RAI Volume 2, Chapter 2.1.1.7, Fifth Set, Number 1: Supplemental Questions

A follow-up clarification call for RAI Volume 2 – Chapter 2.1.1.7, Sets 5 and 6 was held on June 30, 2009. DOE's response to RAI 2.2.1.1.7-5-001 stated that based on the results of the preclosure safety analysis (PCSA) and detailed design, appropriate sections of nuclear related codes and standards will be applied. The NRC requested DOE to provide a comprehensive table with the following information:

- Applicable principal codes and standards,
- List of important to safety (ITS) structures, systems, or components (SSC) related to the ITS instrumentation, control and electrical systems;
- Justification or rationale for sections of the Institute of Electrical and Electronics Engineers (IEEE) principal codes and standards applicable to the repository.

1. SUPPLEMENTAL RESPONSE

The applicable principal codes and standards for spatial separation, independence, isolation, and redundancy used in the design of ITS instrumentation, control, and electrical systems are:

- IEEE Std 308-2001, *IEEE Standard Criteria for Class 1E Power Systems for Nuclear Power Generating Stations*,
- IEEE Std 379-2000, *IEEE Standard Application of the Single-Failure Criterion to Nuclear Power Generating Station Safety Systems*,
- IEEE Std 384-1992, *IEEE Standard Criteria for Independence of Class 1E Equipment and Circuits*,
- IEEE Std 603-1998, *IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations*,
- ASME NOG-1-2004, *Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)*.

None of the above IEEE standards are invoked by 10 CFR Part 63, NUREG-1804, or the NRC's Division of High-Level Waste Repository Safety Interim Staff Guidance. These principal codes and standards were developed for the commercial nuclear power industry. They have been either adopted in whole or in part based on whether they are determined applicable or appropriately adapted for use in the Yucca Mountain repository design, consistent with the PCSA, the requirements of 10 CFR Part 63, and the guidance of NUREG-1804 and other staff guidance. The extent each section of these codes and standards is applicable to the repository is determined

by the failure probabilities of the design features that implement the repository safety functions and the supporting safety analysis.

The correlation of the terminology between power reactor applications and the risk-informed, performance-based application for the repository are summarized in Table 1.

Table 2 provides a numbered list of ITS SSCs derived from SAR Table 1.4.2-1 (ITS controls) and SAR Section 1.4.1.2 (ITS electrical), their associated safety functions, and applicability of principal codes and standards to each ITS component.

Tables 3 through 6 provide the specific code section applicability for IEEE Std 308-2001, IEEE Std 379-2000, IEEE Std 384-1992, and IEEE Std 603-1998, respectively. In addition, the tables provide a rationale or comment for each section of the standard that uses an alternate method or is not applicable to the risk-informed performance-based repository design. Annexes designated as "information only" for each of the IEEE principal codes and standards were not subject to review regarding applicability.

This response also addresses the principal codes and standards identified in response to the supplemental RAI 2.2.1.1.7-6-004 and RAI 2.2.1.1.7-6-009.

2. COMMITMENTS TO NRC

None.

3. DESCRIPTION OF PROPOSED LA CHANGE

None.

4. REFERENCES

ANSI/ASME NQA-1-1983. *Quality Assurance Program Requirements for Nuclear Facilities*. New York, New York: American Society of Mechanical Engineers. TIC: 216628.

ANSI N14.6-1993. *American National Standard for Radioactive Materials—Special Lifting Devices for Shipping Containers Weighing 10000 Pounds (4500 kg) or More*. New York, New York: American National Standards Institute. TIC: 236261.

ASME NOG-1-2004. 2005. *Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)*. New York, New York: American Society of Mechanical Engineers. TIC: 257672.

DOE O 414.1C. 2005. *Quality Assurance, with errata*. Washington, D.C.: U.S. Department of Energy. ACC: HQO.20060615.0001.

DOE (U.S. Department of Energy) 2009. *Quality Assurance Requirements and Description*. DOE/RW-0333P, Rev. 21. Washington, D.C.: U.S. Department of Energy, Office of Civilian Radioactive Waste Management. ACC: DOC.20090102.0004.

IEEE Std 308-2001. 2002. *IEEE Standard Criteria for Class 1E Power Systems for Nuclear Power Generating Stations*. New York, New York: Institute of Electrical and Electronic Engineers. TIC: 252746.

IEEE Std 379-2000. 2001. *IEEE Standard Application of the Single-Failure Criterion to Nuclear Power Generating Station Safety Systems*. New York, New York: Institute of Electrical and Electronics Engineers. TIC: 255427.

IEEE Std 384-1992. 1998. *IEEE Standard Criteria for Independence of Class 1E Equipment and Circuits*. New York, New York: Institute of Electrical and Electronics Engineers. TIC: 258693.

IEEE Std 387-1995. 2001. *IEEE Standard Criteria for Diesel-Generator Units Applied as Standby Power Generating Stations*. New York, New York: Institute of Electrical and Electronics Engineers. TIC: 258750.

IEEE Std 603-1998. *IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations*. New York, New York: The Institute of Electrical and Electronics Engineers. TIC: 242993.

Table 1. Terminology

Terminology (Definitions) from IEEE Standards 308-2001, 379-2000, 384-1992, and 603-1998	**Yucca Mountain Repository Terminology**
Associated circuit Non-Class 1E circuits that are not physically separated or are not electrically isolated from Class 1E circuits by acceptable separation distance, safety class structures, barriers, or isolation devices.	Alternate method. All ITS circuits are electrically isolated and physically separated from non-ITS circuits
Class 1E electrical equipment or system The safety classification of the electric equipment and systems that are essential to emergency reactor shutdown, containment isolation, reactor core cooling, and containment and reactor heat removal, or are otherwise essential in preventing significant release of radioactive material to the environment. NOTE: Users of this standard are advised that "Class 1E" is a functional term. Equipment and systems are to be classified Class 1E only if they fulfill the functions listed in the definition. Identification of systems or equipment as Class 1E based on anything other than their function is an improper use of the term and should be avoided.	ITS electrical equipment or systems The safety classification of the electric equipment and systems that prevent or mitigate Category 1 or Category 2 event sequences.
Division, channel The designation applied to a given system or set of components that enables the establishment and maintenance of physical, electrical, and functional independence from other redundant sets of components. NOTE: The terms division, train, channel, separation group, safety group, or load group, when used in this context, are interchangeable.	Train The designation applied to a given system or set of components that enables the establishment and maintenance of physical, electrical, and functional independence from other redundant sets of components
Design basis event Postulated abnormal events used in the design to establish the acceptable performance requirements of the structures, systems, and components.	Alternate method The scope and definitions of design basis events are based on regulatory requirements different from the preclosure performance objectives and analysis requirements of 10 CFR 63.111 and 63.112. Initiating events and their resulting event sequences as defined in 10 CFR 63.2: Category 1—Those event sequences that are expected to occur one or more times before permanent closure of the geologic repository operations. Category 2—Event sequences that have at least one chance in 10,000 of occurring before permanent closure.

