Exelon Generation Company, LLC
Braidwood Station
35100 South Route 53, Suite 84
Braceville, IL 60407-9619

www.exeloncorp.com

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10 CFR 50.59(d)(2)

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
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Braidwood Station, Units 1 and 2
Facility Operating License Nos. NPF-72 and NPF-77
NRC Docket Nos. STN 50-456 and STN 50-457

Subject: 10 CFR 50.59 Summary Report

Pursuant to the requirements of 10 CFR 50.59, "Changes, tests, and experiments," paragraph (d)(2), Braidwood Station is providing the required report for Facility Operating License Numbers NPF-72 and NPF-77. This report is being provided for the time period of June 19, 2012 through June 18, 2014, and consists of the 10 CFR 50.59 Coversheets for changes to the facility or procedures as described in the Updated Final Safety Analysis Report (UFSAR), and tests or experiments not described in the UFSAR.

Please direct any questions regarding this submittal to Mr. Phil Raush, Regulatory Assurance Manager, at (815) 417-2800.

Respectfully,

Mark E. Kanavos
Site Vice President
Braidwood Station

Attachment: Braidwood Station 10 CFR 50.59 Summary Report

cc: NRR Project Manager – Braidwood Station
Illinois Emergency Management Agency – Division of Nuclear Safety
US NRC Regional Administrator, Region III
US NRC Senior Resident Inspector (Braidwood Station)

Braidwood Station 10 CFR 50.59 Summary Report

Evaluation No.	Title
BRW-E-2012-126, Revision 1	Install Time Delayed Auto-Restart for U-1 (U-2) VD Fans in Support of High Energy Line Break Mitigation Strategy
BRW-E-2012-156, Revision 0	Install Time Delayed Auto-Restart for Unit 1 Unit 2 VX Fans in Support of High Energy Line Break Mitigation Strategy
BRW-E-2012-194, Revision 0	Main Control Room Ventilation High Energy Line Break Pressure Sensor to Control Emergency Intake Dampers Modification (Unit Common)
BRW-E-2013-078, Revision 0	Turbine Building High Energy Line Break Licensing and Design Basis
BRW-E-2013-102, Revision 0	Steam Generator 2B FW Nozzle Flow High Low
BRW-E-2013-119, Revision 1	Changes to Unit 01 AB System Due to Transient Analyses (RH SRV to RHUT Discharge Piping)
BRW-E-2013-121, Revision 1	Changes to Unit 02 AB System Due to Transient Analyses (RH SRV to RHUT Discharge Piping)
BRW-E-2013-125, Revision 0	1/2BwOA SEC-4 Loss of Instrument Air Unit 1/2 Revision Number: (originally REV 3 1998 - Current Rev103 2013)
BRW-E-2013-134, Revision 1	Implementation of WCAP-16676-NP, "Analysis Update for the Inadvertent Loading Event"
BRW-E-2013-141, Revision 0	Unit 1 Main Turbine Roll for Ventilation Testing
BRW-E-2013-155, Revision 0	Configuration Change Documents Associated with RH Relief Valve Discharge to the Recycle Hold Up Tank
BRW-E-2013-187, Revision 0	UFSAR Revision for Reactor Head Lift – Polar Crane Single Failure Proof Equivalency per NEI 08-05
BRW-E-2013-250, Revision 0	Install Time Delayed Auto-Restart For U-1 (U-2) VE Fans In Support of High Energy Line Break Mitigation Strategy
BRW-E-2013-252, Revision 0	Install High Energy Line Break (HELB) Dampers for Div 11/12 MEER Room Div. 11/12 to Support HELB Project" and "Install HELB Dampers for Div 21/22 MEER Room Div. 21/22 to Support HELB Project
BRW-E-2013-254, Revision 0	Install High Energy Line Break (HELB) Dampers and Install High Temp. Thermal Links on Fire Dampers for Div. 11/12 ESF Switchgear Rooms and Div. 12 Cable Spreading Rm. Install HELB Damper on Non-ESF Room and Install HELB Dampers and High Temperature Thermal Links for Div. 21/22 ESF Switchgear Rooms and Div. 22 Cable Spreading RM Fire DMPRs. Install HELB Damper on Non-ESF SWGR Room
BRW-E-2013-256, Revision 0	Install HELB Dampers and Install High Temperature Thermal Links on Fire Dampers for Div. 11/12 EDG Room and Install HELB Dampers and High Temperature Thermal Links for Div. 21/22 EDG Room Fire Dampers
BRW-E-2014-041, Revision 0	Evaluation of Long-Term Removal from Service of the CVCS Positive Displacement Pump to Address 2013 NRC Inspection Finding
BRW-E-2014-074, Revision 0	Change In-Core Decay Time for A2R17

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood Units 1 and 2

Activity/Document Number: EC 388475 / EC 388946 **Revision Number:** 1 / 1

Title: Install Time Delayed Auto-Restart for U-1 (U-2) VD Fans in Support of HELB Mitigation Strategy

NOTE: For 50.59 Evaluations, information on this form will provide the basis for preparing the biennial summary report submitted to the NRC in accordance with the requirements of 10 CFR 50.59(d)(2).

Description of Activity:
(*Provide a brief, concise description of what the proposed activity involves.*)

The proposed activity consists of two engineering changes, one for Unit 1 and one for Unit 2:

- EC 388475 – Install Time Delayed Auto-Restart for U-1 VD Supply Fans in Support of HELB Mitigation Strategy
- EC 388946 – Install Time Delayed Auto-Restart for U-2 VD Supply Fans in Support of HELB Mitigation Strategy

The proposed activity consists of the installation of a time-delayed auto restart for the diesel generator room and day tank room ventilation (VD) system supply fans in support of a new high energy line break (HELB) mitigation strategy. The ECs will install new timers and circuit changes to automatically restart the fans, following a short time delay, after a high differential pressure trip. This feature will work with the new HELB damper installation under EC 388398 and EC 388948 to mitigate the consequences of a HELB in the turbine building. The 50.59 assessment for the installation of the new HELB dampers is performed as part of the damper installation design changes (EC 388398 and EC 388948).

The final configuration considered in this screening includes the installation of the new timers and circuit changes via the completion of these ECs along with the installation of the new HELB dampers.

The proposed activity (along with EC 388398 and EC 388948) is being undertaken to address a vulnerability identified during a review of the effects of certain high energy line breaks in the turbine building which could affect redundant trains of safety-related equipment.

EC 388475 and EC 388946 modify the control circuits for the following fans:

- 1(2)VD01CA – Division 11 (21) DG Room Ventilation Supply Fan
- 1(2)VD01CB – Division 12 (22) DG Room Ventilation Supply Fan

A new time delay relay will be installed to automatically restart the fan after a fan trip on high differential pressure occurs. The auto restart will occur a short time after the differential pressure trip. The time delay is intended to restart the supply fan after a brief time following momentary isolation of the exhaust path – a condition that could occur following a nearby high energy line break in the turbine building (which may close the new HELB dampers added by EC 388398 and EC 388948). The new time delay relays will be installed in existing local panels.

The new HELB dampers are designed to close upon reverse flow from the turbine building to the auxiliary building. Closure of the HELB dampers with the VD ventilation supply fans running will create back pressure to the fan which may cause it to trip on high differential pressure, disrupting supply airflow to the EDG Room. In order to minimize the heat up of the room, the proposed activity will modify the control logic for the EDG Room supply fans such that the fans will auto-restart one time following a high differential pressure trip after a time delay of sufficient duration to allow the HELB pressure transient to dissipate and allow restart of the fans, thereby re-establishing ventilation through the new HELB dampers.

The UFSAR will require updates to reflect the design of the differential pressure trip to allow one automatic fan restart attempt. These changes will be processed under DRP 14-084.

Reason for Activity:
(*Discuss why the proposed activity is being performed.*)

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood Units 1 and 2

Activity/Document Number: EC 388475 / EC 388946 **Revision Number:** 1 / 1

Title: Install Time Delayed Auto-Restart for U-1 (U-2) VD Fans in Support of HELB Mitigation Strategy

The proposed activity is part of an improved method for mitigating turbine building HELB effects in areas serviced by the VD system.

The current strategy for mitigating the effects of such breaks, as described in the UFSAR, credits closure of the affected fire dampers as the result of the thermal link temperature exceeding its setting due to the high temperatures in the vicinity of the piping failure. The fire damper closure results in tripping of the VD supply fans (when running) on high differential pressure once the damper closes and blocks the normal ventilation path from the affected room to the turbine building. Room ventilation is restored at a later time via operator action. Analyses were performed to demonstrate that the room heat up during the period that ventilation is lost would not cause required electrical equipment to become unavailable.

However, a recent review of the effects of a turbine building high energy line break determined that the closure of the affected fire dampers might not occur in the time frame assumed in the analyses. In order to address this vulnerability, the proposed activity will reconfigure the dampers and ventilation systems to provide for automatic restoration of the VD system shortly after a high energy line break in the turbine building. The prompt restoration of the system, following a time delay of sufficient duration to allow the HELB pressure to dissipate, will allow for maintaining the diesel generator room rooms as a mild environment following a turbine building HELB to help ensure that electrical equipment in the affected rooms will remain available.

Effect of Activity:
(Discuss how the activity impacts plant operations, design bases, or safety analyses described in the UFSAR.)

The new fan auto restart feature will not affect normal fan operation (starting and stopping by the operator). In the event of a high differential pressure, a fan that is running will trip, as at present. However, the auto restart feature will attempt to restart the supply fan after a short time delay. If the high differential pressure was due to HELB damper closure (see EC 388398 and EC 388948) following a turbine building high energy line break, the turbine building pressure will have decreased to the point where the restarted fan can re-open the HELB dampers and return the ventilation system to operation. Likewise, if a VD supply fan start attempt occurs after initiation of the turbine building HELB event, the turbine building pressure will have decreased to the point where the fan can start or restart, thereby re-opening the HELB dampers and returning the ventilation system to operation. If the high differential pressure was due to a condition that does not clear within approximately1 ½ times the fan restart time delay setpoint, the restarted fan will trip again on high differential pressure and will then be blocked from further restart attempts until and operator investigates and resets the trip.

The automatic restoration of an affected VD system following a high energy line break in the turbine building will eliminate the need for a manual restoration of room ventilation by an operator following the initial VD fan high differential pressure trip.

Like the existing VD equipment, a malfunction of the new equipment would not affect the availability of the redundant VD train. This is consistent with the system design bases and safety analyses requirements.

Summary of Conclusion for the Activity's 50.59 Review:
(Provide justification for the conclusion, including sufficient detail to recognize and understand the essential arguments leading to the conclusion. Provide more than a simple statement that a 50.59 Screening, 50.59 Evaluation, or a License Amendment Request, as applicable, is not required.)

The proposed activity involves the installation of a new auto restart feature on the diesel generator room and day tank room ventilation (VD) system supply fans to help mitigate the consequences of a high energy line break (HELB) in the turbine building. Following installation of this feature, the VD system will continue to be capable of performing its UFSAR-described design functions of: (1) continuous ventilation for the day tank room during normal plant operation, (2) ventilation for the diesel generator when it operates, and (3) a source of combustion air for the diesel generator. As at present, the failure of a ventilation supply fan would lead to the loss of one train of the VD system. The loss of one train does not affect the safe shutdown capability of the station since independent ventilation systems are provided for each redundant division.

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood Units 1 and 2

Activity/Document Number: EC 388475 / EC 388946 **Revision Number:** 1 / 1

Title: Install Time Delayed Auto-Restart for U-1 (U-2) VD Fans in Support of HELB Mitigation Strategy

New HELB dampers, installed under a separate activity, will be available to permit air flow through the room both during normal ventilation system operation and shortly after a nearby turbine building high energy line break, allowing the ventilation system to continue to perform its ventilation and cooling functions.

A 50.59 Evaluation (BRW-E-2012-126) was performed to address two potential adverse effects of the proposed activity:

- The replacement of the current *manual* method of restoring room ventilation following its isolation in the event of a nearby high energy line break in the turbine building with an *automatic* method involving auto restart of the affected fans and the resultant re-opening of the backdraft dampers
- The automatic restarting of a VD fan after an existing equipment protection feature (fan high differential pressure trip) had stopped the fan

Based on the quality classification and testing of the new components, and because the proposed activity reduces the likelihood of a malfunction of the electrical equipment in the VD areas, Evaluation BRW-E-2012-126 concluded that the potential adverse effects of the automatic system restoration following a HELB and the automatic fan restart following a trip on high differential pressure did not cause more than a minimal increase in the frequency or occurrence of an accident previously evaluated in the UFSAR and did not cause more than a minimal increase in the likelihood of a malfunction of an SSC important to safety previously evaluated in the UFSAR.

The new fan auto restart feature does not involve a change to a procedure that adversely affects how UFSAR-described SSC design functions are performed or controlled. However, the change from manual to automatic restoration of room ventilation following its isolation in response to a turbine building high energy line break was addressed in the evaluation. As discussed in the previous paragraph, the evaluation concluded that this change did not cause more than a minimal increase in the frequency or occurrence of an accident previously evaluated in the UFSAR and did not cause more than a minimal increase in the likelihood of a malfunction of an SSC important to safety previously evaluated in the UFSAR.

The analyses performed as part of this activity do not involve UFSAR-described methodologies or alternate methodologies used in establishing the design bases or in the safety analyses.

The VD system and associated components will not be utilized or controlled in a manner that is outside the reference bounds for their design or that is inconsistent with analyses or descriptions in the UFSAR. Since the VD system is not addressed in the Technical Specification or Operating License, no change to these documents is required.

In conclusion, the proposed activity does not require prior approval by the NRC, and the activity can be implemented per the governing procedure.

Attachments:
Attach all 50.59 Review forms completed, as appropriate.

Forms Attached: (Check all that apply.)

☐	**Applicability Review**				
☒	**50.59 Screening**	**50.59 Screening No.**	BRW-S-2012-127	**Rev.**	1
☒	**50.59 Evaluation**	**50.59 Evaluation No.**	BRW-E-2012-126	**Rev.**	1

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood Units 1 and 2

Activity/Document Number: EC 388474/ EC 388945 / DRP 14-084 **Revision Number:** 0 / 0 / 0

Title: Install Time Delayed Auto-Restart for U-1 (U-2) VX Fans in Support of HELB Mitigation Strategy

NOTE: For 50.59 Evaluations, information on this form will provide the basis for preparing the biennial summary report submitted to the NRC in accordance with the requirements of 10 CFR 50.59(d)(2).

Description of Activity:
(*Provide a brief, concise description of what the proposed activity involves.*)

The proposed activity consists of two engineering changes, one for Unit 1 and one for Unit 2:

- EC 388474 – Install Time Delayed Auto-Restart for U-1 VX Fans in Support of HELB Mitigation Strategy
- EC 388945 – Install Time Delayed Auto-Restart for U-2 VX Fans in Support of HELB Mitigation Strategy

The proposed activity consists of the installation of a time delayed auto-restart for the Switchgear Room Ventilation System (VX) Fans 1(2)VX01C, 1(2)VX 02C, 1(2)VX 03C, and 1(2)VX 04C in support of a high energy line break (HELB) mitigation strategy. These ECs will install new timers and circuit changes to auto restart the VX fans, following a short time delay, after a high differential pressure trip. This feature will work with the new HELB damper installation under EC 388397 and EC 388947 to mitigate the consequences of a postulated turbine building HELB. The 50.59 assessment for the installation of the new HELB dampers was performed as part of the damper installation design changes (EC 388397 and EC 388947).

The final configuration considered in this screening includes the installation of the new timers and circuit changes via the completion of these ECs along with the installation of HELB dampers.

The proposed activity (along with EC 388397 and EC 389947) is being undertaken to address a vulnerability identified during a review of the effects of certain high energy line breaks in the turbine building which could affect redundant trains of safety-related equipment.

EC 388474 and EC 388945 modify the control circuits for the following fans:

- 1(2)VX01C – Division 12 (22) ESF Switchgear Supply Fan
- 1(2)VX02C – Non-ESF Switchgear Supply Fan
- 1(2)VX03C – Division 12 (22) Cable Spreading Room Supply Fan
- 1(2)VX04C – Division 11 (21) ESF Switchgear Supply Fan

A new time delay relay will be installed to automatically restart the fan after a fan trip on high differential pressure occurs. The auto restart will occur approximately 60 seconds after the differential pressure trip. The time delay is intended to restart the fan after a brief time following momentary isolation of the exhaust path – a condition that could occur following a nearby high energy line break in the turbine building (which may close the new HELB dampers added by EC 388397 and EC 388947). The new time delay relays will be installed in existing local panels (1(2)VX01J, 1(2)VX02J, and 1(2)VX04J).

Redundant HELB dampers will be installed in series with fire dampers via EC 388397 and EC 388947. The new HELB dampers are designed to close upon reverse flow from the turbine building to the auxiliary building. Closure of the HELB dampers with the VX ventilation fans running will create back pressure to the operating fan which may cause it to trip on high differential pressure, disrupting the supply airflow. In order to minimize the heat up of the affected areas, the proposed activity (EC 388474 and EC 388945) will modify the control logic for the fans listed above, such that the fans will auto-restart one time following a high differential pressure trip after a time delay of sufficient duration to allow the HELB pressure transient to dissipate and allow restart of the fans, thereby re-establishing ventilation through the new HELB dampers.

The UFSAR will require updates to reflect the design of the differential pressure trip to allow one automatic fan restart attempt. This will require changes to Section 7.3.1.1.11 "Essential Switchgear Rooms, Miscellaneous Electrical Equipment Rooms and Battery Rooms Ventilation Systems Instrumentation and Controls", Section 9.4.5.4 "ESF Switchgear Ventilation Systems" and Table 9.4-16 "Switchgear Room Ventilation System Failure Analysis". These changes will be processed under DRP 14-084.

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood Units 1 and 2

Activity/Document Number: EC 388474/ EC 388945 / DRP 14-084 **Revision Number:** 0 / 0 / 0

Title: Install Time Delayed Auto-Restart for U-1 (U-2) VX Fans in Support of HELB Mitigation Strategy

Reason for Activity:
(*Discuss why the proposed activity is being performed.*)

The proposed activity is part of an improved method for mitigating turbine building HELB effects in areas serviced by the VX system.

The current strategy for mitigating the effects of such breaks, as described in the UFSAR, credits closure of the affected fire dampers as the result of the thermal link temperature exceeding its setting due to the high temperatures in the vicinity of the piping failure. The fire damper closure results in tripping of the ventilation system fans on high differential pressure once the damper closes and blocks the normal ventilation path from the affected room to the turbine building. Room ventilation is restored at a later time via operator action. Analyses were performed to demonstrate that the room heat up during the period that ventilation is lost would not cause required electrical equipment to become unavailable.

However, a recent review of the effects of a turbine building high energy line break determined that the closure of the affected fire dampers might not occur in the time frame assumed in the analyses. In order to address this vulnerability, the proposed activity will reconfigure the dampers and ventilation systems to provide for automatic restoration of the VX system shortly after a high energy line break in the turbine building. The prompt restoration of the system, following a time delay of sufficient duration to allow the HELB pressure to dissipate, will allow for maintaining the switchgear rooms as a mild environment following a turbine building HELB to help ensure that electrical equipment in the affected rooms will remain available.

Effect of Activity:
(*Discuss how the activity impacts plant operations, design bases, or safety analyses described in the UFSAR.*)

The new fan auto restart feature will not affect normal fan operation (starting and stopping by the operator). In the event of a high differential pressure, the fan will trip, as it does at present. However, the auto restart feature will attempt to restart the fan after approximately 60 seconds. If the high differential pressure was due to HELB damper closure (see EC 388397 and EC 388947) following a turbine building high energy line break, the turbine building pressure will have decreased to the point where the restarted fan can re-open the HELB damper and return the ventilation system to operation. If the high differential pressure was due to a condition that does not clear within approximately 60 seconds, the restarted fan will trip again on high differential pressure and will then be blocked from further restart attempts until and operator investigates and resets the trip.

The automatic restoration of an affected VX system following a high energy line break in the turbine building will eliminate the need for a manual restoration of room ventilation by an operator following the initial VX fan high differential pressure trip.

Like the existing VX equipment, a malfunction of the new equipment would not affect the availability of the redundant VX train. This is consistent with the system design bases safety analyses requirements.

Summary of Conclusion for the Activity's 50.59 Review:
(*Provide justification for the conclusion, including sufficient detail to recognize and understand the essential arguments leading to the conclusion. Provide more than a simple statement that a 50.59 Screening, 50.59 Evaluation, or a License Amendment Request, as applicable, is not required.*)

The proposed activity involves the installation of a new auto restart feature on the engineered safety features switchgear ventilation system fans to help mitigate the consequences of a high energy line break in the turbine building. Following installation of this feature, the VX system will continue to be capable of performing its UFSAR-described design function of removing equipment heat to maintain the room temperatures in accordance with equipment requirements under normal, abnormal, and accident conditions, as described in the UFSAR. As at present, the failure of a ventilation system fan would lead to the loss of one train of the VX ventilation system. The loss of one train does not affect the safe shutdown capability of the station since independent switchgear ventilation systems are provided for each redundant division of switchgear.

New HELB dampers, installed under a separate activity, will be available to permit air flow through the room both during normal ventilation system operation and shortly after a nearby turbine building high energy line break, allowing the ventilation system to continue to perform its ventilation and cooling functions.

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood Units 1 and 2

Activity/Document Number: EC 388474/ EC 388945 / DRP 14-084 **Revision Number:** 0 / 0 / 0

Title: Install Time Delayed Auto-Restart for U-1 (U-2) VX Fans in Support of HELB Mitigation Strategy

A 50.59 Evaluation (BRW-E-2012-156) was performed to address two potential adverse effects of the proposed activity:

- The replacement of the current *manual* method of restoring room ventilation following its isolation in the event of a nearby high energy line break in the turbine building with an *automatic* method involving auto restart of the affected fans and the resultant re-opening of the HELB dampers
- The potential adverse effect on a VX fan from automatically restarting the fan after an existing equipment protection feature (fan high differential pressure trip) had stopped the fan

Based on the quality classification and testing of the new components, and because the proposed activity reduces the likelihood of a malfunction of the electrical equipment in the VX areas, Evaluation BRW-E-2012-156 concluded that the potential adverse effects of the automatic system restoration following an HELB and the automatic fan restart following a trip on high differential pressure did not cause more than a minimal increase in the likelihood of a malfunction of an SSC important to safety previously evaluated in the UFSAR.

The new fan auto restart feature does not involve a change to a procedure that adversely affects how UFSAR-described SSC design functions are performed or controlled. However, the change from manual to automatic restoration of room ventilation following its isolation in response to a turbine building high energy line break was addressed in the evaluation. As discussed in the previous paragraph, the evaluation concluded that this change did not cause more than a minimal increase in the likelihood of a malfunction of an SSC important to safety previously evaluated in the UFSAR.

The analyses performed in support of the new fan auto restart feature do not involve UFSAR-described methodologies or alternate methodologies used in establishing the design bases or in the safety analyses.

The VX system and associated components will not be utilized or controlled in a manner that is outside the reference bounds for their design or that is inconsistent with analyses or descriptions in the UFSAR. Since the VX system is not addressed in the Technical Specification or Operating License, no change to these documents is required.

In conclusion, the proposed activity does not require prior approval by the NRC, and the activity can be implemented per the governing procedure.

