



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**

REGION III
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April 6, 2016

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

SUBJECT: DRESDEN NUCLEAR POWER STATION, UNITS 2 AND 3 - NRC DESIGN
BASES INSPECTION (TEAM) INSPECTION REPORT 05000237/2016008;
05000249/2016008

Dear Mr. Hanson:

On February 26, 2016, the U.S. Nuclear Regulatory Commission (NRC) completed the team portion of the pilot Design Bases Inspection at your Dresden Nuclear Power Station, Units 2 and 3. The enclosed report documents the results of this inspection, which were discussed on February 26, 2016, with Mr. P. Karaba, and other members of your staff.

Based on the results of this inspection, the NRC inspectors did not identify any findings or violations of more than minor significance.

In accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) 2.390, "Public Inspections, Exemptions, Requests for Withholding," of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC's Public Document Room or from the Publicly Available Records (PARS) component of the NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Sincerely,

/RA/

David E. Hills, Acting Chief
Engineering Branch 2
Division of Reactor Safety

Docket Nos. 50-237, 50-249
License Nos. DPR-19; DPR-25
Enclosure:
IR 05000237/2016008; 05000249/2016008

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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket Nos: 05000237; 05000249
License Nos: DPR-19; DPR-25

Report No: 05000237/2016008; 05000249/2016008

Licensee: Exelon Generation Company, LLC

Facility: Dresden Nuclear Power Station, Units 2 and 3

Location: Morris, IL

Dates: February 8 – 12, 2016
February 22 – 26, 2016

Inspectors: A. Dunlop, Senior Engineering Inspector, Lead
S. Sheldon, Senior Engineering Inspector, Electrical
G. O'Dwyer, Engineering Inspector, Mechanical
R. Baker, Operations Engineer
S. Kobylarz, Electrical Contractor
G. Gardner, Mechanical Contractor

Observer: N. Hansing, Engineering Inspector, NRO

Approved by: David E. Hills, Acting Chief
Engineering Branch 2
Division of Reactor Safety

Enclosure

SUMMARY

Inspection Report 05000237/2016008; 05000249/2016008, 02/08/2016 – 02/26/2016; Dresden Nuclear Power Station, Units 2 and 3; Pilot Design Bases Inspection (Team).

The inspection was a 2-week onsite baseline inspection that focused on the design of components. The inspection was conducted by regional engineering inspectors and two consultants. No findings of significance were identified by the inspectors. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 5, dated February 2014.

NRC-Identified and Self-Revealed Findings

No findings were identified during this inspection.

Licensee-Identified Violations

No findings were identified during this inspection.

REPORT DETAILS

1. REACTOR SAFETY

Cornerstone: Initiating Events, Mitigating Systems, and Barrier Integrity

1R21 Design Bases Inspection (Team) (71111.21M)

.1 Introduction

The objective of the pilot Design Bases Inspection is to verify that design bases have been correctly implemented for the selected risk-significant components and that operating procedures and operator actions are consistent with design and licensing bases. As plants age, their design bases may be difficult to determine and an important design feature may be altered or disabled during a modification. The Probabilistic Risk Assessment model assumes the capability of safety systems and components to perform their intended safety function successfully. This inspectable area verifies aspects of the Initiating Events, Mitigating Systems, and Barrier Integrity cornerstones for which there are no indicators to measure performance.

Specific documents reviewed during the inspection are listed in the Attachment to the report.

.2 Inspection Sample Selection Process

The inspectors selected risk-significant components and operator actions for review using information contained in the licensee's Probabilistic Risk Assessment and the Dresden Standardized Plant Analysis Risk Model. In general, the selection was based upon the components and operator actions having a risk achievement worth of greater than 1.3 and/or a risk reduction worth greater than 1.005. Based on this process, a number of risk-significant components, including those with Large Early Release Frequency implications, were selected for the inspection. The operator actions or operating procedures selected for review included actions taken by operators both inside and outside of the control room during postulated accident scenarios associated with the selected components. In addition, the inspectors selected operating experience issues associated with the selected components.

The inspectors performed a margin assessment and detailed review of the selected risk-significant components to verify that the design bases have been correctly implemented and maintained. This design margin assessment considered original design reductions caused by design modification, or power uprates, or reductions due to degraded material condition. Equipment reliability issues were also considered in the selection of components for detailed review. These included items such as performance test results, significant corrective action, repeated maintenance activities, Maintenance Rule (a)(1) status, components requiring an operability evaluation, system health reports, and U.S. Nuclear Regulatory Commission (NRC) resident inspector input of problem areas/equipment. Consideration was also given to the uniqueness and complexity of the design, operating experience, and the available defense in depth margins. A summary of the reviews performed and the specific inspection findings identified are included in the following sections of the report.

The inspectors also identified procedures and modifications for review that were associated with the selected components. In addition, the inspectors selected operating experience issues associated with the selected components.

This inspection constituted 13 samples (8 components, 2 components with Large Early Release Frequency implications, and 3 operating experience) as defined in Inspection Procedure 71111.21M-2.01.

.3 Component Design

a. Inspection Scope

The inspectors reviewed the Updated Final Safety Analysis Report (UFSAR), Technical Specifications (TS), design basis documents, drawings, calculations and other available design basis information, to determine the performance requirements of the selected components. The inspectors used applicable industry standards, such as the American Society of Mechanical Engineers Code, Institute of Electrical and Electronics Engineers Standards, and the National Electric Code, to evaluate acceptability of the systems' design. The NRC also evaluated licensee actions, if any, taken in response to NRC issued operating experience, such as Bulletins, Generic Letters, Regulatory Issue Summaries, and Information Notices (INs). The review was to verify that the selected components would function as designed when required and support proper operation of the associated systems. The attributes that were needed for a component to perform its required function included process medium, energy sources, control systems, operator actions, and heat removal. The attributes to verify that the component condition and tested capability was consistent with the design bases and was appropriate may include installed configuration, system operation, detailed design, system testing, equipment and environmental qualification, equipment protection, component inputs and outputs, operating experience, and component degradation.