Terminology (Definitions) from IEEE Standards 308-2001, 379-2000, 384-1992, and 603-1998	Yucca Mountain Repository Terminology
Single failure criteria A systematic rule-based design approach, including hazard analysis and the application of Boolean logic.	Alternate method In lieu of a single failure criteria, the preclosure safety analysis identifies the necessary redundancy and diversity to achieve the required reliability of ITS SSCs. A risk-informed preclosure safety analysis defines both ITS SSCs and the nuclear safety design bases necessary to achieve categorization in compliance with 10 CFR Part 63. As detailed design progresses, specific items that might require application of redundancy and/or diversity to achieve compliance with the nuclear safety design bases will be identified.
Safety class structure Structures designed to protect Class 1E equipment against the effects of the design basis events. NOTE: For the purposes of this standard, separate safety class structures can be separate rooms in the same building. The rooms may share a common wall.	ITS structure Structures designed to protect ITS electrical equipment against the effects of initiating events and their resulting event sequences. Structures designed to reduce the probability of building collapse and collapse of ITS waste handling equipment during seismic events.
Safety function	ITS function
Safety group	ITS group
Safety system Prevents or mitigates the consequences of accidents that could result in potential off-site exposures comparable to the 10 CFR Part 100 guidelines.	ITS system (1) Provides reasonable assurance that high-level waste can be received, handled, packaged, stored, emplaced, and retrieved in compliance with the requirements of 10 CFR 63.111(b)(1) for Category 1 event sequences; or (2) Prevents or mitigates Category 2 event sequences that could result in radiological exposures exceeding the values specified at 10 CFR 63.111(b)(2) to any individual located on or beyond any point on the boundary of the site.
Standby power supply The power supply that is selected to furnish electric energy when the preferred power supply is not available.	ITS diesel generators The ITS diesel generators provide power to ITS electrical loads when the normal power supply is not available. The non-ITS standby diesel generators provide power to non-ITS loads that contribute to the efficient operation of the GROA and adjacent support facilities.

Table 2 ITS SSC Principal Code and Standard Applicability

ITS Controls Principal Codes and Standards						
#	**ITS SSC**	**Safety Function Implemented through ITS Controls**	**Electrical Component / Interlock**	**Principal Codes and Standards**	**Applicable Sections**	**Comments**
1	Equipment Shield Door	Protect against inadvertent direct exposure of personnel to radiation Mitigate the consequences of radionuclide release (CRCF cask unloading room shield doors)	Slide Gate Closed Limit Switches Waste Package Loadout Room Radiation Monitor (not high) Confinement Door Closed Limit Switches Waste Package Loadout Room Equipment Shield Door Closed Limit Switch Personnel Shield Door Closed Limit Switch Motor Starter (assembly)	IEEE Std. 308	NA	Applicable to ITS Power System. See Table 3 for additional rationale.
				IEEE Std. 379	NA	Alternate method applied. No requirement identified for multiple safety groups. See Table 4 and response to RAI 2.2.1.1.7-6-009.
				IEEE Std. 384	5.1–5.3, 5.5.1, 5.5.2, 5.5.3, 5.6, 5.9, 6.1, 6.7, 6.9, 7.1.1, 7.1.2.1, 7.1.2.3, 7.1.2.4, 7.2	See Table 5 for additional rationale.
				IEEE Std. 603	4, 5.2, 5.3, 5.4, 5.5, 5.6.3.1, 5.6.3.2, 5.6.3.3, 5.6.4, 5.7–5.12, 5.14–5.16, 6, 7, 8.3	See Table 6 for additional rationale.
2	Port Slide Gate – Single	Protect against inadvertent direct exposure of personnel to radiation Maintain DOE SNF canister separation (CRCF transportation, aging and disposal canister slide gate)	CTM In-place Limit Switch CTM Centered Switch Motor Starter (assembly)	IEEE Std. 308	NA	Applicable to ITS Power System. See Table 3 for additional rationale.
				IEEE Std. 379	NA	Alternate method applied. No requirement identified for multiple safety groups. See Table 4 and response to RAI 2.2.1.1.7-6-009.
				IEEE Std. 384	5.1–5.3, 5.5.1, 5.5.2, 5.5.3, 5.6, 5.9, 6.1, 6.7, 6.9, 7.1.1, 7.1.2.1, 7.1.2.3, 7.1.2.4, 7.2	See Table 5 for additional rationale.
				IEEE Std. 603	4, 5.2, 5.3, 5.4, 5.5, 5.6.3.1, 5.6.3.2, 5.6.3.3, 5.6.4, 5.7–5.12, 5.14–5.16, 6, 7, 8.3	See Table 6 for additional rationale.

ITS Controls Principal Codes and Standards

#	ITS SSC	Safety Function Implemented through ITS Controls	Electrical Component / Interlock	Principal Codes and Standards	Applicable Sections	Comments
3	Port Slide Gate – Double	Protect against inadvertent direct exposure of personnel to radiation Preclude canister drop onto floor (CRCF and IHF waste package port) Maintain DOE SNF canister separation (CRCF cask and waste package ports)	CTM Skirt In-place Limit Switch CTM Centered Switch TAD Waste Package Present Switch (CRCF Only) Waste Package Transfer Trolley w/Shield Ring Present Aging Overpack Present Switch (CRCF) Shield Door Closed Limit Switches Motor Starter (assembly)	IEEE Std. 308	NA	Applicable to ITS Power System. See Table 3 for additional rationale.
				IEEE Std. 379	NA	Alternate method applied. No requirement identified for multiple safety groups. See Table 4 and response to RAI 2.2.1.1.7-6-009.
				IEEE Std. 384	5.1–5.3, 5.5.1, 5.5.2, 5.5.3, 5.6, 5.9, 6.1, 6.7, 6.9, 7.1.1, 7.1.2.1, 7.1.2.3, 7.1.2.4, 7.2	See Table 5 for additional rationale.
				IEEE Std. 603	4, 5.2, 5.3, 5.4, 5.5, 5.6.3.1, 5.6.3.2, 5.6.3.3, 5.6.4, 5.7–5.12, 5.14–5.16, 6, 7, 8.3	See Table 6 for additional rationale.
4	Personnel Access and Shield Door	Protect against inadvertent direct exposure of personnel to radiation (CRCF and IHF)	Personnel Access Door Locked Switch Radiation High Switch Radiation Element Electronic Door Lock Coil	IEEE Std. 308	NA	Applicable to ITS Power System. See Table 3 for additional rationale.
				IEEE Std. 379	NA	Alternate method applied. No requirement identified for multiple safety groups. See Table 4 and response to RAI 2.2.1.1.7-6-009.
				IEEE Std. 384	5.1–5.3, 5.5.1, 5.5.2, 5.5.3, 5.6, 5.9, 6.1, 6.7, 6.9, 7.1.1, 7.1.2.1, 7.1.2.3, 7.1.2.4, 7.2	See Table 5 for additional rationale.
				IEEE Std. 603	4, 5.2, 5.3, 5.4, 5.5, 5.6.3.1, 5.6.3.2, 5.6.3.3, 5.6.4, 5.7–5.12, 5.14–5.16, 6, 7, 8.3	See Table 6 for additional rationale.

