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WESTINGHOUSE EVINCI - SAFETY EVALUATION OF TOPICAL REPORT WCAP-18810-

P/NP, "ADVANCED LOGIC SYSTEM V2 PLATFORM ELIMINATION OF TECHNICAL

SPECIFICATION SURVEILLANCE REQUIREMENTS"

EPID: (L-2023-TOP-0056)

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Brief Description of the Topical Report:

1.0 INTRODUCTION

By letter dated December 20, 2023, (Agencywide Documents Access and Management System (ADAMS) Accession No. ML23354A139), Westinghouse Electric Company, LLC., (Westinghouse) submitted for the U.S. Nuclear Regulatory Commission (NRC) staff's review, WCAP-18810-P and WCAP-18810-NP, "Advanced Logic System v2 Platform Elimination of Technical Specification Surveillance Requirements," (ML23354A139). The stated purpose of this topical report (TR) is to "provide a methodology to eliminate certain Technical Specification (TS) Surveillance Requirements (SRs) related to the ALS v2 platform." The NRC staff understands that the terms "eliminate" and "elimination" refer to a licensee's physical TSs, specifically the section of the licensee's TS known as "SURVEILLANCE REQUIREMENTS". Based on the applicant's submittal, the staff will evaluate and determine whether it would be appropriate to eliminate certain manual TS required functional surveillance tests from the SURVEILLANCE REQUIREMENTS section of a licensee's TS. The staff further understands that the 10 CFR 50.36(c)(3) requirements related to conducting functional surveillance testing for these TS-related equipment and instrument channels are not being eliminated, rather, certain manual TS related functional surveillance tests are being replaced with continuous or periodic online self-diagnostics. Therefore, throughout the safety evaluation (SE), the words "eliminate" or "elimination" should be interpreted to refer to certain SURVEILLANCE REQUIREMENTS within a licensee's TS and that online monitoring and self-diagnostic tests are replacing, rather than eliminating, certain manual functional surveillance tests in accordance

Enclosure 1

with 10 CFR 50.36(c)(3). The scope of WCAP-18810-P/NP is limited to TS SRs that would apply to an instrumentation and control (I&C) safety system using the ALS v2 Platform.

TR WCAP-18810-P, provides an overview of how Westinghouse proposes to account for the SRs via the replacement of certain manual functional surveillance tests by referencing multiple previously approved platform TRs. A more detailed discussion of these documents is presented in Section 3.0 of the SE.

2.0 REGULATORY EVALUATION

The NRC staff considered the following regulatory requirements and guidance in reviewing the concepts presented in WCAP-18810-P/NP:

- Title 10 of the *Code of Federal Regulations* (10 CFR) “Energy,” Part 50, “Domestic Licensing of Production and Utilization Facilities,” Section 50.36, “Technical specifications,” imposes limits, operating conditions, and other requirements upon reactor facility operation for the public health and safety. Paragraph 50.36(c)(3), “Surveillance requirements,” states that “Surveillance requirements are requirements relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the limiting conditions for operation will be met.”
- Appendix B, “Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants,” to 10 CFR Part 50 requires, in part, that licensees apply a quality assurance (QA) program to the design, fabrication, construction, and testing of structures, systems, and components of the facility.

The following are the NRC technical requirements applicable to WCAP-18810-P/NP:

- General Design Criteria (GDC) 13, “Instrumentation and control,” Instrumentation shall be provided to monitor variables and systems over their anticipated ranges for normal operation, for anticipated operational occurrences, and for accident conditions as appropriate to assure adequate safety, including those variables and systems that can affect the fission process, the integrity of the reactor core, the reactor coolant pressure boundary, and the containment and its associated systems. Appropriate controls shall be provided to maintain these variables and systems within prescribed operating ranges.
- GDC 21, “Protection System Reliability and Testability,” requires, in part, that “The protection system shall be designed for high functional reliability and inservice testability commensurate with the safety functions to be performed.... The protection system shall be designed to permit periodic testing when the reactor is in operation, including a capability to test channels independently to determine failures and losses of redundancy that may have occurred.”
- Paragraph 50.55a(h), “Protection and Safety Systems,” of 10 CFR, incorporates the 1991 version of the Institute of Electrical and Electronics Engineers (IEEE) Std. 603, “IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations,” by reference, including the correction sheet dated January 30, 1995.