Attachments:
Attach all 50.59 Review forms completed, as appropriate.

Forms Attached: (Check all that apply.)

☐	**Applicability Review**				
☒	**50.59 Screening**	**50.59 Screening No.**	**BRW-S-2012-104**	**Rev.**	**0**
☒	**50.59 Evaluation**	**50.59 Evaluation No.**	**BRW-E-2012-156**	**Rev.**	**0**

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood / Unit 0

Activity/Document Number: EC 389634; DRP#14-095, Basis Change Request 12-010, 011 **Revision Number:** 0, 0, 0, 0

Title: Main Control Room Ventilation (VC) High Energy Line Break (HELB) Pressure Sensor to Control Emergency Intake Dampers Modification (Unit Common)

NOTE: For 50.59 Evaluations, information on this form will provide the basis for preparing the biennial summary report submitted to the NRC in accordance with the requirements of 10 CFR 50.59(d)(2).

Description of Activity:
(Provide a brief, concise description of what the proposed activity involves.)

The proposed activity will install pressure sensors and controls to keep the emergency make-up air Turbine Building intake damper (0VC25Y / 0VC09Y) closed on high intake pressure (resulting from HELB) and automatically transfer to the outside air intake (0VC312Y / 0VC313Y) for emergency make-up. This will be accomplished via the installation of three pressure sensors that will detect overpressure in the turbine building intake damper ductwork. The sensors will be configured in a normally energized 2 out of 3 logic to prevent spurious actuation and to build redundancy into the design. The control loops will be powered by an uninterruptible source (120VAC Instrument Buses 1IP01J and 1IP04J) to enable detection of a HELB concurrent with a loss of power and will be designed to fail the dampers to the Emergency Outside Air mode on loss of power to the control logic. The Control Room make-up filter inlet selector switch will be replaced with a 3 position (Turbine-Auto-Outside Air) switch. Operating Procedures will normally maintain the hand switch in "Auto". Additionally, the failure position for the Turbine Building intake dampers 0VC25Y and 0VC09Y will be changed from Fail Open to Fail Closed. Finally, the ductwork from L-row wall to the intake damper 0VC25Y / 0VC09Y will be qualified such that it can withstand the HELB pressure pulse.

The UFSAR Change Request DRP 14-095 will update UFSAR Sections 6.4, 6.5.1, 7.3.1, 7.3.1, 7.3.2, 15.1.5, UFSAR Tables 7.3-5 and 15.0-12: UFSAR Figures 6.4-5, 6.4-6, 6.4-7, 6.4-8 to reflect the installation of the new HELB detection instrumentation and controls and modified system operation and updated Chapter 15 accident analysis consequences. The fire protection report will be updated by FDRP 26-001.

Technical Specification Basis Change request 12-010 (A Train) and 12-011 (B Train) will update the basis for Technical Specification B.3.7.10 to reflect the modified system operation during a HELB event in the turbine building.

Reason for Activity:
(Discuss why the proposed activity is being performed.)

The proposed activity is intended to protect the Control Room from the effects of a HELB in the Turbine Building. A HELB in the Turbine Building can adversely affect the Main Control Room (MCR) via a make-up ventilation connection in the Turbine Building. The ventilation connection could allow steam from a HELB to enter the MCR, exposing the equipment and personnel to high temperatures and humidity. The design of the Control Room Ventilation (VC) System is currently configured such that emergency make-up air following a Main Steam Line Break, Reactor Coolant Pump Shaft Seizure (Locked Rotor), Loss of Coolant Accident, Steam Generator Tube Rupture (SGTR) Event and Fuel Handling Accident is drawn from the Turbine Building (versus outside).

Effect of Activity:
(Discuss how the activity impacts plant operations, design bases, or safety analyses described in the UFSAR.)

The control room HVAC system (VC) will function under normal conditions as described in UFSAR Section 9.4.1. Under post-accident conditions, the UFSAR will be revised to reflect that the control room envelope will be protected from a HELB in the turbine building by ensuring the Turbine Building intake dampers (0VC25Y / 0VC09Y) are closed and the outside intake dampers (0VC312Y / 0VC313Y) are open. If HELB conditions are not present in the turbine building, the system will function as currently described in the UFSAR (makeup air from the turbine building). The Turbine Building intake dampers (0VC25Y/0VC09Y) will be changed from fail open to fail closed. The loading on 120VAC Instrument Buses 1IP01J and 1IP04J will be increased which has been reviewed and is within the capacity of the inverter feeding the instrument bus with adequate design margin. The change also adds a minor amount of heat load to the control room envelope impacting the control room ventilation system and is well within the systems cooling capability.

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood / Unit 0

Activity/Document Number: EC 389634; DRP#14-095, Basis Change Request 12-010, 011 **Revision Number:** 0, 0, 0, 0

Title: Main Control Room Ventilation (VC) High Energy Line Break (HELB) Pressure Sensor to Control Emergency Intake Dampers Modification (Unit Common)

Summary of Conclusion for the Activity's 50.59 Review:
(Provide justification for the conclusion, including sufficient detail to recognize and understand the essential arguments leading to the conclusion. Provide more than a simple statement that a 50.59 Screening, 50.59 Evaluation, or a License Amendment Request, as applicable, is not required.)

1. The modification to install new HELB detection instrumentation and changes the failure position of the turbine building emergency intake damper will not affect the control room ventilation system operation during normal operation. The abnormal operation of the VC system is not affected except for the HELB accident,. During a HELB the emergency makeup air will be drawn from the emergency outside air intake preventing an adverse environment in the control room. Therefore, this modification will ensure the control room environment is maintained with the design basis limits for critical instrumentation and controls. As a result, the possibility of failures of safety related control system due to adverse environmental conditions which could initiate a transient or accident is not created. The Control Room Ventilation System (VC) is not an accident initiating system. Therefore, it is concluded that the modified control room emergency intake damper controls and the modified turbine building emergency intake damper failure position does not result in an increase in the frequency of occurrence of an accident previously evaluated in the UFSAR.

2. The modification to install new HELB detection instrumentation and change the failure position of the turbine building emergency intake damper will not result in more than a minimal increase in the likelihood of occurrence of a malfunction of an SSC important to safety previously evaluated in the UFSAR because the new components are qualified, safety related components and failure of the turbine building intake damper is less likely by changing the damper to fail closed since the hydraulic system will no longer be required to hold the damper closed. The impact on control room ventilation due to the minor increase in heat loads was evaluated and well within the system capability. Inverter loading due to the increased load on the instrument buses was evaluated and the loading was within the capacity of the inverter with adequate design margin. The battery evaluations consider the inverter fully loaded. Given the inverters are tested and evaluated for full loading and the battery evaluation considers the inverters fully loaded the addition of the new controls on the instrument buses does not result in more than a minimal increase in the likelihood of occurrence of a malfunction of the inverter or batteries.

3. The modification to install new HELB detection instrumentation and change the failure position of the turbine building emergency intake damper will decrease the dose to the control room operator following a Main Steam line break. The Steam Generator Tube Rupture, Loss of Coolant Accident, Fuel Handling Accident, Reactor Coolant Pump Shaft Seizure (Locked Rotor) dose calculations remain bounding. Therefore, the modification to install the HELB detection control system and change the failure position of the turbine building emergency intake damper will not result in a more than a minimal increase in the consequences of an accident previously evaluated in the UFSAR.

4. UFSAR Chapter 9 Section 9.4.1.3 discusses that redundant equipment is provided to assure safety system function. Table 9.4-2 described the existing control room system failure analysis. The table reviews various failures including a Make-up Air Filter Unit Fan Failure which would result in an alarm in the main control room and switching to the redundant train. The consequences of these failures have not been affected. The consequences of the new fail closed turbine building emergency intake damper failing to open have been reviewed and are bounded by the existing malfunction consequences. In addition, the failure of the HELB Detection instrumentation and controls have been reviewed and determined to be bounded by the existing malfunction consequences. Therefore, the modification to install the HELB detection control system and change the failure position of the turbine building emergency intake damper does not result in a more than minimal increase in the consequences of a malfunction of an SSC important to safety previously evaluated in the UFSAR.

5. The installation of the new HELB detection instruments and changing the turbine building damper to fail closed from fail open does not introduce the possibility of a new accident because the control room ventilation system is not an initiator of any accident and the change will not affect the control room temperature controls such that it could introduce failure of control circuits located within the area served by the control room ventilation. Failure of the

Station/Unit(s): Braidwood / Unit 0

Activity/Document Number: EC 389634; DRP#14-095, Basis Change Request 12-010, 011 **Revision Number:** 0, 0, 0, 0

Title: Main Control Room Ventilation (VC) High Energy Line Break (HELB) Pressure Sensor to Control Emergency Intake Dampers Modification (Unit Common)

turbine building emergency intake damper to open when required is similar to a fan failure on the makeup air handing unit which has previously been evaluated and a redundant train is available.

6. This change does change the failure position of the turbine building emergency intake damper from fail open to fail closed. As a result, the makeup fan could start and the turbine building intake damper could fail to open when required. Currently, the damper is de-energized to open and a spring drives the damper to the open position. In the modified configuration, the hydraulic operator would be required to open the damper. If the hydraulic operator failed to open the damper, the makeup system low flow alarm in the main control room would alert the operator and the alternate train could be started. This failure has the same result as a makeup fan failure, a filter unit high DP causing low flow or a fire damper failure. Based on the above, the failure to open the emergency turbine building intake damper has the same result as failures previously evaluated and would be mitigated by switching to the alternate train of ventilation.

7. Installation of the new controls and modifying the failure position of the turbine building intake dampers does not affect the integrity of the fission product barriers utilized for mitigation of radiological dose consequences as a result of an accident. Plant response as modeled in the safety analyses is unaffected since the control room ventilation system can still be configured in the emergency make up mode within the thirty minutes credited in the accident analysis and no parameter which impacts a fission product barrier is changed. Hence, the mass and radioactivity releases used as input to the dose calculations are unchanged from those previously assumed. Therefore, it is concluded that the modified control room emergency intake damper controls and the modified turbine building emergency intake damper failure position does not result in a design basis limit for a fission product barrier as described in the UFSAR being exceeded or altered.

8. The methods used in the plant accident analyses are not affected by the modified control room emergency intake damper controls and the modified turbine building emergency intake damper failure position. The atmospheric dispersion factor (X/Q) inputs for the main steam line break accident have changed as a result of this change since the air will be drawn from a different outside air instead of the turbine building, however the methodology has not changed. As stated above, none of the accident analyses credits the control room ventilation system filtration for the first 30 minutes. This input is not changed. All other accident dose analyses' are not changed. Therefore, it is concluded that the modified control room emergency intake damper controls and the modified turbine building emergency intake damper failure position does not result in a departure from a method of evaluation described in the UFSAR used in establishing the design bases or in the safety analyses.

Based on the above, the proposed activity may be implemented without prior NRC approval.

Attachments:
Attach all 50.59 Review forms completed, as appropriate.

Forms Attached: (Check all that apply.)

☐	**Applicability Review**				
☐	**50.59 Screening**	**50.59 Screening No.**		**Rev.**	
☒	**50.59 Evaluation**	**50.59 Evaluation No.**	BRW-E-2012-194	**Rev.**	0

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood Station, Units 1 and 2

Activity/Document Number: EC-390487, DRP 14-084

Revision Number: 0 / 0

Title: Turbine Building High Energy Line Break Licensing and Design Basis

NOTE: For 50.59 Evaluations, information on this form will provide the basis for preparing the biennial summary report submitted to the NRC in accordance with the requirements of 10 CFR 50.59(d)(2).

Description of Activity:
(Provide a brief, concise description of what the proposed activity involves.)

The proposed activity is a change in the thermal-hydraulic analysis of a High Energy Line Break (HELB) in the Turbine Building, and the resulting environmental affects in rooms containing safety-related equipment that have ventilation intake and or exhaust openings to the Turbine Building. The changes include the mitigation strategy for these rooms/areas that are currently credited to demonstrate these rooms/areas maintain suitable environmental conditions to safely shut down the plant following a HELB in the Turbine Building. Engineering Change EC-390487 describes the changes in design being credited and in the thermal-hydraulic analysis of the Turbine Building HELB and the resulting environmental profiles in the affected rooms/areas, and the justification that demonstrates the environmental conditions in these rooms/areas are suitable to safely shutdown the plant following the HELB. The EC describes the changes to the UFSAR that will be made to incorporate the new thermal-hydraulic analysis as well as the analysis to reflect that safety-related equipment/components are protected from HELB-induced jet effects. The affected ventilation systems are the Emergency Diesel Generator EDG) Room Ventilation (VD) System, the Engineered Safeguards Features (ESF) Switchgear Room Ventilation (VX) System, the Miscellaneous Electric Equipment Rooms (MEER's) Ventilation (VE) System.

In summary, the mitigation strategy to protect against a HELB in the Turbine Building is being changed from:

- allowing the Turbine Building environment into the affected Auxiliary Building rooms for a short period of time (no dampers in the ventilation exhaust opening to the Turbine Building that automatically close in response to a HELB in the Turbine Building),
- isolating the affected rooms following closure of the fire damper in the ventilation exhaust opening (allowing the fire damper to actuate due to a HELB, which is a function in addition to its fire protection function),
- room cooling manually restored by operator action (room fans trip due to closure of the exhaust flowpath, with subsequent loss-of-HVAC resulting in room temperatures substantially exceeding design basis temperatures), and
- thermal-hydraulic event analyzed to predict environmental conditions (limited number of line breaks analyzed, Mass & Energy releases analyzed in a way that did not maximize enthalpy, and the thermal-hydraulic event analyzed utilizing a proprietary software similar to COMPARE and RELAP4.

to:

- keeping the Turbine Building environment out of the Auxiliary Building rooms (isolating the rooms by means of new HELB dampers in the ventilation exhaust openings),
- configuring the fire dampers to close only in the event of a fire (keeping them open during the HELB to allow the ventilation exhaust path to remain open),
- room cooling automatically restored (automatically restarting of the room ventilation fans following a time delay after tripping on high differential pressure, to minimize the temperature peak and to minimize time room temperatures are elevated; i.e., keep the rooms within their design basis temperature limits), and
- performing a new analysis of the thermal-hydraulic event to environmental conditions following the HELB (a larger spectrum of line breaks considered, Mass & Energy releases for steam lines performed utilizing WCAP-10961, which maximizes enthalpy, Mass & Energy releases for liquid lines that maximize enthalpy, and the thermal-hydraulic event analyzed utilizing GOTHIC [Generation of Thermal-Hydraulic Information for Containments], Version 7.2a, which has been widely used in analyzing HELB's outside containment).

Changes are also made to the Control Room ventilation system to automatically prevent a Turbine Building HELB environment from entering the Control Room envelope in lieu of the current protection strategy of relying on manual action to react to the condition and prevent the environment from entering the Control Room envelope. In a similar manner, modifications are made

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to automatically sense the HELB environment and prevent the environment from adversely affecting the safety-related SSC's in the Diesel Oil Storage Tank (DOST Rooms.

In addition, modifications are installed to ensure divisional separation walls and other safety-related structures that may be exposed to the Turbine Building HELB environment can withstand the transient pressure loads that they may experience and modifications also installed to protect vulnerable SSC's from jet impingement resulting from a HELB.

Reason for Activity:
(Discuss why the proposed activity is being performed.)

A review of the current HELB mitigation strategy has determined that the closure of the affected fire dampers might not occur in the manner assumed in the analyses, and the temperatures in these rooms following the event deviating from the design temperature more than and for a longer duration than is considered suitable for demonstrating that the equipment in these rooms can support safe shutdown of the plant. Also, the design of the DOST Room ventilation system, in which air is exhausted into the Turbine Building on the 401' Elevation and which draws its suction source from the Turbine Building on the 401' Elevation, is such that these areas could be subjected to a Turbine Building HELB environment. Therefore, it must be demonstrated that the equipment in the DOST rooms can support safe shutdown of the plant. Additionally, the robustness of relying on operator action to detect a HELB in the Turbine Building and to take manual action to provide protection for the Control Room is being re-considered. Finally, the absence of consideration of the impact of a Turbine Building HELB on the L-row wall barrier between the Turbine Building and the Auxiliary Building, and the absence of a HELB-induced load on the divisional separation walls is lacking, as single failure mechanisms that could result in adjacent rooms experiencing different environmental conditions (e.g., room pressure) are not considered.

Effect of Activity:
(Discuss how the activity impacts plant operations, design bases, or safety analyses described in the UFSAR.)

The new HELB dampers will remain open during normal operation when the VD, VX, or VE fans are running. The new HELB dampers are fast acting and will close quickly upon detection of HELB reverse flow from the turbine building to minimize the affected room exposure to a Turbine Building HELB. After the HELB pressure dissipates in the turbine building, the HELB dampers will reopen. The fire dampers will remain open unless the thermal links are actuated by the high temperatures characteristic of a fire. The setpoints for the fire damper links are changed as appropriate to reduce the possibility of closure of the fire dampers in the event of a Turbine Building HELB, allowing for prompt restoration of the ventilation systems following the HELB event. Thus the new dampers will not require new operator actions. The HELB dampers will allow for restoration of affected VD, VX, and VE systems following a high energy line break in the turbine building and eliminate the need for a manual restoration of room ventilation by an operator.

Likewise, the new fan auto restart feature will not affect normal fan operation (starting and stopping by the operator). In the event of a high differential pressure, the fan that is running will trip, as at present. However, the auto restart feature will attempt to restart the supply fan after a short time delay. If the high differential pressure was due to HELB damper closure following a Turbine Building HELB, the turbine building pressure will have decreased to the point where the restarted fan can re-open the HELB dampers and return the ventilation system to operation. Likewise, if a VD, VX, or VE fan start attempt occurs after initiation of the Turbine Building HELB event, the Turbine Building pressure will have decreased to the point where the fan can start or restart, thereby re-opening the HELB dampers and returning the ventilation system to operation. If the high differential pressure was due to a condition that does not clear within the time delay period, the restarted fan will trip again on high differential pressure and will then be blocked from further restart attempts until an operator investigates and resets the trip.

The automatic restoration of an affected VD, VX, and VE systems following a HELB in the Turbine Building will eliminate the need for a manual restoration of room ventilation by an operator following the initial fan high differential pressure trip. Like the existing VD, VX, and VE equipment, a malfunction of the new equipment would not affect the availability of the redundant VD, VX, or VE train. This is consistent with the system design bases safety analyses requirements.

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Title: Turbine Building High Energy Line Break Licensing and Design Basis

Summary of Conclusion for the Activity's 50.59 Review:
(Provide justification for the conclusion, including sufficient detail to recognize and understand the essential arguments leading to the conclusion. Provide more than a simple statement that a 50.59 Screening, 50.59 Evaluation, or a License Amendment Request, as applicable, is not required.)

The proposed activity involves crediting 1). the installation of a new auto restart feature to various fans in the Emergency Diesel Generator (EDG) Room Ventilation (VD) system, the Engineered Safeguards Features (ESF) Switchgear Room Ventilation (VX) System, and the Miscellaneous Electric Equipment Rooms (MEER's) Ventilation (VE) System, 2). the installation of new HELB dampers in the VD, VX, and VE system exhaust openings between the affected rooms and the Turbine Building, and 3) the changes to ensure the fire dampers in the VD, VX, and VE system exhaust openings between the affected rooms and the Turbine Building remain open under all plant conditions exclusive of a fire, to help mitigate the consequences of a HELB in the Turbine Building. Following installation of these features, the VD, VX, and VE systems will continue to be capable of performing their UFSAR-described design functions. As at present, the failure of a ventilation fan would lead to the loss of one train of the VD, VX, or VE system. The loss of one train does not affect the safe shutdown capability of the station since independent ventilation systems are provided for each redundant division.

A new thermal-hydraulic analysis of the Turbine Building HELB and the resulting environmental profiles in the affected rooms/areas was performed to credit these new design features. The change in HELB mitigation strategy results in the affected room environmental results for the event being less severe and for a much shorter duration than those identified in UFSAR Table 3.11-2. The revised analysis demonstrates that the environmental parameters within these zones would not be significantly more severe than the environment that would occur during normal plant operation. Therefore, the change is not adverse and the changed room environmental profiles do not represent an adverse change to a UFSAR described design function.

New HELB dampers, installed under a separate activity, will be available to permit air flow through the room both during normal ventilation system operation and shortly after a nearby turbine building high energy line break, allowing the ventilation system to continue to perform its ventilation and cooling functions.

50.59 Evaluations BRW-E-2012-126, BRW-E-2012-156, BRW-E-2013-250, BRW-E-2013-256, BRW-E-2013-254, and BRW-E-2013-252 were performed for the stand-alone Engineering Changes installing the new HELB dampers and fan auto-restart features to address the following potential adverse effects of the proposed activity:

- The replacement of the current *manual* method of restoring room ventilation following its isolation in the event of a nearby high energy line break in the turbine building with an *automatic* method involving auto restart of the affected fans and the re-opening of the HELB dampers
- The automatic restarting of a VD, VX, or VE fan after an existing equipment protection feature (fan high differential pressure trip) had stopped the fan
- The potential adverse effect on the reliability of the VD, VX, or VE system caused by the addition of the new HELB damper sections, where the failure of either could result in a loss of one VD, VX, or VE train

As EC-390487 is for the integrated change in response to a Turbine Building HELB, the evaluations documented in 50.59 Evaluations BRW-E-2012-126, BRW-E-2012-156, BRW-E-2013-250, BRW-E-2013-256, BRW-E-2013-254, and BRW-E-2013-252 were repeated in 50.59 Evaluation BRW-E-2013-078.

Based on the quality classification and testing of the new components, and because the proposed activity reduces the likelihood of a malfunction of the electrical equipment in the VD, VX, and VE areas, the evaluation concluded that the potential adverse effects did not cause more than a minimal increase in the likelihood of a malfunction of an SSC important to safety previously evaluated in the UFSAR. Based on the quality classification and testing of the new components, and because the proposed activity reduces the likelihood of a malfunction of the electrical equipment in the VD, VX, and VE areas, 50.59 Evaluation BRW-E-2013-078 concluded that the potential adverse effects of the automatic system restoration following a HELB and the automatic fan restart following a trip on high differential pressure did not cause more than a minimal increase in the frequency or

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Activity/Document Number: EC-390487, DRP 14-084

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Title: Turbine Building High Energy Line Break Licensing and Design Basis

occurrence of an accident previously evaluated in the UFSAR and did not cause more than a minimal increase in the likelihood of a malfunction of an SSC important to safety previously evaluated in the UFSAR.

The new fan auto restart feature does not involve a change to a procedure that adversely affects how UFSAR-described SSC design functions are performed or controlled. However, the change from manual to automatic restoration of room ventilation following its isolation in response to a Turbine Building HELB was addressed in 50.59 Evaluation 6G-13-010. As discussed in the previous paragraph, the evaluation concluded that this change did not cause more than a minimal increase in the frequency or occurrence of an accident previously evaluated in the UFSAR and did not cause more than a minimal increase in the likelihood of a malfunction of an SSC important to safety previously evaluated in the UFSAR.

The replacement damper assemblies do not involve a change to a procedure that adversely affects how UFSAR-described SSC design functions are performed or controlled. However, the change from manual to automatic restoration (unassisted opening of HELB dampers) of room ventilation following its isolation in response to a Turbine Building HELB was addressed in 50.59 Evaluation BRW-E-2013-078. As discussed in the previous paragraph, the evaluation concluded that this change did not cause more than a minimal increase in the likelihood of a malfunction of an SSC important to safety previously evaluated in the UFSAR.