For each of the components selected, the inspectors reviewed the maintenance history, preventive maintenance activities, system health reports, operating experience-related information, vendor manuals, electrical and mechanical drawings, and licensee Corrective Action Program (CAP) documents. Field walkdowns were conducted for all accessible components to assess material condition, including age-related degradation and to verify that the as-built condition was consistent with the design. Other attributes reviewed are included as part of the scope for each individual component.

The following 10 components (samples) were reviewed:

- Emergency Diesel Generator (EDG) 2 (2-6601): The inspectors reviewed EDG loading calculations focusing primarily on core spray pump loading. The EDG output breaker control logic, protective relaying, and control voltage were reviewed to verify adequate voltage would be available to close the output breaker when needed. The inspectors reviewed the licensee had analyzed equipment operation considering the voltage and frequency bounds identified in the TS. Surveillance procedures were reviewed to verify the adequacy of the licensee's testing of the EDG initiation logic. The inspectors also reviewed completed TS surveillances including the endurance test to ensure that the loading test was conducted in accordance with the TS. The EDG operating

and standby readiness procedures were reviewed to verify operations conformed to design requirements and complied with TS. The inspectors also reviewed the following EDG sub-components:

- EDG 2 Air Start (2-4600): The inspectors reviewed the sizing of the air start receivers to verify system capacity to support the minimum number of required starts for the EDG. The inspectors reviewed EDG surveillances to verify that all various combinations of air start compressor and air filter alignment were properly tested. In addition, the modifications replacing the air start air filters and one air compressor were reviewed to verify the system design basis was maintained.
- EDG 2 Jacket Water (2-6600): The inspectors examined the operational history, condition reports, and testing of the jacket water system to ensure it was capable to support EDG operations. Vendor manuals were reviewed to verify recommended operating limits were properly incorporated in station procedures.
- Diesel Generator Cooling Water Pump (2-3903): The inspectors reviewed the system hydraulic calculations such as, net positive suction head, vortexing, and minimum required flow to ensure that the pump was capable of performing its safety function. The inspectors also reviewed the vendor manual for the pump to determine whether the pumps characteristics met the design basis requirements and these requirements were accurately incorporated in periodic testing of the pump. Inservice testing results were reviewed to assess potential component degradation and impact on design margins. Pump operation from various suction sources was reviewed to evaluate the pump's ability to provide the required flow from each source. The inspectors reviewed pump control logic, pump voltage requirements, thermal overload sizing, and voltage drop calculations to verify adequate voltage would be available to operate the pump when required. The inspectors reviewed the normal and abnormal operating procedures for the pump to verify operations conformed to design requirements and complied with TS.
- EDG 2 Room Ventilation Fan (2-5790): The inspectors reviewed calculations addressing the room airflow required to maintain the EDG room below the maximum design basis temperature limit with the EDG at full load. Modifications and maintenance records, including the replacement of a damaged fan, were reviewed to verify correct components were used and post maintenance testing was adequate to verify operational readiness. Periodic testing and corrective action for the inlet, outlet, and temperature control ventilation dampers were reviewed to verify if TS requirement were satisfied. Corrective actions for out of specification ventilation flow readings were examined to verify the cause of the problem and actions were adequate to resolve the issue. Normal and abnormal operating procedures were reviewed to verify the procedures were properly updated after implementation of the modifications. The inspectors reviewed the supply fan maximum brake horsepower requirements to verify the adequacy of the motor capability to supply power during worse case design basis conditions. The results of load flow and voltage regulation analyses were reviewed to assess the adequacy of motor starting and running during degraded offsite voltage conditions coincident with a postulated design basis accident. The inspectors

reviewed the motor breaker settings to assess the adequacy of motor overcurrent protection during the most limiting design basis operating conditions. The EDG operating and standby readiness procedures were reviewed to verify operations of the EDG ventilation system operation conformed to functionality and design requirements. The inspectors also reviewed instrumentation used for the automatic operation of the room ventilation, including power supplies and setpoints to ensure proper system operation.

- 250 Volts Direct Current (VDC) Turbine Building Motor Control Center (MCC) #2 (2-83250-2): The inspectors reviewed the design basis loading calculations, breaker settings, and the available short circuit current at the MCC to assess the capability of the selected breakers to operate reliably during design basis conditions and to withstand limiting maximum short circuit conditions. The load flow and voltage analysis for the MCC was reviewed to verify the adequacy of voltage at selected components during limiting design basis conditions. The inspectors reviewed an engineering change that installed structural bracing to improve the capability of the MCC to withstand seismic forces. The applicable operating procedures for MCC 2 were reviewed to verify operations conformed to design requirements and complied with TS.
- 480 Volts Alternating Current (VAC) Switchgear Bus 29 (2-7329-2): The inspectors reviewed the load flow analysis short circuit calculation to verify breakers were adequately sized for interrupt capability. Bus supply transformer T29 replacement modification was reviewed to ensure design adequacy. The low pressure coolant injection swing bus cross-connect between MCC 29-7 and MCC 28-7 was reviewed to verify the automatic transfer on loss of Bus 29. The inspectors also reviewed the time delay setpoint calculations, and recent surveillances to verify the transfer would occur within limits assumed in the loss-of-offsite-power/loss-of-coolant-accident (LOCA) accident analysis. The inspectors reviewed the normal and abnormal operating procedures for the 480 VAC distribution system to verify operations conformed to design requirements and complied with TS.
- Unit 2 Essential Service System Power Supply Inverter, Distribution Panel, and Automatic Transfer Switch (2-0902-49): The inspectors reviewed the calculations that determined the maximum loading on the inverter to assess the adequacy of the inverter capacity rating and the voltage supplied to the inverter from the station battery during design basis operating conditions. The breaker settings for the safety-related VDC power supplied to the inverter were reviewed to verify the adequacy of the selected trip settings. The inspectors also reviewed vendor test documentation to verify the capability of the inverter for reliably operation at maximum expected loading conditions. The essential service systems distribution panel loading and voltage drop analysis were reviewed to assess the adequacy of the available voltage during design basis operating conditions. The inspectors also reviewed an engineering change that incorporated vendor recommended capacitor replacements to ensure equipment reliability. The inspectors also observed control room operator actions and the plant safety-system response for a simulated design basis accident scenario at the plant control room simulator. Operating procedures applicable to the inverter

power supply were reviewed to verify that periodic tests conformed to the TS requirements and industry standards. The inverter testing procedures were also reviewed to verify they conformed to the requirements for functionality of equipment that supports TS equipment operability.