- IEEE 603, Clause 4.10, in part, requires that the critical points in time or the plant conditions, after the onset of a design basis event are “defined for completion of the safety function.”
- IEEE 603, Clause 5.7, “Capability for Test and Calibration,” of IEEE Std 603-1991 states, in part, that the capability for testing and calibration of safety system equipment shall be provided during power operation and shall duplicate, as closely as practicable, performance of the safety function.
- IEEE 603, Clause 6.5, “Capability for Testing and Calibration,” states, in part, that means shall be provided for checking, with a high degree of confidence, the operational availability of each sense and command feature input sensor required for a safety function during reactor operation.

The following are the specific NRC guidance documents applicable to WCAP-18810-P/NP:

- NUREG-0800, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition,” Branch Technical Position (BTP) 7-17, “Guidance on Self-Test and Surveillance Test Provisions.” WCAP-18810-P/NP addresses the acceptance criteria in BTP 7-17, which, in part, states that self-test functions should be verified during periodic functional tests.
- NUREG-1431, “Standard Technical Specifications - Westinghouse Plants.”

3.0 TECHNICAL EVALUATION

Westinghouse submitted TR, WCAP-18810-P, “Advanced Logic System® v2 Platform Elimination of Technical Specification Surveillance Requirements,” to the NRC staff to conduct a review of the diagnostic and self-test features of the platform. The NRC staff, as documented in this SE, assessed which automated self-test and diagnostic features of the ALS v2 platform could be credited in place of TS related manual functional tests to satisfy SRs, such that certain manual TS SRs may be removed from the TSs.

As the platform-based diagnostics and self-test features are part of the larger ALS v2 platform and its development process, the WCAP-18810 TR makes multiple references to the other ALS v2 reports listed below, that have been approved by the NRC staff:

Advanced Logic System Version 2 (ALS v2)

- [[[REDACTED] /]] WCAP-18762-NP-A, “Advanced Logic System® v2 Platform Topical Report,” Revision 0, (ML25059A082)
- [[[REDACTED] /]] WCAP-18780-NP-A, “Advanced Logic System v2 Development Process Topical Report,” Revision 0, (ML25059A084)

The referenced TRs listed above have a single SE covering both TRs. This format allows the structure of the ALS v2 SE to match the format used in the original ALS approved TR, now

referred to as ALS v1, frequently referenced in the ALS v2 approved TRs.

Advanced Logic System Topical Report (ALS v1)

- [[[REDACTED] /]] 6002-00301-NP-A, “Advanced Logic System Topical Report,” Revision 4, (ML13298A094)

In addition, Westinghouse references document 6003-00033, “Advanced Logic System (ALS) v2 Self-Diagnostics Functionality,” Revision 4, which provides a more detailed explanation of the features of the system’s diagnostics and self-test features. Staff reviewed document 6003-0003 and relied on information provided therein for its evaluation of WCAP-18810.

A diagram showing the relationship amongst the various TRs is depicted below.



The NRC staff reviewed the WCAP-18810 TR to determine at what level the ALS v2 diagnostics

and self-test features provide confidence in channel operability that is at least equivalent to manual functional tests to fulfill the SRs typically required in TSs to demonstrate the operability of an instrument channel in an I&C safety system (also referred to as channel operability tests¹). Depending on the reactor design, these SRs may include time response tests of the ALS platform and any future system(s) that may use it in accordance with approved methods including those described in NUREG-1431.

The NRC staff's evaluation of this TR serves as a generic basis for future system-specific applications under 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants," or license amendment requests (LARs) under 10 CFR 50.90, "Application for amendment of license, construction permit, or early site permit," to remove certain TS required manual functional surveillance tests and channel operability test requirements, depending on the system design. These SRs are required per 10 CFR 50.36(c)(3). The limitations of the evaluation are described later in section 4.0, "Limitations and Conditions," of this SE. These limits are required because no physical ALS v2 platform has been formally developed or undergone verification and validation (V&V) testing at the time of this SE's writing. Refer to the SEs associated with WCAP-18762 or WCAP-18780, listing of generic open items (GOIs) and application-specific action items (ASAs) for further information (References 6 and 8).