The analyses performed as part of the replacement damper assemblies do not involve UFSAR-described methodologies or alternate methodologies used in establishing the design bases or in the safety analyses.

The VD, VX, and VE systems and associated components will not be utilized or controlled in a manner that is outside the reference bounds for their design or that is inconsistent with analyses or descriptions in the UFSAR. Since the VD, VX, and VE systems are not addressed in the Technical Specification or Operating License, and since implementation of the new design feature does not alter existing functions such addition to the Technical Specifications is required, no change to these documents is required. In addition, the modifications installed for the VC system did not require a change to the Technical Specifications or Operating License.

The thermal-hydraulic analysis performed to credit the aforementioned modifications to the VD, VX, and VE systems and determine the resulting environmental profiles in the rooms served by the VD, VX, and VE systems involves the use of an alternative methodology from what was previously used in establishing the design basis. However 50.59 Evaluation BRW-E-2013-078, determined that the use of GOTHIC to evaluate the effects of a high energy line break effects on various rooms at Byron is not a departure from a method of evaluation described in the UFSAR because it is appropriate for the intended application and the method has been approved by the NRC.

Attachments:
Attach all 50.59 Review forms completed, as appropriate.

Forms Attached: (Check all that apply.)

☐	**Applicability Review**				
☒	**50.59 Screening**	**50.59 Screening No.**	**BRW-S-2013-081**	**Rev.**	**0**
☒	**50.59 Evaluation**	**50.59 Evaluation No.**	**BRW-E-2013-078**	**Rev.**	**0**

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood Unit1 1 & 2

Activity/Document Number: Procedure BwAR 2-15-B11 : Revision Number: 6a
Title: S/G 2B FW Nozzle Flow High Low

NOTE: For 50.59 Evaluations, information on this form will provide the basis for preparing the biennial summary report submitted to the NRC in accordance with the requirements of 10 CFR 50.59(d)(2).

Description of Activity:

Procedure revision to support maintenance on the 2FW039B valve required for 2FW039B to be operable (close in the required Technical Specification time of 6 seconds). Valve 2FW039B must be closed to perform the required repairs.

The 2FW039A-D valves are normally open below 20 percent power and above 80 percent power. The 2FW039A-D valves close between 20 and 80 percent power. Procedure BwAR 2-15-B I I directs that the 2FW039B be opened if the S/G 2B FW Nozzle Flow High alarm is received. This 50.59 document will evaluate the temporary procedure change to BwAR 2-15-B11, S/G 2B FW Nozzle Flow High Low, to allow the 2FW039B to remain closed if the high flow alarm annunciates (if in support of maintenance) after which the subsequent operator actions will be taken to reduce power to 80 percent or until the alarm clears. This evaluation will address closing valve 2FW039B at approximately 89 percent power to encompass the procedure change in support of maintenance.

Reason for Activity:
(Discuss why the proposed activity is being performed.)

The 2FW039A-D valves are normally open below 20 percent power and above 80 percent power and closed between 20 and 80 percent power. The operation of these valves is discussed in the UFSAR in the section titled "Split Feedwater Flow". Specifically, this section describes that at low power levels, prior to opening the feedwater isolation valves, the majority of the feedwater flow is introduced to the upper nozzle of the steam generator by the preheater bypass piping. At higher power levels after the main feedwater isolation valves have opened, only a small portion of the feedwater flow bypasses the preheater. The split feedwater flow arrangement provides an approximate 80 percent of full flow limit to the main feedwater nozzle at higher power levels in order to minimize the potential for tubing vibration in the steam generator. Feedwater flow is monitored and alarms, if flow rises above approximately 90 percent to allow actions to be taken to reduce flow. Additionally, it states that the preheater bypass valves remain open throughout the startup and low load conditions, as well as above 80 percent power to full power operation.

Effect of Activity:
(Discuss how the activity impacts plant operations, design bases, or safety analyses described in the UFSAR.)

This activity does not adversely impact plant operations. EC# 372964 (see reference section) was performed for closing preheater bypass isolation valve 2FW039C at 89 percent power and determined that the projected feedwater flow will result in essentially the same main feedwater flow conditions as full power. Therefore, closing the preheater bypass isolation valve for a short period of time will have a negligible effect on steam generator tube wear rates (as a result of increased tube vibration) currently being seen in the preheater region of the steam generators. EC# 394419 (see reference section) performed a similar evaluation for closing valve 2FW039B at 89 percent power. The conclusions of both ECs found that closing of the feedwater bypass isolation valve will have a negligible effect on the tube wear rates currently being seen in the preheater region of the Model D5 Steam Generators. This conclusion can be made since the projected feedwater flow will result in essentially the same main feedwater flow conditions as full power for the maximum 8 hour repair duration. Inspection data trends indicate that only a limited number of in service tubes in the 2B steam generator are experiencing flow induced tube wear in the preheater region. The cycle to cycle wear growth rate for the tubes is modest and this level of tube wear is not expected to change during the maximum 8 hour period of the valve repair. EC#394419 was performed to evaluate closing valve 2FW039B at a similar power level as was evaluated previously for closing valve 2FW039C. The EC evaluated the current Steam Generator Operational Assessment performed following A2R16 (EC#391608) and concluded that the previous evaluation of tube vibration and potential wear effects in the preheater region documented in EC#372964 encompass the current conditions.

Summary of Conclusion for the Activity's 50.59 Review:
(Provide justification for the conclusion, including sufficient detail to recognize and understand the essential arguments leading to the conclusion. Provide more than a simple statement that a 50.59 Screening, 50.59 Evaluation, or a License Amendment Request, as applicable, is not required.)

With the plant operating at 89 percent power with the feedwater bypass line closed during the 2FW039B repair evolution, the total flow to the preheater region of the steam generator tube bundle is nearly the same as during full power operation for the expected eight hour maintenance activity. Based on the duration and flow conditions operation of the plant at the described conditions is not expected to change the current predictions for tube wear indication growth rates. UFSAR section 10.4.7.3.3, "Split Feedwater Flow" states that the preheater bypass valves (2FW039A-D) remain open throughout the startup and low load conditions, as well as above 80

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Activity/Document Number: Procedure BwAR 2-15-B11 **: Revision Number:** 6a
Title: S/G 2B FW Nozzle Flow High Low

percent power to full power operation. The split feedwater flow arrangement provides an approximate 80 percent of full flow limit to the main feedwater nozzle at higher power levels in order to minimize the potential for tubing vibration in the steam generator. This activity revises procedure BwAR 2-15-B11 to allow 2FW039B to remain closed if the high flow alarm is received followed by subsequent operator actions to reduce power to less than or equal to 80 percent or until the alarm clears. The 50.59 evaluation process indicates that procedure changes that fundamentally alter the existing means of performing or controlling design functions should be conservatively treated as adverse. Therefore, this activity screens in and a 50.59 evaluation is necessary.

The results of the 50.59 Evaluation show that the activity can be implemented without NRC approval. This activity does not result in an increase in the consequences of an accident or in the consequences of a malfunction of an SSC important to safety. The design function of the split feedwater flow at higher power levels is to minimize the potential for tubing vibration and wear in the steam generator. The Westinghouse analysis has determined that there is a negligible effect on tube vibration and wear for the activity.

This activity does not create a possibility for an accident of a different type than any previously evaluated in the UFSAR; isolation of the bypass line is not an initiator of any accident and no new failure modes are introduced.

This activity does not create a possibility for a malfunction of an SSC important to safety with a different result than any previously evaluated in UFSAR. Isolation of the feedwater bypass line at a power level greater than 80 percent is not evaluated in the UFSAR as a cause for malfunction of the steam generators or any feedwater system components.

The results of the Westinghouse evaluation indicate that when the plant is operating at 89 percent power with the feedwater preheater bypass line isolated during the repair evolution, the total flow to the preheater region of the steam generator tube bundle is nearly the same as during full power operation. Operation of the plant in this condition for a short period of time (less than 8 hours) will have a negligible effect on the steam generator tube wear rates currently being experienced at 100 percent. Therefore, the activity does not result in a design basis limit or fission product barrier as described in the UFSAR being exceeded or altered.

Operation of the feedwater system at approximately 89 percent power with the 2FW039B closed for maintenance does not involve a method of evaluation change. Therefore, this activity is not considered a departure from the methodology described in the UFSAR used in establishing the design bases or in the safety analysis.

Attachments:
Attach all 50.59 Review forms completed, as appropriate.

Forms Attached: (Check all that apply.)

☐	**Applicability Review**				
☐	**50.59 Screening**	**50.59 Screening No.**		**Rev.**	
☒	**50.59 Evaluation**	**50.59 Evaluation No.**	**BRW-E-2013-102**	**Rev.**	**0**

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood Unit 1

Activity/Document Number: EC 393552 **Revision Number:** 001

Title: Changes to Unit 01 AB System Due to Transient Analyses (RH SRV to RHUT Discharge Piping)

NOTE: For 50.59 Evaluations, information on this form will provide the basis for preparing the biennial summary report submitted to the NRC in accordance with the requirements of 10 CFR 50.59(d)(2).

Description of Activity:
(Provide a brief, concise description of what the proposed activity involves.)

The proposed activity involves changes to piping in the boron recycle system:

1. Three new drain lines and a vent line – with isolation valves and associated appurtenances – will be connected to 4-inch boron recycle system headers which collect the discharge from relief valves on the residual heat removal (RHR), safety injection (SI), and chemical and volume control (CVCS) systems. This relief valve discharge is directed to the recycle holdup tanks (RHUTs). Each of the new drain and vent lines will be routed to an auxiliary building floor drain. One 3/8" flow restrictor and one normally closed isolation valve in each vent/drain path will allow for manual draining/venting of the 4-inch header to prevent a buildup of water which might otherwise facilitate the generation of excessive dynamic loads (i.e., water hammer) when certain relief valves open. A sight glass will be installed on each of the new drain lines downstream of the flow restrictor.

2. New pipe supports for the new vent and drain lines will be installed, and existing pipe supports on the 4-inch headers will be modified as necessary.

Reason for Activity:
(Discuss why the proposed activity is being performed.)

It was recently determined that the loads which could result from a relief valve discharge into the boron recycle system piping were not given adequate consideration during the original design of the station. The proposed activity was undertaken to address this condition. The new vent and drain lines are intended to prevent a buildup of water that might otherwise facilitate the generation of excessive dynamic loads (i.e., water hammer) when certain relief valves discharge to the boron recycle system piping.

Effect of Activity:
(Discuss how the activity impacts plant operations, design bases, or safety analyses described in the UFSAR.)

The physical changes to be implemented involve the installation or modification of piping supports and the installation of new drain and vent lines on the boron recycle system piping which receives the discharge from various RHR, SI, and CVCS relief valves. The new drain and vent lines will contain manual isolation valves which will be positioned during initial system alignment and will be operated, as necessary, to drain water from the affected 4-inch headers in the boron recycle system. A sight glass in each drain line will provide an indication of water buildup in this portion of the system.

The proposed activity does not affect the design bases or safety analyses described in the UFSAR.

Summary of Conclusion for the Activity's 50.59 Review:
(Provide justification for the conclusion, including sufficient detail to recognize and understand the essential arguments leading to the conclusion. Provide more than a simple statement that a 50.59 Screening, 50.59 Evaluation, or a License Amendment Request, as applicable, is not required.)

The proposed activity involves: (1) the installation of new drain lines and a new vent line in the boron recycle system to prevent a buildup of water which might otherwise facilitate the generation of excessive dynamic loads (i.e., water hammer) when certain relief valves open and (2) the installation and modification of piping supports on the affected portions of the boron recycle system piping. Each of the new drain and vent lines will be routed to an auxiliary building floor drain. One 3/8" flow restrictor and one normally closed isolation valve in each vent/drain path will be installed to allow for manual draining/venting of existing 4-inch boron recycle system headers. A sight glass will be installed on each of the new drain lines downstream of the flow restrictor.

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood Unit 1

Activity/Document Number: EC 393552 **Revision Number:** 001

Title: Changes to Unit 01 AB System Due to Transient Analyses (RH SRV to RHUT Discharge Piping)

The normally open flow restrictor will become the boundary separating the existing safety-related header and the new non-safety-related drain and vent piping. This reduction in safety classification for a portion of the boron recycle system piping – from Safety Category I, Quality Group C, to Safety Category II, Quality Group D – was considered to adversely affect a portion of a system whose postulated failure could, under certain circumstances, release reactor coolant or other radioactive fluids.

50.59 Evaluation BRW-E-2013-119 determined that since the new drain and vent lines will be designed in accordance with the requirements of ANSI B31.1 and will meet Seismic Category II/I requirements, the new drain and vent piping is expected to maintain the required pressure boundary integrity. Appendix A of the UFSAR states that the station is in compliance with the quality group classifications defined in Regulatory Guide 1.26, Rev. 3, and referenced in NUREG-0800, Section 3.2.2, Rev. 1. Because the failure of a new drain line would result in conservatively calculated offsite doses that are much less than the dose criterion threshold of R.G. 1.26, Section C.2.d, the proposed connection of Safety Category II drain piping to a common existing Safety Category I relief valve discharge header does not constitute a departure from the Regulatory Guide requirements for the boron recycle system piping. Under the proposed activity, the relief valves that discharge to the boron recycle system will continue to be connected to a closed system, thereby providing the required assurance that containment integrity will be maintained following an accident. An evaluation of the impact of a failure in the new piping on auxiliary building flooding concluded that existing flooding analyses would remain bounding.

As a result, the design controls for the new drain and vent lines and the administrative controls on the new valves were sufficient to ensure the proposed activity did not cause more than a minimal increase in the frequency or occurrence of an accident previously evaluated in the UFSAR (i.e., failure of a small line carrying primary coolant outside containment) and did not cause more than a minimal increase in the likelihood of a malfunction of an SSC important to safety previously evaluated in the UFSAR.

The radiological consequences of the rupture in the new drain line system piping following actuation of an RHR relief valve were evaluated as part of the proposed activity. That evaluation concluded that the whole body and thyroid doses at the exclusion area boundary remain within the 10 CFR 100 limits cited in UFSAR Section 15.6.2.3, and within the minimal increase standard, as required by 10 CFR 50.59. The Evaluation also determined that the proposed activity would not introduce the potential for a different type of failure or malfunction and that the proposed activity would not result in a design basis limit for a fission product barrier as described in the UFSAR being exceeded or altered.

The piping and support analyses performed as part of this activity do not result in a departure from a method of evaluation described in the UFSAR used in establishing the design bases or in the safety analyses. The boron recycle system and associated components will not be utilized or controlled in a manner that is outside the reference bounds for their design or that is inconsistent with analyses or descriptions in the UFSAR.

The boron recycle system is not addressed in the Technical Specification or Operating License. However, it is recognized that if the subject boron recycle system headers were not drained, a relief valve discharge into the header with an accumulation of water could result in a water hammer in the discharge header that could prevent the relief function from being accomplished. Since the RHR suction relief valves are credited as one of the pressure relief options in T.S. 3.4.12, "Low Temperature Overpressure Protection (LTOP) System", draining of the discharge header is needed to ensure that function can be accomplished.

The MODE of APPLICABILITY for TS 3.4.12 is MODEs 4 and 5, or MODE 6 when the reactor vessel head is on. Therefore, prior to entering MODE 4 or 5, the boron recycle system headers will be drained to assure proper operation of the RHR relief valves (i.e., assure that water hammer will not occur that could adversely affect the function of the relief valves). Manual draining of the boron recycle system headers is similar to a number of activities that are not controlled by TS Surveillance Requirements (SRs); e.g.,

- **Valve lineups performed for safety-related systems prior to declaring the system operable.**
- **TS-related water systems such as auxiliary feedwater, component cooling, and essential service water are confirmed to be filled and vented in accordance with procedures (not TS SRs) prior to declaring the systems operable.**

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood Unit 1

Activity/Document Number: EC 393552 **Revision Number:** 001

Title: Changes to Unit 01 AB System Due to Transient Analyses (RH SRV to RHUT Discharge Piping)

- **Equipment that is not tested under a TS SR; however, provides a support function for TS-related equipment and noted in the TS Bases (consistent with the TS definition for OPERABILITY).**
- **IST program surveillances (i.e., non-TS SRs) that verify operability of valves in TS-related systems.**

Based on these precedents, it is reasonable and appropriate to control the draining of the boron recycle system headers, thereby ensuring the operability of the LTOP system, via a non-TS system lineup or operating procedure. Therefore, a Technical Specification surveillance requirement for ensuring completion of an operator action to monitor or drain the header is not required.

In conclusion, the proposed activity does not require prior approval by the NRC.

Attachments:
Attach all 50.59 Review forms completed, as appropriate.

Forms Attached: (Check all that apply.)

☐	**Applicability Review**				
☒	**50.59 Screening**	**50.59 Screening No.**	BRW-S-2013-118	**Rev.**	1
☒	**50.59 Evaluation**	**50.59 Evaluation No.**	BRW-E-2013-119	**Rev.**	1

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood Unit 2

Activity/Document Number: EC 393838 **Revision Number:** 001

Title: Changes to Unit 02 AB System Due to Transient Analyses (RH SRV to RHUT Discharge Piping)

NOTE: For 50.59 Evaluations, information on this form will provide the basis for preparing the biennial summary report submitted to the NRC in accordance with the requirements of 10 CFR 50.59(d)(2).

Description of Activity:
(Provide a brief, concise description of what the proposed activity involves.)

The proposed activity involves changes to piping in the boron recycle system:

1. A new drain line and a vent line – with isolation valves and associated appurtenances – will be connected to a 4-inch boron recycle system header which collects the discharge from relief valves on the residual heat removal (RHR), safety injection (SI), and chemical and volume control (CVCS) systems. This relief valve discharge is directed to the recycle holdup tanks (RHUTs). Each of the new drain and vent lines will be routed to an auxiliary building floor drain. One 3/8" flow restrictor and one normally closed isolation valve in each vent/drain path will allow for manual draining/venting of the 4-inch header to prevent a buildup of water which might otherwise facilitate the generation of excessive dynamic loads (i.e., water hammer) when certain relief valves open. A sight glass will be installed on the new drain line downstream of the flow restrictor.

2. New pipe supports for the new vent and drain lines will be installed, and an existing pipe support on associated boron recycle system piping will be modified as necessary.

Reason for Activity:
(Discuss why the proposed activity is being performed.)

It was recently determined that the loads which could result from a relief valve discharge into the boron recycle system piping were not given adequate consideration during the original design of the station. The proposed activity was undertaken to address this condition. The new vent and drain lines are intended to prevent a buildup of water that might otherwise facilitate the generation of excessive dynamic loads (i.e., water hammer) when certain relief valves discharge to the boron recycle system piping.

Effect of Activity:
(Discuss how the activity impacts plant operations, design bases, or safety analyses described in the UFSAR.)

The physical changes to be implemented involve the installation or modification of piping supports and the installation of new drain and vent lines on the boron recycle system piping which receives the discharge from various RHR, SI, and CVCS relief valves. The new drain and vent lines will contain manual isolation valves which will be positioned during initial system alignment and will be operated, as necessary, to drain water from the affected 4-inch header in the boron recycle system. A sight glass in each drain line will provide an indication of water buildup in this portion of the system.

The proposed activity does not affect the design bases or safety analyses described in the UFSAR.

Summary of Conclusion for the Activity's 50.59 Review:
(Provide justification for the conclusion, including sufficient detail to recognize and understand the essential arguments leading to the conclusion. Provide more than a simple statement that a 50.59 Screening, 50.59 Evaluation, or a License Amendment Request, as applicable, is not required.)

The proposed activity involves: (1) the installation of a new drain line and a new vent line in the boron recycle system to prevent a buildup of water which might otherwise facilitate the generation of excessive dynamic loads (i.e., water hammer) when certain relief valves open and (2) the installation and modification of piping supports on the affected portions of the boron recycle system piping. Each of the new drain and vent lines will be routed to an auxiliary building floor drain. One 3/8" flow restrictor and one normally closed isolation valve in each vent/drain path will be installed to allow for manual draining/venting of an existing 4-inch boron recycle system header. A sight glass will be installed on the new drain line downstream of the flow restrictor.

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood Unit 2

Activity/Document Number: EC 393838 **Revision Number:** 001

Title: Changes to Unit 02 AB System Due to Transient Analyses (RH SRV to RHUT Discharge Piping)

The normally open flow restrictor will become the boundary separating the existing safety-related header and the new non-safety-related drain and vent piping. This reduction in safety classification for a portion of the boron recycle system piping – from Safety Category I, Quality Group C, to Safety Category II, Quality Group D – was considered to adversely affect a portion of a system whose postulated failure could, under certain circumstances, release reactor coolant or other radioactive fluids.

50.59 Evaluation BRW-E-2013-121 determined that since the new drain and vent lines will be designed in accordance with the requirements of ANSI B31.1 and will meet Seismic Category I requirements, the new drain and vent piping is expected to maintain the required pressure boundary integrity. Appendix A of the UFSAR states that the station is in compliance with the quality group classifications defined in Regulatory Guide 1.26, Rev. 3, and referenced in NUREG-0800, Section 3.2.2, Rev. 1. Because the failure of a new drain line would result in conservatively calculated offsite doses that are much less than the dose criterion threshold of R.G. 1.26, Section C.2.d, the proposed connection of Safety Category II drain piping to a common existing Safety Category I relief valve discharge header does not constitute a departure from the Regulatory Guide requirements for the boron recycle system piping. Under the proposed activity, the relief valves that discharge to the boron recycle system will continue to be connected to a closed system, thereby providing the required assurance that containment integrity will be maintained following an accident. An evaluation of the impact of a failure in the new piping on auxiliary building flooding concluded that existing flooding analyses would remain bounding.

As a result, the design controls for the new drain and vent lines and the administrative controls on the new valves were sufficient to ensure the proposed activity did not cause more than a minimal increase in the frequency or occurrence of an accident previously evaluated in the UFSAR (i.e., failure of a small line carrying primary coolant outside containment) and did not cause more than a minimal increase in the likelihood of a malfunction of an SSC important to safety previously evaluated in the UFSAR.

The radiological consequences of the rupture in the new drain line **system piping** following actuation of an RHR relief valve were evaluated as part of the proposed activity. That evaluation concluded that the whole body and thyroid doses at the exclusion area boundary remain within the 10 CFR 100 **cited in UFSAR Section 15.6.2.3**, and within the minimal increase standard, as required by 10 CFR 50.59. The Evaluation also determined that the proposed activity would not introduce the potential for a different type of failure or malfunction and that the proposed activity would not result in a design basis limit for a fission product barrier as described in the UFSAR being exceeded or altered.

The piping and support analyses performed as part of this activity do not result in a departure from a method of evaluation described in the UFSAR used in establishing the design bases or in the safety analyses. The boron recycle system and associated components will not be utilized or controlled in a manner that is outside the reference bounds for their design or that is inconsistent with analyses or descriptions in the UFSAR.

The boron recycle system is not addressed in the Technical Specification or Operating License. However, it is recognized that if the subject boron recycle system headers were not drained, a relief valve discharge into the header with an accumulation of water could result in a water hammer in the discharge header that could prevent the relief function from being accomplished. Since the RHR suction relief valves are credited as one of the pressure relief options in T.S. 3.4.12, "Low Temperature Overpressure Protection (LTOP) System", draining of the discharge header is needed to ensure that function can be accomplished.

