may be affected by internal flooding caused by the failure or misalignment of nearby sources of water, such as the fire suppression or circulating water systems. The inspectors also reviewed the licensee's corrective action documents with respect to past flood-related items to verify the adequacy of the corrective actions. The inspectors performed a walkdown of the essential service water system area to assess the adequacy of watertight doors and to verify that drains and sumps were clear of debris and were operable, and that the licensee complied with all commitments.</p> <p><b>Discuss general results including corrective actions by licensee.</b></p> <p>The licensee did not identify any regulatory issues, but did identify a number of enhancements. Issues identified by the licensee included:</p> <ul style="list-style-type: none"> <li>• IR 1192624. The licensee identified the need to have a predefined contingent work order in place to prevent unnecessary delays in opening flood seal vaults to access auxiliary feedwater system isolation valves.</li> <li>• IR 1200980. The licensee identified that there were no actions to manually isolate the essential service water pump suction valve by hand or to isolate the essential service water discharge to the lake. Additionally, associated valve labels were difficult to read from the ground.</li> <li>• IR 1197767. The licensee identified there were differences in the Braidwood and Byron flooding procedure isolation points. Due to the similarities in the plant design and licensing basis between these stations, the licensee documented this observation to better understand the basis for these differences.</li> </ul>
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- IR 1197770. The licensee identified that the station's flood seal inspection criteria was general and subjective in nature.

03.04 Assess the thoroughness of the licensee's walkdowns 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 into the corrective action program and any immediate actions taken). As a minimum, the licensee should have performed walkdowns 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 walkdowns and inspections.

Licensee Action	<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>
a. Verify through walkdowns that all required materials are adequate and properly staged, tested, and maintained.	<p>The licensee identified the applicable procedures that would be utilized to mitigate a fire and or flood event to identify any potential that the equipment's function could be lost during a design basis seismic event at the station. The licensee performed walkdowns associated with the storage of fire protection equipment, such as the station's fire brigade truck, carbon dioxide storage tanks, halon bottles, and the emergency diesel generators fuel oil storage tanks' foam suppression system. The licensee evaluated if the equipment and particular storage location was seismically qualified to ascertain if it would be reasonable to conclude if the equipment would be available for use during and following a design basis earthquake.</p> <p><b>Describe inspector 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 reviewed the licensee's assessment related to this area to ensure that the licensee's review was consistent with the expectations provided in the operating experience. Additionally, the inspectors verified that issues, observations, and enhancements were entered into the station's corrective action program as appropriate.</p> <p>The inspectors independently reviewed the procedures that would be utilized during an earthquake, fire, and/or flooding event. The inspectors conducted multiple independent walkdowns and reviewed the documented assessment for the walkdowns conducted by the licensee. These walkdowns included, but were not limited to:</p> <ul style="list-style-type: none"> <li>• B.5.b pump warehouse and ancillary equipment;</li> <li>• All installed fire protection and suppression equipment in the turbine building;</li> </ul>

- The emergency diesel generator fuel oil storage tank rooms;
- The main steam line tunnel area.

**Discuss general results including corrective actions by licensee. Briefly summarize any new mitigating strategies identified by the licensee as a result of their reviews.**

The licensee did not identify any new mitigating strategies as a result of their review.

The licensee did identify that a number of fire protection suppression and support systems were not designed or stored within seismic structures. Additionally, on-site radio and pager communications were also located in non-seismic structures. Therefore, these systems may not be available during a design basis earthquake. For example, the carbon dioxide and halon tanks used as the source of fire suppression for the upper and lower cable spreading rooms were located in the turbine building (IR1199209). Additionally, the station fire brigade vehicle was, at times, stored in the turbine building. The turbine building was not a safety-related seismic structure. The licensee entered these observations into the corrective action program for further internal assessment.



4OA6 Management Meetings

.1 Exit Meeting Summary

On April 21, 2011, the inspectors presented the inspection results to Mr. D. Enright, and other members of the licensee staff. The licensee acknowledged the issues presented. The inspectors confirmed that none of the potential report input discussed was considered proprietary.