3.1. Overview of the Proposed ALS v2 Process Protection System Base Architecture

The ALS v2 digital platform equipment and application logic, which is treated like software by the NRC staff, can have the ability to be used to implement various functions for I&C safety systems. WCAP-18762-P section 3.5.3, "Architecture Example with Daughter Card Implementation," provides one architectural example of a possible three division RPS with voting capabilities. Additionally, document 6002-00301-P-A appendix A, "Reactor Protection System (RPS)/Engineered Safety Features Actuation System (ESFAS) Application," describes a four-division base architecture for the original ALS platform. These base architecture examples provide two possible configurations of equipment that may be used in a new I&C safety-related system or as an upgrade to an existing safety-related I&C system application; therefore, an assessment of the specific system that will use the ALS v2 application is beyond the scope of this evaluation.

3.1.1 Board Types of the ALS v2 Platform

Board Type	ALS v2 Board Number*
Core Logic Board	ALS-152
Digital Input Board	ALS-352
Analog Input Board (RTD and TC) ²	ALS-361
Analog Input (Voltage/Current)	ALS-371
Digital Output	ALS-452
Analog Output	ALS-471

¹ Channel operability test, used in this context, is used in a generic sense, referring to the calibration of all devices in an instrument channel rather than the formal sense of CHANNEL OPERABILITY TEST that appears in various Westinghouse plant's TSs and in NUREG-1431.

² RTD = Resistance Thermocouple Detector and TC = Thermocouple

Communications Board	ALS-651
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*The original ALS (ALSV1) board numbers were numbered with an (X-50) designation, so for example the core logic board for the ALSv1 platform was ALS-102 or (152 – 50 = 102).

3.2. Types of Diagnostic and Self-Test Features of the ALS v2 Platform

There are primarily two types of self-diagnostics that are used to detect faults in an ALS v2 platform:

- 1) Platform level diagnostics, and
- 2) Application self-diagnostics.

3.2.1. ALS v2 Platform Diagnostics and Self-Test Functions

WCAP-18810 states that due to the ALS v2 platform being Field Programmable Gate Array (FPGA) based, without software executing in cycles, the completion of the platform-based diagnostics and self-tests is guaranteed. This characteristic of the self-test features will be verified during the testing and validation process for the platform and any specific systems that are to be developed based on the platform and would be captured as part of GOI 4, “V&V Program,” (ML25059A082 and ML25059A084.)

Westinghouse describes, in document 6003-00033, that the self-diagnostic features at the ALS v2 platform have been developed as part of the platform itself and are not a series of add-on features to the platform. These diagnostic and self-test features will be subject to the same design, development, and V&V processes described and approved in WCAP-18780. However, as described in the staff’s audit report (Reference 11), the ALS v2 self-diagnostics have not yet undergone full integration testing or independent V&V. Section 4.1 of this SE contains a GOI for the development of the self-diagnostic features.

As stated in document 6003-00033, table 2-1, “Self-testing ALS Platform Intervals,” the platform diagnostics operate during initialization of the platform (start-up) and during the device’s operation. For those platform diagnostics that operate during the platform’s operation, the diagnostics operate in a continuous or near continuous fashion that is considerably more frequent than that of a manual functional surveillance test.

3.2.1.1 ALS Platform Boards’ Modes of Operation

Although an FPGA’s logic operates continuously, the programming may be created to simulate different “modes” of operation via the use of finite state machines (FSMs). Document 6003-00033,[[

■ [REDACTED]

■ [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]]

For further information describing these [REDACTED], refer to document 6003-00033.

3.2.1.2 ALS Platform Boards' Self Diagnostics

With the different board types that comprise the ALS v2 platform, there are [REDACTED] [REDACTED] provide an error code. The following summary list provides an overview of Westinghouse's descriptions regarding each of these board detected faults and their impact on functionality.

[[

[REDACTED]

[REDACTED].”] This action will be verified during the development and testing of the application-specific system and is captured in **ASAI 1**.

[[

[REDACTED]

[REDACTED]³.]]

A more detailed description of each detected fault condition is located in document 6003-00033, [REDACTED],”]] as well as WCAP-18762 and WCAP-18780.

3.2.1.3 ALS Platform Boards’ Self Diagnostics Evaluation

The [REDACTED])]] checks of the platform are conducted both during system startup and are running continuously or near continuously during operation.

[REDACTED]

[REDACTED]

[REDACTED]

³ [REDACTED].]]