The MODE of APPLICABILITY for TS 3.4.12 is MODEs 4 and 5, or MODE 6 when the reactor vessel head is on. Therefore, prior to entering MODE 4 or 5, the boron recycle system headers will be drained to assure proper operation of the RHR relief valves (i.e., assure that water hammer will not occur that could adversely affect the function of the relief valves). Manual draining of the boron recycle system headers is similar to a number of activities that are not controlled by TS Surveillance Requirements (SRs); e.g.,

- **Valve lineups performed for safety-related systems prior to declaring the system operable.**
- **TS-related water systems such as auxiliary feedwater, component cooling, and essential service water are confirmed to be filled and vented in accordance with procedures (not TS SRs) prior to declaring the systems operable.**

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood Unit 2

Activity/Document Number: EC 393838 **Revision Number:** 001

Title: Changes to Unit 02 AB System Due to Transient Analyses (RH SRV to RHUT Discharge Piping)

- **Equipment that is not tested under a TS SR; however, provides a support function for TS-related equipment and noted in the TS Bases (consistent with the TS definition for OPERABILITY).**
- **IST program surveillances (i.e., non-TS SRs) that verify operability of valves in TS-related systems.**

Based on these precedents, it is reasonable and appropriate to control the draining of the boron recycle system headers, thereby ensuring the operability of the LTOP system, via a non-TS system lineup or operating procedure. Therefore, a Technical Specification surveillance requirement for ensuring completion of an operator action to monitor or drain the header is not required.

In conclusion, the proposed activity does not require prior approval by the NRC.

Attachments:
Attach all 50.59 Review forms completed, as appropriate.

Forms Attached: (Check all that apply.)

☐	**Applicability Review**				
☒	**50.59 Screening**	**50.59 Screening No.**	BRW-S-2013-120	**Rev.**	1
☒	**50.59 Evaluation**	**50.59 Evaluation No.**	BRW-E-2013-121	**Rev.**	1

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood Unit 1/2

Activity/Document Number: 1/2BwOA SEC-4 Loss of Instrument Air Unit 1/2 **Revision Number: (originally REV 3 1998 - Current Rev103 2013)**

Title: Loss of Instrument Air Unit 1/2

NOTE: For 50.59 Evaluations, information on this form will provide the basis for preparing the biennial summary report submitted to the NRC in accordance with the requirements of 10 CFR 50.59(d)(2).

Description of Activity:
(Provide a brief, concise description of what the proposed activity involves.)

In 1998, revision 3 of 1/2BwOA SEC-4 was implemented. Among the changes was a step to secure the CV pumps on a loss of instrument air coincident with a VCT level of less than 10%. Securing the CV pumps replaced swapping the CV pump suction from the VCT to the RWST. The CV pumps will auto swap to RWST suction at 5% VCT level. This automatic protection was not defeated in this change. The revision implemented in 1998 was evaluated with a 10CFR50.59 screening. Applying more vigorous technical rigor, it has been determined that a full 10CFR50.59 evaluation should have been performed.

The additional changes include numerous editorial changes, formatting changes, usability improvements. In addition The 10CFR50.59 screening covers all the changes made to the procedure, with all but securing the CV pump screening out. The 10CFR50.59 evaluation covers the securing of the CV pump, since this is the only issue not screened out.

The previous design bases was to verify and maintain Volume Control Tank (VCT) level. It is recommended in the 1/2BwOA SEC-4 Rev 2 background documents that this is a continuous step. The background document recommends that if VCT level cannot be maintained the operator is directed to transfer the charging pump (CV) pump suction to the Refueling Water Storage Tank (RWST) and reduce turbine load to maintain Tavg-Tef wihin 3 degrees. Charging pump suction automatically swaps to the RWST at 5% level. This swap should be manually performed to prevent reliance on the auto actuation. This protects the pump from gas intrusion and protects the VCT tank from any potential for vacuum induced structural damage consistent with NUREG-800. If the Tavg cannot be maintained greater than 550 degrees the reactor is tripped and BwEP-0 is performed while continuing with this procedure.

The subject activity revised the previous procedure and recommended action by requiring operator action to attempt to maintain VCT level by placing the downstream charging pumps in the off/standby position at 10% level. This will maintain the VCT level, while not causing an undesired RCS temperature reduction from injecting RWST water at greater than 2300 ppm into the RCS. This allows time to resolve the Instrument Air loss without unnecessarily borating the RCS.

Reason for Activity:
(Discuss why the proposed activity is being performed.)

Provide direction to the operator on the method to control decreasing VCT level during a loss of instrument air event.

RCS charging is not credited for any accident scenarios. The credited purpose of the CV pumps is for High head injection following the initiation of a safety injection, and RCP seal injection. By securing the CV pumps at 10% VCT level, any less than desired consequences are minimized. One is associated with Reactivity Management, i.e. any unintended effects of RWST boron addition to RCS at full power condition is precluded and the other is any adverse affects on the CV pump itself due to cavitation is minimized.

The change to suspend the charging pumps ensures the CV pumps are maintained in standby to ensure boron in solution as boric acid is available from the VCT at nominal boron concentration and also the RWST at high boron concentration to control relatively slow reactivity changes associated with offsetting the moderator temperature changes. Charging flow can be reestablished as required to maintain shutdown margin stated in the technical specifications under conditions where a shutdown and cooldown to ambient temperature is required (concentrated soluble boron remains available to be added to the coolant).

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood Unit 1/2

Activity/Document Number: 1/2BwOA SEC-4 Loss of Instrument Air Unit 1/2 **Revision Number: (originally REV 3 1998 - Current Rev103 2013)**

Title: Loss of Instrument Air Unit 1/2

Effect of Activity:
(Discuss how the activity impacts plant operations, design bases, or safety analyses described in the UFSAR.)

The reactor makeup control system is also used to indicate and maintain proper reactor coolant inventory. VCT level is continuously monitored and controlled by the system and the operator. The UFSAR discusses the use of the VCT and charging for gross leak detection and indication for RCS inventory control and as a secondary surge volume (the pressurizer being the primary surge volume). These functions are the primary reason and purpose of monitoring the VCT level within 1/2BwOA SEC-4. The subject detailed direction to the operator are not an adverse impact and are not addressed further in the attached 10CFR50.59 screening and or 10CFR50.59 evaluation. There are revised actions for the operator to restore these functions during subsequent operations (restoration of charging versus realignment from the RWST) created by this change but those are controlled by the general operations procedures and/or other steps in this procedure and are beyond the scope of this evaluation and not further addressed.

Technical specification and Technical Specification bases 3.5.5 requires seal injection flow in modes 1, 2 and 3 describes the design and operation of the charging system to ensure that charging flow paths do not provide a flow path that adversely impacts ECCS injection flow rates if required. LCO 3.5.5 ensures that seal injection flow will be sufficient for RCP seal integrity but limited so that the ECCS trains will be capable of delivering sufficient water to match boiloff rates soon enough to minimize uncovering of the core following a large LOCA. It also ensures that the centrifugal charging pumps will deliver sufficient water for a small LOCA and sufficient boron to maintain the core subcritical. The function of limiting seal injection to ensure adequate ECCS flow is not impacted by the subject change and is not addressed further in the attached 50.59 screening and or 50.59 evaluations. A primary design function of the charging system to provide Reactor Coolant Pump (RCP) seal injection as required to ensure RCS coolant boundary seal integrity is impacted by the subject change. This is a continuous function which is removed in the subject procedure and replaced by an inferred manual action (restoration as required). This is determined to be an adverse change in the attached 50.59 screening and is therefore evaluated further in the attached 10CFR50.59 evaluation and it would require entry into technical specification 3.5.5 LCO.

One of the CVCS design functions in the plant design is to satisfy General Design Criteria 26 of 10CFR50 (Ref. 1), (restated in UFSAR Chapter 3) is the reactivity control systems are redundant and capable of holding the reactor core subcritical when shut down under cold conditions. Two independent reactivity control systems are provided, and that one of these systems is capable of maintaining the core subcritical under cold conditions. These requirements are provided by the use of movable Rod Control Cluster Assemblies (RCCAs) and soluble boric acid in the Reactor Coolant System (RCS). The Chemical and Volume Control System (CVCS) boration system provides the Shutdown Margin during power operation and is capable of making the core subcritical rapidly enough to prevent exceeding acceptable fuel damage limits, assuming that the rod of highest reactivity worth remains fully withdrawn. The system also provides soluble boron concentration to compensate for fuel absorber depletion during operation and all xenon burnout reactivity changes and maintain the reactor subcritical under cold conditions.

If the normal charging line is not available, charging to the RCS is continued via reactor coolant pump seal injection at the rate of approximately 5 gpm per pump. At the charging rate of 20 gpm, approximately 5 hours are required to add enough boric acid solution to counteract xenon decay, although xenon decay below the full power equilibrium operating level will not begin until approximately 25 hours after the reactor is shut down. As backup to the normal boric acid supply, the operator can align the refueling water storage tank outlet to the suction of the charging pumps. Operating procedures verify that adequate boron injection flow paths to the RCS are available from the boric acid tank. Borated water from the boric acid tank can be delivered to the charging pump via the unit specific or unit common boric acid transfer pump. This procedure ensures sufficient water sources for these flow paths.

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood Unit 1/2

Activity/Document Number: 1/2BwOA SEC-4 Loss of Instrument Air Unit 1/2 **Revision Number: (originally REV 3 1998 - Current Rev103 2013)**

Title: Loss of Instrument Air Unit 1/2

The system is described in UFSAR 15.4.6 "Chemical and Volume Control System Malfunction that results in a Decrease in Boron Concentration in the Reactor Coolant". The principal means of causing an inadvertent boron dilution are the opening of the primary water makeup control valve and failure of the blend system, either by controller or mechanical failure. The CVCS and RMCS are designed to limit, even under various postulated failure modes, the potential rate of dilution to values which, with indication by VCT volumes alarms and instrumentation, will allow sufficient time for operator response, depending on the mode of operation, to terminate the dilution. An inadvertent dilution from the RMCS may be terminated by closing the primary water makeup control valve, CV-111A. All expected sources of dilution may be terminated by closing isolation valves in the CVCS, LCV-112B and C. The lost shutdown margin (SDM) may be regained by the opening of isolation valves to the RWST, LCV-112D and E, thus allowing the addition of 2300 ppm borated water to the RCS.

The boric acid makeup control provides boric acid flow indications and flow deviations alarms to alert the operator, and automatic indication of boron dilution results from the resulting control rod position indication and low and low-low insertion limit alarms. This would provide the operator adequate time to determine the cause of dilution and isolate the reactor water makeup source before there is insufficient negative control rod reactivity to terminate criticality upon reactor trip. This ensures the required diverse shutdown system rapidly required to respond to loss of shutdown margin from this condition is maintained. The subject loss of instrument air is a level two transient as a dilution event is also a second level 2 transient and has no potential to proceed to any higher level condition. This VCT design function is not addressed further in the attached 10CFR50.59 screening and or 10CFR50.59 evaluation.

The Refueling Water Storage Tank (RWST) [Technical Specification B3.5.4] is an independent source of borated water which supplies borated water to offset large mass changes during abnormal operating conditions, required for refueling, and its primary function is to supply large borated water inventory to the ECCS and Containment Spray at 2300 ppm boron. The RWST contains borated water to support the ECCS during the injection phase of a LOCA or Steamline break. The RWST may provide sufficient boron for emergency boration in Mode 1 or 2 or to compensate for xenon decay at hot no load temperature with letdown isolated without discharging water volume through the Pressurizer PORV. Pressurizer PORV operation may be presently limited due to system limitations described IR01468044. IR01468044 states that the valves may not fully open for the three (3) manual cycles needed to meet the assumptions made in the design bases Natural Circulation Cooldown Analysis. Restoration of the normal boration from the Boric Acid Tank therefore is the preferred source of boric acid during operation and or cooldown after a loss of instrument air event, if it can be restored.

UFSAR 15.8 describes the consequences of a hypothetical failure to trip following anticipated transients and shows that no significant core damage would result prior to the event being terminated by the operator using the reactivity control system including emergency boration and system peak pressures should be limited to acceptable values, and no failure of the reactor coolant system would result. The process used to evaluate the ATWS risk in compliance with 10 CFR 50.62. This system function could be impacted by the termination of charging and is evaluated in the attached 10CFR50.59 screening and it is not adversely impacted and is not addressed further in the attached 10CFR50.59 evaluation

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood Unit 1/2

Activity/Document Number: 1/2BwOA SEC-4 Loss of Instrument Air Unit 1/2 **Revision Number: (originally REV 3 1998 - Current Rev103 2013)**

Title: Loss of Instrument Air Unit 1/2

REFERENCES

1. 10 CFR 50, Appendix A, GDC 26
2. Technical Specification Bases REACTIVITY CONTROL SYSTEMS B 3.1.1 SHUTDOWN MARGIN (SDM)
3. Technical Specification Bases EMERGENCY CORE COOLING SYSTEM 3.5.5 Seal Injection Flow
4. Braidwood Technical Requirements Manual (TRM), Section 3.1.f, "Borated Water Sources - Operating".
5. Braidwood Technical Requirements Manual (TRM), Sections 3.1.e, "Borated Water Source -Shutdown".
6. Braidwood Technical Requirements Manual (TRM), Sections 3.1.a, "Boration Flowpath - Shutdown".
7. Braidwood Technical Requirements Manual (TRM), Section 3.1.b, "Boration Flowpath - Operating".
8. Braidwood Updated Final Safety Evaluation Report (UFSAR) Section 5.4.13
9. Braidwood Updated Final Safety Evaluation Report (UFSAR) Section 6.3.2
10. Braidwood Updated Final Safety Evaluation Report (UFSAR) Section 7.1.2
11. Braidwood Updated Final Safety Evaluation Report (UFSAR) Section 7.3.1
12. Braidwood Updated Final Safety Evaluation Report (UFSAR) Section 7.4.1
13. Braidwood Updated Final Safety Evaluation Report (UFSAR) Section 9.3.1
14. Braidwood Updated Final Safety Evaluation Report (UFSAR) Chapter 15
15. INPO SOER 88-01
16. NRC Generic Letter 88-14
17. NUREG 800 Standard Review Plan Water

Summary of Conclusion for the Activity's 50.59 Review:

(Provide justification for the conclusion, including sufficient detail to recognize and understand the essential arguments leading to the conclusion. Provide more than a simple statement that a 50.59 Screening, 50.59 Evaluation, or a License Amendment)

The operations procedure controls and/or requires activities that operate SSCs per their UFSAR design conditions of the Reactor (GDC 10) and Reactivity System (GDC 26). This procedure controls operations which have potential effects on plant operations, and the fuel design bases therefore the procedure does meet the definition of a procedure described in the UFSAR. The majority of procedure additions add additional detail that does conflict with the present description in the UFSAR and therefore requires no further review under 10CFR 50.59 other than the 10CFR50.59 screening. The RCP Seal Injection question involves a change to a procedure that adversely affects how UFSAR described SSC design functions are performed or controlled, and is reviewed in the attached 10CFR50.59 evaluation. That review determined that a license amendment would be required to proceed with this change.

Attachments:
Attach all 50.59 Review forms completed, as appropriate.

Forms Attached: (Check all that apply.)

☐	**Applicability Review**			
☒	**50.59 Screening No.**	**BRW-S-2013-124**	**Rev.**	**0**
☒	**50.59 Evaluation No.**	**BRW-E-2013-125**	**Rev.**	**0**

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Byron and Braidwood Units 1 and 2

Activity/Document Number: DRP 15-029, EC 392455, EC 392431, EC 391626, EC 392442, NF-BY-312, BwVS TRM 3.1.H.1
Revision Number: 0, 0, 0, 1, 0, 8, 17

Title: Implementation of WCAP-16676-NP, "Analysis Update for the Inadvertent Loading Event"

OTE: For 50.59 Evaluations, information on this form will provide the basis for preparing the biennial summary report submitted to the NRC in accordance with the requirements of 10 CFR 50.59(d)(2).

Description of Activity:
(Provide a brief, concise description of what the proposed activity involves.)

This Activity is the implementation of an updated generic analysis of the Inadvertent Loading of a Fuel Assembly into an Improper Location (aka Misload) event, described in UFSAR Section 15.4.7. Implementing this generic analysis will require an update to UFSAR Section 15.4.7 to revise the information contained within this section, adding a reference to Section 15.4, and eliminating Figures 15.4-13 through 15.4-17. Revisions to NF-BY-312 and BwVS TRM 3.1.H.1 will also be required to include the flux map review criteria associated with this generic analysis.

Reason for Activity:
(Discuss why the proposed activity is being performed.)

UFSAR Section 15.4.7 currently describes the analysis of the Misload event as a comparison of the X-Y power distributions for a properly loaded core to the X-Y power distributions for a case with a misload configuration. The cases that were previously analyzed and described in the UFSAR are as follows:

Case A: Case in which a Region 1 assembly is interchanged with a Region 3 assembly. The particular case considered was the interchange to two adjacent assemblies near the periphery of the core.

Case B: Case in which a Region 1 assembly is interchanged with a neighboring Region 2 fuel assembly. Two analyses have been performed for this case:

In Case B-1, the interchange is assumed to take place with the burnable poison rods transferred with the Region 2 assembly mistakenly loaded into Region 1.

In Case B-2, the interchange is assumed to take place closer to core center and with burnable poison rods located in the correct Region 2 position but in a Region 1 assembly mistakenly loaded in the Region 2 position.

Case C: Enrichment error: Case in which a Region 2 fuel assembly is loaded in the core central location.

Case D: Case in which a Region 2 fuel assembly instead of a Region 1 fuel assembly is loaded near the core periphery.

The enrichments for the fuel regions utilized in the original analysis were 2.10 w/o U-235 for Region 1, 2.60 w/o U-235 for Region 2, and 3.10 w/o U-235 for Region 3. While these were typical enrichments at the time, modern core designs utilize much higher enrichments, typically in the 4.20-4.95 w/o U-235 range. In addition, the types of burnable absorbers used in the core are different and loading pattern strategies have changed since the previous analysis was performed, notably in the fact that fresh fuel is no longer loaded on the periphery of the core but is instead interspersed with once-burned assemblies on the interior and once- or twice-burned fuel is placed on the periphery. In addition, reload batch sizes have increased from 64-65 assemblies to 88-89 assemblies or more. Based on these factors, the previous analysis that was discussed in UFSAR Section 15.4.7 doesn't represent current core designs.

In 2001, Byron and Braidwood revised the power level at which the first flux map could be taken from <30% rated thermal power (RTP) to up to <50% RTP, based on input from Nuclear Fuels. To support this effort, Nuclear Fuels has been performing cycle-specific design analyses in order to confirm whether delaying the first flux map to ~50% RTP is acceptable. The cycle-specific analyses used the cases from the UFSAR as a guideline as to what scenarios needed to be evaluated and took into account current core design practices, enrichments, and burnable absorbers. The cycle-specific analyses confirmed that the current flux map review criteria were similarly capable of detecting the misload scenarios described in the UFSAR at both 30% RTP and 50% RTP and, if they were not, established new acceptance criteria for that specific beginning of cycle flux map.

Station/Unit(s): Byron and Braidwood Units 1 and 2

Activity/Document Number: DRP 15-029, EC 392455, EC 392431, EC 391626, EC 392442, NF-BY-312, BwVS TRM 3.1.H.1
Revision Number: 0, 0, 0, 1, 0, 8, 17

Title: Implementation of WCAP-16676-NP, "Analysis Update for the Inadvertent Loading Event"

These cycle-specific analyses also determined whether the $F_{\Delta H}$ values resulting from the misload scenarios exceeded the RTP Core Operating Limits Report (COLR) $F_{\Delta H}$ limit adjusted for off-rated conditions so that it could be confirmed that the acceptance criteria for this event as described in NUREG-0800, the Standard Review Plan (SRP), Section 15.4.7, would still be met. The acceptance criteria for this event, as described in SRP Section 15.4.7, Rev. 1 (issued in 1981) are:

a. To meet the requirements of [General Design Criterion] 13, plant operating procedures should include a provision requiring that reactor instrumentation be used to search for potential fuel loading errors after fueling operations.
b. In the event the error is not detectable by the instrumentation system and fuel rod failure limits could be exceeded during normal operation, the offsite consequences should be a small fraction of the 10 CFR Part 100 guidelines.

The cycle-specific analyses performed by Nuclear Fuels confirmed that <1% of the fuel would have $F_{\Delta H}$ values in excess of the RTP COLR $F_{\Delta H}$ limit adjusted for off-rated conditions. The 1% criterion is consistent with the assumptions documented in UFSAR Section 12.2, Radiation Sources, since it was conservatively assumed that a fuel rod with an $F_{\Delta H}$ value in excess of this value would be likely to fail, when in reality, only rods with an $F_{\Delta H}$ value above the limit for DNB at normal operating conditions would be likely to fail.

Westinghouse performed an updated generic analysis for this event as described in WCAP-16676-NP. The Westinghouse updated analysis was performed using more representative enrichments (~4.00 - ~4.80 w/o U-235), updated burnable absorber types, current loading pattern strategies, and a more representative batch size (84 assemblies). This analysis also looked at the difference in detectability not only between 30% RTP and 50% RTP, but also depending on the number of detector locations available during the flux map. Consistent with the original generic analysis, Westinghouse performed the analysis by comparing the X-Y power distributions for cores with and without misloads to determine the power distribution impacts of misloaded assemblies. A calculation of the resulting $F_{\Delta H}$ values was also performed to determine whether the resulting $F_{\Delta H}$ values would exceed the RTP COLR limit or the limit for Deptarture from Nucleate Boiling (DNB) at normal operating conditions. Westinghouse assumed a RTP COLR $F_{\Delta H}$ limit of 1.65 and a limit for DNB at normal operating conditions of 1.99 for these comparisons. (In comparison, the Byron and Braidwood RTP COLR $F_{\Delta H}$ limit is 1.70, and the limit for DNB at normal operating conditions is 2.16 for non-MUR conditions and 2.14 for MUR conditions. For $F_{\Delta H}$ lower limits are more restrictive, so the limits assumed in the updated generic analysis are conservative with respect to the limits for Byron and Braidwood.)

A series of 500 random assembly swaps, encompassing the types of misload scenarios that are currently detailed in the UFSAR, were utilized in the updated analysis along with 1000 combinations of unavailable detectors. In addition, a series of 1158 single assembly "misloads" were analyzed with 1000 combinations of unavailable detectors, covering a range of reactivities from a very highly reactive feed assembly to a low reactivity twice-burned assembly. Of the 500 assembly swap configurations that were analyzed, only 66 were shown to result in an $F_{\Delta H}$ in excess of the limit for DNB at normal operating conditions, and of the 1158 single assembly misloads analyzed, only 242 were shown to result in an $F_{\Delta H}$ in excess of the limit for DNB at normal operating conditions. The Westinghouse analysis described in WCAP-16676-NP is not only more comprehensive than both the original generic analysis and the cycle-specific analyses that Nuclear Fuels has been performing by evaluating several hundred misload scenarios instead of the five scenarios analyzed in the original generic analysis, but the WCAP also establishes a set of review criteria for flux maps. The current flux map review criteria used for the initial cycle flux map are based on a recommendation in ANSI/ANS 19.6.1-2011, "Reload Startup Physics Tests for Pressurized Water Reactors." The criteria established by Westinghouse as part of this analysis are not only more stringent than the current criteria based on the addition of a comparison of the measurements in symmetric locations in addition to the current comparison of the measured-to-predicted reaction rates, but also take into account the effects of having detectors out of service. These criteria were shown to be capable of detecting a large fraction (> ~60%) of the misload scenarios that would result in an $F_{\Delta H}$ in excess of the RTP COLR limit and > 99% of the misload scenarios that would result in an $F_{\Delta H}$ in excess of the limit for DNB at normal operating conditions, even if not all detector locations are available for the initial flux map. In addition, this analysis shows that, of the misload scenarios that would result in $F_{\Delta H}$ in excess of the limit for DNB at normal operating conditions, only a small fraction of them (<< 1%) are not capable of being detected during an initial flux map. This satisfies the confirmation that Nuclear Fuels was performing in their cycle-specific analyses that the flux map review criteria would be effective in detecting fuel failures, since the least restrictive criteria established by Westinghouse in this analysis are more restrictive than the criteria currently used by Byron and Braidwood.