ATTACHMENT: SUPPLEMENTAL INFORMATION

## **SUPPLEMENTAL INFORMATION**

### **KEY POINTS OF CONTACT**

#### Licensee

D. Enright, Site Vice President  
M. Kanavas, Plant Manager  
P. Daly, Radiation Protection Manager  
B. Finlay, Security Manager  
R. Gadbois, Maintenance Manager  
G. Galloway, Work Control Manager  
M. Marchionda, Operations Manager  
S. McKinney, Emergency Preparedness Coordinator  
J. Moser, Radiation Protection Manager  
R. Radulovich, Nuclear Oversight Manager  
J. Rappeport, Chemistry/Environmental Manager  
A. Ferko, Engineering Manager  
C. VanDenburgh, Regulatory Assurance Manager  
W. Waznis, Nuclear Oversight

#### Nuclear Regulatory Commission

E. Duncan, Chief, Branch 3, Division of Reactor Projects

### **LIST OF ITEMS OPENED**

#### Opened

None.

## LIST OF DOCUMENTS REVIEWED

The following is a list of documents reviewed during the inspection. Inclusion in 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.

### 03.01 Assess The Licensee's Capability To Mitigate Conditions That Result From Beyond Design Basis Events

<b><u>Number</u></b>	<b><u>Description or Title</u></b>	<b><u>Date or Revision</u></b>
IR 1188580	NOS Id Portable Lighting Non-functional at B5B Equip Storage	March 17, 2011
IR1189326	NER 11-009 – B.5.B Pump Failure to Start	March 18, 2011
IR 1190174	NER 11-009 – Deficiency/Enhancement B.5.B Pump Procedures	March 21, 2011
IR 1190186	NER 11-009 – Deficiency/Enhancement: Deepwell Impact	March 21, 2011
IR 1190194	NER 11-009 – Deficiency/Enhancement: OCAG Review	March 21, 2011
IR 1190203	NER 11-009 – Deficiency/Enhancement: OFP298 Access	March 21, 2011
IR 1190207	NER 11-009 – Deficiency/Enhancement: OFP5201 Needs Tag	March 21, 2011
IR 1190212	NER 11-009 – Deficiency/Enhancement: Current B.5.B Building	March 21, 2011
IR 1190217	NER 11-009 – Deficiency/Enhancement: Miscellaneous Materials	March 21, 2011
IR 1190228	NER 11-009 – Deficiency/Enhancement:H2 Recombiners	March 21, 2011
IR 1190292	B.5.B Valves Need Labels	March 21, 2011
IR 1190508	NER 11-009 – Deficiency/Enhancement: 0BwOS 0ALE-Q1 Review	March 22, 2011
IR 1190517	NER 11-009 – Deficiency/Enhancement: EDMG Review	March 22, 2011
IR 1190574	NER 11-009 – Deficiency/Enhancement: SACRG-1 Review	March 22, 2011
IR 1190588	NER 11-009 – Deficiency/Enhancement: SACRG-1 Review	March 22, 2011
IR 1192716	No Vehicle to Tow B5B Equipment	March 26, 2011
IR 1192865	CDA Disaster Recovery Drill – DRPLAN-BWD-PPD Rev 0	March 27, 2011
IR 1192881	CDA Disaster Recovery Drill – DRPLAN-PPC-BWD Firewall Rev 0	March 27, 2011
IR 1192915	CDA Disaster Recovery Drill – DRPLAN-BWD-PI Server Rev 0	March 27, 2011
IR 1192921	CDA Disaster Recovery Drill – DRPLAN-BWD-RM11 Rev 0	March 27, 2011
IR 1192928	CDA Disaster Recovery Drill – DRPLAN-BWD-REC Honeywell	March 27, 2011
IR 1192935	CDA Disaster Recovery Drill – DRPLAN-BWD-REC Yokogawa	March 27, 2011
IR 1194229	Enhancement Identified As A Result Of Japan Disaster	March 29, 2011
IR 1194736	NOS IDS B.5.B Procedure Lacks Required Steps	March 30, 2011
IR 1195986	NOS Id Untimely Completion of B.5.B Actions to NOS Elevation	April 1, 2011
IR 1202017	TI 2515/183 NRC Inspection Enhancement – Update NPDES Permit	April 12, 2011
EDMG-4	Extensive Damage Mitigation Guideline	Revision 1
EDMG-2	Internal Spent Fuel Pool (SFP) Make-up Strategy	Revision 3
EDMG-3	External Spent Fuel Pool (SFP) Make-up Strategy	Revision 4