[REDACTED]

[REDACTED] .]] This is **GOI Number 4** of section 4.1, “Generic Open Items,” that is captured in the SE for WCAP-18762 and WCAP-18780 (ML25059A082 and ML25059A084) and is applicable to the limitations applied in this SE (section 4.0 of this SE).

Additionally, the NRC staff recognizes that the ALS-152 CLB and the ALS-651 Communications Board are responsible for annunciating error and fault codes from subordinate boards via the RAB whose fault conditions may impact the greater system’s reportability of its operability status. The applicant or licensee will need to pay particular attention to the V&V methods applied during the formal testing process for the ALS v2 platform. This is to ensure that, even if one or both boards mentioned above experience a fault, the resultant output signals of those boards, dependent on the nature of the error code, must drive the platform or system to a safe or known state that also provides awareness of the fault conditions presented to the operators. **This is ASAI 1.**

3.2.2 Application Based Diagnostics

Westinghouse asserts that the safety system application in the ALS-152 CLB has the ability to add additional diagnostics to augment the platform diagnostics or to address plant-specific TS SRs.

Application Specific Self-Diagnostics are described in WCAP-18810, section 5.2, “Application Diagnostics,” (ML23354A142).

Three of these diagnostics for an example system are listed below:

- Inter-Channel Comparison Check
- Double RAB Timeout
- Addressable Constant Verification

The Inter-Channel Comparison Check has the ability to automate the TS SR CHANNEL CHECK, described in NUREG-1431, to allow the replacement of the manual SR associated with the ALS v2 safety system. The Double RAB Timeout augments the platform diagnostics RAB1 Timeout and RAB2 Timeout and is independent of those two individual alarms. When communication loss is detected by both the CLB and the respective input, output, or communications board, the CLB continues to function normally using the last known “good” data from that particular board.

The application diagnostic addressable constant verification has the ability to address the portion of Channel Operational Tests (COTs) that includes “adjustments, as necessary,” of the required alarm, interlock, and trip setpoints required for channel OPERABILITY such that the

setpoints are within the necessary range and accuracy.” Westinghouse asserts that the Addressable Constant Verification Application Diagnostic has the ability to ensure that the addressable constants stored by the platform have not been corrupted, enabling the specific system to be tested automatically and replacing the need to test the system to verify that the logic trips in accordance with the setpoints entered into the system. This diagnostic also ensures that the setpoint requested to be modified via the ALS Service Unit (ASU) is not corrupted between entering the value in the ASU and storing the requested setpoint value in the platform.

As described in the ALS v2 SE, and the original ALS SE, the ASU is understood by the NRC staff to be an administratively controlled “maintenance workstation” that may periodically be connected to the ALS v2 system for testing and maintenance activities.

3.2.2.1 ALS Application-Specific Self Diagnostics Evaluation

Westinghouse described multiple application-specific platform level diagnostics that have the capability to monitor the health of the individual boards of the ALS platform, the diagnostics and comparisons across identical boards in multiple divisions of a safety system, and the system response in the case of a Double RAB timeout. The NRC staff understands that when warranted, the error information and fault conditions generated in the channels [[
[REDACTED]
[REDACTED]
[REDACTED]]] and further transmitted to the operators who will be notified of the fault condition.

The NRC staff understands that since no specific system has yet to be developed that has undergone an adequate V&V program, namely the approved development process in WCAP-18780 (and captured as GOI 4 in the SE for WCAP-18762 and WCAP-18780), a future evaluation of these application-specific error codes, faults, operator notifications, and resultant system response to them will be required. **This is ASAI 2.**

3.3. TS Related Manual Functional Surveillance Tests Identified in WCAP-18810 for Removal

WCAP-18810, section 2.1.1, “Westinghouse Standard Technical Specification Surveillance Requirements,” describes the different types of manual functional surveillance tests that Westinghouse asserts can be removed and replaced with automatic diagnostic and self-testing within the ALS v2 platform based on the definitions in NUREG-1431.

- Channel Checks
 - Channel checks serve as a comparative tool where indications among different independent channels or divisions of I&C systems are verified to provide assurance of proper operation of each instrument channel.
- COTs
 - A COTs purpose is to provide assurance that all devices in the instrument channel (or division) are operating properly, from as close as practicable to the sensor to the output of the system.