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Byron and Braidwood Units 1 and 2

Activity/Document Number: DRP 15-029, EC 392455, EC 392431, EC 391626, EC 392442, NF-BY-312, BwVS TRM 3.1.H.1
Revision Number: 0, 0, 0, 1, 0, 8, 17

Title: Implementation of WCAP-16676-NP, "Analysis Update for the Inadvertent Loading Event"

Westinghouse performed an additional analysis on potentially undetected misload scenarios to determine what fraction of the core would have $F_{\Delta H}$ values in excess of the limit for DNB at normal operating conditions. This additional analysis assumed the maximum number of inoperable detectors in combination with the least restrictive flux map review criteria in order to maximize the number of misload scenarios that would not be detected. Each of the misload cases was simulated in ANC, and full power depletions were performed. Fuel census data was collected from these depletions, which provides the percentage of fuel rods in the core above a given relative power. The best estimate fuel rod powers were increased by an 8% design allowance, which effectively increases the number of fuel rods above a given relative power. Westinghouse determined that, given these constraints, the most limiting time in the cycle would be at the beginning of cycle (150 MWD/MTU). The results of the most limiting misload case at this most limiting time in the cycle showed that, while 1.5%-2.0% of the core would have $F_{\Delta H}$ values above the RTP COLR limit (a percentage which would be decreased to below 1% if the $F_{\Delta H}$ limit was adjusted for off-rated conditions), only 0.58% of the core would have $F_{\Delta H}$ values in excess of the limit for DNB at normal operating conditions. This satisfies the criteria that <1% of the core would have $F_{\Delta H}$ values in excess of the limit for DNB at normal operating conditions that Nuclear Fuels was confirming in their cycle-specific analyses.

As described above, implementing the generic analysis described in WCAP-16676-NP will establish a set of flux map review criteria that have been shown to have the capability of detecting > ~60% of the misload scenarios that would result in an $F_{\Delta H}$ in excess of the RTP COLR limit and > 99% of the misload scenarios that could would result in an $F_{\Delta H}$ in excess of the limit for DNB at normal operating conditions. The newly established flux map review criteria are more restrictive than the criteria currently in use by Byron and Braidwood, and the analysis confirms that, even for the worst undetectable misload scenario, <1% of the core would have $F_{\Delta H}$ values in excess of the limit for DNB at normal operating conditions. It would also eliminate the need for Nuclear Fuels to perform cycle-specific analyses for the Misload event and would update the UFSAR to describe the updated analysis and show the new flux map criteria. Revisions to NF-BY-312 and BwVS TRM 3.1.H.1 will update the flux map review criteria utilized by Byron and Braidwood that were established based on the generic analysis performed by Westinghouse.

Effect of Activity:
(Discuss how the activity impacts plant operations, design bases, or safety analyses described in the UFSAR.)

Implementation of the generic analysis described in WCAP-16676-NP will accomplish several things. First, it will establish a set of flux map review criteria that have been shown to be able to detect > ~60% of the misload scenarios that would result in an $F_{\Delta H}$ in excess of the RTP COLR limit and > 99% of the misload scenarios that would result in an $F_{\Delta H}$ in excess of the limit for DNB at normal operating conditions. Second, the analysis also is much more comprehensive than both the original analysis performed by Westinghouse and the analyses that Nuclear Fuels has been performing. It accounts for current core design practices in addition to validating that the capability of detecting misload scenarios is similar between 30% RTP and 50% RTP, which formally documents that it is acceptable to proceed up to 50% RTP before taking the first flux map of the cycle, so the need for Nuclear Fuels to perform cycle-specific analyses will be eliminated. Third, this implementation will lead to an update to UFSAR Section 15.4.7 that describes the updated analysis and establishes the flux map review criteria. Last, the procedures that are utilized by Byron and Braidwood will be updated with the new flux map review criteria to ensure both sites are using a consistent set of review criteria that are capable of detecting a large fraction of misload scenarios.

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Byron and Braidwood Units 1 and 2

Activity/Document Number: DRP 15-029, EC 392455, EC 392431, EC 391626, EC 392442, NF-BY-312, BwVS TRM 3.1.H.1
Revision Number: 0, 0, 0, 1, 0, 8, 17

Title: Implementation of WCAP-16676-NP, "Analysis Update for the Inadvertent Loading Event"

Summary of Conclusion for the Activity's 50.59 Review:
(Provide justification for the conclusion, including sufficient detail to recognize and understand the essential arguments leading to the conclusion. Provide more than a simple statement that a 50.59 Screening, 50.59 Evaluation, or a License Amendment Request, as applicable, is not required.)

The proposed Activity, which will implement the updated generic analysis for the Inadvertent Loading and Operation of a Fuel Assembly in an Improper Location (aka Misload) event as described in WCAP-16676-NP, "Analysis Update for the Inadvertent Loading Event," and update the UFSAR Section 15.4.7 to describe the updated generic analysis as well as revising procedures NF-BY-312 and BwVS TRM 3.1.H.1 in order to implement the flux map review criteria developed as part of the WCAP-16676-NP evaluation, can be performed without NRC review or approval. The attached 50.59 Screening concludes that the proposed Activity does not involve a change to an SSC that adversely affects an UFSAR described design function (Question 1), nor does it involve a test or experiment not described in the UFSAR where an SSC is utilized or controlled in a manner that is outside the reference bounds of the design for that SSC or in a manner that is inconsistent with the analyses or descriptions in the UFSAR (Question 4) or require a change to the Technical Specifications or Facility Operating License (Question 5). The criteria used for reviewing flux maps, which is being revised in NF-BY-312 and BwVS TRM 3.1.H.1 is not currently described in the UFSAR, and the method of performing flux maps is not being changed. The minimum number of detectors required to be available for an initial flux map is not being revised, so the proposed Activity does not involve a change to a procedure that adversely affects how UFSAR described design functions are performed or controlled (Question 2). UFSAR Section 15.4.7 currently contains a description of the evaluation of the Misload event, but the method used for evaluating the impacts of misload scenarios is the same in the updated generic analysis as it was in the original analysis and the cases that were analyzed are more comprehensive than those used in the original analysis. In addition, no flux map review criteria used to determine whether a misload configuration exists are currently defined in the UFSAR. However, the X-Y power distributions that were calculated for the updated analysis used a different computer code than the codes used in the original analysis, which constitutes the use of an alternative methodology and requires a 50.59 Evaluation (Question 3).

The attached 50.59 Evaluation concluded that the computer code that was used to generate the X-Y power distributions used in this updated generic analysis (ANC) was previously approved by the NRC as a direct replacement for the computer codes that were described in the UFSAR as being used in the original analysis (TURTLE and PALADON). ANC was previously approved for use by Exelon by the NRC, and is already described in the UFSAR as a code used for the calculation of X-Y power distributions. Therefore, use of this code in the generation of X-Y power distributions for the analysis of the Misload event does not constitute a departure from a method of evaluation described in the UFSAR used in establishing the design bases or in the safety analyses, and thus NRC approval is not required prior to its use in this capacity.

Attachments:
Attach all 50.59 Review forms completed, as appropriate.

Forms Attached: (Check all that apply.)

☐	**Applicability Review**				
☒	**50.59 Screening**	**50.59 Screening No.**	**6D-13-016/ BRW-S-2013-115**	**Rev.**	**2**
☒	**50.59 Evaluation**	**50.59 Evaluation No.**	**6G-13-013 / BRW-E-2013-134**	**Rev.**	**1**

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood Station Unit 1

Activity/Document Number: SPP 13-003 **Revision Number:** 0

Title: Unit 1 Main Turbine Roll for Ventilation Testing

NOTE: For 50.59 Evaluations, information on this form will provide the basis for preparing the biennial summary report submitted to the NRC in accordance with the requirements of 10 CFR 50.59(d)(2).

Description of Activity:
(Provide a brief, concise description of what the proposed activity involves.)

This Special Procedure, Test, or Experiment (SPP) is being created to provide the instructions required to roll the Unit 1 Main Turbine from zero speed to the 450 and 600 rpm plateaus for ventilation testing following replacement of the generator hydrogen cooler. Main Turbine speed will be controlled using the installed Ovation Digital Electro-hydraulic (DEH) system in the same manner as a turbine roll during unit startup. The difference between the normal unit startup and the turbine roll for the generator ventilation testing is that the reactor will not be critical. The plant will be in Mode 3 at Normal Operating Pressure (NOP) and Normal Operating Temperature (NOT) with the steam dumps controlling Reactor Coolant System (RCS) temperature in the steam pressure mode of operation. The steam created from Reactor Coolant Pump (RCP) heat and decay heat that would normally be dumped to the main condenser through the steam dumps will used to roll the turbine to the test speed plateaus.

Reason for Activity:
(Discuss why the proposed activity is being performed.)

This SPP will allow the Unit 1 Main Turbine to be rolled to 450 and then 600 rpm so that internal generator air flows can be checked following replacement of the hydrogen cooler. The new hydrogen cooler is being installed during A1R17 and must be checked to verify that adequate air flows through the cooler are obtained to ensure proper cooling of the hydrogen in the main generator.

Effect of Activity:
(Discuss how the activity impacts plant operations, design bases, or safety analyses described in the UFSAR.)

There is the potential for an RCS cooldown due to the steam demand from rolling the Main Turbine, however the SPP provides guidance in the form of abort criteria to prevent an adverse plant effect. The SPP will roll the Main Turbine to the designated speed plateaus to allow Engineering to obtain the required data in order to verify adequate air flow through the new cooler and therefore adequate cooling of the hydrogen in the main generator. The Main Turbine will not be operated near the resonant speed range of 800 – 1200 rpm. Abort criteria in the form of minimum Pressurizer (PZR) level, RCS temperature, Steam Generator (SG) level and pressure, as well as a loss of DEH control is provided. The abort criteria will ensure an adequate margin exists to prevent inadvertent Engineered Safety Features (ESF) actuation (Safety Injection, Auxiliary Feedwater, Main Steam Isolation, Letdown Line Isolation), excessive cooldown or turbine trip.

Summary of Conclusion for the Activity's 50.59 Review:
(Provide justification for the conclusion, including sufficient detail to recognize and understand the essential arguments leading to the conclusion. Provide more than a simple statement that a 50.59 Screening, 50.59 Evaluation, or a License Amendment Request, as applicable, is not required.)

The activity being implemented (SPP 13-003) does not operate the Main Steam, Turbine, or DEH systems in a manner that is outside of the reference bounds of their design basis or in a manner that is inconsistent with the descriptions found in the UFSAR. The implementation and performance of the SPP does not result in more than a minimal increase in the frequency of the Inadvertent Operation of the Emergency Core Cooling Systems. There are no physical changes required to any UFSAR described SSCs as a result of the performance of the SPP. The systems are being operated in the same manner for which they were designed. Performance of the turbine roll for ventilation testing is not the initiator of any new accident and no new failure modes are introduced.

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood Station Unit 1

Activity/Document Number: SPP 13-003 **Revision Number:** 0

Title: Unit 1 Main Turbine Roll for Ventilation Testing

The actions performed in the SPP for rolling the Main Turbine to the required speed plateaus are the same as those performed during a normal unit startup therefore the activity does not create the possibility for a malfunction of an SSC that is important to safety with a different result that has been evaluated in the UFSAR. There is no effect on any design basis limits for fission product barriers, or any UFSAR described evaluation methodologies as a result of the performance of the SPP.

Therefore based upon the above, the SPP may be implemented as proposed without prior permission from the NRC.

Attachments:
Attach all 50.59 Review forms completed, as appropriate.

None

Forms Attached: (Check all that apply.)

☐	**Applicability Review**				
☐	**50.59 Screening**	**50.59 Screening No.**		**Rev.**	
☒	**50.59 Evaluation**	**50.59 Evaluation No.**	**BRW-E-2013-141**	**Rev.**	**0**

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Byron and Braidwood Units 1 & 2

Activity/Document Number: EC 377550 (Byron), EC 384898 (Braidwood), DRP 15-040 **Revision Number:** 0/0/0

Title: CONFIGURATION CHANGE DOCUMENTS ASSOCIATED WITH RH RELIEF VALVE DISCHARGE TO THE RECYCLE HOLD UP TANK (HUT)

NOTE: For 50.59 Evaluations, information on this form will provide the basis for preparing the biennial summary report submitted to the NRC in accordance with the requirements of 10 CFR 50.59(d)(2).

Description of Activity:

ECs 377550 and 384898 revise the design basis analysis associated with the RH relief valve discharge piping and the Boron Recycle Holdup Tanks (HUTs):

1. Revised dose analysis for an atmospheric release from a postulated failure of the Boron Recycle Holdup Tank.
2. Revised atmospheric diffusion factors (χ/Q) for the Exclusion Area Boundary (EAB) and Low Population Zone (LPZ) calculated based on finer wind speed categories from Regulatory Guide 1.23 Revision 1.
3. Analyses of the boron recycle holdup tank associated with postulated discharge of RCS liquid with a temperature greater than 200° F to the HUT from a RHR suction side relief valve.

The design changes include new and revised design analysis, corrections to drawings, and revisions to the UFSAR description.

Reason for Activity:

The design basis analyses associated with the Boron Recycle Holdup Tanks (HUTs) were revised to address findings identified in a November 12, 2008, Byron Station NRC Baseline Inspection Report and a February 9, 2009, Braidwood Station NRC Integrated Inspection Report. The NRC inspection reports identified the following:

1. A minor violation associated with the UFSAR analysis for rupture of a HUT. Discrepancies were identified between the inputs and assumptions used in the analysis and actual configuration. Specifically the existing analysis for the rupture of a recycle holdup tank failed to recognize that the gas spaces of the HUTs are normally cross-connected and that a gas decay tank normally had open communication with at least one HUT.
2. A Non-Cited Violation (NCV), associated with the licensee's failure to analyze and establish an adequate quench volume within the boron recycle system holdup tanks and failure to analyze the water hammer loads on boron recycle system holdup tank inlet piping induced by relief valve discharges .
3. A NCV, for failure to adequately update the Updated Final Safety Analysis Report. Specifically, the description of: (1) the boron recycle system did not identify if the system was designed or capable of handling discharges from the safety injection and residual heat removal relief valves; (2) the residual heat removal system did not identify deviations from the system design standard with respect to the suction pipe relief valve single failure analysis and collection of relief valve discharges outside containment.

New atmospheric diffusion factors (χ/Q values) were calculated to satisfy a commitment made to the NRC to reevaluate χ/Q values based on finer wind speed categories provided in the latest appropriate regulatory guidance the next time calculations associated with the dose consequences are revised.

Effect of Activity:
(Discuss how the activity impacts plant operations, design bases, or safety analyses described in the UFSAR.)

The safety analysis description in the UFSAR is revised to indicate that the radiological consequences for a atmospheric release of a Boron Recycle Holdup Tank failure utilizes the Alternate Source Term methodology per Regulatory Guide 1.183 with dose acceptance criteria per 10 CFR 50.67. The UFSAR description of the input parameters and assumptions are revised to reflect that the gas space in both HUTs are connected to a common header, a waste gas decay tank is normally aligned to provide cover gas for the HUTs, that the water in the un-ruptured HUT could also drain via the cross-tie piping that inter-connects the two tanks, and the potential for higher activity RCS water from a RH suction side relief valve discharge to the HUT to be released to the HUT cubicle following a tank rupture.

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Byron and Braidwood Units 1 & 2

Activity/Document Number: EC 377550 (Byron), EC 384898 (Braidwood), DRP 15-040 **Revision Number:** 0/0/0

Title: CONFIGURATION CHANGE DOCUMENTS ASSOCIATED WITH RH RELIEF VALVE DISCHARGE TO THE RECYCLE HOLD UP TANK (HUT)

The calculated Control Room, EAB, and LPZ doses increase but the dose is small compared to the regulatory limit. The increase in dose was determined to be less than minimal. The UFSAR is changed to reflect the revised dose results for a Recycle Holdup Tank failure.

Branch Technical Position RSB 5-1 states that fluid discharged through the RHR system pressure relief valves must be collected and contained such that a stuck open relief valve will not: (c) Result in a non-isolatable situation in which the water provided to the RCS to maintain the core in a safe condition is discharged outside of containment. Byron/Braidwood is subject to the technical requirements of RSB 5-1 as they apply to Class 2 plants. For Class 2 plants compliance with the BTP requirement for collection and containment of the relief discharge is not required if it is shown that adequate alternate methods of disposing of discharge are available. The fluid discharge by the RHR suction side relief valves and the discharge side relief valves is collected in the recycle holdup tank of the boron recycle system. The recycle holdup tank is located outside of containment. An analysis has been made to evaluate the Recycle Holdup Tank response to the opening of a relief valve. The analysis indicates the pressure in the HUT remains below the tank design pressure. The following operator actions are assumed in the analysis:

1) The analysis is based on the most limiting event of a letdown/charging flow mismatch with one charging pump running. Operator action is assumed to be taken within 30 minutes to allow the relief valve to close or to isolate the relief valve.

2) Initial liquid level in the HUT aligned to receive input from the RH relief valve is assumed to $\geq$ 40%. This level provides a quench of the input from the relief valves. When RH is aligned for shutdown cooling and the RCS temperature is above 200° F the level in the HUT aligned to receive input from the RH relief valves is administratively controlled above 40%.

Summary of Conclusion for the Activity's 50.59 Review:
(Provide justification for the conclusion, including sufficient detail to recognize and understand the essential arguments leading to the conclusion. Provide more than a simple statement that a 50.59 Screening, 50.59 Evaluation, or a License Amendment Request, as applicable, is not required.)

As described in UFSAR Section 15.7.2.1 an unspecified event causes the complete release of the radioactive inventory of the boron recycle holdup tanks. UFSAR Section 15.7.2.1 states: "Postulated events that could cause the release of the radioactive inventory of the spent resin storage tank and the boron recycle holdup tanks are cracks in the tanks and operator error." A failure of the HUT is expected to occur with the frequency of a limiting fault. The changes in the design basis analysis do not result in a more than a minimal increase in the frequency of a system leak or failure for the following reasons:

- The change to the dose analysis and the revised χ/Q analysis has no impact on any accident initiators.
- Analysis of a postulated RHR suction side relief discharge shows that the recycle holdup tank pressure remains below the tank design pressure.
- Analysis of the recycle holdup tank indicates that the localized increase in temperature in the tank that may occur due to discharge from the RH suction side relief valves does adversely affect the tank design. The tank stresses remain below the allowable stress values.
- As discussed in UFSAR Section 15.7.2.1 a radioactive release from a tank caused by operator error is also considered a remote possibility. The UFSAR credits "Operating techniques and administrative procedures emphasize detailed system and equipment operating instructions" for minimizing the risk of tank failure due to operator error. The revised analysis utilizes similar administrative procedure controls on HUT water level to provide a quench for possible discharge from the RH suction side relief valves.

The change to the design basis does not result in more than a minimal increase in the likelihood of occurrence of a malfunction of a SSC important to safety previously evaluated in the USFAR. The recycle holdup tank pressure remains below the tank design pressure during a postulated RHR suction side relief discharge. The tank stresses remain below the allowable stress values. The revised dose analysis, revised analysis of atmospheric dispersion factors, and analysis of HUT conditions during a relief valve lift does not change system/equipment redundancy, diversity, or independence.

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Byron and Braidwood Units 1 & 2

Activity/Document Number: EC 377550 (Byron), EC 384898 (Braidwood), DRP 15-040 **Revision Number:** 0/0/0

Title: CONFIGURATION CHANGE DOCUMENTS ASSOCIATED WITH RH RELIEF VALVE DISCHARGE TO THE RECYCLE HOLD UP TANK (HUT)

Failure of the main control room ventilation system to automatically realign to the emergency mode of operation is evaluated in UFSAR Section 7.3.1.1.9.1 and UFSAR Section 9.4.1. In the event one train fails to automatically realign to the emergency mode of operation the redundant equipment, instrumentation, and controls would automatically realign the redundant train. During a postulated Boron Recycle Holdup Tank rupture event, operator action is conservatively assumed to be taken within 30 minutes to manually realign the Main Control Room (MCR) ventilation system to the emergency mode of operation. This action would be required if both trains of the MCR ventilation system do not automatically realign upon detection of high radiation. As described in Technical Specification Bases 3.3.7: "The radiological dose assessments performed for the applicable Design Bases Accidents (DBAs) assume initiation of the VC Filtration System within 30 minutes." Thus the action to manually realign the MCR ventilation system to the emergency mode of operation within 30 minutes is consistent with existing radiological dose assessments and does not increase the likelihood of occurrence of a malfunction of an SSC important to safety. This action is already included in the stations operator response time program procedures, OP-BY-102-106 and OP-BR-102-106.

During an event that results in a RHR suction relief valve lift, operator action is assumed to be taken within 30 minutes to stop RCS discharge to the HUT. Operating procedures B(w)OA PRI-1 and B(w)OA S/D-2 would be used to diagnose and perform the action to stop the relief valve discharge. The operators are trained on these procedure actions. The subject action can be taken from the control room and based on input from Operations the action can be completed within the time required. ECs 377550 and 384898 revise procedures OP-BY-102-106 and OP-BW-102-106 to add the required action to the operator response time program for Byron and Braidwood. Thus this operator action does not increase the likelihood of occurrence of a malfunction of an SSC important to safety.

The proposed activity revises the dose analysis for an atmospheric release from a postulated failure of the Boron Recycle Holdup Tank (HUT) as described in Section 15.7.2 of the UFSAR. The failure of the Boron Recycle Holdup Tank is the only accident affected by this change. The revised analysis addresses the following:

- Minimum initial water volume (maximum gas space volume) in the HUT.
- Maximum initial water volume in the HUT.
- Interconnection of the HUT with one waste gas decay tank. As described in UFSAR Section 11.3.2.5, one waste gas decay tank is normally aligned to provide cover gas for the HUTs.
- RCS water from a postulated RH suction relief valve discharge.

There is only a minimal change in the consequences of postulated failure of the HUT from the current UFSAR analysis. The increase in consequences meets the NEI 96-07 Section 4.3.3 and LS-AA-104-1001 Section 6.2.3 definition to be no more than minimal based on; 1) The increase is less than 10 percent of the difference between the current calculated dose value and the regulatory guideline value, and 2) the increase in dose does not exceed the current SRP guideline value for the particular design basis event.