- 2B Core Spray Pump (2-1401-2B): The inspectors reviewed the core spray pump and motor design basis including performance, net positive suction head, and electrical power requirements. The inspectors reviewed the function of the pump during postulated small and large break LOCAs including required minimum flow and runout limits. The emergency operating procedure associated with transferring the pump suction for post-LOCA operation from the torus to the condensate storage tank was reviewed. The inspectors also reviewed setpoints associated with the transfer of the pump suction from the torus to the condensate storage tank. Surveillance test procedures and recent test results were reviewed to verify acceptance criteria were appropriate and met, and performance degradation would be identified. The inspectors reviewed motor sizing, pump brake horsepower requirements, vendor ratings, and pump test data to ensure the pump and motor were sufficient for design basis load conditions. The load flow analysis was reviewed to determine the adequacy of voltage at motor terminals during degraded voltage conditions. The motor protective device coordination curves were reviewed to determine the adequacy of electrical protection. The inspectors also reviewed core spray initiation logic and associated surveillances to verify conformance with design and TS requirements.
- 2B Core Spray Pump Discharge Valve(2-1402-25B): The inspectors reviewed the motor-operated valve (MOV) calculations, including required thrust, weak link, voltage drop, and maximum differential pressure, to assess its capability to perform its functioning under design and licensing bases conditions. Inservice test results, including diagnostic testing, leak rate testing, valve exercising, and remote pushbutton control stations were reviewed to verify acceptance criteria were met and assess the licensee's ability to detect performance degradation. The inspectors also reviewed the maintenance activities associated with the MOV's remote push button station to ensure it was adequate to resolve a previous issue that prevented an MOV from operating when called upon. The inspectors reviewed the valve control logic to ensure design interlocks and permissive functioned as designed, and conformed to design requirements and operating procedures. This included reviewing calibration surveillances for the low pressure injection permissive. The inspectors reviewed thermal overload settings for adequacy considering the valve's use as a throttle valve. The procedures used to throttle the core spray discharge valves when the injection system would be used to aid in long term control of reactor vessel level was reviewed to ensure the valve would continue to be able to perform its design functions in this mode of operation.
- Unit 2 Reactor Building to Torus Vacuum Relief Valve (2-1601-20B): The inspectors reviewed the design basis of the air-operated vacuum relief valve including requirements for the valve to operate under postulated transient and accident conditions. This review included the capacity of the safety-related portion of the pneumatic supply system to operate the valve under the most limiting conditions. Surveillance test procedures, as well as the results of recent tests, were reviewed to verify acceptance criteria were met and performance

degradation would be identified. The inspectors also reviewed the capability of the valve to operate under the most limiting temperature and pressure conditions. The inspectors reviewed the vacuum relief valve pilot solenoid valve schematic diagrams for operational requirements and the environmental conditions required for the solenoid to operate during design basis events. The solenoid valve voltage rating was reviewed to assess operational capability during a postulated design basis accident.

- Unit 2 Torus Vent and Purge Valve (2-1601-56): The inspectors reviewed the design basis of the air-operated torus vent and purge valve including requirements for the valve to operate under postulated transient and accident conditions. This review included the capacity of the safety-related portion of the pneumatic supply system to operate the valve under the most limiting conditions. The inspectors reviewed surveillance test procedures, as well as the results of recent tests, to verify acceptance criteria were met and performance degradation would be identified. This included verifying testing of stroke times for primary containment isolation valves was consistent with design limits specified in the UFSAR and Technical Requirements Manual. The inspectors also reviewed the capability of the valve to operate under the most limiting temperature and pressure conditions. The inspectors reviewed the vent and purge valve pilot solenoid valve schematic diagrams for operational requirements and the environmental conditions required for the solenoid to operate during design basis events. The solenoid valve voltage rating was reviewed to assess operational capability during a postulated design basis accident. The inspectors reviewed the engineering change to upgrade the solenoid valve qualification requirements to environmental qualification level 1. The inspectors reviewed control logic and schematic diagrams to verify operation of valve conformed to design requirements and operating procedures.

b. Findings

No findings were identified.

.4 Operating Experience

a. Inspection Scope

The inspectors reviewed three operating experience issues (samples) to ensure that NRC generic concerns had been adequately evaluated and addressed by the licensee. The operating experience issues listed below were reviewed as part of this inspection:

- Generic Letter 96-01, "Testing of Safety-Related Logic Circuits";
- IN 89-07, "Failures of Small-Diameter Tubing in Control Air, Fuel Oil, and Lube Oil Systems Which Render Emergency Diesel Generators Inoperable"; and
- IN 2010-23, "Malfunctions of Emergency Diesel Generator Speed Switch."

b. Findings

No findings were identified.