ITS Controls Principal Codes and Standards

#	ITS SSC	Safety Function Implemented through ITS Controls	Electrical Component / Interlock	Principal Codes and Standards	Applicable Sections	Comments
5	Equipment Confinement Door – Double	Mitigate the consequences of radionuclide release (CRCF)	Shield Door Closed Limit Switch Motor Starter (assembly)	IEEE Std. 308	NA	Applicable to ITS Power System. See Table 3 for additional rationale.
				IEEE Std. 379	NA	Alternate method applied. No requirement identified for multiple safety groups. See Table 4 and response to RAI 2.2.1.1.7-6-009.
				IEEE Std. 384	5.1–5.3, 5.5.1, 5.5.2, 5.5.3, 5.6, 5.9, 6.1, 6.7, 6.9, 7.1.1, 7.1.2.1, 7.1.2.3, 7.1.2.4, 7.2	See Table 5 for additional rationale.
				IEEE Std. 603	4, 5.2, 5.3, 5.4, 5.5, 4, 5.2, 5.3, 5.4, 5.5, 5.6.3.1, 5.6.3.2, 5.6.3.3, 5.6.4, 5.7–5.12, 5.14–5.16, 6, 7, 8.3	See Table 6 for additional rationale.
6	Waste Package Transfer Trolley	Protect against spurious movement	Slide Gate Closed Limit Switch Waste Package Transfer Trolley Not In Position for Loading Trolley Circuit Breaker	IEEE Std. 308	NA	Applicable to ITS Power System. See Table 3 for additional rationale.
				IEEE Std. 379	NA	Alternate method applied. No requirement identified for multiple safety groups. See Table 4 and response to RAI 2.2.1.1.7-6-009.
				IEEE Std. 384	5.1–5.3, 5.5.1, 5.5.2, 5.5.3, 5.6, 5.9, 6.1, 6.7, 6.9, 7.1.1, 7.1.2.1, 7.1.2.3, 7.1.2.4, 7.2	See Table 5 for additional rationale.
				IEEE Std. 603	4, 5.2, 5.3, 5.4, 5.5, 5.6.3.1, 5.6.3.2, 5.6.3.3, 5.6.4, 5.7–5.12, 5.14–5.16, 6, 7, 8.2, 8.3	See Table 6 for additional rationale.

ITS Controls Principal Codes and Standards

#	ITS SSC	Safety Function Implemented through ITS Controls	Electrical Component / Interlock	Principal Codes and Standards	Applicable Sections	Comments
7	Cask Preparation Crane	Protect against drop (IHF)	Motor Power Disconnecting Switches - No Final Hoist UL - No Rope Misspool Limit Switches (hoist) - No First Hoist UL - No Broken Rope - No Over Capacity Limit Cask Yoke Arms Engaged (left/right) Switch Cask Yoke Arms Disengaged Switch Hoist Circuit Breaker Adjustable Speed Drive Holding Brake Coil	ASME NOG-1	Section 6000 Electrical Components (Type I Crane)	

ITS Controls Principal Codes and Standards

#	ITS SSC	Safety Function Implemented through ITS Controls	Electrical Component / Interlock	Principal Codes and Standards	Applicable Sections	Comments
8	Cask Handling Crane	Protect against drop Limit drop height	Motor Power Disconnecting Switches - No Final Hoist UL - No Rope Misspool Limit Switches (hoist) - No First Hoist UL - No Broken Rope - No Over Capacity Limit Hoist Circuit Breaker Adjustable Speed Drive Holding Brake Coil	ASME NOG-1	Section 6000 Electrical Components (Type I Crane)	
	Cask Handling Crane Auxiliary Hoist	Protect against drop	Motor Power Disconnecting Switches - No Final Hoist UL - No Rope Misspool Limit Switches (hoist) - No First Hoist UL - No Broken Rope - No Over Capacity Limit - Grapple Disengaged - Grapple Engaged Hoist Circuit Breaker (Auxiliary) Adjustable Speed Drive Holding Brake Coil	ASME NOG-1	Section 6000 Electrical Components (Type I Crane)	
9	Cask Handling Yoke	Protect against drop	Yoke Pin Engaged Switch Yoke Arm Coil	ASME NOG-1	Section 6000 Electrical Components (Auxiliary Equipment)	
10	Pool Cask Handling Yoke	Protect against drop (WHF)	Yoke Connected Switch Yoke Engaged Switch Yoke Arm Coils (left and right)	ASME NOG-1	Section 6000 Electrical Components (Auxiliary Equipment)	
11	Cask Lid Lifting Grapple	Protect against drop (CRCF and RF)	Grapple Connected Switch Grapple Engage Coil	ASME NOG-1	Section 6000 Electrical Components (Auxiliary Equipment)	

ITS Controls Principal Codes and Standards						
#	**ITS SSC**	**Safety Function Implemented through ITS Controls**	**Electrical Component / Interlock**	**Principal Codes and Standards**	**Applicable Sections**	**Comments**
12	Canister Transfer Machine	Protect against drop Limit drop height Protect against spurious movement Protect against inadvertent direct exposure of personnel to radiation	Motor Power Disconnecting Switches - No Final Hoist UL - No Rope Misspool Limit Switches (hoist) - No First Hoist UL - No Broken Rope - No Over Capacity Limit - CTM Shield Skirt Lowered/Raised - CTM Canister Grapple Engaged or Disengaged - No Canister Clear of Slide Gate - MCO/SNF Canister Grapple Engaged or Disengaged - DWPF/INL/WPDP HLW Canister Grapple Engaged or Disengaged - Grapple Connected - Slide Gate Closed Canister Hoist Circuit Breaker - Canister Hoist Trolley and Shield Bell Trolley Not Locked Adjustable Speed Drive (Hoist) Holding Brake Coil Adjustable Speed Drive (Bridge) Motor Starter (Shield Skirt) Motor Starter (Slide Gate) Adjustable Speed Drive (Shield Bell Trolley) Adjustable Speed Drive (Hoist Trolley)	ASME NOG-1	Section 6000 Electrical Components (Type I Crane)	

ITS Controls Principal Codes and Standards						
#	**ITS SSC**	**Safety Function Implemented through ITS Controls**	**Electrical Component / Interlock**	**Principal Codes and Standards**	**Applicable Sections**	**Comments**
13	Canister Transfer Machine Canister Grapple	Protect against drop	Grapple Connected Switch Grapple Engage Coil	ASME NOG-1	Section 6000 Electrical Components (Auxiliary Equipment)	
14	SNF Canister Grapple	Protect against drop (CRCF)	Grapple Connected Switch Grapple Engage Coil	ASME NOG-1	Section 6000 Electrical Components (Auxiliary Equipment)	
15	Waste Package Inner Lid Grapple	Protect against drop (IHF)	Grapple Connected Switch Grapple Engage Coil	ASME NOG-1	Section 6000 Electrical Components (Auxiliary Equipment)	
16	High Level Waste Canister Grapple	Protect against drop (CRCF and IHF)	Grapple Connected Switch	ASME NOG-1	Section 6000 Electrical Components (Auxiliary Equipment)	
17	Jib Crane	Protect against a drop (WHF)	Motor Power Disconnecting Switches - No Final Hoist UL - No Rope Misspool Limit Switches (hoist) - Lid Lifting Grapple Engaged/Disengaged - No First Hoist UL - No Weight Limit Exceeded Hoist Circuit Breaker Adjustable Speed Drive Holding Brake Coil	ASME NOG-1	Section 6000 Electrical Components (Type I Crane)	
18	Jib Crane Lid Lifting Grapple	Protect against drop (WHF)	Grapple Connected Switch Grapple Motor Actuator	ASME NOG-1	Section 6000 Electrical Components (Auxiliary Equipment)	