The proposed activity involves analysis associated with the RH system relief valves, the discharge piping from the valves to the recycle holdup tank, and the recycle holdup tanks. The proposed activity does not change how the RH system relief valves function or the failure modes. Thus the consequences of a RH system relief valve failure are unchanged. The proposed activity revises the dose analysis for an atmospheric release from a postulated failure of the HUT. The proposed activity results in less than a minimal increase in the consequences of a failure of the HUT or piping connected to the HUT. Thus the proposed activity does not result in more than a minimal increase in the consequences of a malfunction of a SSC important to safety previously in the UFSAR.

As described in UFSAR Section 15.7.2.1 an unspecified event causes the complete release of the radioactive inventory of the boron recycle holdup tanks. UFSAR Section 15.7.2.1 states: "Postulated events that could cause the release of the radioactive inventory of the spent resin storage tank and the boron recycle holdup tanks are cracks in the tanks and operator error." A failure of the HUT is expected to occur with the frequency of a limiting fault. The change does not introduce the possibility of a new accident because the revised analyses are not an initiator of any accident and no new failure modes are introduced. The most limiting failure mode of a recycle holdup tank rupture is already evaluated in the UFSAR.

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Byron and Braidwood Units 1 & 2

Activity/Document Number: EC 377550 (Byron), EC 384898 (Braidwood), DRP 15-040 **Revision Number:** 0/0/0

Title: CONFIGURATION CHANGE DOCUMENTS ASSOCIATED WITH RH RELIEF VALVE DISCHARGE TO THE RECYCLE HOLD UP TANK (HUT)

As discussed in the UFSAR the rupture of the boron recycle tank would leave little recourse to the operator and no credit is taken for operator action or for ventilation system isolation in evaluating the event. The proposed activity does not credit any new equipment for mitigation of a boron recycle tank rupture event. Thus the change does not introduce a new failure result.

Failure of the main control room ventilation system to automatically realign to the emergency mode of operation is evaluated in UFSAR Section 7.3.1.1.9.1 and UFSAR Section 9.4.1. In the event one train fails to automatically realign redundant equipment, instrumentation, and controls would automatically realign the redundant train. The revised calculated dose to the control room operators assumes both trains of the main control room ventilation system do not automatically realigned to the emergency mode of operation and that operator action is taken within 30 minutes to manually realign the Main Control Room (MCR) ventilation system to the emergency mode of operation. Thus the revised analysis assumption is more conservative and bounded by the UFSAR described malfunction result.

The proposed UFSAR change adds a description of failure effects for the postulated malfunction of the RHR suction or discharge relief valves to UFSAR Table 5.4-18. If any one of the normally closed relief valves fails open water will be will be discharged to the Recycle Holdup Tank. The inventory loss would be diagnosed by either by the decreasing level in the pressurizer and/or the increasing level in the recycle holdup tank. Failed relief valves RH8708A, RH8708B, SI8856A, and SI8856B can be isolated by closing the isolation valves for one train of RH cooling. The result of this malfunction (loss of one train of RH cooling) is the same as other malfunctions of an SSC important to safety evaluated in UFSAR Table 5.4-18. A failed SI8842 relief valve can be isolated by closing valves RH8716A/B. Isolation of valves RH8716A/B would not adversely impact the system function to cool down from 350° F to cold shutdown.

The proposed changes to the design basis analysis associated with the Boron Recycle Holdup Tanks and revised atmospheric diffusion factors does not result in a design basis limit for a fission product barrier described in the UFSAR being exceeded or altered. The changes affect the operation of the Boron Recycle System. The proposed changes do not affect the design basis limits associated with the fuel cladding, RCS boundary, or containment.

The proposed changes to the design basis analysis associated with the Boron Recycle Holdup Tanks and revised atmospheric diffusion factors involves new and revised methods of evaluation. The method used for the revised dose analysis was previously approved by the NRC for radiological analyses at Byron and Braidwood. Thus the change in dose analysis method does not result in a departure from a method of evaluation described in the UFSAR used in the establishing the design bases or in the safety analysis. The change in method for calculating atmospheric diffusion factors was previously accepted by the NRC through issuance of a SER, thus the change does not result in a departure from a method of evaluation described in the UFSAR used in the establishing the design bases or in the safety analysis. The method of evaluation used in analyses of the boron recycle holdup tank pressurization is not specified in the UFSAR.

Based on the 50.59 review the proposed activity may be implemented without obtaining a License Amendment.

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Byron and Braidwood Units 1 & 2

Activity/Document Number: EC 377550 (Byron), EC 384898 (Braidwood), DRP 15-040 **Revision Number:** 0/0/0

Title: CONFIGURATION CHANGE DOCUMENTS ASSOCIATED WITH RH RELIEF VALVE DISCHARGE TO THE RECYCLE HOLD UP TANK (HUT)

Attachments:
Attach all 50.59 Review forms completed, as appropriate.

Forms Attached: (Check all that apply.)

☐	**Applicability Review**				
☐	**50.59 Screening**	**50.59 Screening No.**		**Rev.**	
☒	**50.59 Evaluation**	**50.59 Evaluation No.**	**6G-12-013** **BRW-E-2013-155**	**Rev.**	**0** **0**

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Byron Units 1 & 2 / Braidwood Unit 2

Activity/Document Number: DRP 15-059 **Revision Number:** 0

Title: UFSAR Revision for Reactor Head Lift – Polar Crane Single Failure Proof Equivalency per NEI 08-05

NOTE: For 50.59 Evaluations, information on this form will provide the basis for preparing the biennial summary report submitted to the NRC in accordance with the requirements of 10 CFR 50.59(d)(2).

Description of Activity:

(Provide a brief, concise description of what the proposed activity involves.)

The proposed activity changes the requirements necessary to perform the Reactor Vessel Head lift over irradiated fuel. This change incorporates the guidelines contained in NEI 08-05, "Industry Initiative on Control of Heavy Loads", necessary to declare the Polar Crane "Single Failure-Proof Equivalent" (SFPE). This change provides a SFPE crane for handling the Reactor Vessel Head, thus ensuring the risk of a load drop on irradiated fuel is minimal. This provision is in lieu of a Reactor Head drop analysis. The polar crane is not modified by this change.

Note: This activity is applicable to Byron Units 1 & 2 and Braidwood Unit 2. Braidwood Unit 1 will be addressed under a separate activity.

Reason for Activity:

(Discuss why the proposed activity is being performed.)

The proposed activity is being performed to address an industry issue applicable to Byron and Braidwood Stations with respect to handling of the Reactor Vessel Head over irradiated fuel. This issue is discussed in NEI 08-05,"Industry Initiative on Control of Heavy Loads".

Effect of Activity:

(Discuss how the activity impacts plant operations, design bases, or safety analyses described in the UFSAR.)

This activity revises the methodology used to ensure that the handling of the Reactor Vessel Head over irradiated fuel does not pose a significant risk to the public health and safety. Currently, the methodology used relies on the results of a Reactor Head Drop analysis to ensure that the fuel remains covered and sufficient cooling is available. The proposed activity uses an NRC approved methodology to consider the Polar Crane as SFPE to provide this assurance.

Summary of Conclusion for the Activity's 50.59 Review:

(Provide justification for the conclusion, including sufficient detail to recognize and understand the essential arguments leading to the conclusion. Provide more than a simple statement that a 50.59 Screening, 50.59 Evaluation, or a License Amendment Request, as applicable, is not required.)

The proposed activity changes the requirements necessary to perform the Reactor Vessel Head lift over irradiated fuel. This change incorporates the guidelines contained in NEI 08-05 "Industry Initiative on Control of Heavy Loads", necessary to declare the Polar Crane SFPE. This change provides a SFPE crane for handling the Reactor Vessel Head, thus ensuring that the risk of a load drop on irradiated fuel is minimal. This provision is in lieu of a Reactor Head drop analysis. The polar crane is not modified by this change. Only the procedures utilized for inspection and maintenance of the crane, as well as those utilized for handling the Reactor Head are affected.

Procedures associated with this activity include those utilized for inspection and maintenance of the crane, as well as those utilized for handling the Reactor Head. These procedures contain the necessary instructions to satisfy the SFPE requirements per NEI 08-05; therefore, there are no adverse changes to these procedures.

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Byron Units 1 & 2 / Braidwood Unit 2

Activity/Document Number: DRP 15-059 **Revision Number:** 0

Title: UFSAR Revision for Reactor Head Lift – Polar Crane Single Failure Proof Equivalency per NEI 08-05

This activity changes the methodology to address handling of the Reactor Vessel Head. Currently, the potential for a load drop involving the Reactor Vessel head is addressed by performance of a load drop analysis. The proposed activity utilizes the guidelines provided in NEI 08-05 to provide a SFPE crane. This methodology has been approved for use by the NRC as stated in Regulatory Issue Summary (RIS) 2008-28 "Endorsement of Nuclear Energy Institute Guidance for Reactor Vessel Head Heavy Load Lifts". A Safety Evaluation accepting this methodology was provided by the NRC in a letter dated September 5, 2008.

There is no test or experiment performed by this activity. The Polar Crane is the only SSC utilized under this activity. Enhancements to the Polar Crane inspection and Reactor Head lifting procedures are provided to minimize the potential for a load drop accident involving the Reactor Head.

There are no Technical Specifications associated with use of the Polar Crane for lifting the Reactor Head. Therefore, no changes to the Technical Specifications or facility Operating License are required.

Therefore, except for Question 3 regarding evaluation methodologies, a 50.59 screening is appropriate for this activity. The change in evaluation methodology is addressed in a 50.59 evaluation (Question 8, only). The answer to this question is "No"; therefore, the proposed change may be implemented without NRC approval.

Attachments:

Attach all 50.59 Review forms completed, as appropriate.

Forms Attached: (Check all that apply.)

☐	**Applicability Review**			
☒	**50.59 Screening**	**50.59 Screening No.**	**6E-13-202 /**	**Rev. 0**
			BRW-S-2013-186	**Rev. 0**
☒	**50.59 Evaluation**	**50.59 Evaluation No.**	**6G-13-016 /**	**Rev. 0**
			BRW-E-2013-187	**Rev. 0**

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood Units 1 and 2

Activity/Document Number: EC 388473 / 388944 / DRP 14-084 **Revision Number:** 0 / 0 / 0

Title: Install Time Delayed Auto-Restart For U-1 (U-2) VE Fans In Support of HELB Mitigation Strategy

NOTE: For 50.59 Evaluations, information on this form will provide the basis for preparing the biennial summary report submitted to the NRC in accordance with the requirements of 10 CFR 50.59(d)(2).

Description of Activity:
(*Provide a brief, concise description of what the proposed activity involves.*)

The proposed activity consists of two engineering changes, one for Unit 1 and one for Unit 2:

- EC 388473 - Install Time Delayed Auto-Restart For U-1 VE Fans In Support Of HELB Mitigation Strategy
- EC 388944 - Install Time Delayed Auto-Restart For U-2 VE Fans In Support Of HELB Mitigation Strategy

The proposed activity consists of installation of a time delayed auto-restart for U1(U2) Miscellaneous Electric Equipment Room (MEER) VE fans (1(2)VE01C/1(2)VE04C/1(2)VE05C) in support of a high energy line break (HELB) mitigation strategy. These ECs will install new timers and circuit changes to automatically restart the VE fans, following a short time delay, after a high differential pressure trip. This feature will work with the new HELB damper installation under EC 388742 and EC 389635 to mitigate the consequences of a postulated turbine building HELB. The 50.59 assessment for the installation of the new HELB dampers was performed as part of the damper installation design changes (EC 388742 and EC 389635).

The final configuration considered in this screening includes the installation of the new timers and circuit changes via the completion of these ECs along with the installation of the new HELB dampers.

The proposed activity (along with EC 388742 and EC 389635) is being undertaken to address a vulnerability identified during a review of the effects of certain high energy line breaks in the turbine building which could affect redundant trains of safety-related equipment.

EC 388473 and EC 388944 modify the control circuits for the following fans:

- 1(2)VE01C – Division 12(22) MEER Supply Fan
- 1(2)VE04C – Division 11(21) MEER Exhaust Fan
- 1(2)VE05C – Division 12(22) MEER Exhaust Fan

A new time delay relay will be installed to automatically restart the fan after a fan trip on high differential pressure occurs. The auto restart will occur approximately 60 seconds after the differential pressure trip. The time delay is intended to restart the fan after a brief time following momentary isolation of the exhaust path – a condition that could occur following a nearby high energy line break in the turbine building, which may close the new HELB dampers added by EC 388742 and EC 389635. The new time delay relays will be installed in existing local panels (1(2)VE01J and 1(2)VX01J).

Redundant HELB dampers will be installed in series with fire dampers via EC 388742 and EC 389635. The new HELB dampers are designed to close upon reverse flow from the turbine building to the auxiliary building. Closure of the HELB dampers with the VE ventilation fans running will create back pressure to the operating fan which may cause it to trip on high differential pressure, disrupting supply airflow to the MEER. In order to minimize the heat up of the MEER, the proposed activity (EC 388473 and EC 388944) will modify the control logic for fans 1(2)VE01C, 1(2)VE04C, and 1(2)VE05C, such that the fans will auto-restart one time following a high differential pressure trip after a time delay of sufficient duration to allow the HELB pressure transient to dissipate and allow restart of the fans, thereby re-establishing ventilation through the new HELB dampers.

The UFSAR will require updates to reflect the design of the differential pressure trip to allow one automatic fan restart attempt. This will require changes to Section 7.3.1.1.11 "Essential Switchgear Rooms, Miscellaneous Electrical Equipment Rooms and Battery Rooms Ventilation Systems Instrumentation and Controls", Section 9.4.5.3 "Miscellaneous Electric Equipment Room Ventilation System" and Table 9.4-14 "Miscellaneous Electric Equipment Room Ventilation System Failure Analysis". These changes will be processed under DRP 14-084.

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood Units 1 and 2

Activity/Document Number: EC 388473 / 388944 / DRP 14-084 **Revision Number:** 0 / 0 / 0

Title: Install Time Delayed Auto-Restart For U-1 (U-2) VE Fans In Support of HELB Mitigation Strategy

Reason for Activity:
(*Discuss why the proposed activity is being performed.*)

The proposed activity is part of an improved method for mitigating turbine building HELB effects in areas serviced by the VE system.

The current strategy for mitigating the effects of such breaks, as described in the UFSAR, credits closure of the affected fire dampers as the result of the thermal link temperature exceeding its setting due to the high temperatures in the vicinity of the piping failure. The fire damper closure results in tripping of the ventilation system fans on high differential pressure once the damper closes and blocks the normal ventilation path from the affected room to the turbine building. Room ventilation is restored at a later time via operator action. Analyses were performed to demonstrate that the room heat up during the period that ventilation is lost would not cause required electrical equipment to become unavailable.

However, a recent review of the effects of a turbine building high energy line break determined that the closure of the affected fire dampers might not occur in the time frame assumed in the analyses. In order to address this vulnerability, the proposed activity will reconfigure the dampers and ventilation systems to provide for automatic restoration of the VE system shortly after a high energy line break in the turbine building. The prompt restoration of the system, following a time delay of sufficient duration to allow the HELB pressure to dissipate, will allow for maintaining the MEER as a mild environment following a turbine building HELB to help ensure that electrical equipment in the affected rooms will remain available.

Effect of Activity:
(*Discuss how the activity impacts plant operations, design bases, or safety analyses described in the UFSAR.*)

The new fan auto restart feature will not affect normal fan operation (starting and stopping by the operator). In the event of a high differential pressure, the fan will trip, as it does at present. However, the auto restart feature will attempt to restart the fan after approximately 60 seconds. If the high differential pressure was due to HELB damper closure (see EC 388742 and EC 389635) following a turbine building high energy line break, the turbine building pressure will have decreased to the point where the restarted fan can re-open the HELB dampers and return the ventilation system to operation. If the high differential pressure was due to a condition that does not clear within approximately 60 seconds, the restarted fan will trip again on high differential pressure and will then be blocked from further restart attempts until and operator investigates and resets the trip.

The automatic restoration of an affected VE system following a high energy line break in the turbine building will eliminate the need for a manual restoration of the system by an operator following the initial VE fan high differential pressure trip.

Like the existing VE equipment, a malfunction of the new equipment would not affect the availability of the redundant VE train. This is consistent with the system design bases and safety analyses requirements.

Summary of Conclusion for the Activity's 50.59 Review:
(*Provide justification for the conclusion, including sufficient detail to recognize and understand the essential arguments leading to the conclusion. Provide more than a simple statement that a 50.59 Screening, 50.59 Evaluation, or a License Amendment Request, as applicable, is not required.*)

The proposed activity involves the installation of a new fan auto restart feature on the miscellaneous electric equipment room ventilation system fans to help mitigate the consequences of a high energy line break in the turbine building. Following installation of this feature, the VE system will continue to be capable of performing its UFSAR-described design functions of: maintaining the room temperatures in accordance with equipment requirements, maintaining the room at atmospheric pressure when the supply fans are in full outside air mode, and maintaining ventilation of the battery area to limit the accumulation of hydrogen, as described in the UFSAR. As at present, the failure of a ventilation system fan would lead to the loss of one train of the VE ventilation system. The loss of one train does not affect the safe shutdown capability of the station since independent ventilation systems are provided for each redundant division.

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood Units 1 and 2

Activity/Document Number: EC 388473 / 388944 / DRP 14-084 **Revision Number:** 0 / 0 / 0

Title: Install Time Delayed Auto-Restart For U-1 (U-2) VE Fans In Support of HELB Mitigation Strategy

New HELB dampers, installed under a separate activity, will be available to permit air flow through the room both during normal ventilation system operation and shortly after a nearby turbine building high energy line break, allowing the ventilation system to continue to perform its ventilation and cooling functions.

A 50.59 Evaluation (BRW-E-2013-250) was performed to address two potential adverse effects of the proposed activity:

- The replacement of the current *manual* method of restoring room ventilation following its isolation in the event of a nearby high energy line break in the turbine building with an *automatic* method involving auto restart of the affected fans and the resultant re-opening of the HELB dampers
- The potential adverse effect on a VE fan from automatically restarting the fan after an existing equipment protection feature (fan high differential pressure trip) had stopped the fan

Based on the quality classification and testing of the new components, and because the proposed activity reduces the likelihood of a malfunction of the electrical equipment in the VE areas, Evaluation BRW-E-2013-250 concluded that the potential adverse effects of the automatic system restoration following a HELB and the automatic fan restart following a trip on high differential pressure did not cause more than a minimal increase in the likelihood of a malfunction of an SSC important to safety previously evaluated in the UFSAR.

The new fan auto restart feature does not involve a change to a procedure that adversely affects how UFSAR-described SSC design functions are performed or controlled. However the change from manual to automatic restoration of room ventilation following its isolation in response to a turbine building high energy line break was addressed in the evaluation. As discussed in the previous paragraph, the evaluation concluded that this change did not cause more than a minimal increase in the likelihood of a malfunction of an SSC important to safety previously evaluated in the UFSAR.

The analyses performed in support of the new fan auto restart feature and replacement damper assemblies do not involve UFSAR-described methodologies or alternate methodologies used in establishing the design bases or in the safety analyses.

The VE system and associated components will not be utilized or controlled in a manner that is outside the reference bounds for their design or that is inconsistent with analyses or descriptions in the UFSAR. Since the VE system is not addressed in the Technical Specification or Operating License, no change to these documents is required.

In conclusion, the proposed activity does not require prior approval by the NRC, and the activity can be implemented per the governing procedure.

Attachments:
Attach all 50.59 Review forms completed, as appropriate.

Forms Attached: (Check all that apply.)

☐	**Applicability Review**				
☒	**50.59 Screening**	**50.59 Screening No.**	**BRW-S-2013-249**	**Rev.**	**0**
☒	**50.59 Evaluation**	**50.59 Evaluation No.**	**BRW-E-2013-250**	**Rev.**	**0**

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood Unit 1 and 2

Activity/Document Number: EC 388742 / EC389635/ DRP 14-084 **Revision Number:** 0 / 0 /0

Title: "Install HELB Dampers for Div 11/12 MEER Room Div. 11/12 to Support HELB Project" and "Install HELB Dampers for Div 21/22 MEER Room Div. 21/22 to Support HELB Project"

NOTE: For 50.59 Evaluations, information on this form will provide the basis for preparing the biennial summary report submitted to the NRC in accordance with the requirements of 10 CFR 50.59(d)(2).

Description of Activity:
(*Provide a brief, concise description of what the proposed activity involves.*)

The proposed activity consists of two engineering changes, one for Unit 1 and one for Unit 2:

- EC 388742 – Install HELB Dampers for Div 11/12 MEER Room Div. 11/12 to Support HELB Project
- EC 389635 – Install HELB Dampers for Div 21/22 MEER Room Div. 21/22 to Support HELB Project

The proposed activity consists of the installation of new Miscellaneous Electrical Equipment Room (MEER) Ventilation System (VE) high energy line break (HELB) damper assemblies. These assemblies consist of new backdraft / reverse flow dampers and fire dampers which replace existing fire dampers 1(2)VE05Y and 1(2)VE07Y. The HELB damper assemblies are to be installed in ventilation openings in the Div 11/12 (21/22) Miscellaneous Electrical Equipment Rooms in support of a High Energy Line Break (HELB) Mitigation Strategy.

This engineering change will result in the following:

- Installation of new backdraft / reverse flow damper sections, in the openings connecting the MEER ventilation systems with the turbine building, which will close on a turbine building HELB in order to prevent the effects of the HELB from impacting the room environment
- Replacement of the fire dampers and associated thermal links (fusible link) in the openings connecting the MEER ventilation systems with the turbine building

The activity – along with EC 388473 and EC 388944, which install a time-delayed automatic restart feature for the VE fans – is being undertaken to address a vulnerability identified during a review of the effects of certain high energy line breaks in the turbine building which could affect redundant trains of safety-related equipment.

EC 388742 and EC 389635 modify the configuration of the following VE system fire dampers:

- 1(2) VE05Y Div 12 (22) MEER fire damper
- 1(2) VE07Y Div 11 (21) MEER fire damper

The existing fire dampers, which are installed in the openings between the VE-served room and the turbine building, allow air in the room to be exhausted to the turbine building. These fire dampers will be removed, and a new assembly consisting of a new fire damper and two backdraft / reverse flow damper sections will be installed in each opening to provide faster closure in response to a turbine building HELB. The new HELB backdraft / reverse flow damper sections are open when the associated VE exhaust fan is in operation and requires exhaust to the turbine building, but will close upon detection of reverse flow (air flow from turbine building to the room). In this way they will perform the immediate high energy line break mitigation function for which the affected fire dampers were previously credited. Consistent with the existing fire dampers, the replacement fire dampers are designed to remain normally open but to close on a high temperature caused by a fire or fire detection signal for the room fire protection system, in order to interrupt the flow of air and to restrict the passage of flame.

The existing thermal links (fusible links) for the affected rooms have a temperature rating of 165°F. The fusible links on fire dampers 1(2)VE05Y and 1(2)VE07Y maintain the same setpoint temperature. The temperature rating of the fusible links is high enough that the fire dampers will remain open in the event of a nearby high energy line break. However, the dampers will close after the links reaches the rated temperature in the event of a fire. In this way, the fire damper can continue to perform its fire protection function, but its closure will no longer be credited with any high energy line break mitigation function.