.5 Modifications

a. Inspection Scope

The inspectors reviewed five permanent plant modifications related to selected risk significant components to verify that the design bases, licensing bases, and performance capability of the components had not been degraded through modifications. The modifications listed below were reviewed as part of this inspection effort:

- Engineering Change (EC) 330522, Replace Existing Transformer T29 with New Style;
- EC 376572, Replace Emergency Core Cooling System Low Pressure Permissive Pressure Switch 2-0263-52B;
- EC 331868, Replace VERSA Solenoid Valves 2-1601-22, -23, -56 and -63 with Environmentally Qualified ASCO Solenoid Valves;
- EC 341875, Install Bracing on 250 VDC MCCs and 125 VDC Distribution Panel – Seismic Qualification Utility Group -U2; and
- EC 377973, Replace Capacitors C201, C202 & C203, Located on Essential Service System Inverter.

b. Findings

No findings were identified.

.6 Operating Procedure Accident Scenarios

a. Inspection Scope

The inspectors performed a detailed review of the procedures listed below associated with a sample of the selected risk-significant components selected for this inspection, specifically EDG 2, 480 VAC Bus 29, and the Unit 2 essential service system power supply and distribution panel 902-49. The procedures were compared to the UFSAR, design assumptions, and training materials to ensure consistency. For identified significant operator actions, the inspectors performed a detailed review and walk through of associated procedures, including observing the performance of operator actions in the station's simulator and in the plant, to assess operator knowledge level and training effectiveness. Additionally, the inspectors reviewed adequacy of selected procedural use and operator actions during execution of the following simulator scenario event. Unit 2 was initially at full rated power, and the operators responded to a loss of offsite power, with a failure of EDG 2/3 to start/run, and no operator actions occur for the initial 10 minutes of the event. Specifically, the inspectors reviewed the following operating procedures in detail:

- DGA-12, "Loss of Offsite Power";
- DOA 6600-01, "Diesel Generator Failure";
- DOP 6700-02, "Transferring 480 Volt Busses";

- DOP 6800-01, “Essential Service System”; and
- DEOP 0100-00, “RPV [Reactor Pressure Vessel] Control.”

The inspectors also performed a margin assessment and detailed review of four time critical operator actions. These actions were selected from the licensee’s site specific Operator Response Time program, and focused on the use of risk significant components selected for review during this inspection. Where possible, margins were determined by the review of the assumed design basis and UFSAR response times compared to validation performance times documented by job performance measures results. For the selected operator actions, the inspectors performed a detailed review and walk through of associated procedures, including observing the performance of simulated licensed operator actions in the station’s control room, and in the plant by qualified plant operators to assess operator knowledge level, adequacy of procedures, and availability of special equipment where required.

The following operator actions were reviewed:

- Time Critical Action 4; Initiate Low Pressure Coolant Injection Torus Cooling (Control Room Action) during Loss of Offsite Power;
- Time Critical Action 16; Initiate Station Blackout Diesel Generators to Provide Power to 4kV Busses in Each Unit Following a Station Blackout;
- Time Sensitive Action 21; Align Low Pressure Emergency Core Cooling System Pumps to the Condensate Storage Tanks (Specifically using the core spray pump); and
- Time Sensitive Action ELAP6; Supply Power to 480 VAC Safety Related Busses (Specifically to provide power to Bus 902-49).

b. Findings

No findings were identified.

4. OTHER ACTIVITIES

4OA2 Identification and Resolution of Problems

.1 Review of Items Entered Into the Corrective Action Program

a. Inspection Scope

The inspectors reviewed a sample of the selected component problems identified by the licensee and entered into the CAP. The inspectors reviewed these issues to verify an appropriate threshold for identifying issues and to evaluate the effectiveness of corrective actions related to design issues. In addition, corrective action documents written on issues identified during the inspection were reviewed to verify adequate problem identification and incorporation of the problem into the CAP. The specific corrective action documents sampled and reviewed by the inspectors are listed in the attachment to this report.

The inspectors also selected two issues identified during previous Component Design Bases Inspections to verify that the concern was adequately evaluated and corrective actions were identified and implemented to resolve the concern, as necessary. The following issues were reviewed:

- NCV [Non-Cited Violation] 05000237/2013007-01; 05000249/2013007-01; Adequate Voltage not Assured for EDG Air Start Solenoid Valve; and
- FIN [Finding] 05000237/2013007-03; 05000249/2013007-03; Failure to Ensure Functionality of High Pressure Coolant Injection Steam Supply Valve during an Anticipated Transient Without Scram.

b. Findings

No findings were identified.

4OA6 Management Meetings

.1 Exit Meeting Summary

On February 26, 2016, the inspectors presented the inspection results to Mr. P. Karaba, and other members of the licensee staff. The licensee acknowledged the issues presented. Several documents reviewed by the inspectors were considered proprietary information and were either returned to the licensee or handled in accordance with NRC policy on proprietary information.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee

P. Karaba, Site Vice President
J. Washko, Station Plant Manager
J. Biegelson, Plant Engineering Manager
M. Budelier, Senior Engineering Manager
P. DiSalvo, Senior Engineer
D. Eaman, Electrical Design Engineer
J. Feigl, Engineering Manager
B. Franzen, Regulatory Assurance Manager
F. Gogliotti, Engineering Director
J. Hansen, Mechanical Design Engineer
M. Hosain, Site Equipment Qualification Engineer
B. Madderom, Engineering Manager
G. Morrow, Operations Director
M. Murskyj, Senior Engineering Manager
P. O'Brien, Senior Site Assessor
F. Polak, Mechanical Design Engineer
P. Prater, Operations Training Manager
D. Walker, Regulatory Assurance – NRC Coordinator
F. Winter, Operations
D. Wolverton, Engineering Manager