ITS Controls Principal Codes and Standards

#	ITS SSC	Safety Function Implemented through ITS Controls	Electrical Component / Interlock	Principal Codes and Standards	Applicable Sections	Comments
19	Auxiliary Pool Crane	Protect against a drop (WHF)	Motor Power Disconnecting Switches - No Final Hoist UL - No Rope Misspool Limit Switches (hoist) - No First Hoist UL - No Broken Rope - No Over Capacity limit - Grapple Disengaged - Grapple Engaged Hoist Circuit Breaker (Auxiliary) Adjustable Speed Drive Holding Brake Coil	ASME NOG-1	Section 6000 Electrical Components (Type I Crane)	
20	Pool Lid Lifting Grapple	Protect against drop (WHF)	Grapple Connected Switch Grapple Motor Actuator	ASME NOG-1	Section 6000 Electrical Components (Auxiliary Equipment)	
21	Spent Fuel Transfer Machine	Protect against drop (WHF) Protect against lifting an SNF assembly above the safe limit for workers (WHF)	Motor Power Disconnecting Switches - No Final Hoist UL - No Rope Misspool Limit Switches (hoist) - No First Hoist UL - No Broken Rope - No Over Capacity Limit - Grapple Engaged/ Disengaged - SFTM Grapple Engaged Mast Hoist Circuit Breaker Adjustable Speed Drive Hoist Holding Brake Coil	ASME NOG-1	Section 6000 Electrical Components (Type I Crane)	

ITS Controls Principal Codes and Standards

#	ITS SSC	Safety Function Implemented through ITS Controls	Electrical Component / Interlock	Principal Codes and Standards	Applicable Sections	Comments
22	Pressurized Water Reactor and Boiling Water Reactor Lifting Grapples	Protect against drop	Grapple Connected Switch Grapple Motor Actuator	ASME NOG-1	Section 6000 Electrical Components (Auxiliary Equipment)	
23	Transport and Emplacement Vehicle	Protect against inadvertent direct exposure of personnel to radiation	TEV Location Switch TEV Shield Door Motors (left and right)	IEEE Std. 308	NA	Applicable to ITS Power System. See Table 3 for additional rationale.
				IEEE Std. 379	NA	Alternate method applied. No requirement identified for multiple safety groups. See Table 4 and response to RAI 2.2.1.1.7-6-009.
				IEEE Std. 384	5.1–5.3, 5.5.1, 5.5.2, 5.5.3, 5.6, 6.9, 7.1.1, 7.1.2.1, 7.1.2.3, 7.1.2.4, 7.2	See Table 5 for additional rationale.
				IEEE Std. 603	4, 5.1–5.12, 5.14–5.16, 6, 7, 8.2, 8.3	See Table 6 for additional rationale.

ITS Controls Principal Codes and Standards

#	ITS SSC	Safety Function Implemented through ITS Controls	Electrical Component / Interlock	Principal Codes and Standards	Applicable Sections	Comments
24	CRCF HVAC	Mitigate the consequences of radionuclide release Support ITS electric power	HEPA Filter Delta P Not Low HEPA Filter Delta P Not High Fan Discharge Flow Not Low Fan Delta P Not Low Adjustable Speed Drive Fan Motors Sequencer Start Exhaust Fan Failure, or Tripped, or HEPA Filter Delta P High, or Low Adjustable Speed Drive FCU Fan Motors FCU Discharge Flow Not Low FCU Delta P Not Low Sequencer Start FCU Failure, or Tripped Adjustable Speed Drive Battery Exhaust Fan Motors Fan Discharge Flow Not Low Fan Delta P Not Low Sequencer Start Battery Room Fan Failure, or Tripped	IEEE Std. 308	NA	Applicable to ITS Power System. See Table 3 for additional rationale.
				IEEE Std. 379	4, 5.1–5.5, 6.2, 6.3.1, 6.3.3	See Table 4 for additional rationale.
				IEEE Std. 384	5.1–5.4, 5.5.1, 5.5.2, 5.5.3, 5.6, 5.7, 5.9, 5.10, 6.1, 6.7–6.9, 7.1.1, 7.1.2.1, 7.1.2.3, 7.1.2.4, 7.2	See Table 5 for additional rationale.
				IEEE Std. 603	4, 5.1–5.12, 5.14–5.16, 6, 7, 8.3	See Table 6 for additional rationale.

ITS Controls Principal Codes and Standards

#	ITS SSC	Safety Function Implemented through ITS Controls	Electrical Component / Interlock	Principal Codes and Standards	Applicable Sections	Comments
25	WHF HVAC	Mitigate the consequences of radionuclide release Support ITS electric power	HEPA Filter Delta P Not Low HEPA Filter Delta P Not High Fan Discharge Flow Not Low Fan Delta P Not Low Adjustable Speed Drive Fan Motors Sequencer Start Exhaust Fan Failure, or Tripped, or HEPA Filter Delta P High, or Low Adjustable Speed Drive FCU Fan Motors FCU Discharge Flow Not Low FCU Delta P Not Low Sequencer Start FCU Failure, or Tripped Adjustable Speed Drive Battery Exhaust Fan Motors Fan Discharge Flow Not Low Fan Delta P Not Low Sequencer Start Battery Room Fan Failure, or Tripped	IEEE Std. 308	NA	Applicable to ITS Power System. See Table 3 for additional rationale.
				IEEE Std. 379	4, 5.1–5.5, 6.2, 6.3.1, 6.3.3	See Table 4 for additional rationale.
				IEEE Std. 384	5.1–5.4, 5.5.1, 5.5.2, 5.5.3, 5.6, 5.7, 5.9, 5.10, 6.1, 6.7–6.9, 7.1.1, 7.1.2.1, 7.1.2.3, 7.1.2.4, 7.2	See Table 5 for additional rationale.
				IEEE Std. 603	4, 5.1–5.12, 5.14–5.16, 6, 7, 8.3	See Table 6 for additional rationale.
26	Emergency Diesel Generator Facility HVAC	Support ITS electric power	Start (local) (Exhaust Fan) Generator Room Temp Low Generator Room Temp Not High ITS Exhaust Fan Motor Starter Auto (local) (Exhaust Fan) Stop (local) (Exhaust Fan) Battery Rm Fan Discharge Flow Not Low	IEEE Std. 308	NA	Applicable to ITS Power System. See Table 3 for additional rationale.
				IEEE Std. 379	4, 5.1–5.5, 6.2, 6.3.1, 6.3.3	See Table 4 for additional rationale.
				IEEE Std. 384	5.1–5.4, 5.5.1, 5.5.2, 5.5.3, 5.6, 5.7, 5.9, 5.10, 6.1, 6.7–6.9, 7.1.1, 7.1.2.1, 7.1.2.3, 7.1.2.4, 7.2	See Table 5 for additional rationale.

ITS Controls Principal Codes and Standards						
#	ITS SSC	Safety Function Implemented through ITS Controls	Electrical Component / Interlock	Principal Codes and Standards	Applicable Sections	Comments
			Battery Rm Fan Delta P Not Low Sequencer Start Battery Room Exhaust Fan Failure or Tripped Battery Room Exhaust Fan motor Starter Open (local) Inlet Damper Diesel Gen Not Running Auto (local) Inlet Damper Damper Fully Open Close (local) Inlet Damper Damper Fully Closed Inlet Damper Motor starter Open (local) Outlet Damper Auto (local) Outlet Damper Damper Fully Open Close (local) Outlet Damper Damper Fully Closed Outlet Damper Motor starter AHU Fan Discharge Flow Not Low AHU Fan Delta P Not Low Sequencer Start Battery Room A EXH Fan (1 & 2) Running No Smoke Signal Inlet Damper Fully Open Inlet Damper Fully Closed ASD AHU Motor Inlet Damper Room Motor starter (A and B)	IEEE Std. 603	4, 5.1–5.12, 5.14–5.16, 6, 7, 8.3	See Table 6 for additional rationale.