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood Unit 1 and 2

Activity/Document Number: EC 388742 / EC389635/ DRP 14-084 **Revision Number:** 0 / 0 /0

Title: "Install HELB Dampers for Div 11/12 MEER Room Div. 11/12 to Support HELB Project" and "Install HELB Dampers for Div 21/22 MEER Room Div. 21/22 to Support HELB Project"

Because the new damper assemblies will extend a few inches into the turbine building, deflectors will be installed (under a separate activity, EC 390805) to protect the new HELB dampers from damage due to any overhead objects in the turbine building which might come loose during a seismic event.

Reason for Activity:
(*Discuss why the proposed activity is being performed.*)

The proposed activity provides an improved method for protecting electrical equipment in areas serviced by the VE system from the effects of a nearby high energy line break in the turbine building.

The current strategy for mitigating the effects of such breaks, as described in the UFSAR, credits closure of the affected fire dampers as the result of the thermal link temperature exceeding its setting due to the high temperatures in the vicinity of the piping failure. The fire damper closure results in tripping of the ventilation system fans on high differential pressure once the damper closes and blocks the normal ventilation path from the affected room to the turbine building. Room ventilation is restored at a later time via operator action. Analyses were performed to demonstrate that the room heat up during the period that ventilation is lost would not cause required electrical equipment to become unavailable.

However, a recent review of the effects of a turbine building high energy line break determined that the closure of the affected fire dampers might not occur in the time frame assumed in the analyses. In order to address this vulnerability, the proposed activity will reconfigure the dampers to allow for restoration of the VE system shortly after a high energy line break in the turbine building. The installation of the HELB dampers will provide for quick isolation of the turbine building ventilation path following a turbine building HELB event. These new HELB dampers will provide protection to the affected rooms from a turbine building HELB steam release and will also allow for restoration of the ventilation system in the affected room after the turbine building HELB event is over. The prompt restoration of the affected room ventilation systems will allow for maintaining the affected rooms as a mild environment following a turbine building HELB to ensure that electrical equipment in the affected rooms will remain available.

Effect of Activity:
(*Discuss how the activity impacts plant operations, design bases, or safety analyses described in the UFSAR.*)

As described above, the current strategy for coping with a nearby high energy line break in the turbine building relies on closure of the fire damper, which results in a trip of the fan on high differential pressure and manual restoration of room ventilation by the operator at a later time.

If a fan high differential pressure condition occurs due to HELB damper closure following a turbine building high energy line break, the turbine building pressure will then decrease to the point where the fans can be restarted and re-open the HELB dampers and return the ventilation system to operation.

The new HELB dampers will remain open when the VE system exhaust fan is exhausting to the turbine building. The new HELB dampers are fast acting and will close quickly upon detection of reverse flow from the turbine building to minimize the affected room exposure to a turbine building HELB. The fire dampers will remain open unless the thermal links are actuated by the high temperatures characteristic of a fire. The temperature setpoint (165 °F) of the fusible links on fire dampers 1(2)VE05Y and 1(2)VE07Y has been evaluated to ensure this setpoint is adequate to reduce the possibility of closure of the fire dampers in the event of a turbine building HELB, allowing for prompt restoration of the ventilation systems following the HELB event. Thus the new dampers will not require new operator actions. The HELB dampers will allow for restoration of an affected VE system following a high energy line break in the turbine building and eliminate the need for a manual restoration of room ventilation by an operator.

Like the existing VE equipment, a malfunction of the new equipment would not affect the availability of the redundant VE train. This is consistent with the system design bases and safety analyses requirements.

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood Unit 1 and 2

Activity/Document Number: EC 388742 / EC389635/ DRP 14-084 **Revision Number:** 0 / 0 /0

Title: "Install HELB Dampers for Div 11/12 MEER Room Div. 11/12 to Support HELB Project" and "Install HELB Dampers for Div 21/22 MEER Room Div. 21/22 to Support HELB Project"

Summary of Conclusion for the Activity's 50.59 Review:
(Provide justification for the conclusion, including sufficient detail to recognize and understand the essential arguments leading to the conclusion. Provide more than a simple statement that a 50.59 Screening, 50.59 Evaluation, or a License Amendment Request, as applicable, is not required.)

Following installation of the new damper assemblies, the miscellaneous electric equipment room ventilation (VE) system will continue to be capable of performing its UFSAR-described design functions of: maintaining the room temperatures in accordance with equipment requirements, maintaining the room at atmospheric pressure when the supply fans are in full outside air mode, and maintaining ventilation of the battery area to limit the accumulation of hydrogen, as described in the UFSAR. The failure of a damper to open when required would lead to the same failure effects as the failure of an existing fire damper to open: loss of one train of the VE system. The loss of one train does not affect the safe shutdown capability of the station since independent ventilation systems are provided for each redundant division.

New HELB dampers will be available to perform the immediate high energy line break mitigation function for which the affected fire dampers were previously credited. The fire dampers will no longer be needed for rapid isolation of the affected areas from the adverse environmental effects of a turbine building high energy line break, but will remain open to permit air flow through the rooms both during normal ventilation system operation and following a nearby high energy line break, allowing the ventilation system to continue to perform its ventilation and cooling functions.

A 50.59 Evaluation was performed (BRW-E-2013-252) to address two potential adverse effects of the proposed activity:

- The replacement of the current *manual* method of restoring room ventilation following its isolation in the event of a nearby high energy line break in the turbine building with an *automatic* method involving re-opening of the HELB dampers when the fans are restarted
- The potential adverse effect on the reliability of the VE system caused by the addition of the new backdraft / reverse flow damper sections, where the failure of either could result in a loss of one VE train

Based on the quality classification and testing of the new components, and because the proposed activity reduces the likelihood of a malfunction of the electrical equipment in the VE areas, the evaluation concluded that these potential adverse effects did not cause more than a minimal increase in the likelihood of a malfunction of an SSC important to safety previously evaluated in the UFSAR.

The replacement damper assemblies do not involve a change to a procedure that adversely affects how UFSAR-described SSC design functions are performed or controlled. However, the change from manual to automatic restoration (unassisted opening of HELB dampers) of room ventilation following its isolation in response to a turbine building high energy line break was addressed in 50.59 Evaluation BRW-E-2013-252. As discussed in the previous paragraph, the evaluation concluded that this change did not cause more than a minimal increase in the likelihood of a malfunction of an SSC important to safety previously evaluated in the UFSAR.

The analyses performed in support of the replacement damper assemblies do not involve UFSAR-described methodologies or alternate methodologies used in establishing the design bases or in the safety analyses.

The VE system and associated components will not be utilized or controlled in a manner that is outside the reference bounds for their design or that is inconsistent with analyses or descriptions in the UFSAR. Since the VE system is not addressed in the Technical Specification or Operating License, no change to these documents is required.

In conclusion, the proposed activity does not require prior approval by the NRC, and the activity can be implemented per the governing procedure.

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood Unit 1 and 2

Activity/Document Number: EC 388742 / EC389635/ DRP 14-084 **Revision Number:** 0 / 0 /0

Title: "Install HELB Dampers for Div 11/12 MEER Room Div. 11/12 to Support HELB Project" and "Install HELB Dampers for Div 21/22 MEER Room Div. 21/22 to Support HELB Project"

Attachments:
Attach all 50.59 Review forms completed, as appropriate.

Forms Attached: (Check all that apply.)

☐	**Applicability Review**				
☒	**50.59 Screening**	**50.59 Screening No.**	**BRW-S-2013-251**	**Rev.**	**0**
☒	**50.59 Evaluation**	**50.59 Evaluation No.**	**BRW-E-2013-252**	**Rev.**	**0**

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood Units 1 and 2

Activity/Document Number: EC 388397 / EC 388947 / DRP 14-084 **Revision Number:** 0 / 0 / 0

Title: "Install HELB Dampers and Install High Temp. Thermal Links on Fire Dampers for Div. 11/12 ESF Switchgear Rooms and Div. 12 Cable Spreading Rm. Install HELB Damper on Non-ESF Room" and "Install HELB Dampers and High Temperature Thermal Links for Div. 21/22 ESF Switchgear Rooms and Div. 22 Cable Spreading RM Fire DMPRs. Install HELB Damper on Non-ESF SWGR Room"

NOTE: For 50.59 Evaluations, information on this form will provide the basis for preparing the biennial summary report submitted to the NRC in accordance with the requirements of 10 CFR 50.59(d)(2).

Description of Activity:
(*Provide a brief, concise description of what the proposed activity involves.*)

The proposed activity consists of two engineering changes, one for Unit 1 and one for Unit 2:

- EC 388397 – Install HELB Dampers and Install High Temp. Thermal Links on Fire Dampers for Div. 11/12 ESF Switchgear Rooms and Div. 12 Cable Spreading Rm. Install HELB Damper on Non-ESF Room
- EC 388947 – Install HELB Dampers and High Temperature Thermal Links for Div. 21/22 ESF Switchgear Rooms and Div. 22 Cable Spreading RM Fire DMPRs. Install HELB Damper on Non-ESF SWGR Room

The proposed activity consists of the installation of new Switchgear Room Ventilation System (VX) high energy line break (HELB) damper assemblies. These assemblies consist of new backdraft / reverse flow dampers and fire dampers which replace existing fire dampers 1(2)VX13Y, 1(2)VX17Y, 1(2)VX20Y, 1(2)VX21Y and 1(2)VX28Y. The HELB damper assemblies are to be installed, as part of a turbine building HELB mitigation strategy, in ventilation openings that supply air to the ESF Switchgear Rooms, Div 12 (22) Cable Spreading Room, Electrical Pipe Tunnel Rooms, and Non-ESF Switchgear Rooms. .

These engineering changes will result in the following:

- Installation of new backdraft / reverse flow damper sections, in the openings connecting the switchgear and cable spreading room ventilation systems with the turbine building, which will close on a turbine building HELB in order to prevent the effects of the HELB from impacting the room environment.
- Replacement of the fire dampers and associated thermal links (electro-thermal link (ETL) or fusible link) in the openings connecting the switchgear and cable spreading room ventilation systems with the turbine building.

The activity – along with EC 388474 and EC 388945, which install a time-delayed automatic restart feature for the VX fans – is being undertaken to address a vulnerability identified during a review of the effects of certain high energy line breaks in the turbine building which could affect redundant trains of safety-related equipment.

EC 388397 and EC 388947 modify the configuration of the following VX system fire dampers:

- 1(2)VX13Y, Non-ESF Switchgear Room fire damper
- 1(2)VX17Y, Div 12 (22) ESF Switchgear Room fire damper
- 1(2)VX20Y, Div 11 (21) ESF Switchgear Room fire damper
- 1(2)VX21Y, Electrical Pipe Tunnel fire damper
- 1(2)VX28Y, Div 12 (22) Cable Spreading Room fire damper

The existing fire dampers, which are installed in the openings between the VX-served room and the turbine building, allow air in the room to be exhausted to the turbine building. These fire dampers will be removed, and a new assembly consisting of a new fire damper and two backdraft / reverse flow damper sections will be installed in each opening to provide faster closure in response to a turbine building HELB. The new HELB backdraft / reverse flow damper sections are open when the associated VX fan is in operation and requires exhaust to the turbine building, but will close upon detection of reverse flow (air flow from turbine building into the room). In this way, they will perform the immediate high energy line break mitigation function for which the affected fire dampers were previously credited. Consistent with the existing fire dampers, the replacement fire dampers are designed to remain normally open but to close on a high temperature caused by a fire or fire detection signal for the room fire protection system, in order to interrupt the flow of air and to restrict the passage of flame. The closure of fire dampers

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood Units 1 and 2

Activity/Document Number: EC 388397 / EC 388947 / DRP 14-084 **Revision Number:** 0 / 0 / 0

Title: "Install HELB Dampers and Install High Temp. Thermal Links on Fire Dampers for Div. 11/12 ESF Switchgear Rooms and Div. 12 Cable Spreading Rm. Install HELB Damper on Non-ESF Room" and "Install HELB Dampers and High Temperature Thermal Links for Div. 21/22 ESF Switchgear Rooms and Div. 22 Cable Spreading RM Fire DMPRs. Install HELB Damper on Non-ESF SWGR Room"

1(2)VX21Y and 1(2)VX28Y will also help contain the carbon dioxide (CO_2) released as part of the fire protection system response to the fire within the Electrical Pipe Tunnel and Cable Spreading Rooms.

The existing thermal links (ETLs and fusible links) for the affected rooms have a temperature rating of 165°F. The fusible links on fire dampers 1(2)VX17Y and 1(2)VX20Y are replaced with fusible links designed to melt at 286°F, whereas the ETLs on fire dampers 1(2)VX21Y and 1(2)VX28Y are replaced with new ETLs designed to actuate at 281°F. The fusible link on fire damper 1(2)VX13Y, however, will be replaced with a new fusible link designed to melt at the original 165°F. The temperature ratings of the replacement links are high enough that the fire dampers will remain open in the event of a nearby high energy line break. However, the dampers will close after the links reaches the rated temperature in the event of a fire. In this way, the fire damper can continue to perform its fire protection function, but its closure will no longer be credited with any high energy line break mitigation function.

Because the new damper assemblies will extend a few inches into the turbine building, deflectors will be installed (under a separate activity, EC 390805) to protect the new HELB dampers from damage due to any overhead objects in the turbine building which might come loose during a seismic event.

Reason for Activity:
(*Discuss why the proposed activity is being performed.*)

The proposed activity provides an improved method for protecting electrical equipment in areas serviced by the VX system from the effects of a nearby high energy line break in the turbine building.

The current strategy for mitigating the effects of such breaks, as described in the UFSAR, credits closure of the affected fire dampers as the result of the thermal link temperature exceeding its setting due to the high temperatures in the vicinity of the piping failure. The fire damper closure results in tripping of the ventilation system fans on high differential pressure once the damper closes and blocks the normal ventilation path from the affected room to the turbine building. Room ventilation is restored at a later time via operator action. Analyses were performed to demonstrate that the room heat up during the period that ventilation is lost would not cause required electrical equipment to become unavailable.

However, a recent review of the effects of a turbine building high energy line break determined that the closure of the affected fire dampers might not occur in the time frame assumed in the analyses. In order to address this vulnerability, the proposed activity will reconfigure the dampers to allow for restoration of the VX system shortly after a high energy line break in the turbine building. The installation of the HELB dampers will provide for quick isolation of the turbine building ventilation path following a turbine building HELB event. These new HELB dampers will provide protection to the affected rooms from a turbine building HELB steam release and will also allow for restoration of the ventilation system in the affected room after the turbine building HELB event is over. The prompt restoration of the affected room ventilation systems will allow for maintaining the affected rooms as a mild environment following a turbine building HELB to ensure that electrical equipment in the affected rooms will remain available.

Effect of Activity:
(*Discuss how the activity impacts plant operations, design bases, or safety analyses described in the UFSAR.*)

As described above, the current strategy for coping with a nearby high energy line break in the turbine building relies on closure of the fire damper, which results in a trip of the fan on high differential pressure and manual restoration of room ventilation by the operator at a later time.

If a fan high differential pressure condition occurs due to HELB damper closure following a turbine building high energy line break, the turbine building pressure will then decrease to the point where the fans can be restarted and re-open the HELB dampers and return the ventilation system to operation.

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood Units 1 and 2

Activity/Document Number: EC 388397 / EC 388947 / DRP 14-084 **Revision Number:** 0 / 0 / 0

Title: "Install HELB Dampers and Install High Temp. Thermal Links on Fire Dampers for Div. 11/12 ESF Switchgear Rooms and Div. 12 Cable Spreading Rm. Install HELB Damper on Non-ESF Room" and "Install HELB Dampers and High Temperature Thermal Links for Div. 21/22 ESF Switchgear Rooms and Div. 22 Cable Spreading RM Fire DMPRs. Install HELB Damper on Non-ESF SWGR Room"

The new HELB dampers will remain open when the VX system supply fan is exhausting to the turbine building. The new HELB dampers are fast acting and will close quickly upon detection of reverse flow from the turbine building to minimize the affected room exposure to a turbine building HELB. The fire dampers will remain open unless the thermal links are actuated by the high temperatures characteristic of a fire. The higher temperature setpoint (increased from the original 165 °F) fusible links on fire dampers 1(2)VX17Y and 1(2)VX20Y (replaced with fusible links designed to melt at 286°F) and ETLs on fire dampers 1(2)VX21Y and 1(2)VX28Y (replaced with new ETLs designed to melt at 281°F) will help to reduce the possibility of closure of the fire dampers in the event of a turbine building HELB, allowing for prompt restoration of the ventilation systems following the HELB event. Thus the new dampers will not require new operator actions. The HELB dampers will allow for restoration of an affected VX system following a high energy line break in the turbine building and eliminate the need for a manual restoration of room ventilation by an operator.

Like the existing VX equipment, a malfunction of the new equipment would not affect the availability of the redundant VX train. This is consistent with the system design bases safety analyses requirements.

Summary of Conclusion for the Activity's 50.59 Review:
(Provide justification for the conclusion, including sufficient detail to recognize and understand the essential arguments leading to the conclusion. Provide more than a simple statement that a 50.59 Screening, 50.59 Evaluation, or a License Amendment Request, as applicable, is not required.)

Following installation of the new damper assemblies, the engineered safety features switchgear ventilation (VX) system will continue to be capable of performing its UFSAR-described design function of removing equipment heat to maintain the room temperatures in accordance with equipment requirements under normal, abnormal, and accident conditions, as described in the UFSAR. The failure of a damper to open when required would lead to the same failure effects as the failure of an existing fire damper to open: loss of one train of the VX ventilation system. The loss of one train does not affect the safe shutdown capability of the station since independent switchgear ventilation systems are provided for each redundant division of switchgear.

New HELB dampers will be available to perform the immediate high energy line break mitigation function for which the affected fire dampers were previously credited. The fire dampers will no longer be needed for rapid isolation of the affected areas from the adverse environmental effects of a turbine building high energy line break, but will remain open to permit air flow through the room both during normal ventilation system operation and following a nearby high energy line break, allowing the ventilation system to continue to perform its function of removing equipment heat to maintain the room temperatures in accordance with equipment requirements.

A 50.59 Evaluation was performed (BRW-E-2013-254) to address two potential adverse effects of the proposed activity:

- The replacement of the current *manual* method of restoring room ventilation following its isolation in the event of a nearby high energy line break in the turbine building with an *automatic* method involving re-opening of the HELB dampers when the fans are restarted
- The potential adverse effect on the reliability of the VX system caused by the addition of the new backdraft / reverse flow damper sections, where the failure of either could result in a loss of one VX train

Based on the quality classification and testing of the new components, and because the proposed activity reduces the likelihood of a malfunction of the electrical equipment in the VX areas, the evaluation concluded that these potential adverse effects did not cause more than a minimal increase in the likelihood of a malfunction of an SSC important to safety previously evaluated in the UFSAR.

The replacement damper assemblies do not involve a change to a procedure that adversely affects how UFSAR-described SSC design functions are performed or controlled. However, the change from manual to automatic restoration (unassisted opening of HELB dampers) of room ventilation following its isolation in response to a turbine building high energy line break was addressed in 50.59 Evaluation BRW-E-2013-254. As discussed in the previous paragraph, the evaluation concluded that this change did not

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood Units 1 and 2

Activity/Document Number: EC 388397 / EC 388947 / DRP 14-084 **Revision Number:** 0 / 0 / 0

Title: "Install HELB Dampers and Install High Temp. Thermal Links on Fire Dampers for Div. 11/12 ESF Switchgear Rooms and Div. 12 Cable Spreading Rm. Install HELB Damper on Non-ESF Room" and "Install HELB Dampers and High Temperature Thermal Links for Div. 21/22 ESF Switchgear Rooms and Div. 22 Cable Spreading RM Fire DMPRs. Install HELB Damper on Non-ESF SWGR Room"

cause more than a minimal increase in the likelihood of a malfunction of an SSC important to safety previously evaluated in the UFSAR.

The analyses performed in support of the replacement damper assemblies do not involve UFSAR-described methodologies or alternate methodologies used in establishing the design bases or in the safety analyses.

The VX system and associated components will not be utilized or controlled in a manner that is outside the reference bounds for their design or that is inconsistent with analyses or descriptions in the UFSAR. Since the VX system is not addressed in the Technical Specification or Operating License, no change to these documents is required.

In conclusion, the proposed activity does not require prior approval by the NRC, and the activity can be implemented per the governing procedure.

Attachments:
Attach all 50.59 Review forms completed, as appropriate.

Forms Attached: (Check all that apply.)

☐	**Applicability Review**				
☒	**50.59 Screening**	**50.59 Screening No.**	**BRW-S-2013-253**	**Rev.**	**0**
☒	**50.59 Evaluation**	**50.59 Evaluation No.**	**BRW-E-2013-254**	**Rev.**	**0**

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood Units 1 and 2

Activity/Document Number: EC 388398 / EC 388948 / DRP 14-084 **Revision Number:** 0 / 0 / 0

Title: "Install HELB Dampers and Install High Temperature Thermal Links on Fire Dampers for Div. 11/12 EDG Room" and "Install HELB Dampers and High Temperature Thermal Links for Div. 21/22 EDG Room Fire Dampers"

NOTE: For 50.59 Evaluations, information on this form will provide the basis for preparing the biennial summary report submitted to the NRC in accordance with the requirements of 10 CFR 50.59(d)(2).

Description of Activity:
(*Provide a brief, concise description of what the proposed activity involves.*)

The proposed activity consists of two engineering changes, one for Unit 1 and one for Unit 2:

- EC 388398 – Install HELB Dampers and Install High Temperature Thermal Links on Fire Dampers for Div. 11/12 EDG Room
- EC 388948 – Install HELB Dampers and High Temperature Thermal Links for Div. 21/22 EDG Room Fire Dampers

The proposed activity consists of the installation of new Diesel Generator Room Ventilation System (VD) high energy line break (HELB) damper assemblies. These assemblies consist of new backdraft / reverse flow damper sections and fire dampers which replace existing fire dampers 1(2)VD17YA, 1(2)VD17YB, 1(2)VD24YA, and 1(2)VD24YB. The HELB damper assemblies are to be installed, as part of a turbine building HELB mitigation strategy, in ventilation openings that supply air to the diesel generator rooms.

These engineering changes will result in the following:

- Installation of new backdraft / reverse flow damper sections, in the openings connecting the diesel generator room ventilation systems with the turbine building, which will close on a turbine building HELB in order to prevent the effects of the HELB from impacting the room environment.
- Replacement of the fire dampers and associated electro-thermal links (ETLs) in the openings connecting the diesel generator room ventilation systems with the turbine building.

The activity – along with EC 388475 and EC 388946, which install a time-delayed automatic restart feature for the VD supply fans – is being undertaken to address a vulnerability identified during a review of the effects of certain high energy line breaks in the turbine building which could affect redundant trains of safety-related equipment.

