



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**

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

February 2, 2018

Mr. Bryan C. Hanson
Senior VP, Exelon Generation Company, LLC
President and CNO, Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

**SUBJECT: BRAIDWOOD STATION, UNITS 1 AND 2—NRC TEMPORARY INSTRUCTION
2515/191, MITIGATION STRATEGIES, SPENT FUEL POOL INSTRUMENTATION
AND EMERGENCY PREPAREDNESS INSPECTION REPORT 05000456/2018011
AND 05000457/2018011**

Dear Mr. Hanson:

On January 19, 2018, the U.S. Nuclear Regulatory Commission (NRC) completed a Temporary Instruction (TI) 2515/191, "Inspection of the Implementation of Mitigation Strategies and Spent Fuel Pool Instrumentation Orders and Emergency Preparedness Communication/Staffing/Multi-Unit Dose Assessment Plans" inspection at your Braidwood Station, Units 1 and 2. The NRC inspectors discussed the results of this inspection with Ms. A. Ferko and other members of your staff. The results of this inspection are documented in the enclosed report.

The inspection examined activities conducted under your license as they relate to the implementation of mitigation strategies and spent fuel pool instrumentation orders (EA-12-049 and EA-12-051) and Emergency Preparedness Communication/Staffing/Multi-Unit Dose Assessment Plans, your compliance with the Commission's rules and regulations, and with the conditions of your operating license. Within these areas, the inspection involved examination of selected procedures and records, observation of activities, and interviews with station personnel.

The NRC inspectors did not identify any findings or violations during this inspection.

This letter, its enclosure, and your response (if any) will be made available for public inspection and copying at <http://www.nrc.gov/reading-rm/adams.html> and at the NRC Public Document Room in accordance with 10 CFR 2.390, "Public Inspections, Exemptions, Requests for Withholding."

Sincerely,

/RA/

Ann Marie Stone, Team Leader
Technical Support Branch
Division of Reactor Projects

Docket Nos. 50-456; 50-457 and 72-073
License Nos. NPF-72 and NPF-77

Enclosure:
IR 05000456/2018011; 05000457/2018011

cc: Distribution via ListServ®

Letter to Bryan Hanson from Ann Marie Stone dated February 2, 2018

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ADAMS Accession Number: ML18033A711

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**U.S. NUCLEAR REGULATORY COMMISSION
Inspection Report**

REGION III

Docket Numbers: 50-456; 50-457; 72-073

License Numbers: NPF-72; NPF-77

Report Numbers: 05000456/2018011; 05000457/2018011

Enterprise Identifier: I-2018-011-0000

Licensee: Exelon Generation Company, LLC

Facility: Braidwood Station, Units 1 and 2

Location: Braceville, IL

Dates: January 16 through January 19, 2018

Inspectors: L. Rodriguez, Reactor Inspector
S. Sheldon, Project Engineer
D. Betancourt, Resident Inspector
M. Domke, Reactor Inspector

Approved by: A. Stone, Team Leader
Technical Support Staff
Division of Reactor Projects

Enclosure

SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) continued monitoring licensee's performance by conducting a Temporary Instruction 2515/191, "Implementation of Mitigation Strategies and Spent Fuel Pool Instrumentation Orders and Emergency Preparedness Communication/Staffing/Multi-Unit Dose Assessment Plans," inspection at Braidwood Station Units 1 and 2 in accordance with the Reactor Oversight Process. The Reactor Oversight Process is the NRC's program for overseeing the safe operation of commercial nuclear power reactors. Refer to <https://www.nrc.gov/reactors/operating/oversight.html> for more information. Additional items are summarized in the table below.

List of Findings and Violations

No findings were identified.