- Actuation Logic Tests (ALTs)
 - An ALT tests the logic of a system by testing all the combinations of the logic in the system to provide assurance of the proper operability of the logic circuits and a continuity of output logic devices.
- Response Time Tests (RTT)
 - The RTT ensures that the time interval between the sensing of a system parameter above or below a monitored setpoint to the execution of the system's safety function does not exceed any time requirements in the chapter 15 analysis.

The TR also states that the "Calibration," which the NRC staff interprets as CHANNEL CALIBRATION and TRIP ACTUATING DEVICE OPERATIONAL TEST (TADOT), defined in NUREG-1431, are not part of the scope of this SE.

ALS v2 platform self-testing and diagnostic features may be oriented in a series of overlapping tests from the input presented to the respective ALS v2 input board to the possible output continuity of the output board of the platform dependent upon the architectural make-up of the specific system using the ALS v2 platform.

3.3.1 Evaluation of Proposed Removal of TS Related Manual Functional Tests

WCAP-18810, section 7.1.1, "Channel Check Elimination Analysis," describes the use of an [{"REDACTED"}] that may be used to replace a manual CHANNEL CHECK. The NRC staff understands that the use of such a comparison would be part of a multi-divisional system. Once constructed and adequately tested, the operation of such a comparison check may provide system TS SR coverage so that a manual Channel Check surveillance may be replaced with the [{"REDACTED"}]; however, such an analysis is beyond the scope of this SE.

Appendix A, "Application and TS Assumptions," provides a proposed approach to replace TS related manual functional tests with automated ALS v2 platform and application-specific diagnostics and self-tests.

WCAP-18810, appendix C, "NUREG-1431 MARKUPS," depicts proposed Westinghouse Standard TS (STS) mark-ups to NUREG-1431, "Standard Technical Specifications Westinghouse Plants," and provides an example of how manual functional surveillance tests could be removed and replaced with automated platform and application-specific self-diagnostics with supporting justification in the TR.

The NRC staff understands that the use of overlapping surveillance tests is consistent with the method applied in NUREG-1431. Using Westinghouse's "ALS Platform Self-Testing" figure as a reference, the NRC staff notes that Westinghouse's apparent assertion that a COT begins at the backplane of the ALS v2's Input Board is not consistent with the definition of a COT in NUREG-1431. NUREG-1431 states, in part, "A COT shall be the injection of a simulated or actual signal into the channel as close to the sensor as practicable to verify OPERABILITY of all devices in the channel required for channel OPERABILITY." Therefore, per the definition in

NUREG-1431, if it is practicable, a COT would begin at the closest accessible field termination point of the sensor if the sensor termination point itself cannot be reasonably accessed. However, if no accessible field termination point prior to the input termination exists, the termination point at the ALS Input Board would meet the intent of the definition of the COT in NUREG-1431.

Related to the ALT, which is a system-specific test, the architecture of a system must be verified to be able to support a continuity check from the output signal being presented to the output circuitry before consideration is given to replacing the manual ALT TS-related functional test with an automated replacement.

Taken in whole, the NRC staff considers the proposed changes to the STS as a future possibility, but premature at this point given the development stage of the ALS v2 platform. Specifically, a system specific design and operational experience of the ALS v2 platform configured to serve as a reactor protective system or engineered safety features system, which has not been provided to the NRC staff, would be required before a complete evaluation is able to be conducted. As a result of the status of a formal development of this platform, section 4.0, "Limitations and Conditions," provides the actions required to be completed by the applicant or licensee to support its assertion that many manual TS required SRs may be eliminated and certain manual TS related functional surveillance tests may be replaced with automated diagnostic and self-test features of the application-specific system, as required per 10 CFR 50.36(c)(3). The diagnostic and self-test features support the possibility that multiple TS required manual functional surveillance tests may be replaced with automated testing, but the NRC staff will consider the STS changes in the future for licensees with a specific system design referencing this TR. **This is ASAI 3.** Additionally, when the platform and the system specific design have been completed and tested, for a first of a kind system or systems, an NRC licensing review of the detailed development process and specific system design for an N+1 system is not expected to be required, except in cases where the system design has been appreciably altered.