EC 388398 and EC 388948 modify the configuration of the following VD system fire dampers:

- 1(2)VD17YA DG Room 1(2)B fire damper
- 1(2)VD17YB DG Room 1(2)B fire damper
- 1(2)VD24YA DG Room 1(2)A fire damper
- 1(2)VD24YB DG Room 1(2)A fire damper

The existing fire dampers, which are installed in the opening between the VD-served room and the turbine building, allow for the flow of air between the diesel generator rooms and the turbine building. These fire dampers will be removed, and a new assembly consisting of a new fire damper and two backdraft / reverse flow damper sections will be installed in each opening to provide faster closure in response to a turbine building HELB. The new HELB backdraft / reverse flow damper sections are open when the VD supply or exhaust fans are in operation but will close upon detection of HELB flow from the turbine building into the room. After the HELB pressure dissipates in the turbine building, the HELB dampers will reopen. In this way, the HELB backdraft / reverse flow dampers will perform the immediate high energy line break mitigation function for which the affected fire dampers were previously credited and will support the restoration of room ventilation following the turbine building HELB. Consistent with the existing fire dampers, the replacement fire dampers are designed to remain normally open but to close on a high temperature caused by a fire or fire detection signal for the room fire protection system, in order to interrupt the flow of air and to restrict the passage of flame. The closure of the fire dampers will also help contain the carbon dioxide (CO_2) released as part of the fire protection system response to a fire within the diesel generator rooms.

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood Units 1 and 2

Activity/Document Number: EC 388398 / EC 388948 / DRP 14-084 **Revision Number:** 0 / 0 / 0

Title: "Install HELB Dampers and Install High Temperature Thermal Links on Fire Dampers for Div. 11/12 EDG Room" and "Install HELB Dampers and High Temperature Thermal Links for Div. 21/22 EDG Room Fire Dampers"

The existing ETLs for the affected rooms are designed to melt upon exposure to temperatures of 165°F or greater. The replacement ETLs are designed to melt at temperatures of 281°F or greater. (Like the existing ETLs, the replacement ETLs will also be actuated by the fire detection system.) The temperature rating of the replacement links is high enough that the fire dampers will remain open in the event of a nearby high energy line break. However, the dampers will close after the links reach the rated temperature in the event of a fire. In this way, the fire damper can continue to perform its fire protection function, but its closure will no longer be credited with any high energy line break mitigation function.

Because the new damper assemblies will extend a few inches into the turbine building, deflectors will be installed (under a separate activity, EC 390805) to protect the new HELB dampers from damage due to any overhead objects in the turbine building which might come loose during a seismic event.

Reason for Activity:
(*Discuss why the proposed activity is being performed.*)

The proposed activity provides an improved method for protecting electrical equipment in areas serviced by the VD system from the effects of a nearby high energy line break in the turbine building.

The current strategy for mitigating the effects of such breaks, as described in the UFSAR, credits closure of the affected fire dampers as the result of the thermal link temperature exceeding its setting due to the high temperatures in the vicinity of the piping failure. The fire damper closure results in tripping of the ventilation system fans on high differential pressure once the damper closes and blocks the normal ventilation path between the affected room and the turbine building. Room ventilation is restored at a later time via operator action. Analyses were performed to demonstrate that the room heat up during the period that ventilation is lost would not cause required electrical equipment to become unavailable.

However, a recent review of the effects of a turbine building high energy line break determined that the closure of the affected fire dampers might not occur in the time frame assumed in the analyses. In order to address this vulnerability, the proposed activity will reconfigure the dampers to allow for restoration of the VD system shortly after a high energy line break in the turbine building. The installation of the HELB dampers will provide for quick isolation of the turbine building ventilation path following a turbine building HELB event. These new HELB dampers will provide protection to the affected rooms from a turbine building HELB steam release and will also allow for restoration of the ventilation system in the affected room after the turbine building HELB event is over. The prompt restoration of the affected room ventilation systems will allow for maintaining the affected rooms as a mild environment following a turbine building HELB to ensure that electrical equipment in the affected rooms will remain available.

Effect of Activity:
(*Discuss how the activity impacts plant operations, design bases, or safety analyses described in the UFSAR.*)

As described above, the current strategy for coping with a nearby high energy line break in the turbine building relies on closure of the fire damper, which results in trip of the fan on high differential pressure, and manual restoration of room ventilation by the operator at a later time.

The new HELB dampers will remain open during normal operation when either the VD supply or VD exhaust fans are running. The new HELB dampers are fast acting and will close quickly upon detection of HELB reverse flow from the turbine building to minimize the affected room exposure to a turbine building HELB. After the HELB pressure dissipates in the turbine building, the HELB dampers will reopen. The fire dampers will remain open unless the thermal links are actuated by the high temperatures characteristic of a fire. The higher temperature setpoint (increased from the original 165°F to 281°F) on the fire damper ETLs will help to reduce the possibility of closure of the fire dampers in the event of a turbine building HELB, allowing for prompt restoration of the ventilation systems following the HELB event. Thus the new dampers will not require new operator actions. The HELB dampers will allow for restoration of an affected VD system following a high energy line break in the turbine building and eliminate the need for a manual restoration of room ventilation by an operator.

Station/Unit(s): Braidwood Units 1 and 2

Activity/Document Number: EC 388398 / EC 388948 / DRP 14-084 **Revision Number:** 0 / 0 / 0

Title: "Install HELB Dampers and Install High Temperature Thermal Links on Fire Dampers for Div. 11/12 EDG Room" and "Install HELB Dampers and High Temperature Thermal Links for Div. 21/22 EDG Room Fire Dampers"

Like the existing VD equipment, a malfunction of the new equipment would not affect the availability of the redundant VD train. This is consistent with the system design bases safety analyses requirements.

Summary of Conclusion for the Activity's 50.59 Review:
(Provide justification for the conclusion, including sufficient detail to recognize and understand the essential arguments leading to the conclusion. Provide more than a simple statement that a 50.59 Screening, 50.59 Evaluation, or a License Amendment Request, as applicable, is not required.)

Following installation of the new damper assemblies, the diesel generator room and day tank room ventilation (VD) system will continue to be capable of performing its UFSAR-described design functions of: (1) continuous ventilation for the day tank room during normal plant operation, (2) ventilation for the diesel generator when it operates, and (3) a source of combustion air for the diesel generator. The system will continue to maintain the room temperatures in accordance with equipment requirements. The failure of a damper to open when required would lead to the same failure effects as the failure of an existing fire damper to open: loss of one train of the VD system. The loss of one train does not affect the safe shutdown capability of the station since independent ventilation systems are provided for each redundant division.

New HELB dampers will be available to perform the immediate high energy line break mitigation function for which the affected fire dampers were previously credited. The fire dampers will no longer be needed for rapid isolation of the affected areas from the adverse environmental effects of a turbine building high energy line break, but will remain open to permit air flow through the room both during normal ventilation system operation and following a nearby high energy line break, allowing the ventilation system to continue to perform its ventilation and cooling functions.

A 50.59 evaluation was performed (BRW-E-2013-256) to address two potential adverse effects of the proposed activity:

- The replacement of the current *manual* method of restoring room ventilation following its isolation in the event of a nearby high energy line break in the turbine building with an *automatic* method involving re-opening of the HELB dampers
- The potential adverse effect on the reliability of the VD system caused by the addition of the new backdraft / reverse flow damper sections, where the failure of either could result in a loss of one VD train

Based on the quality classification and testing of the new components, and because the proposed activity reduces the likelihood of a malfunction of the electrical equipment in the VD areas, the evaluation concluded that the potential adverse effects did not cause more than a minimal increase in the likelihood of a malfunction of an SSC important to safety previously evaluated in the UFSAR.

The replacement damper assemblies do not involve a change to a procedure that adversely affects how UFSAR-described SSC design functions are performed or controlled. However, the change from manual to automatic restoration (unassisted opening of HELB dampers) of room ventilation following its isolation in response to a turbine building high energy line break was addressed in 50.59 Evaluation BRW-E-2013-256. As discussed in the previous paragraph, the evaluation concluded that this change did not cause more than a minimal increase in the likelihood of a malfunction of an SSC important to safety previously evaluated in the UFSAR.

The analyses performed as part of the replacement damper assemblies do not involve UFSAR-described methodologies or alternate methodologies used in establishing the design bases or in the safety analyses.

The VD system and associated components will not be utilized or controlled in a manner that is outside the reference bounds for their design or that is inconsistent with analyses or descriptions in the UFSAR. Since the VD system is not addressed in the Technical Specification or Operating License, and since implementation of the new design feature does not alter existing functions such addition to the Technical Specifications is required, no change to these documents is required.

In conclusion, the proposed activity does not require prior approval by the NRC, and the activity can be implemented per the governing procedure.

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood Units 1 and 2

Activity/Document Number: EC 388398 / EC 388948 / DRP 14-084 **Revision Number:** 0 / 0 / 0

Title: "Install HELB Dampers and Install High Temperature Thermal Links on Fire Dampers for Div. 11/12 EDG Room" and "Install HELB Dampers and High Temperature Thermal Links for Div. 21/22 EDG Room Fire Dampers"

Attachments:
Attach all 50.59 Review forms completed, as appropriate.

Forms Attached: (Check all that apply.)

☐	**Applicability Review**				
☒	**50.59 Screening**	**50.59 Screening No.**	BRW-S-2013-255	**Rev.**	0
☒	**50.59 Evaluation**	**50.59 Evaluation No.**	BRW-E-2013-256	**Rev.**	0

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood

Activity/Document Number: Corrective Action Assignment 01512303-03 **Revision Number:** 0

Title: Evaluation of Long-Term Removal from Service of the CVCS Positive Displacement Pump to Address 2013 NRC Inspection Finding

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NOTE: For 50.59 Evaluations, information on this form will provide the basis for preparing the biennial summary report submitted to the NRC in accordance with the requirements of 10 CFR 50.59(d)(2).

Description of Activity:

This evaluation is being performed to document the acceptability of long term operation with the Chemical and Volume Control System (CVCS) Positive Displacement Pump (PDP) out of service.

Reason for Activity:

Byron and Braidwood Stations made the decision early in plant life to not use the PDP for normal CVCS charging functions. The decision was based on the PDP's low capacity which made it unable to support station preferred Reactor Coolant System letdown flow rates for coolant chemistry control. The PDP was tagged out of service with no intent of performing maintenance. This constituted a plant configuration change which requires a review in accordance with 10 CFR 50.59. In 1997, Braidwood Station completed a 10 CFR 50.59 Safety Evaluation, BRW-SE-1997-676, to document the long term out of service on the PDP.

In May, 2013, the NRC issued Braidwood Station Integrated Inspection Report 05000456/2013002, 05000457/2013002. The Inspection Report identified a Severity Level IV finding associated with Safety Evaluation BRW-SE-1997-676. Specifically, the Finding indicated that

> A Licensee 10 CFR 50.59 evaluation performed in 1997 examined a number of indirect consequences, but failed to adequately evaluate the direct consequences that isolating and removing the CVCS PDPs from service would have on the CVCS PDP-supported safety functions as described in the UFSAR.

As a result of the Finding documented in the Inspection Report, Exelon committed to re-perform the Safety Evaluation to ensure the identified concern was addressed (Ref. IR 01512303).

Effect of Activity:

There is no impact on plant operations, design basis or safety analyses described in the UFSAR. This activity is addressing a historic decision to not utilize the CVCS PDP for normal charging duties. Revisions were made to the UFSAR in 1997 to reflect the potential long term removal from service of the PDP (ref. DRP 7-072). Procedures impacted by the unavailability of the PDP have already been revised.

Summary of Conclusion for the Activity's 50.59 Review:

The Evaluation utilized the statements made in the UFSAR and the NRC Safety Evaluation Report (SER) to identify relevant System, Structure and Component (SSC) Design Functions, Design Bases Functions, Equipment Important to Safety and what constitutes UFSAR descriptive information. The review confirmed that while the non-safety related PDP did have UFSAR specified functions, it is not considered to have any Design or Design Basis Functions and is not Equipment Important to Safety. The CVCS PDP is not credited in any Safety Analysis in the UFSAR for the mitigation of any accident or transient.

- *The PDP is not credited for mitigation of any transient or accident and is not the initiator of any transient or accident. Since the PDP is not the initiator of any accident or transient, the activity does not have the potential to increase in the frequency of occurrence of an accident previously evaluated in the UFSAR.*
- *Since the PDP is not credited for the mitigation of any accident or transient, the activity does not have the potential to increase in the consequences of an accident previously evaluated in the UFSAR.*

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood

Activity/Document Number: Corrective Action Assignment 01512303-03 **Revision Number:** 0

Title: Evaluation of Long-Term Removal from Service of the CVCS Positive Displacement Pump to Address 2013 NRC Inspection Finding

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- *Since the PDP is not the initiator of any accident or transient, the activity does not have the potential to create a possibility for an accident of a different type than any previously evaluated in the UFSAR.*
- *The long-term removal from service of the PDP does not affect any DBLFPB since the PDP is not credited for mitigating the consequences of any accident or transient and does not provide a support function for any equipment credited with protection of any DBLFPB.*
- *This long-term removal from service of the PDP modifies the normal system alignment that does not involve a method of evaluation as defined in LS-AA-104. Therefore, the removal of the PDP from service does not result in a departure from a method of evaluation described in the UFSAR used in establishing the design bases or in the safety analyses.*

The Evaluation performed an in-depth review of the Current Licensing Basis information related to the Design Basis Functions of the CVCS. The Evaluation demonstrated that the CVCS PDP does not have any UFSAR Design Basis Function as defined by 10 CFR 50.2 showing that the PDP was neither (1) required by, or otherwise necessary to comply with, regulations, license conditions, orders or technical specifications, nor (2) credited in safety analyses to meet NRC requirements. Excerpts from the UFSAR and from the NRC SER were used to demonstrate that the Safety Analyses associated with the CVCS credited only the safety related equipment and flow paths in the mitigation of events. It was shown that although a Failure Modes and Effects Analysis Table mentions the possibility of using the PDP for mitigative purposes, this is considered to be descriptive information, not a specified Design Basis Function for the PDP since the actual plant response to the event documented in the Safety Analysis does not credit any response from the PDP.

The Evaluation concluded, based on the Safety Analyses presented in the UFSAR and the statements of acceptance provided in the NRC SER, that the CVCS PDP is not considered to be Equipment Important to Safety since the PDP is neither (1) relied upon to mitigate accidents or transients; nor (2) equipment whose failure could prevent safety-related SSCs from fulfilling their Design Function. The PDP is not relied upon to mitigate any accident or transient. All UFSAR Safety Analyses credit use of the safety related centrifugal charging pumps. While some station non-safety related equipment is credited for mitigating transients (e.g. non-ESF Boric Acid Transfer pumps), the PDPs are not explicitly relied upon. The failure of the PDP would have no effect on any safety related or non-safety related SSC fulfilling its Design Function. No station equipment is dependent on the operational support of the PDP.

Based on this Evaluation, it was determined that the long term removal from service of the PDP does not have the potential to increase in the likelihood of occurrence, or increase in the consequences of, a malfunction of an SSC important to safety previously evaluated in the UFSAR. In addition, the activity does not create a possibility for a malfunction of an SSC important to safety with a different result than any previously evaluated in UFSAR since the documented Safety Analyses did not credit performance of the PDP so the results documented remain unaffected.

Attachments:
Attach all 50.59 Review forms completed, as appropriate.

Forms Attached: (Check all that apply.)

☐	**Applicability Review**				
☐	**50.59 Screening**	**50.59 Screening No.**		**Rev.**	
☒	**50.59 Evaluation**	**50.59 Evaluation No.**	**BRW-E-2014-41**	**Rev.**	**0**

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Braidwood Unit 2

Activity /Document Number: TRM Change #14-012 **Revision Number:** N/A

Title: Change In-Core Decay Time for A2R17

NOTE: For 50.59 Evaluations, information on this form will provide the basis for preparing the biennial summary report submitted to the NRC in accordance with the requirements of 10 CFR 50.59(d)(2).

Description of Activity:
(Provide a brief, concise description of what the proposed activity involves)

The proposed activity makes the following changes to the Technical Requirements Manual (TRM) to reduce the minimum required In-Core Decay Time (ICDT) for A2R17 from 100 hours to 95 hours:

- **Braidwood TRM Section 3.9.a, "Decay time," states "The reactor shall be subcritical for ≥ the last 100 hours (≥ 95 hours for A2R16)." This activity will revise this statement by replacing "(≥ 95 hours for A2R16)" with "(≥ 95 hours for A2R17)."**
- **Condition A under TRM 3.9.a states "Reactor subcritical for < 100 hours (< 95 hours for A2R16)". This activity will replace "(< 95 hours for A2R16)" with "(< 95 hours for A2R17)".**
- **Surveillance requirement TSR 3.9.a.1 will be revised by replacing "≥ 95 hours for A2R16" with "≥ 95 hours for A2R17".**

Reason for Activity:
(Discuss why the proposed activity is being performed)

It is anticipated that during A2R17, work activities will be completed and the required plant configuration will be established to support commencing movement of irradiated fuel from the reactor vessel to the Spent Fuel Pool (SFP) prior to the current TRM fuel movement ICDT constraint of 100 hours after reactor shutdown.

Effect of Activity:
(Discuss how the activity impacts plant operations, design basis, or safety analyses described in the UFSAR.)

The proposed changes will allow starting A2R17 reactor core offloading activities at 95 hours after the reactor is shutdown.

The Byron and Braidwood spent fuel pool cooling design basis analysis (#BRW-00-0010-M Revision 000Y) is based on the minimum ICDT of 100 hours prior to starting fuel transfer, however an outage specific evaluation has been performed to support a reduced ICDT for A2R17. This is in compliance with UFSAR Section 9.1.3.1, which states that outage specific evaluations may be performed, in support of shorter fuel decay times in the reactor, by taking credit for existing margins in the design basis analysis. The limiting case for the design basis analysis for the Spent Fuel Pool is based on one train of Spent Fuel Pool Cooling in operation.

Starting core offload at 95 hours after shutdown will not result in increasing the design basis heat load for the Spent Fuel Pool (SFP) Cooling System.

Moving fuel at 95 hours after the reactor is shutdown does result in an increase in the heat load input to the Spent Fuel pool, from the offloaded assemblies, when compared to starting core offload at 100 hrs or later. However, the cumulative heat load to the spent fuel pool will not be greater than the design basis heat load, since the actual heat load in the SFP due to previously stored fuel assemblies is less than the heat load that was included in the SFP design basis analysis. A margin in excess of 3 MBTU/hr or

50.59 REVIEW COVERSHEET FORM

Activity /Document Number: TRM Change #14-012 Revision Number: N/A

Title: Change In-Core Decay Time for A2R17

about 5.8% of the design basis heat load for the SFP has been calculated between the total heat load that is added to the SFP during A2R17 and the design basis heat load. The resulting maximum bulk water temperature will be below the design basis maximum calculated bulk water temperature of 165.3 °F.

The impact of the higher heat load on the temperature in the Spent Fuel Pool, with one train of cooling in operation, will be minimal. In fact, the total heat load increase due to moving fuel at 95 hours after shutdown is < 2% higher than the heat load that is added moving fuel at 100 hours. This increase is minimal and would result in a minimal temperature increase for the Spent Fuel Pool with the bulk temperature remaining well below the calculated limit of 165.3 °F. This temperature increase does not have a degrading effect on the Spent Fuel Racks, including the boral poison panels. Limitations and alarms related to Spent Fuel temperatures have not been changed and are in place during core offload. In addition, Operating Procedure BwOP FC-1 includes a precaution to monitor Spent Fuel Pool temperature frequently and make adjustments as necessary to spent fuel pool cooling, during periods of high heat loads, such as core offloads.

The radiological design basis analysis for the Fuel Handling Accident is based on a minimum decay time of 48 hours prior to movement of irradiated fuel assemblies (Reference design analysis #BRW-04-0041-M/BYR04-047 Revision 3). Sections B3.9.4 and B3.9.7 of the Braidwood Technical Specification Bases are not being revised as part of the A2R17 activity since the minimum ICDT for radiological considerations is not being revised and the revised ICDT of 95 hours for A2R17 still meets the constraint of 48 hours.

Occupational Radiation Dose
Occupational radiation dose will remain within limits. Access to the areas that are affected by the defueling operations is controlled in accordance with station procedures. Electronic dosimeters are required to continuously monitor the incurred radiation dose in the areas in order to limit personnel exposure to below 10CFR20 limits. These existing controls are not affected.

Summary of Conclusion for the Activities 50.59 Review:
(Provide justification for the conclusion, including sufficient detail to recognize and understand the essential arguments leading to the conclusion. Provide more than a simple statement that a 50.59 Screening, 50.59 Evaluation, or a License Amendment Request, as applicable, is not required.)

This activity does not increase the frequency of occurrence of a Fuel Handling Accident or a Loss of Spent Fuel Pool Cooling event, or increase the likelihood of occurrence of a malfunction of an SSC important to safety. The proposed change does not increase the failure rate of refueling equipment or increase the risk of a fuel handling accident due to human error. Spent fuel handling tools will not change, nor will the method or procedures for handling spent fuel assemblies. Existing administrative controls and precautions remain in effect, only one spent fuel assembly is lifted at a time, and the fuel is moved at low speeds, exercising caution that the fuel assembly does not strike anything during movement. An outage specific evaluation (Design analysis #BRW-00-0010-M Revision 000Z) has concluded that the total actual heat load in the Spent Fuel Pool as a result of the reduced ICDT is bounded by the total heat load specified in the design basis analysis. Thus, there is not an additional demand, beyond the heat load considered in the design basis analysis, on the cooling system.

This activity does not result in an increase in the consequences of an accident or in the consequences of a malfunction of an SSC important to safety. The offsite dose resulting from a Fuel Handling Accident with a minimum In-Core Decay Time of 95 hours is bounded by the design basis Fuel Handling Accident dose with a minimum ICDT of 48 hours.

This activity does not create a possibility for an accident of a different type than any previously evaluated in the UFSAR as there is no new equipment being introduced, and all existing fuel transfer equipment is being operated using existing procedures.

50.59 REVIEW COVERSHEET FORM

Activity /Document Number: TRM Change #14-012 Revision Number: N/A

Title: Change In-Core Decay Time for A2R17

This activity does not create a possibility for a malfunction of an SSC important to safety with a different result than any previously evaluated in UFSAR. The increase in heat load in the Spent Fuel Pool has been evaluated; although an input parameter (offload start time) has been changed, the resulting impact on the SFP bulk water temperature analysis is bounded by the design basis analysis. In addition, the local water temperature, fuel cladding temperature, and maximum heat flux have also been evaluated and have been found to be acceptable.

The adequacy of the reduced ICDT for A2R17 is based on margin in background decay heat since the SFP is not filled to its capacity.

The reduction in ICDT does not result in a change in the internal containment pressure that would represent a challenge to the containment design basis limit internal pressure of 50 psig (Reference UFSAR Table 3.8-4). The maximum cladding temperature for the spent fuel is well below the design basis limit of 2,200 °F from 10CFR50.46 (Reference UFSAR Section 15.6.5).
This activity does not change the method of evaluation for the Spent Fuel Pool Cooling System described in the UFSAR or in the SER for the Margin Uncertainty Recapture Power Uprate Project. Decay heat input to the spent fuel pool was calculated for the earlier ICDT of 95 hours using the method described in NRC Branch Technical Position ASB 9-2. This is the same method that was used to calculate the decay heat values that are evaluated in the design basis temperature analysis for the Spent Fuel Pool (BRW-00-0010-M Rev. 000Y).

Attachments:

Attach all 50.59 Review forms completed, as appropriate.

Forms Attached: (Check all that apply.)

[ ]	**Applicability Review**				
[ ]	**50.59 Screening**	**50.59 Screening No.**	_____	**Rev.**	_____
[X]	**50.59 Evaluation**	**50.59 Evaluation No.**	**BRW-E-2014-74**	**Rev.**	**0**