Additional Tracking Items

Type	Issue Number	Title	Report Section	Status
URI	05000456; 05000457/2018011-01	Installed Plant Equipment Protection Against Tornado Missiles	Other Activities	Open
TI	2515/191	Implementation of Mitigation Strategies and Spent Fuel Pool Instrumentation Orders and Emergency Preparedness Communication/Staffing/Multi-Unit Dose Assessment Plans	Other Activities	Closed

INSPECTION SCOPES

Inspections were conducted using the appropriate portions of the inspection procedures (IPs) in effect at the beginning of the inspection unless otherwise noted. Currently approved IPs with their attached revision histories are located on the public website at <http://www.nrc.gov/reading-rm/doc-collections/insp-manual/inspection-procedure/index.html>. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel to assess licensee performance and compliance with Commission rules and regulations, license conditions, site procedures, and standards.

OTHER ACTIVITIES—TEMPORARY INSTRUCTIONS, INFREQUENT AND ABNORMAL

TI 2515/191—Inspection of the Implementation of Mitigation Strategies and Spent Fuel Pool Instrumentation Orders and Emergency Preparedness Communication/Staffing/Multi-Unit Dose Assessment Plans

The inspectors verified plans for complying with NRC Orders EA-12-049, “Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events,” (ADAMS Accession No. ML12056A045) and EA-12-051, “Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation,” (ADAMS Accession No. ML12054A679) are in place and are being implemented by the licensee. Additionally, the inspection verified implementation of staffing and communications information provided in response to the March 12, 2012, request for information letter (ADAMS Accession No. ML12053A340) and multiunit dose assessment information provided per COMSECY-13-0010, “Schedule and Plans for Tier 2 Order on Emergency Preparedness for Japan Lessons Learned,” dated March 27, 2013, (ADAMS Accession No. ML12339A262).

- (1) Based on samples selected for review, the inspectors verified that the licensee satisfactorily implemented appropriate elements of the Diverse and Flexible Coping Strategies (FLEX) as described in the plant specific submittals and the associated safety evaluation (ADAMS Accession No. ML17103A345) and determined that the licensee is in compliance with NRC Order EA-12-049, “Order Modifying Licenses With Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events.” The inspectors, with the exception of the Unresolved Item (URI) described in the Inspection Results section of this report, verified the licensee satisfactorily:
 - a) developed and issued FLEX Support Guidelines (FSGs) to implement the FLEX strategies for postulated external events;
 - b) integrated their FSGs into their existing plant procedures such that entry into and departure from the FSGs were clear when using existing plant procedures;
 - c) protected FLEX equipment from site-specific hazards;
 - d) developed and implemented adequate testing and maintenance of FLEX equipment to ensure their availability and capability;
 - e) trained their staff to assure personnel proficiency in the mitigation of beyond-design basis events; and
 - f) developed the means to ensure the necessary off-site FLEX equipment would be available from off-site locations.

- (2) Based on samples selected for review, the inspectors verified that the licensee satisfactorily implemented appropriate elements of the FLEX strategy as described in the plant specific submittals and the associated safety evaluation and determined that the licensee is in compliance with NRC Order EA-12-051, "Order Modifying Licenses With Regard to Reliable Spent Fuel Pool Instrumentation." The inspectors verified the licensee satisfactorily:
- a) installed the spent fuel pool (SFP) instrumentation sensors, cabling and power supplies to provide physical and electrical separation as described in the plant specific submittals and safety evaluation;
 - b) installed the SFP instrumentation display in the location, environmental conditions and accessibility as described in the plant specific submittals;
 - c) trained their staff to assure personnel proficiency with the maintenance, testing, and use of the SFP instrumentation; and
 - d) developed and issued procedures for maintenance, testing and use of the reliable SFP instrumentation.
- (3) The inspectors reviewed information provided in the licensee's multi-unit dose submittal and in response to the NRC's March 12, 2012, request for information letter, and verified that the licensee satisfactorily implemented enhancements pertaining to Near-Term Task Force (NTTF) Recommendation 9.3 response to a large scale natural emergency event that results in an extended loss of all ac power to all site units and impedes access to the site. The inspectors verified the following:
- a) the licensee satisfactorily implemented required staffing changes to support a multi-unit extended loss of alternating current (ac) power (ELAP) scenario;
 - b) emergency preparedness (EP) communications equipment and facilities are sufficient for dealing with a multi-unit ELAP scenario; and
 - c) the licensee implemented multi-unit dose assessment capabilities (including releases from spent fuel pools) using the licensee's site-specific dose assessment software and approach.