ITS Controls Principal Codes and Standards

#	ITS SSC	Safety Function Implemented through ITS Controls	Electrical Component / Interlock	Principal Codes and Standards	Applicable Sections	Comments
27	ITS Diesel Fuel Oil System	Support ITS electrical power	Day Tank Level Not Low Motor Starter Fuel Pumps	IEEE Std. 308	4.1–4.4, 4.7–4.10, 4.12, 4.14, 5.2.4.1–5.2.4.6, 5.5.1, 5.5.2, 5.5.3, 5.6.1. 5.6.2, 6.1-6.4, 8.1, 8.3	See Table 3 for additional rationale.
				IEEE Std. 379	4, 5.1–5.5, 6.2, 6.3.1, 6.3.3	See Table 4 for additional rationale.
				IEEE Std. 384	5.1–5.4, 5.5.1, 5.5.2, 5.5.3, 5.6, 5.7, 5.9, 5.10, 6.1, 6.2.2, 6.7–6.9, 7.1.1, 7.1.2.1, 7.1.2.3, 7.1.2.4, 7.2	See Table 5 for additional rationale.
				IEEE Std. 603	4, 5.1–5.12, 5.14–5.16, 6, 7, 8.3	See Table 6 for additional rationale.
28	ITS Diesel Starting Air System	Support ITS electrical power	Air Receiver Pressure Not Low Motor Starter Compressor	IEEE Std. 308	4.1–4.4, 4.7–4.10, 4.12, 4.14, 5.2.4.1–5.2.4.4, 5.2.4.6, 5.5.1, 5.5.2, 5.6.1. 5.6.2, 6.1–6.4, 8.1, 8.3	See Table 3 for additional rationale.
				IEEE Std. 379	4, 5.1–5.5, 6.2, 6.3.1, 6.3.3	See Table 4 for additional rationale.
				IEEE Std. 384	5.1–5.4, 5.5.1, 5.5.2, 5.5.3, 5.6, 5.7, 5.9, 5.10, 6.1, 6.2.2, 6.7–6.9, 7.1.1, 7.1.2.1, 7.1.2.3, 7.1.2.4, 7.2	See Table 5 for additional rationale.
				IEEE Std. 603	4, 5, 5.1, 5.2, 5.3, 5.4, 5.5, 5.6.1–5.6.3, 5.6.3.1–5.6.3.3, 5.6.4, 5.7, 5.8.-5.12, 5.14–5.1 6,7, 8	See Table 6 for additional rationale.

ITS Controls Principal Codes and Standards

#	ITS SSC	Safety Function Implemented through ITS Controls	Electrical Component / Interlock	Principal Codes and Standards	Applicable Sections	Comments
29	ITS Diesel Generator Note: For the applicability of IEEE Std 387 see RAI 2.2.1.1.7-6-008 and SAR Section 1.4.1.2.8	Provide ITS electrical power	13.8 kV ITS Diesel Generators	IEEE Std. 308	4.1–4.10, 4.12, 4.14, 5.1.1–5.1.3, 5.2.1, 5.2.4.1–5.2.4.4, 5.2.4.6, 5.5.1, 5.5.2, 5.6.1. 5.6.2, 6.1–6.4, 8.1, 8.3	See Table 3 for additional rationale.
				IEEE Std. 379	4, 5.1–5.5, 6.2, 6.3.1, 6.3.3	See Table 4 for additional rationale.
				IEEE Std. 384	5.1–5.4, 5.5.1, 5.5.2, 5.5.3, 5.6, 5.7, 5.9, 5.10, 6.1, 6.2, 6.7–6.9, 7.1.1, 7.1.2.1, 7.1.2.3, 7.1.2.4, 7.2	See Table 5 for additional rationale.
				IEEE Std. 603	4, 5.1–5.12, 5.14–5.16, 6 – 7, 8.1, 8.3	See Table 6 for additional rationale.
30	ITS Electrical Power	Provide electrical power to ITS surface nuclear confinement HVAC systems	13.8 kV ITS Switchgear 13.8 kV ITS Breaker Automatic Load Sequencers 13.8 kV to 480 V ITS Transformers 480 V ITS Load Centers 480 V ITS Motor Control Centers ITS Uninterruptible Power Supplies DG Protective Relays 13.8 kV ITS SWGR Buss and FMR Protective Relays DG Output Breaker "Close" Permit Signal DG Output Breaker “Auto" Load Sequencer ITS Distribution (feeders up to and including ITS loads, ITS direct current power, ITS uninterruptible power supply power)	IEEE Std. 308	4.1–4.12, 4.14, 5.1.1–5.1.3, 5.2.1, 5.2.2.1–5.2.2.4, 5.2.4.3, 5.2.4.6, 5.3.1, 5.3.2.1–5.3.2.4, 5.4.1, 5.4.2.1–5.4.2.4, 5.4.5.1–5.4.5.4, 5.5.1, 5.5.2, 5.6.1. 5.6.2, 6.1-6.4, 8.1–8.3	See Table 3 for additional rationale.
				IEEE Std. 379	4, 5.1–5.5, 6.2, 6.3.1, 6.3.3	See Table 4 for additional rationale.
				IEEE Std. 384	5.1–5.6, 5.9, 5.10, 6.1, 6.3.2, 6.4, 6.6, 6.7–6.9, 7.1.1, 7.1.2.1, 7.1.2.3, 7.1.2.4, 7.2	See Table 5 for additional rationale.
				IEEE Std. 603	4, 5.1–5.12, 5.14–5.16, 6–8	See Table 6 for additional rationale.

ITS Controls Principal Codes and Standards

#	ITS SSC	Safety Function Implemented through ITS Controls	Electrical Component / Interlock	Principal Codes and Standards	Applicable Sections	Comments
31	ITS Batteries	Support ITS electrical power	125 V DC ITS Batteries ITS Battery Chargers	IEEE Std. 308	4.1–4.4, 4.7–4.10, 4.12, 4.14, 5.3.1, 5.3.2.4, 5.3.3.1–5.3.3.7, 5.3.4.1–5.3.4.7, 5.5.1, 5.5.2, 5.6.1. 5.6.2, 6.1-6.4, 8.1, 8.3	See Table 3 for additional rationale.
				IEEE Std. 379	4, 5.1–5.5, 6.2, 6.3.1, 6.3.3	See Table 4 for additional rationale.
				IEEE Std. 384	5.1–5.6, 5.9, 5.10, 6.1, 6.3, 6.6.1, 6.7–6.9, 7.1.1, 7.1.2.1, 7.1.2.3, 7.1.2.4, 7.2	See Table 5 for additional rationale.
				IEEE Std. 603	4, 5.1–5.12, 5.14, 5.16, 6–8	See Table 6 for additional rationale.

NOTE: AHU = air handling unit; CRCF = Canister Receipt and Closure Facility; CTM = canister transfer machine; DC = direct current; DG = diesel generator; DWPF = Defense Waste Processing Facility (Savannah River); FCU = fan cooling unit; FMR = feeder management relay; HEPA = high-efficiency particulate air; HVAC = heating, ventilation, and air-conditioning; IHF = Initial Handling Facility; INL = Idaho National Laboratory; MCO = multi-canister overpack; NA = not applicable; RF = Receipt Facility; SNF = spent nuclear fuel; TAD = transportation, aging, and disposal; TEV = transport and emplacement vehicle; UL = upper limit; WHF = Wet Handling Facility; WPDP = West Valley Defense Processing Facility.