U.S. Nuclear Regulatory Commission

D. Hills, Chief, Engineering Branch 1
G. Roach, Senior Resident Inspector
R. Elliot, Resident Inspector

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

None

LIST OF DOCUMENTS REVIEWED

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

CALCULATIONS

Number	Description or Title	Revision
3C2/3-0489-001	Verification of Adequacy of Accumulator Capacity for SOER 88-01 Response	0
8900-77-19-1	Calculation for Contactor/Interposing Relay Coil Voltage During Starting	010
8982-13-19-4	Evaluation of 460 V Diesel Generator Cooling Water Pump Minimum Starting Voltage	001A
8982-15-19-1	Non-Size 2 Motor Control Center (MCC) Control Voltage Contactor Circuit Lengths fed from Switchgear 29	4
9389-46-19-2	Calculation For Diesel Generator 2 Loading Under Design Bases Accident Condition	003,A,B,C
AOV-MEDP-DRE-16-001	2-1601-20A/B DP CALC Report Airbase Version 3.1	0
CE-QC-004	Weak Link Analysis for Crane 10" Gate Valve	1
DG-1	Diesel Generator Room Ventilation Load Verification	001B
DR019-E002	4kV Bus 23-1 /33-1 and 24-1 /34-1 - Coordination Study	003,A,B
DRE 2-1402-25B	MIDACALC 2-1402-25B AC Motor Operated GL 95-06 Gate Valve	3
DRE00-0107	LPCI Swing Bus Automatic Transfer Time Delay Relay Setpoint Change for Extended Power Uprate (EPU)	002
DRE01-0041	Updated EQ Zone Parameter Tables Following Implementation of Extended Power Uprate	3
DRE02-0052	Motor Operated Valve AC Motor Terminal Voltage Calculation for Dresden System 1402, Unit 2	001
DRE03-0025	Baseline Calculation for 125 VDC ELMS-DC Conversion to DCSDM	002
DRE03-012	Core Spray System Combined DBD and DP Calculation	0
DRE04-0003	Baseline Calculation for 250VDC ELMS-DC Conversion to DCSDM	1
DRE05-0038	Auxiliary Power Analysis for Dresden Unit 2	003
DRE06-0023	Diesel Generator Room Ventilation	2
DRE06-0041	Unit 2 Turbine Building MCC Thermal Overload Relay Heater Sizing for AC Loads at Post LOCA Temperature	001
DRE07-0001	EDG Loading for CS Pump- LOCA Long Term Cooling	00
DRE07-0005	Determination of Connected Loading on 120/240 VAC ESS Bus Dist. Panel 902-49 Powered from UPS at Panel 902-63	4
DRE09-0026	Reactor Low Pressure (350 psig) ECCS Permissive Setpoint Error Analysis for Pressure Switch 2(3)-0263-52B and 2(3)-0263-52B1 at Normal Operating Conditions	000A
DRE96-0149	Breaker Settings for Bus 28 and 29	004

CALCULATIONS

<u>Number</u>	<u>Description or Title</u>	<u>Revision</u>
DRE96-0196	CSPs Ability to Deliver 4700 gpm at Discharge Pressure of 235 psig or Greater	0
DRE97-0021	Dresden LPCI/Core Spray NPSH Temperature Limits	2
DRE97-0162	Diesel Generator Cooling Water and HPCI Room Cooler Hydraulic Model	0
DRE98-0031	Unit 2 Reactor Building MCCs Thermal Overload Relay Heater Sizing for AC Loads at Post LOCA Temperature	004
NED-I-EIC-0099	Reactor Low Pressure (350 psig) ECCS Permissive Setpoint Error Analysis at Normal Conditions	004A
PMED-8684-80-01	Diesel Generator Cooling Water Pump Suction Piping Minimum I.D.	0

CORRECTIVE ACTION DOCUMENTS GENERATED DUE TO THE INSPECTION

<u>Number</u>	<u>Description or Title</u>	<u>Date</u>
02621525	Error on Drawing M-974	02/03/16
02622831	Ceiling Lights Burnt out in U2 250VDC Battery Room	02/07/16
02623024	U2 Battery Room Light Bulbs Need to be Replaced	02/08/16
02623349	DGCW Pump Floor Slab Thickness	02/08/16
02623369	Bus 29 Cub 1C Door Latch Needs Adjustment	02/08/16
02623651	DOA 0010-01 Error in Elevation on Intake Canal Lip	02/09/16
02624064	Passport and DOP 6600-01 PR Setting Mismatch	02/10/16
02624237	Correction Required in DOS 1500-01	02/10/16
02624262	Unapproved Operator Aids: 2-5772-100	02/10/16
02624275	Lighting Out on U2 TB 538' Elevation-Near ATS Panels	02/10/16
02624364	Missing Labels on Dampers/Drawing Error	02/10/16
02624371	U2 Intake Damper Paint on Actuator	02/10/16
02624646	Keys for Local MOV Control Station	02/11/16
02625059	EDG HVAC Documentation Updates Needed	02/11/16
02625334	EDG 2 Room Vent HP Discrepancy in Calc DRE06-0023	02/12/16
02627008	Evaluate DEP 0040-09	02/16/16
02627629	Drawing Change Required for M-974	02/17/16
02628767	NRC Questions M-974 Note 4 Wording	02/19/16
02629741	TRM and Test Procedure Failed to Specify Max Closing Time from UFSAR for Valves 2(3)-1601-20A&B and TIP Valves	02/19/15
02630415	Administrative Errors in Calculation DRE04-0003	02/23/16
02630942	Change Calc PMED-8684-80-01 to Historical	02/24/16
02631136	Discrepancies in ESS UPS VTIP Binder D2015	02/24/16
02631300	Potential Discrepancy Between 250VDC and UPS Calc	02/24/16
02631620	Discrepancies in UPS UV Trip Testing for Unit 2	02/25/16
02631814	UPS UV Trip Lack of Periodic Testing	02/25/16
02631818	Calculation DRE04-0003	02/25/16

CORRECTIVE ACTION DOCUMENTS REVIEWED DURING THE INSPECTION

<u>Number</u>	<u>Description or Title</u>	<u>Date</u>
01151887	3-1501-3A Breaker Control Power Xfmr Burnt Up	12/13/10
01462897	Potential Mounting Issue with ESS BUS ABT Panel	01/15/13