The inspectors verified that noncompliances with requirements, and standards identified during the inspection were entered into the licensee's corrective action program as appropriate. The corrective action program documents generated as a result of the inspection are listed in the Documents Reviewed section of this inspection report. This TI is considered closed.

INSPECTION RESULTS

TI 2515/191—Inspection of the Implementation of Mitigation Strategies and Spent Fuel Pool Instrumentation Orders and Emergency Preparedness Communication/Staffing/Multi-Unit Dose Assessment Plans

Unresolved Item (Open)	Installed Plant Equipment Protection Against Tornado Missiles URI 05000456; 05000457/2018011-01	TI 2515/191
<p>Description: On May 25, 2016, the licensee generated Action Request (AR) 2673854, “Nonconforming Conditions Identified – Tornado Missiles,” and made a 10 Code of Federal Regulations (CFR) 50.72, “Immediate Notification Requirements for Operating Nuclear Power Reactors,” notification documented in Event Report # 51959 because they discovered some equipment required by their Technical Specifications was nonconforming to the current licensing basis for protection against tornado missiles. The report was supplemented by Licensee Event Report 2016-002 (ADAMS Accession No. ML16201A336) on July 19, 2016. Some of the equipment found to be nonconforming included: (1) the Auxiliary Feed Diesel exterior exhaust stacks; (2) conduits and cabinets associated with the battery chargers and DC buses; (3) and instrument inverter cabinets. The licensee invoked EGM 15-002, “Enforcement Discretion for Tornado-Generated Missile Protection Non-compliance,” which allows the NRC to exercise enforcement discretion when an operating power plant does not comply with its current licensing basis for tornado-generated missile protection. The use of enforcement discretion for this issue at Braidwood was documented in NRC Inspection Report 05000456/2016002; 05000457/2016002 (ADAMS Accession No. ML16209A139) on July 27, 2016, under EA-6-126. In accordance with EGM 15-002, the licensee implemented compensatory measures to provide additional protection such that the likelihood of tornado missile effects was lessened. One such compensatory measure was to confirm readiness of equipment and procedures dedicated to the Diverse and Flexible Coping Strategy (FLEX) for the site.</p> <p>On December 7, 2016, Braidwood submitted their Compliance Letter and Final Integrated Plan (ADAMS Accession No. ML16348A053) for the Mitigation Strategies for Beyond-Design-Basis External Events Order EA-12-049. Braidwood’s compliance to the Order is based on following the guidance of NEI 12-06, “Diverse and Flexible Coping Strategies (FLEX) Implementation Guide,” (ADAMS Accession No. ML12242A378) which was endorsed by the NRC in JLD-ISG-2012-01 (ADAMS Accession No. ML12229A174). The NRC subsequently approved the licensee’s integrated plan on May 10, 2017, in a Safety Evaluation Report. The licensee’s integrated plan relies on installed plant equipment to implement the mitigation strategies required by Order EA-12-049. Part of the installed plant equipment relied upon for the implementation of the mitigation strategies includes the equipment described above that was found to be nonconforming to the current licensing basis for protection against tornado missiles.</p> <p>NRC Order EA-12-049 Attachment 2, “Requirements For Mitigation Strategies for Beyond-Design-Basis External Events at Operating Reactor Sites and Construction Permit Holders,” Item (3), has the following requirement for installed plant equipment that is relied upon to implement the initial phase of the mitigation strategies:</p> <p style="padding-left: 40px;"><u>Licensees or Construction Permit holders must provide reasonable protection for the associated equipment from external events.</u> Such protection must demonstrate that there is adequate capacity to address challenges to core cooling, containment, and SFP cooling</p>		

capabilities at all units on a site subject to this Order. [emphasis added]

NEI 12-06 section 3.2, "Performance Attributes," used by Braidwood to demonstrate compliance with Order EA-12-049, states the following:

The baseline assumptions have been established on the presumption that other than the loss of the ac power sources and normal access to the UHS, installed equipment that is designed to be robust with respect to design basis external events is assumed to be fully available. Installed equipment that is not robust is assumed to be unavailable. [emphasis added]

NEI 12-06 section 3.2.1.3, "Initial Conditions," Item (6) also states:

Permanent plant equipment that is contained in structures with designs that are robust with respect to seismic events, floods, and high winds, and associated missiles, are available.