3.4 FMEDA of ALS v2 Platform

WCAP-18810, section 6, "Failure Modes, Effects, and Diagnostic Analyses," provides a failure modes, effects, and diagnostic analyses (FMEDA) of the standalone printed circuit boards (PCBs) that comprise the ALS v2 platform. This evaluation of how the boards respond in the presence of different failures supports Westinghouse's claim that a system developed using the ALS v2 platform would possess the capability to operate in a manner that would support meeting TS required SRs. Beyond the FMEDA, WCAP-18810, appendix B, "Licensee Required Actions," outlines licensee required actions (LRAs). Specifically, LRA_1 directs the licensee to perform its own system-level FMEDA to verify that the future system, along with its self-test features and diagnostics, operates reliably. This evaluation is necessary to ensure that replacing manual TS required SRs with automated self-testing provided by the ALS v2 platform and application-specific diagnostics is sufficient.

This would include understanding how a failure of a component on a PCB would impact not only that board, but the boards that comprise that system, due to the failure.

The NRC staff determined that this LRA_1 requires additional clarification of the specific reviews and analysis needed to provide reasonable assurance that the plant or application-specific failure modes and effects analysis (FMEA) is bounded. When performing a comparison of an

application-based FMEA with the FMEDA tables in WCAP-18810, the following actions should be performed:

1. Identify any failure modes that are application (plant) specific, (i.e., those failure modes not identified in the WCAP-18810 FMEDA tables) and perform an analysis of system self-diagnostic features to determine if each failure mode is detectable by an existing function or if a new ASAI application diagnostic function is required.
2. Review all application self-diagnostic functions identified in the FMEA and FMEDA tables and verify that each function is either included in the specific system design or is identified as a system-based application requirement to be developed and implemented in the system design.
3. Identify any components or subsystems in the WCAP-18810 FMEDA tables that are not being implemented in the plant design or are being implemented in the plant specific design in a manner different than described in WCAP-18810, appendix A, "Applications and TS Assumptions," subsection A.1, "Architecture and Application SW Assumptions."
4. Each of the functions performed by these components or sub-systems should be analyzed to determine the effects of any reduced diagnostic coverage and the impact to the system and the plant.

3.5 Licensee Required Actions

The LRAs listed in WCAP-1880, appendix B support validating the system-specific requirements that would enable the licensee to replace multiple manual surveillance functional tests with their automated counterparts. However, enhancements to those LRAs, such as those for LRA_1 in the section above, that address the FMEDA need to be addressed.

Concerning LRA_2, the identification of licensee specific functions that vary from those in the standard technical specifications (STS), those actions will be needed in addition to the V&V activities necessary to verify that the existing STS manual functional tests may be replaced when the actual ALS v2 platform is constructed and configured to serve as an RTS or ESFAS for "standardized" Westinghouse plants.

LRA_3 and LRA_5 would also need to ensure that beyond alarm response procedures, the alarm notifications provided, or reported, to the system operators are adequate to ensure that the operator notification (alarm) system complies with IEEE 603-1991, Clause 5.8, "Information Displays."

LRA_4 correctly asserts that interconnections and interdependencies between SRs for impacted systems must be accounted for via an explanation of non-standard performance requirements in the TS Bases.

LRA_6 describes the administrative controls that will be required to verify that the system monitoring and system health checks have been adequately incorporated into the overall SR paradigm as required per 10 CFR 50.36, to ensure proper system operation. The level of robustness of these administrative controls would be determined by multiple factors, including the specific I&C safety system(s) and plant design, the accessibility of the system's error and fault log, as well as attributes of LRA_3 and LRA_5.

LRA_7 needs to account for failure modes of the system's self-diagnostics, their reliability, ability to annunciate the fault condition and alert system operators, and appropriate interface with all non-safety systems.

LRA_8, to verify the maximum drift of the crystal oscillator, which would place limits on any timing errors of the system, must be verified by the system developer via its testing program. As this calculation note is a platform-based, if the platform has not been modified or otherwise altered to impact maximum drift of the crystal oscillator, it is expected that this calculation will be a one-time evaluation.

These LRAs are captured as ASAI 4.

3.6 Regulatory Compliance

The methodology provided in WCAP-18810 proposes crediting automated system self-diagnostic functions as an alternate means of providing adequate assurance that the necessary quality of systems and components is maintained, and states that facility operation will be within safety limits and that the limiting conditions for operation will be satisfied and meet the requirements of 10 CFR 50.36. The NRC staff finds that the methodology proposed in WCAP-18810 can be applied to replace manual TS related surveillance requirements for components in which automatic self-diagnostic coverage can be demonstrated to provide adequate and reliable surveillance coverage, thus replacing the manual surveillance requirements. A licensee applying these methods shall perform a plant specific assessment of system diagnostics to ensure that the requirements of 10 CFR 50.36(c), can be met upon the elimination of certain SRs of its TS.