CORRECTIVE ACTION DOCUMENTS REVIEWED DURING THE INSPECTION

Number	Description or Title	Date
01472605	CDBI 2013 - EDG Air Start Solenoid Voltage Calculations	02/07/13
01481290	D2 EDG SSPI LCO FRAGNET Critique/LL	02/28/13
01513428	ESS Bus Undervoltage Relay Timing OOT	05/13/13
01533722	MOV 2-1402-25B Motor Cannot be Internally Borescoped	07/09/13
01546078	Receipt of NRC CDBI Inspection Report 2013-007	08/13/13
01582591	Issues While Racking in BUS 29 XTIE TO 28	11/08/13
01585176	MCC28-7/29-7 Did not Transfer as Expected	11/14/13
01586918	MOV 2-1402-25B Stem Nut Degraded	11/18/13
01620296	SER Point 0615 Failed to Activate	02/12/14
01620362	SER Point 0617 Failed to Activate	02/12/14
01692683	Excess Buildup on Intake Screens to 2B CSP Motor	08/14/14
02389466	U2 Swing Bus Transfer Time did not Meet Acceptance Criteria	10/01/14
02395698	Breaker Failed PM	10/15/14
02414006	U3 ESS Bus Normal Supply Inverter Operation	11/18/14
02432819	SPC 023881320 03 (Lab Rpt on 2EDG Air Start Components)	01/05/15
02484471	Procedure Revisions ID'd During ILT 14-01 NRC Test Prep	04/13/15
02488474	U2 EDG Fail to Start	04/21/15
02496795	2B Core Spray Discharge Press High	05/06/15
02496986	Issues with OP-DR-102-106, Time Sensitive Actions	05/07/15
02509849	Common Cause ACE Requested for Critical Component Failures	07/07/15
02531455	Revision to OP-DR-102-106 Needed	07/22/15
02532555	UHS INSP – Calc For DGCW Pump Based At Elevation 501	07/24/15
02532734	UHS NRC INSP – Basis for UHS Volume (2 Million Gallons)	07/25/15
02533713	Further Info on 0253255 – DGCW Pump Calculation	07/28/15
02541257	SPC- U3 EDG Start Failure	08/13/15
02546029	Engineering Review Needed for Time Critical Action 4	08/25/15
02549329	PS 2-0263-52A As Found Reset OOT	09/01/15
02549334	PS 2-0263-52B As Found Trip OOT	09/01/15
02558925	Request Inspection/Cleaning of U2 EDG Air Start Piping	09/22/15
02587677	Small Air Leaks Found On 2-1601-20B	11/15/15
02587682	Small Air Leak on 2-1601-56	11/15/15
02588761	2-1601-20B Has No Closed Indication	11/17/15
02592404	2-1601-56 Timed Closed in the Alert Range During DOS 1600-03	11/25/15
02602366	10 Minute Limit for TCA4, Torus Cooling Requires Revisiting	12/18/15
02621683	DG FASA: PCM Template Review	02/04/16
02621708	DG FASA: Issues Observed During System Walkdowns	02/04/16
02621795	DG FASA: Maintenance Rule Reliability Reporting	02/04/16
02621828	DG FASA: Engine Analysis Not Being Performed	02/04/16

DRAWINGS

Number	Description or Title	Revision
12E-2096	Electrical Installation Crib House Plan Elv. 490'-8" & 517'-6"	BU
12E-2303, Sh. 2	Key Diagram 4160V Switchgears 23 and 24	V

DRAWINGS

Number	Description or Title	Revision
12E-2304	Key Diagram 4160V Switchgears 23-1 and 24-1	V
12E-2305	Key Diagram Turbine Building 480V Switchgears 25, 26, 27	AS
12E-2306	Key Diagram Reactor Building 480VAC Switchgear 28 & 29	AE
12E-2321	Key Diagram 250V DC Motor Control Center	AS
12E-2346, Sh. 2	Schematic Diagram 4160V Bus 24-1 Standby Diesel 2 Feed	AT
12E-2346, Sh. 3	Schematic Diagram 4160V Bus 24-1 Undervoltage Relays Standby Diesel Generator 2 Overvoltage Relays	AO
12E-2350A, Sh. 1	Schematic Diagram Engine Control & Gen. Excitation Standby Diesel Generator 2	AT
12E-2350B, Sh. 1	Schematic Diagram Diesel Generator 2 Auxiliaries & Start Relays	AO
12E-2350B, Sh. 2	Schematic Diagram Diesel Generator 2 Auxiliaries & Start Relays	AQ
12E-2429, Sh. 1	Relay Metering & Schematic Diagram CS Pump 2-1401-A	AE
12E-2429, Sh. 2	Relay Metering & Schematic Diagram CS Pump 2-1401-B	AD
12E-2430, Sh. 1	Schematic Diagram Core Spray System 1	BU
12E-2430, Sh. 2	Schematic Diagram Core Spray System 2	BW
12E-2431, Sh. 1	Schematic Diagram Core Spray MOVs 2-1402-24A & 2-1402-25A	AE
12E-2431, Sh. 2	Schematic Diagram Core Spray MOVs 2-1402-24B & 2-1402-25B	AD
12E-2512	Schematic Diagram Primary Containment Isolation System Drywell & Torus Vent & Purge Isolation Control	AL
12E-2550	Schematic Diagram Pressure Suppression System	V
12E-2682	Wiring Diagram 120/240 V AC Dist Panels ESS Serv Bus Dist Panel 902-49 Instrument Bus Dist Panel 902-50	BB
12E-2769A	Wiring Diagram Instrument Rack 2202-5 Section A Reactor Instrument & Protection	AE
12E-2770A	Wiring Diagram Reactor Instrument & Protection Local Rack 2202-6 Section A	AJ
12E-2811B	Single Line Diagram Uninterruptible Power Supply Panel 902-63	G
12E-3096	Electrical Installation Crib House Plan Elv. 490'-8" & 517'-6"	BC
12E-6400A	MOV Limit Switch Development	E
B-47	Crib House Section C - C	G
M-173	Diagram of Corrosion Test & Diesel Start-up Air Piping	BE
M-192	Crib House Piping Sections	Z
M-194	Outdoor Piping	U
M-22	Diagram of Service Water Piping	ED
M-22, Sh. 1	Diagram of Service Water Piping	K
M-270	Diagram of Turbine Building Ventilation	AJ
M-355	Diagram of Service Water Piping	SJ
M-517, Sh.1	Diesel Generator Engine Cooling Water	H
M-974	Diagram of Diesel Generator Room Ventilation	1