The inspectors questioned whether the installed plant equipment which is nonconforming to the current licensing basis for protection against tornado missiles, and is relied upon to implement the mitigations strategies, meets the requirements of Order EA-12-049 for reasonable protection from external events. Since the inspectors need more information to determine whether the licensee is in compliance with Order EA-12-049, this issue of concern is considered an Unresolved Item (URI).

Planned Closure Action(s): Resolution of this URI is contingent on the resolution of the actions associated with the Enforcement Discretion granted under EA-16-126. Therefore, once the current licensing basis discrepancies regarding tornado missile protection are resolved, the inspectors will be able to determine whether or not the requirements of Order EA-12-049 are met for reasonable protection against tornado missiles for installed plant equipment relied upon to implement the mitigations strategies.

Licensee Action(s): The licensee entered the nonconforming conditions identified for protection of Technical Specification equipment against tornado missiles in their Corrective Action Program as discussed above. Through discussions with the licensee, the inspectors were informed that the licensee ultimately plans to submit a License Amendment Request to resolve the current licensing basis issues related to equipment protection against tornado missiles.

Corrective Action Reference(s): AR 2673854, "Nonconforming Conditions Identified – Tornado Missiles," 5/25/2016

EXIT MEETINGS AND DEBRIEFS

The inspectors verified no proprietary information was retained or documented in this report.

- On January 19, 2018, the inspectors presented the Temporary Instruction 2515/191 inspection results to Ms. A. Ferko, and other members of the licensee staff.