Table 3 IEEE Std 308-2001 Applicability

IEEE Std 308-2001, Standard Criteria for Class 1E Power Systems for Nuclear Power Generating Stations			
Section Number & Title	**Applicable**	**ITS SSC Number from Table 2 See Note 1**	**Rationale or Comment**
1. Overview	Yes	–	
2. References	Yes	–	The scope of this applicability review only incorporates the principal codes and standards cited in Table 1 (IEEE Stds 308-2001, 379-2000, 384-1992 and 603-1998).
3. Definitions	Alternate Method	–	See Table 1, *Terminology*.
4. Principal design criteria	–	–	
4.1 General	Alternate Method	27–31	The second bullet or "A loss of electric power to equipment that could result in a reactor transient capable of causing significant damage to the fuel cladding or to the reactor coolant pressure boundary" is not applicable.
4.2 Relationship between the safety system and Class 1E power system	Yes	27–31	ITS HVAC systems are connected to the ITS Power Systems; however, since these systems are not part of the ITS Electrical power system this requirement is not applicable. Other ITS Systems that provide protective actions fail safe, and are not required to be connected to ITS power.
4.3 Design basis event effects	Yes	27–31	See terminology in Table 1 for design basis event.
4.4 Design basis	Yes	27–31	See terminology in Table 1 for design basis event.
4.5 Power quality	Yes	29–30	
4.6 Location of indicators and control	Alternate Method	29–30	Safe-Shut down condition is not applicable to the repository.
4.7 Identification	Yes	27–31	
4.8 Independence	Yes	27–31	
4.9 Equipment qualification	Yes	27–31	Equipment qualification will be in accordance with SAR Section 1.13.
4.10 Single-failure criterion	Alternate Method	27–31	See Table 1 and response to RAI 2.2.1.1.7-6-009 for additional clarification
4.11 Connection of non-Class 1E circuits	Yes	30	
4.12 Control of access	Yes	27–31	
4.13 Circuits that penetrate containment	No	None	There are no containment vessels that require electrical penetrations
4.14 Protection	Yes	27–31	
5. Supplementary design criteria	–	–	
5.1 Class 1E power systems	–	–	
5.1.1 Description	Yes	29–30	
5.1.2 Function	Yes	29–30	

IEEE Std 308-2001, Standard Criteria for Class 1E Power Systems for Nuclear Power Generating Stations			
Section Number & Title	**Applicable**	**ITS SSC Number from Table 2 See Note 1**	**Rationale or Comment**
5.1.3 Interaction	Alternate Method	29–30	The duration of the connection between the normal power supply and the ITS diesel generators will be determined in detailed design.
5.2 Alternating current power systems	–	–	
5.2.1 General	Yes	29–30	
5.2.2 Distribution system	–	–	
5.2.2.1 Description	Yes	30	
5.2.2.2 Capability	Yes	30	
5.2.2.3 Independence	Yes	30	
5.2.2.4 Auxiliary devices	Yes	30	
5.2.2.5 Feeders	No	None	CRCF and WHF are ITS structures; however, the PCSA has determined the EDGF is a non-ITS structure. See SAR Table 1.9-1.
5.2.3 Preferred power supply	Yes	Normal Power System	The preferred power supply to ITS components is the normal electrical power supply.
5.2.4 Standby power supply	–	–	
5.2.4.1 Description	Yes	27–29	
5.2.4.2 Capability	Yes	27–29	
5.2.4.3 Independence	Yes	27–30	
5.2.4.4 Availability	Yes	27–29	
5.2.4.5 Energy storage	Alternate Method	27	The ITS HVAC and associated ITS power supply shall operate for 30 days after a radionuclide release caused by a Category 2 event sequence. Stored diesel fuel at the site is sufficient to allow management of the diesel generators and refueling of the storage tanks to maintain continuous operation for 30 days.
5.2.4.6 Test provisions	Alternate Method	27–30	Except provision b).
5.3 DC power systems	–	–	
5.3.1 General	Yes	30–31	
5.3.2 Distribution system	–	–	
5.3.2.1 Description	Yes	30	
5.3.2.2 Capability	Yes	30	
5.3.2.3 Independence	Yes	30	
5.3.2.4 Auxiliary devices	Yes	30,31	
5.3.2.5 Feeders	No	None	CRCF and WHF are ITS structures; however, the PCSA has determined the EDGF is a non-ITS structure. See SAR Table 1.9-1.
5.3.3 Battery supply	–	–	
5.3.3.1 Description	Yes	31	
5.3.3.1 Description	Yes	31	
5.3.3.3 Availability	Yes	31	

IEEE Std 308-2001, Standard Criteria for Class 1E Power Systems for Nuclear Power Generating Stations			
Section Number & Title	**Applicable**	**ITS SSC Number from Table 2 See Note 1**	**Rationale or Comment**
5.3.3.4 Independence	Yes	31	
5.3.3.5 Stored energy	Yes	31	
5.3.3.6 Test provisions	Yes	31	
5.3.3.7 Installation	Yes	31	
5.3.4 Battery charger	–	–	
5.3.4.1 Description	Yes	31	
5.3.4.2 Function	Yes	31	
5.3.4.3 Capability	Yes	31	
5.3.4.4 Independence	Yes	31	
5.3.4.5 Disconnecting means	Yes	31	
5.3.4.6 Feedback protection	Yes	31	
5.3.4.7 Transient protection	Yes	31	
5.4 Instrument and control power systems	–	–	
5.4.1 General	Yes	30	
5.4.2 Distribution system	–	–	
5.4.2.1 Description	Yes	30	
5.4.2.2 Capability	Yes	30	
5.4.2.3 Independence	Yes	30	
5.4.2.4 Auxiliary devices	Yes	30	
5.4.3 Battery supply	Yes	31	
5.4.4 Battery charger	Yes	31	
5.4.5 Alternating current supply	–	–	
5.4.5.1 Description	Yes	30	
5.4.5.2 Capability	Yes	30	
5.4.5.3 Independence	Yes	30	
5.4.5.4 Surveillance	Yes	30	
5.5 Execute features	–	–	
5.5.1 General	Yes	27–31	
5.5.2 Manual control	Yes	27–31	
5.6 Sense and command features	–	–	
5.6.1 General	Yes	27–31	
5.6.2 Protective devices	Yes	27–31	
6. Surveillance and test requirements	–	–	
6.1 Surveillance methods	Yes	27–31	
6.2 Preoperational equipment tests and inspections	Yes	27–31	

IEEE Std 308-2001, Standard Criteria for Class 1E Power Systems for Nuclear Power Generating Stations			
Section Number & Title	**Applicable**	**ITS SSC Number from Table 2 See Note 1**	**Rationale or Comment**
6.3 Preoperational system test	Yes	27–31	
6.4 Periodic tests	Yes	27–31	
7. Multiunit station considerations	No	None	Not applicable.
8. Documentation	–	–	
8.1 Design documentation records	Yes	27–31	The *Quality Assurance Requirements and Description* (QARD) document, DOE/RW-0333P, establishes the requirements for the OCRWM quality assurance program, and meets 10 CFR 63.142 ,DOE O 414.1C, *Quality Assurance,* and ANSI/ASME NQA-1-1983.
8.2 Verification and validation	Yes	30	ITS components do not utilize programmable digital computer systems.
8.3 Test records	Yes	27–31	

NOTE: 1. Cranes, Yokes, and Grapples (7–22) are covered by ASME NOG-1-2004, Section 6000 and/or ANSI N14.6-1993.

CRCF = Canister Receipt and Closure Facility; HVAC = heating, ventilation, and air-conditioning; WHF = Wet Handling Facility.