MISCELLANEOUS

Number	Description or Title	Date or Revision
	480V Switchgear System Health Report	Q3-2015
	System Health Report for Primary Containment 4Q2015	Q4-2015
	System Health Report for Primary Containment 2Q2015	Q2-2015
	System Health Report for Core Spray and Flooding	Q4-2015
	System Health Report for Core Spray and Flooding	Q3-2015
	Cyberex Inc. Test Report 35 KVA Uninterruptible Power Supply Serial No. 10049-1, 10049-2, 10050-1, 10050-2	05/07/81
06-001	EDG Ventilation Flow Less Than Design	09/07/06
25235	Bingham Pump Test Curve for 2B Core Spray pump 260805	01/10/68
25243	Bingham Pump Test Curve for 2B Core Spray pump 260804	01/11/68
D-11	EMD 645E4C/4F Engine Maintenance & Operator's Manual	NA
D2015	Vendor Technical Manual Cyberex 35 KVA Uninterruptible Power Supply	3
D2064	Pratt Butterfly Valves Installation and Service Manual	12/11/96
DRF 0000-0068-2709	Reduced Voltage Closing of GE Magne-Blast 4kV Circuit Breakers	05/17/07
EC-360034	Evaluation of DG Room Temperature at Reduced Ventilation Flow	0
EC-362545	2B EDG Starting Air Compressor / 2-4611-B Air Supply	1
EC-383274	Unit 2 Emergency Diesel Generator Ventilation Fan Damage	0
EC-403120	DGCW Pump NPSH following Dresden Lock & Dam Failure	0
EC-403652	Unit #3 Diesel Cooling Water Pump NPSH	1C
EDE LTR 89-418	Dresden Review of NTC Information Notice 89-07 (Failure Of Small Diameter Tubing Rendering EDG Inoperable)	06/02/89
GE SIL 300	Instrumentation for Core Spray Sparger Line Break Detection	09/1979
NP 408	Joy Manufacturing Series 1000 Axivane Fan Maintenance and Installation Manual	NA
S-1500-11	Job Performance Measure-Line Up LPCI to the CST	4
TODI 06-021	Inputs for Evaluation of Diesel Generator Room Temperature – DG Ventilation Fan Curve	0
VETIP D1995	General Electric Tri-Clad Vertical Induction Motors	001

MODIFICATIONS

Number	Description or Title	Revision
EC 330522	Replace Existing Transformer T29 with New Style	001
EC 331868	Replace VERSA Solenoid Valves 2-1601-22, -23, -56 and -63 with EQ ASCO Solenoid Valves	2
EC 341875	Install Bracing on 250 VDC MCCs and 125 VDC Dist Panel – SQUG-U2	0
EC 376572	Replace ECCS Low Pressure Permissive Pressure Switch 2-0263-52B	001
EC 377973	Replace Capacitors C201, C202 & C203, Located on ESS Inverter	0

PROCEDURES

<u>Number</u>	<u>Description or Title</u>	<u>Revision</u>
DAN 902(3) E-8	ESS UPS on DC or Alternate AC	9
DAN 902(3) F-8	ESS UPS Trouble	5
DEOP 0010-00	Guidelines for Use of Dresden Emergency Operating Procedures and Severe Accident Management Guidelines	15
DEOP 0500-03	Alternate Water Injection Systems	23
DEP 0040-09	Limitorque Valve Operator Maintenance	15
DES 8100-01	Electrical Surveillance of the Uninterruptible Power Supply (UPS) for Essential Service System (ESS) (W-7)	16
DGA-12	Loss of Offsite Power	74
DIS 1400-05	Core Spray System Logic System Functional Test	49
DIS 1400-09	Core Spray System Load Shedding Circuitry Logic System Functional Test	07
DIS 1600-04	ECCS Drywell Pressure Switches Channel Calibration and Channel Functional Test	25
DOA 0010-01	Dresden Lock and Dam Failure	34
DOA 2300-03	High Pressure Coolant Injection System Local Manual Operation	17
DOA 6600-01	Diesel Generator Failure	16
DOA 6800-01	Loss of Power to Essential Service System Bus or Instrument Bus	34
DOA 6900-04	Failure of Unit 2(3) 250VDC Power Supply	20
DOP 1400-01	Core Spray System Preparation for Standby Operation	13
DOP 1400-03	ECCS Fill System	61
DOP 1600-01	Normal Pressure Control of the Drywell or Torus	24
DOP 6600-01	Diesel Generator 2(3) Preparation for Standby Operation	28
DOP 6600-02	Diesel Generator 2(3) Startup	35
DOP 6600-E1	Unit 2 Standby Diesel Generator	4
DOP 6600-M1	Unit 2 Standby Diesel Generator	29
DOP 6700-02	Transferring 480 Volt Busses	16
DOP 6800-01	Essential Service System	31
DOP 6800-E1	Unit 2 Essential Service Bus Electrical Checklist	8
DOP 6900-01	250 VDC Electrical System	36
DOS 0040-04	Monthly Check of MOVs Position Indicating Lights	16
DOS 1500-01	LPCI System Valve Operability	37
DOS 1600-03	Unit 2 Quarterly Valve Timing	52
DOS 6600-05	Bus Undervoltage and ECCS Integrated Functional Test for Unit 2 Diesel Generator	66
DOS 6600-07	Testing LPCI Swing Bus Protective Relays and Auto Transfer Function	29
MA-DR-771-402	Unit 2 – 4 KV Tech Spec Undervoltage and Degraded Voltage Relay Routines	14
OP-DR-102-106	Operator Response Time Program at Dresden	6