Westinghouse also references 10 CFR 50.55a, "Codes and Standards," in which Paragraph (h) discusses the incorporation by reference of IEEE Standard 603-1991, "IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations," and 10 CFR Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants". Specifically, Westinghouse references GDC 13, "Instrumentation and Control," GDC 18, "Inspections and Testing of Electric Power Systems," and GDC 21, "Protection System Reliability and Testability," in the WCAP-18810 TR. However, as those criteria apply to specific protection and safety systems, no evaluation of those IEEE Standard's requirements or the referenced GDCs will be conducted in this SE. In a similar fashion, the NRC staff did not evaluate the criteria presented in IEEE Std 7-4.3.2-2016, as that standard acts as a companion standard to IEEE Std 603-1991 for programmable digital devices in safety related systems in nuclear power plants.

Regulatory Guide (RG) 1.118, "Periodic Testing of Electric Power and Protection Systems" endorses IEEE 338-1987, "IEEE Standard Criteria for the Periodic Surveillance Testing of Nuclear Power Generating Station Safety Systems." This standard provides guidance for how surveillance tests are conducted on nuclear power safety systems and is applicable for specific safety systems and is therefore beyond the scope of this SE. Westinghouse's assertion that self-diagnostic coverage would satisfy the guidance in IEEE 338-1987 is valid, since in certain instances, the self-diagnostics included within the ALSv2 platform would be used to verify that the safety system is capable of meeting its designed safety function in lieu of manual testing as part of the surveillance program.

WCAP-18810 discusses Westinghouse's approach to meet the guidance in BTP 7-17, "Guidance on Self-Test and Surveillance Test Revisions," which, in part, states that in lieu of

response time testing, response time can be verified by other periodic tests (e.g., functional testing and calibration checks). The LAR addresses these criteria via its descriptions of its platform-based and application-specific self-test and diagnostic features that will need to be evaluated on a system-specific application.

Additionally, Westinghouse's assertion in WCAP-18810, section 3.6, "Evaluation/Conclusion," that its self-test and diagnostic functions may be verified via other periodic functional tests can be addressed by a licensee's plant administrative controls and must be evaluated by the NRC staff as an appropriate mechanism to satisfy the overarching requirements in 10 CFR 50.36, to verify proper operation of system surveillances and multiple dependencies, such as the specific plant design (e.g., passive or active safety systems). Thus, the administrative controls that must be applied to a specific-safety-related system and their periodicity to verify proper functionality of automated self-testing of a system would be evaluated on a system by system and plant by plant basis.

3.7 Technical Evaluation Summary

As the ALS v2 platform and application-specific diagnostics have yet to be formally developed and tested, beyond any ASAs developed during this SE, the previously approved ALS v2 TRs have GOIs and ASAs that must be satisfied before a system using the ALS v2 platform may be used for a high safety significance safety system.

4.0 Limitations and Conditions

For each generic open item and plant-specific action item that applies to the applicant's or licensee's use of the ALS v2 platform, the applicant or licensees referencing this SE should demonstrate that it has satisfactorily addressed the applicable items. The set of applicable items provide limitations and conditions for the ALS v2 platform's use, as reviewed by the NRC staff and documented within this SE.

In addition to the items listed in the following subsections, the applicant or licensee needs to demonstrate that it has adequately addressed the GOIs and ASAs in the SE for the "Advanced Logic System® v2 Platform Topical Report," WCAP-18762, and the "Advanced Logic System® v2 Development Process Topical Report," WCAP-18780, (ML25059A082 and ML25059A084).

4.1 Generic Open Items

In addition to the Generic Open Item (GOI) documented in the SE for WCAP-18762, and WCAP-18780, the following GOI must be addressed by an applicant or licensee crediting the ALS v2 platform's self-testing and diagnostic feature to eliminate manual functional surveillance tests.

GOI 1 - Platform self-testing diagnostic – Because development and testing of the ALS v2 platform self-testing and diagnostic features have not been completed at the time of this SE, the use of these platforms features is contingent upon them being fully developed and comprehensively tested in accordance with the ALS v2's approved development process.