EDMG-4	External Spent Fuel Pool (SFP) Spray Strategy	Revision 2
EDMG-5	External Spent Fuel Pool (SFP) Leakage Control Strategy	Revision 2
EDMG-6	Fire System Management Strategy	Revision 2

### 03.02 Assess The Licensee's Capability To Mitigate Station Blackout (SBO) Conditions

<u>Number</u>	<u>Description or Title</u>	<u>Date or Revision</u>
IR 1192976	NER 11-009 – Deficiency/Enhancement: Unit 2 Air Bottles	March 27, 2011
IR 1192978	NER 11-009 – Deficiency/Enhancement: 2A ELECT Governor	March 27, 2011
IR 1192980	NER 11-009 – Deficiency/Enhancement: 1/2SX169/B Direction	March 27, 2011
IR 1192981	NER 11-009 – Deficiency/Enhancement: Governor Oil Specs	March 27, 2011
IR 1193099	NER-11-009 – Deficiency/Enhancement: Turbine Building Design	March 27, 2011
IR 1193102	NER 11-009 – Deficiency/Enhancement: Unit 1 CWA Lighting	March 27, 2011
IR 1193103	NER 11-009 – Deficiency/Enhancement: U2 CWA Lighting	March 27, 2011
IR 1197616	NER 11-009 – Deficiency/Enhancement: 0BwOS OALe-Q1	April 4, 2011
IR 1198666	NOS Ids SBO/Loop Portable Temp Power Not Considered	April 6, 2011
IR 1204477	NER 11-009 – Deficiency/Enhancement: IEMA Question	April 19, 2011
IR 1204481	NER 11-009 – Deficiency/Enhancement : Flange Cart	April 19, 2011
1BwCA-0.0	Loss of All AC Power	Revision 202 WOG 2
1BwCA-0.3	Response to Opposite Unit Loss of All AC Power	Revision 200 WOG 2
2BwOA ELEC-1	Loss of DC Bus	Revision 103
2BwOA ELEC-2	Loss of Offsite Power	Revision 104
2BwOA ELEC-3	Loss of 4KV ESF Bus	Revision 101
2BwOA ELEC-4	Loss of Offsite Power	Revision 104
1BwOA REFUEL-2	Refueling Cavity or Spent Fuel Pool Level Loss	Revision 102
BwCA 0.0	Loss of All AC Power	Revision 202 WOG 2
BwCA 0.1	Loss of All AC Power WITHOUT SI Required	Revision 201 WOG 2
BwCA 0.2	Loss of All AC Power Recovery WITH SI Required	Revision 201 WOG 2
2BwCA 0.3	Opposite Unit Response Loss of ALL AC Power	Revision 200 WOG 2

### 03.03 Assess The Licensee's Capability To Mitigate Internal And External Flooding Events Required By Station Design

<u>Number</u>	<u>Description or Title</u>	<u>Date or Revision</u>
1BwOA Pri-8	Essential Service Water Malfunction	Revision 103
IR 1137603	Discrepancies found During MOV Maintenance – 0SX165A	November 14, 2011