DOCUMENTS REVIEWED

- Advanced FLEX Training, October 2014; Revision 1
- AR 2393353; New Containment PAD Needed for FLEX Pump #2; 10/9/2014
- AR 2709098; Relocate Pintle Hook Attachment on FLEC Cart Caddy Hitch; 8/26/2016
- AR 2741542; Validation of FLEX Strategies; 11/15/2016
- AR 4022893; 0BwOS FX-4 Equipment Deficiencies; 6/17/2017
- AR 4069677; Improper Trailer Storage and Deficiencies in FLEX Building; 11/1/2017
- AR 4076580; Deficiencies in FLEX Preventative Maintenance Requirements; 11/20/2017
- AR 4093201; 0BwOS FX-11 Acceptance Criteria Not Met; 1/12/2018
- AR 4093681; Ops Cart Caddy in the Commercial Building Broken; 1/15/2018
- AR 4094196; FLEX Cart Caddy Usage; 1/16/2018
- AR 4094507; NRC ID: Enhancement to Figure in 0BwFSG-5 (FLEX Audit); 1/17/2018
- AR 4094526; NRC ID: Revision to FLEX Congested Plan (FLEX Audit); 1/17/2018
- AR 4094540; NRC Walk Down of 0BwOS FX-4 Rev 1 (FLEX Audit); 1/17/2018
- AR 4094851; NRC ID: Fuel Consumption Rate for Low Head FX Pump Incorrect; 1/18/2018
- AR 4094864; FLEX Audit – Inadequate Record Keeping FLEX PMs; 1/18/2018
- AR 4094921; FLEX Calc BRW-14-0030-M Deficiency; 1/18/2018
- AR 4094939; Recommend Revision to FLEX Procedure 0BwFSG-5; 1/18/2018
- AR 4094954; FLEX Audit – Enhancement to the 0BWOS FX-4 FLEX Inventory; 1/18/2018
- AR 4095111; NRC ID: Ball Hitch Not on Comms Trailer; 1/19/2018
- AR 4095118; NRC Identified Gap During FLEX Sat Communications Deployment; 1/19/2018
- AR 4095273; Update Required for FLEX Fuel Consumption Study; 1/19/2018
- AR 4095331; NRC ID: FSG Labels Not on Valves (FLEX Audit); 1/19/2018
- AR 4095342; NRC ID: Labeling on 0BwOS FX-4 Equipment (FLEX Audit); 1/19/2018
- AR 4095348; NRC ID: No Designated FLEX Ladder (FLEX Audit); 1/19/2018
- AR 4095363; NRC ID – Scaffold Storage Area in U1 MS Tunnel Comment; 1/19/2018
- Basic FLEX Training, October 2013; Revision 0
- BD-CA-0.0; Loss of All AC Power; Revision 300
- BRW-13-0160-M; FLEX Pump Sizing and Hydraulic Analysis; Revision 2
- BRW-14-0030-M; Godwin Pump Suction Line Hydraulic Analysis to Support FLEX; Revision 0
- BRW-14-0219-S; Robust FLEX Building – Qualification of Equipment Tie-Down Anchors; Revision 0
- BRW-15-0002-S; Evaluation of FLEX Equipment Haul Paths for Soil Liquefaction Potential; Revision 0
- BwIP 2500-181; Calibration of Guided Wave Radar Spent Fuel Level Instruments; Revision 0
- CC-AA-102-F-01; Design Attribute Review (DAR); Revision 2
- CC-BR-118-1001; Site Implementation of Diverse and Flexible Coping Strategies (FLEX) and Spent Fuel Pool Instrumentation Program; Revision 4
- CC-BR-118-1002; SAFER Response Plan for Braidwood Generating Station; Revision 1
- CC-BR-118-1003; Congested Area Plan Braidwood Power Station; Revision 0
- EC 394151; FUK: ECCS FLEX Suction and High Head Injection Connections U1 FLEX MOD 6, 9, 10; Revision 6
- EC 394152; FUK: FLEX Connections to AF Lines in Main Steam Valve Room FLEX MOD 5; Revision 3
- EC 394194; Diesel Oil Storage FLEX Connection U-1; Revision 2
- EC 394935; Spent Fuel Pool Instrumentation Fukushima; Revision 2
- EC 398039; FLEX Storage Robust Building Construction; Revision 3
- EC 398040; FLEX Buildings – Commercial Building; Revision 2
- EO Cycle Report 16-1; 12/21/2017
- EO Cycle Report 16-2; 12/21/2017