Table 4. IEEE Std 379-2000 Applicability

Standard Application of the Single-Failure Criterion to Nuclear Power Generating Station Safety Systems			
IEEE Std 379-2000 Section Number & Title	**Applicable**	**ITS SSC Number from Table 2**	**Rationale or Comment**
1. Overview	Yes	–	The provisions of this standard are applied to the extent necessary to support the PCSA event sequence analyses demonstration of compliance with the 10 CFR 63.111 performance objectives with sufficient margins of safety. See response to RAI 2.2.1.1.7-6-009 for additional clarification
2. References	Yes	–	The scope of this applicability review only incorporates the principal codes and standards cited in Table 1 (IEEE Stds 308-2001, 379-2000, 384-1992 and 603-1998).
3. Definitions	Alternate Method	–	See Table 1*, Terminology*
4. Statement of the single-failure criterion	Alternate Method	24–31	The provisions of this section are applied to the extent necessary to support the PCSA event sequence analyses demonstration of compliance with the 10 CFR 63.111 performance objectives with sufficient margins of safety. See Table 1 and response to RAI 2.2.1.1.7-6-009 for additional clarification
5. Requirements	–	–	
5.1 Independence and redundancy	Alternate Method	24–31	The principle of independence and redundancy is applied to the ITS electrical power system and those systems with a requirement for multiple safety trains.
5.2 Nondetectable failure	Alternate Method	24–31	Latent failures within event sequences are included in the PCSA and are implicit in the nuclear safety design basis used to meet the 10 CFR 63.111 performance objectives.
5.3 Cascaded failures	Yes	24–31	PCSA analysis of event sequences considered consequential failures.
5.4 Design basis events	Alternate Method	24–31	See Table 1. Risk-informed PCSA performed to comply with 10 CFR Part 63 requirements for Category 1 and 2 event sequences.
5.5 Common-cause failures	Yes	24–31	PCSA analysis of event sequences considered common-cause failures.
5.6 Shared systems	No	None	Not Applicable.
6. Design analysis for single failure	Alternate Method	24–31	Risk-informed PCSA performed to comply with 10 CFR Part 63 requirements for Category 1 and 2 event sequences. See Table 1 and response to RAI 2.2.1.1.7-6-009 for additional clarification
6.1 Procedure	Alternate Method	None	The PCSA identified: the safety function of ITS SSCs; the combinations of conditions, actions and failures that would cause failure of the safety function; ITS features that reduce the failure probability or mitigate the consequences; independent and dependent features. See Table 1 and response to RAI 2.2.1.1.7-6-009 for additional clarification

Standard Application of the Single-Failure Criterion to Nuclear Power Generating Station Safety Systems			
IEEE Std 379-2000 Section Number & Title	**Applicable**	**ITS SSC Number from Table 2**	**Rationale or Comment**
6.2 Systems portions analysis	Alternate Method	24–31	See response to RAI 2.2.1.1.7-6-009 for additional clarification.
6.3 Other considerations	–	–	
6.3.1 Other systems coupled to safety systems	Alternate Method	24–31	See response to RAI 2.2.1.1.7-6-009 for additional clarification.
6.3.2 Performance of a probabilistic assessment	No	None	Section 6.3.2 states that a probabilistic analysis shall not be used in lieu of a single-failure analysis. A single failure analysis is not performed for each safety function; rather the PCSA indentifies the SSCs requiring multiple safety trains. See Table 1 and response to RAI 2.2.1.1.7-6-009 for additional clarification
6.3.3 Potential for system actuation due to single failure	Alternate Method	24–31	See response to RAI 2.2.1.1.7-6-009 for additional clarification.

NOTE: Cranes, Yokes, and Grapples (7 – 22) are covered by ASME NOG-1-2004, Section 6000 and/or ANSI N14.6-1993.

Table 5 IEEE Std 384-1992 Applicability

IEEE Std 384-1992, Standard Criteria for Independence of Class 1E Equipment and Circuits			
Section Number & Title	**Applicable**	**ITS SSC Number from Table 2 See Note 1**	**Rationale or Comment**
1. Scope	Yes	–	
2. Purpose	Yes	–	
3. References	Yes	1–6, 23–31	The scope of this applicability review only incorporates the principal codes and standards cited in Table 1 (IEEE Stds 308-2001, 379-2000, 384-1992 and 603-1998).
4. Definitions	Alternate Method	–	See Table 1, *Terminology*.
5. General Independence Criteria	–	–	
5.1 Required Independence	Yes	1–6, 23–31	
5.2 Methods of Achieving Independence	Yes	1—6, 23–31	
5.3 Equipment and Circuits Requiring Independence	Yes	1–6, 23–31	
5.4 Compatibility With Auxiliary Supporting Features	Yes	24–31	
5.5 Associated Circuits	–	–	
5.5.1 General	Alternate Method	1–6, 23–31	See Table 1, *Terminology*
5.5.2 Criteria	Alternate Method	1–6, 23–31	See Table 1, *Terminology*
5.5.3 Qualification Requirements	Yes	1–6, 23–31	
5.6 Non-Class 1E Circuits; General Criteria	Yes	1–6, 23–31	
5.7 Mechanical Systems	Yes	24–29	The ITS electrical SSCs shall be protected from mechanical hazards described in this section.
5.8 Structures and Equipment	Alternate Method	–	The probability of event sequences that included failure of ITS structures as a result of external events was found to be beyond Category 2. The CRCF, IHF, RF, and WHF are ITS structures; however the PCSA has determined the EDGF as a non-ITS structure. There is no ITS electrical power in the IHF and RF. See SAR Table 1.9-1.
5.9 Fire Protection Systems	Alternate Method	1–6, 24–31	The PCSA did not rely on fire suppression for fire event sequences. Non-fire event sequences that include inadvertent fire suppression actuation are beyond Category 2.

IEEE Std 384-1992, Standard Criteria for Independence of Class 1E Equipment and Circuits			
Section Number & Title	**Applicable**	**ITS SSC Number from Table 2 See Note 1**	**Rationale or Comment**
5.10 Fire	Alternate Method	24–31	The PCSA included a comprehensive fire risk analysis which resulted in nuclear safety design bases related to fires that considers one or more electrical division failures and ensures compliance with 10 CFR Part 63.111.
6. Specific Separation Criteria	–	–	
6.1 Cables and Raceways	Yes	1–6, 24–31	
6.2 Standby Power Supply	–	–	
6.2.1 Standby Generating Units	Alternate Method	29	The CRCF, IHF, RF, and WHF are ITS structures; however the PCSA has determined the EDGF as a non-ITS structure. There is no ITS electrical power in the IHF and RF. See SAR Table 1.9-1.
6.2.2 Auxiliaries and Local Controls	Alternate Method	27–29	The CRCF, IHF, RF, and WHF are ITS structures; however the PCSA has determined the EDGF as a non-ITS structure. There is no ITS electrical power in the IHF and RF. See SAR Table 1.9-1.
6.3 DC System	–	–	
6.3.1 Batteries	Alternate Method	31	CRCF and WHF are ITS structures; however, the PCSA has determined the EDGF as a non-ITS structure. See SAR Table 1.9-1
6.3.2 Battery Chargers	Yes	30, 31	
6.4 Distribution system	Yes	30	
6.5 Containment Electrical Penetrations	No	None	There are no containment vessels that require electrical penetrations
6.6 Control Switchboards	–	–	
6.6.1 Location and Arrangement	Alternate Method	30, 31	CRCF and WHF are ITS structures; however, the PCSA has determined the EDGF as a non-ITS structure. See SAR Table 1.9-1
6.6.2 Internal Separation	Yes	30	
6.6.3 Internal Wiring Identification	Yes	30	
6.6.4 Common Terminations	Yes	30	
6.6.5 Non-Class 1E Wiring	Yes	30	
6.6.6 Cable Entrance	Yes	30	
6.7 Instrumentation Cabinets	Yes	1–6, 24–31	
6.8 Sensors	Yes	24-31	
6.9 Actuated Equipment	Yes	1–6, 23–30	
7. Specific Electrical Isolation Criteria	–	–	
7.1 Power Circuits	–	–	
7.1.1 General	Yes	1–6, 23–31	
7.1.2 Isolation Devices	–	–	