WORK DOCUMENTS

<u>Number</u>	<u>Description or Title</u>	<u>Date</u>
D95703	Replace Damaged Piping in DGCW Suction Piping	10/18/90
00512060	5RFL PM Lube/Inspect Limitorque Valve 2-1402-25B	11/12/13

WORK DOCUMENTS

Number	Description or Title	Date
00719926	D2 2Y PM Baker Test Core Spray Pump Motor 2-1401-B	08/11/08
00874153	5RFL MOV Elec Inspection and Diagnostic Test 2-1402-25B	11/14/13
00988302	FNE Replace Solenoid 2-5790-EP1	02/12/07
01002299	D2 4Y PM North Damper Air-Operator Inspection	02/15/11
01085111	4Y PM Inspect 480V BKR UTC 0001281363	08/29/13
01087118	DGCWP Suction Pipe Corrosion	01/11/08
01224197	EM Replace Capacitors C201, C202 and C203 per EC 377973	11/24/09
01224197	ESS: Field Service Note to Replace Capacitors on Rectifer	11/24/09
01237076	EM D2 40M EQ Repl ASCO Sol Valve 2-1601-20B	03/09/11
01239491	EM D2 40M PM Rpl Solenoid on DW Purge VLV 2-1601-56	09/11/12
01291088	2RFL PM Inspect Cubicle 2B at Bus 29	11/13/13
01410694	U-2 EDG Fan Blades Found Damaged	02/18/11
01410973	D2 4Y PM North Damper Air-operator Inspection	02/17/15
01412826	Need to Secure Door Handles to Prevent Damage to EDG Ventilation	02/14/12
01429081	D2 2Y EDG Perform Post-Maintenance Engine Analysis	04/10/13
01466171	D2 2Y EQ DIS 1600-20 Torus to Rx Bldg DP Xmtr Cal/Insp	02/12/14
01484881	EM 2RFL PM Replace ESS Automatic Bus Transfer Switch	11/12/15
01485168	1RFL IST Seat Leak Test 2-1402-25B	11/15/13
01489071	D2 24M TS Bus 24-1 UV and ECCS Integrated Func Test	11/17/13
01493791	2Y PM Lubricate Valve Stem, Threads 2-1402-25B	08/22/13
01504014	D2 30M/RFL TS LLRT VLV 1601-20A, 20B, 56, 58 and Flange Torus PUR (PMID 1573-01) per DOS 7000-31	11/18/13
01583632	D2 24M TS Test LPCI Swing Bus Relays	10/02/14
01618704	DOS 1400-09 CS System IST Comprehensive/Preservice Pump Test with Torus Available	02/08/15
01635025	24M TS D/G Test/Endurance & Margin/Full Load Reject/ECCS	04/23/15
01672038	D2 2Y DOS 0040-07 TS Verify Remote Cnmt Vlv Position Ind.	09/11/15
01692539	OP D2 RFL DATR Func Test of ESS UPS Power Supply Operability	11/14/15
01694719	EM RFL DATR Maint/Insp/ESS UPS	11/14/15
01835510	D2 QTR TS Reactor Low Pressure (350 psig) ECCS Permissive Calibration	09/01/15
01856464	D2 QTR TS CS Pump Test with Torus Avail for IST Data Surv DOS 1400-05	12/11/15
01857534	D2 QTR TS Reactor Low Pressure (350 psig) ECCS Permissive Calibration	12/04/15
01861632	DOS 1600-03, Rev 51, U2 QTR VLV Timing (IST) completed	11/25/15
01862245	D2 QTR TS D/G CLG WTR Test for IST Program Surv.	12/14/15
01885356	D2 1M TS Unit Diesel Generator Operability	01/07/16
99053296	CE D2 6RFL PM Clean/Insp 250VDC Bus Insul/Joints/Sprts/WIR	11/02/07

LIST OF ACRONYMS USED

ADAMS	Agencywide Document Access and Management System
CAP	Corrective Action Program
CFR	<i>Code of Federal Regulations</i>
EC	Engineering Change
EDG	Emergency Diesel Generator
FIN	Findings
IN	Information Notice
LOCA	Loss of Coolant Accident
MCC	Motor Control Center
MOV	Motor-Operated Valve
NCV	Non-Cited Violation
NRC	U.S. Nuclear Regulatory Commission
PARS	Publicly Available Records
TS	Technical Specification
UFSAR	Updated Final Safety Analysis Report
VAC	Volts Alternating Current
VDC	Volts Direct Current

April 6, 2016

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

SUBJECT: DRESDEN NUCLEAR POWER STATION, UNITS 2 AND 3 - NRC DESIGN
BASES INSPECTION (TEAM) INSPECTION REPORT 05000237/2016008;
05000249/2016008

Dear Mr. Hanson:

On February 26, 2016, the U.S. Nuclear Regulatory Commission (NRC) completed the team portion of the pilot Design Bases Inspection at your Dresden Nuclear Power Station, Units 2 and 3. The enclosed report documents the results of this inspection, which were discussed on February 26, 2016, with Mr. P. Karaba, and other members of your staff.

Based on the results of this inspection, the NRC inspectors did not identify any findings or violations of more than minor significance.

In accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) 2.390, "Public Inspections, Exemptions, Requests for Withholding," of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC's Public Document Room or from the Publicly Available Records (PARS) component of the NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Sincerely,

/RA/
David E. Hills, Acting Chief
Engineering Branch
Division of Reactor Safety

Docket Nos. 50-237, 50-249; 72-037
License Nos. DPR-19; DPR-25

Enclosure:
IR 05000237/2016008; 05000249/2016008

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