- EO Cycle Report 17-3; 12/21/2017
- EPA-FLEX-002; Portable Back-Up Main Control Room (MCR) Satellite Communication System Operating User Aid; Revision 0
- EPA-FLEX-003; Portable TSC/OSC Satellite Communication System Operating User Aid; Revision 0
- EP-AA-124-F-03; Site & Site-Specific EOF Communications 9.3 & EMNET Satellite Communications Systems Semi-Annual Testing & Inventory; Revision B
- LP FX-09; Fukushima FLEX; Revision 0b
- LP 2015-6-AF; Auxiliary Feedwater; 10/28/2015
- OP-BR-FX-1003; High Head FLEX Pump Operating Guideline; Revision 0
- OP-BR-FX-1004; Medium Head FLEX Pump Operating Guideline; Revision 0
- OP-BR-FX-1005; Low Head FLEX Pump Operating Guideline; Revision 0
- PMID 192877; Site & Site-Specific EOF Communications 9.3 & Emnet Satellite Communications Systems Semi-Annual Testing & Inventory; 7/28/2017 & 12/29/2017
- PMID 193879-05; FLEX Diesel Generator Loaded Run; 1/15/2018
- Pump Test Records; 6/15/2017
- RS-14-320; Response to Request for Information; 11/26/2014
- TQ-AA-113; Operator Training Program; Revision 30
- WO 01728158 12; CE 1AP23E-A2 Modify Cubical per EC 394207; 2/23/2015
- WO 01728158 14; CE 1AP27E-D2 Modify Cubical per EC 394207; 2/23/2015
- WO 01728158 16; CE 1AP25EA-A4 Modify Cubical per EC 394207; 2/26/2015
- WO 01728158 18; CE 1AP24E-C3 Modify Cubical per EC 394207; 2/23/2015
- WO 01728158 20; CE 1AP28E-E3 Modify Cubical per EC 394207; 2/23/2015
- WO 01728158 22; CE 1AP46E-A4 Modify Cubical per EC 394207; 2/23/2015
- WO 01728158 30; Continuity Check 4/0 Cable, BCD, Load Cable Reels; 4/2/2015
- WO 01728158 38; Mod Test 0FX01KA Generator per 394207; 3/16/2015
- WO 01728158 39; Mod Test 0FX01KB Generator per 394207; 3/16/2015
- WO 01728158 40; Mod Test 0FX01KC Generator per 394207; 3/16/2015
- WO 01728158 44; Test/Stage FLEX Cables per EC 394207; 4/9/2015
- WO 01766036 07; CE 2AP23E-G4 Modify Cubical per EC 394207; 2/25/2015
- WO 01766036 09; CE 2AP27E-D2 Modify Cubical per EC 394207; 2/26/2015
- WO 01766036 11; CE 2AP25EA-A4 Modify Cubical per EC 394207; 2/27/2015
- WO 01766036 22; Continuity Check 4/0 Cable, BCD, Load Cable Reels; 4/10/2015
- WO 01766036 13; CE 2AP24E-C4 Modify Cubical per EC 394207; 2/25/2015
- WO 01766036 15; CE 2AP28E-E3 Modify Cubical per EC 394207; 2/26/2015
- WO 01766036 17; CE 2AP46E-E5 Modify Cubical per EC 394207; 2/25/2015
- WO 01922461 01; 18M Spent Fuel Pool Level Indic. Calibration, 0L-FC002; 7/7/2017
- WO 04571221; OP FLEX Inventory Surveillance Semiannual; 5/7/2017
- WO 04651132 01; FLEX Equipment Readiness Surv Semiannual; 12/14/2017
- WO 04654063; OP FLEX Inventory Surveillance Semiannual; 11/10/2017
- WO 04712449 01; FLEX General Area Monthly Inspection BWOS FX-5; 12/12/2017
- 0BwFSG-5; Initial Assessment and FLEX Equipment Staging Unit 0; Revision 3
- 0BwFSG-11; Alternate SFP Makeup and Cooling Unit 0; Revision 2
- 0BwFSG-50; FLEX Support Equipment Operation Unit 0; Revision 2
- 0BwFSG-51; Alternate MCR Ventilation Unit 0; Revision 2
- 0BwOS FX-1a; AAR FLEX Support Equipment; Revision 3
- 0BwOS FX-2a; AAR Spent Fuel Pool (SFP) Level Instrumentation; Revision 0
- 0BwOS FX-3; Spent Fuel Pool Level Instrumentation Channel Checks; Revision 2
- 0BwOS FX-4; FLEX Inventory Surveillance; Revision 1
- 0BwOS XFT-A5; Unit Common Freezing Temperature Equipment Protection Out Building Surveillance; Revision 25

- 1BwCA-0.0; Loss of All AC Power Unit 1; Revision 301
- 1BwFSG-1; Long Term RCS Inventory Control Unit 1; Revision 2
- 1BwFSG-2; Alternate AFW/EFW Suction Source Unit 1; Revision 1
- 1BwFSG-4; ELAP DC Bus Load Shed/Management Unit 1; Revision 2
- 1BwFSG-3; Alternate Low Pressure Feedwater Unit 1; Revision 2
- 1BwFSG-5; Initial Assessment and FLEX Equipment Staging Unit 1; Revision 3
- 1BwFSG-8; Alternate RCS Boration Unit 1; Revision 2
- 1BwFSG-9; Low Decay Heat Temperature Control Unit 1; Revision 1
- 1BwFSG-10; Passive RCS Injection Isolation Unit 1; Revision 1
- 1BwFSG-12; Alternate Containment Cooling Unit 1; Revision 0
- 2017-04-FLEX; FLEX Walkthrough; 7/26/2017