IEEE Std 384-1992, Standard Criteria for Independence of Class 1E Equipment and Circuits			
Section Number & Title	**Applicable**	**ITS SSC Number from Table 2 See Note 1**	**Rationale or Comment**
7.1.2.1 Circuit Breaker Tripped by Fault Currents	Yes	1–6, 23–31	
7.1.2.2 Circuit Breaker Tripped by Accident Signals	No	–	There are no accident signal circuits in the ITS power system.
7.1.2.3 Input Current Limiters	Yes	1–6, 23–31	
7.1.2.4 Fuses	Yes	1–6, 23–31	
7.2 Instrumentation and Control Circuits	Yes	1–6, 23–31	

NOTE: Cranes, Yokes, and Grapples (7 – 22) are covered by ASME NOG-1-2004, Section 6000 and/or ANSI N14.6-1993.

CRCF = Canister Receipt and Closure Facility; RF = Receipt Facility; WHF = Wet Handling Facility.

Table 6 IEEE Std 603-1998 Applicability

IEEE Std 603-1998, Standard Criteria for Safety Systems for Nuclear Power Generating Stations			
Section Number & Title	**Applicable**	**ITS SSC Number from Table 2 See Note 1**	**Rationale or Comment**
1.Scope	Yes	–	
2. References	Yes	–	The scope of this applicability review only incorporates the principal codes and standards cited in Table 1 (IEEE Stds 308-2001, 379-2000, 384-1992 and 603-1998).
3. Definitions	Alternate Method	–	See Table 1, *Terminology*.
4. Safety system design basis	Alternate Method	1–6, 23–31	Parts a, b, d, and f through l are applicable. The design basis of each ITS SSC is documented, however it is not in accordance with the requirements of ANSI/ANS 51.1-1983 or ANSI/ANS 52.1-1983. Documentation is provided in the PCSA, Nuclear Safety Design Bases, and Safety Analysis Report .
5. Safety system criteria	Alternate Method	1–6, 23–31	The scope and definitions of design basis events are based on regulatory requirements different from the preclosure performance objectives and analysis requirements of 10 CFR 63.111 and 63.112. The preclosure safety analysis identified ITS SSCs and their nuclear safety design bases..
5.1 Single-failure criterion	Alternate Method	24–31	The provisions of this section are applied to the extent necessary to support the PCSA event sequence analyses demonstration of compliance with the 10 CFR 63.111 performance objectives with sufficient margins of safety. See Tables 1 and 4, and response to RAI 2.2.1.1.7-6-009 for additional clarification.
5.2 Completion of protective action	Yes	1–6, 23–31	
5.3 Quality	Yes	1–6, 23–31	The Quality Assurance Requirements and Description (QARD) document, DOE/RW-0333P, establishes the requirements for the OCRWM quality assurance program, and meet 10 CFR 63.142 ,DOE O 414.1C, Quality Assurance, and ANSI/ASME NQA-1-1983.
5.4 Equipment qualification	Alternate Method	1–6, 23–31	In accordance with SAR Section 1.13.
5.5 System integrity	Yes	1–6, 23–31	
5.6 Independence	–	–	
5.6.1 Between redundant portions of a safety system	Yes	24-31	

IEEE Std 603-1998, Standard Criteria for Safety Systems for Nuclear Power Generating Stations			
Section Number & Title	**Applicable**	**ITS SSC Number from Table 2 See Note 1**	**Rationale or Comment**
5.6.2 Between safety systems and effects of design basis event	Yes	24–31	The PCSA included both ITS and non-ITS SSCs in evaluating system reliability during event sequences. Equipment qualification is in accordance with SAR Section 1.13.
5.6.3 Between safety systems and other systems	–	–	
5.6.3.1 Interconnected equipment	Yes	1–6, 23–31	
5.6.3.2 Equipment in proximity	Yes	1–6, 23–31	
5.6.3.3 Effects of a single random failure	Yes	1–6, 23–31	The PCSA included random failures of both ITS and non-ITS SSCs in evaluating system reliability during event sequences.
5.6.4 Detailed criteria	Yes	1–6, 23–31	See Table 5 for conformance with IEEE Std 384-1992. ITS controls do not rely on computers.
5.7 Capability for testing and calibration	Yes	1–6, 23–31	
5.8 Information displays	Yes	1–6, 23–31	Control room is the facility operations room.
5.9 Control of access	Yes	1–6, 23–31	
5.10 Repair	Yes	1–6, 23–31	
5.11 Identification	Yes	1–6, 23–31	
5.12 Auxiliary features	Yes	1–6, 23–31	
5.13 Multi-unit stations	No	None	There is no sharing of ITS SSCs with other stations.
5.14 Human factors considerations	Yes	1–6, 23–31	
5.15 Reliability	Yes	1–6, 23–31	PCSA determines reliability requirements in accordance with the risk-informed, performance-based approach of 10 CFR Part 63. These are documented in the nuclear safety design bases for ITS SSCs.
5.16 Common cause failure criteria	Yes	1–6, 23–31	Common cause failure is included in the PCSA.
6. Sense and command features functional and design requirements	Yes	1–6, 23–31	
6.1 Automatic control	Yes	1–6, 23–31	
6.2 Manual control	Yes	1–6, 23–31	Control room is the facility operator's room.
6.3 Interaction between the sense and command features and other systems	Alternate Method	1–6, 23–31	See Table 4 and response to RAI 2.2.1.1.7-6-009 for additional clarification of single failure criteria.
6.4 Derivation of system inputs	Yes	1–6, 23–31	
6.5 Capability for testing and calibration	Yes	1–6, 23–31	
6.6 Operating bypasses	Yes	1–6, 23–31	

IEEE Std 603-1998, Standard Criteria for Safety Systems for Nuclear Power Generating Stations			
Section Number & Title	**Applicable**	**ITS SSC Number from Table 2 See Note 1**	**Rationale or Comment**
6.7 Maintenance bypass	Yes	1–6, 23–31	
6.8 Setpoints	Yes	1–6, 23–31	
7. Execute features (functional and design requirements)	–	–	
7.1 Automatic control	Yes	1–6, 23–31	
7.2 Manual control	Yes	1–6, 23–31	
7.3 Completion of protective action	Yes	1–6, 23–31	
7.4 Operating bypass	Yes	1–6, 23–31	
7.5 Maintenance bypass	Yes	1–6, 23–31	
8. Power source requirements	–	–	
8.1 Electrical power sources	Yes	29–31	See Table 3 for applicability of IEEE Std 308-2001.
8.2 Non-electrical power sources	Yes	6, 23, 28	
8.3 Maintenance bypass	Yes	1–6, 23–31	

NOTE 1: Cranes, Yokes, and Grapples (7 – 22) are covered by ASME NOG-1-2004, Section 6000 and/or ANSI N14.6-1993.