IR 1144290	NRC Raised Questions about the 0SX165A & B	February 17, 2011
IR 1142586	0SX165A/B – Cancel PMS – not Required	November 18, 2010
IR 1190228	NER 11-009 – Deficiency/Enhancement: H2 Recombiners	March 21, 2011
IR 1192622	NER 11-009 – Deficiency/Enhancement: Flood Seal Cont Pkg	March 26, 2011
IR 1192623	NER 11-009 – Deficiency/Enhancement: Flood Seal Cont Pkg	March 26, 2011
IR 1192624	NER 11-009 – Deficiency/Enhancement: Flood Seal Cont Pkg	March 26, 2011
IR 1192625	NER 11-009 – Deficiency/Enhancement: Flood Seal Cont Pkg	March 26, 2011
IR 1192628	NER 11-009 – Deficiency/Enhancement: Flood Seal Cont Pkg	March 26, 2011
IR 1192629	NER 11-009 – Deficiency/Enhancement: Flood Seal Cont Pkg	March 26, 2011
IR 1192630	NER 11-009 – Deficiency/Enhancement: Flood Seal Cont Pkg	March 26, 2011
IR 1192631	NER 11-009 – Deficiency/Enhancement: Flood Seal Cont Pkg	March 26, 2011
IR 1197630	NER 11-009 – Deficiency/Enhancement: 1/2BwOA PRI-8	April 4, 2011
IR 1197767	NER 11-009 Compare BRW and BYR SX Isolation Procedures	April 5, 2011
IR 1197770	NER 11-009, Flood Seal Inspection Enhancement Opportunity	April 5, 2011
IR 1198236	NER 11-009 SD/WX Flood Enhancement Review	April 5, 2011
IR 1198240	NER 11-009, Potential Flood Enhancement Post Check Valves	April 5, 2011
IR 1200980	NOS ID: SX Suction/Discharge Valves RE: Flooding Procedures	April 11, 2011

03.04 Assess the thoroughness of the licensee's walkdowns 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

<u>Number</u>	<u>Description or Title</u>	<u>Date or Revision</u>
1BwOA ENV-3	Braidwood Cooling Lake Low Level	Revision 7
0BwOA ENV-4	Earthquake	Revision 108
IR 1190221	NER 11-009 – Deficiency/Enhancement: Fire Brigade Truck	March 21, 2011
IR 1193099	NER 11-009 – Deficiency/Enhancement: Turbine Building Design	March 29, 2011
IR 1193143	IER 11-1, SAMG Procedure SAG-7 Placed on Admin Hold	March 25, 2011
IR 1199209	NER 11-009 ID'd Vulnerability CO2, Halon and Foam Systems	April 7, 2011
IR 1200231	NER 11-009 Identified Vulnerability with Radio Design	April 9, 2011
IR 1200236	NER 11-009 Identified Vulnerability FP Impacts	April 9, 2011
IR 1201338	NER 11-0009, No Removal Date for Scaffold Around CO2 Compress	April 12, 2011
IR 1201393	NER 11-009, Enhancement for Potential AF XTIE to FP	April 12, 2011
IR 1201400	NER 11-009, Evaluate Aux Bldg FP Piping Monitoring	April 12, 2011

IR 1201573	NER 11-009, Identified Vulnerability FP Impact – 2HS-AF134-FU	April 11, 2011
IR 1201581	NER 11-009, Id'd Missing FP Paint Identified – El. 475-S-18/19	April 8, 2011
IR 1201595	NER 11-009, Id'd Vulnerability Impact No FP	April 8, 2011
IR 1201616	NER 11-009, Vulnerability – Fire Equipment Access	April 12, 2011

## LIST OF ACRONYMS USED

AC	Alternating Current
ADAMS	Agencywide Documents Access and Management System
AF	Auxiliary Feedwater
CAP	Corrective Action Program
CFR	Code of Federal Regulations
EDMG	Extensive Damage Mitigation Guideline
ERO	Emergency Response Organization
IP	Inspection Procedure
IR	Issue Report
NOS	Nuclear Oversight
NPDES	National Pollutant Discharge Elimination System
NRC	United States Nuclear Regulatory Commission
RWST	Refueling Water Storage Tank
SAMGs	Severe Accident Management Guidelines
SBO	Station Blackout
TI	Temporary Instruction
UFSAR	Updated Final Safety Analysis Report
URI	Unresolved Item
WM	Non-Essential Service Water

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Sincerely,

**/RA/**

Eric R. Duncan, Chief  
Branch 3  
Division of Reactor Projects

Docket Nos. 50-456; 50-457  
License Nos. NPF-72; NPF-77

Enclosure: Inspection Report 05000456/2011011; 05000457/2011011  
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Letter to M. Pacilio from E. Duncan dated May 13, 2011.

SUBJECT: BRAIDWOOD STATION UNITS 1 AND 2 – NRC TEMPORARY  
INSTRUCTION 2515/183 INSPECTION REPORT 05000456/2011011;  
05000457/2011011

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