4.2 Application-Specific Actions Items

ASAI 1 – The ALS-152 CLB and the ALS-651 Communications Board are responsible for annunciating error and fault codes from subordinate boards via the RAB whose fault conditions may impact the greater system’s reportability of its operability status. The applicant or licensee will need to ensure the V&V methods applied during the formal testing process for the ALS v2 platform confirm that, even if one or both boards experience a fault, that the resultant output signals of those boards, dependent on the nature of the error code, must drive the platform or system to a safe or known state that also provides awareness of the fault conditions to system operators.

ASAI 2 – The applicant or licensee referencing the evaluation of these and other system-specific and/or application-specific error codes, faults, and operator notifications for an ALS v2-based safety system needs to address the system specific requirements related to TS related SRs, (i.e., 10 CFR 50.36(c)(3)), and the resultant system response, to ensure proper system operation and reliability and proper error and fault notification via testing of the system. For example, licensees who choose to eliminate manual functional surveillance tests and replace them with automated functional surveillance tests to satisfy 10 CFR 50.36(c)(3), would need to document and record any administrative controls or actions taken by its staff to determine the automated self-tests and diagnostics are functioning as required for a given period, and these results would be recorded in accordance with the requirements XVII. Quality Assurance Records of 10 CFR Part 50, Appendix B.

ASAI 3 – The diagnostic and self-test features support the possibility that multiple TS related manual functional tests may be replaced with automated testing; however, the applicant or licensee will need to demonstrate how the individual, application-specific TS required SRs are able to be replaced satisfactorily with their automated, built-in, self-testing counterparts.

ASAI 4 - The additional NRC clarification on the LRAs in Section 3.5 must be addressed by the applicant or licensee referencing this SE and related TR (ML23354A142).

5.0 CONCLUSION

Based on the staff’s evaluation described above, including staff’s review of the features of the system’s diagnostics and self-test features described in document 6003-00033, “Advanced Logic System (ALS) v2 Self-Diagnostics Functionality,” Revision 4, the NRC staff determined that the methodology outlined in WCAP-18810 for crediting the ALS v2 automated self-test and diagnostic functions, can be used to provide reasonable assurance that the requirement in 10 CFR 50.36(c)(3) is met, without reliance on performance of manual functional surveillance tests. Therefore, the NRC staff finds that removing surveillance requirements from a plant TS, for which credited ALS v2 automated self-test and diagnostic function coverage is provided, is acceptable with the implementation of the GOIs and ASAs identified in Section 4.0 of this SE.

6.0 REFERENCES

1. Submittal of Westinghouse, WCAP-18810-P/NP, “Common Qualified Platform Surveillance Elimination Topical Report,” (ML23354A139). December 20, 2023.
2. WCAP-18810-NP, Revision 0, “Advanced Logic System v2 Platform Elimination of Technical Specifications Surveillance Requirements,” (ML23354A142). December 2023.

3. WCAP-18810-P, Revision 0, “Advanced Logic System v2 Platform Elimination of Technical Specifications Surveillance Requirements,” (ML23354A141). December 2023.
4. 6003-00033, “Advanced Logic System (ALS) v2 Self Diagnostics Functionality (Proprietary), Revision 4, (ML26042A423). February 2026.
5. WCAP-18762-P-A, “Advanced Logic System® v2 Platform Topical Report” (Proprietary), Revision 0 (ML25059A081). February 2025.
6. WCAP-18762-NP-A, “Advanced Logic System® v2 Platform Topical Report” (Non-Proprietary), Revision 0 (ML25059A082). February 2025.
7. Westinghouse - WCAP-18780-P-A, “Advanced Logic System v2 Development Process Topical Report,” (Proprietary) Revision 0, (ML25059A083). February 2025.
8. Westinghouse - WCAP-18780-NP-A, “Advanced Logic System v2 Development Process Topical Report,” (Non-Proprietary) Revision 0, (ML25059A084). February 2025.
9. 6002-00301-P-A, Revision 4, “Advanced Logic System Topical Report,” Parts 1 and 2 (ML13298A095 and ML13298A096). September 2013.
10. Westinghouse Electric Company, LLC. - Audit Plan for Topical Report Advanced Logic System (ML25101A297). May 28, 2025.
11. Westinghouse Electric Company, LLC. - Audit Report for Advanced Logic System v2 Platform Elimination of Technical Specification Surveillance Requirements (ML25325A150), December 9, 2025.

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