2.4.2 Safety Information and Control System

Design Description

1.0 System Description

The safety information and control system (SICS) is provided as a safety-related human machine interface (HMI) and is specifically designed to provide the operator with the necessary inventory of controls and indications for the following:

- Mitigation of anticipated operational occurrences (AOO) (main control room (MCR)).
- Mitigation of postulated accidents (MCR).
- Reach and maintain safe shutdown (MCR and remote shutdown station (RSS)).
- Mitigation of AOO concurrent with a software common cause failure of the PS (MCR).
- Mitigation of postulated accidents (PA) concurrent with a software common cause failure of the PS (MCR).
- Mitigation of severe accidents (MCR).
- Diverse and flexible mitigation strategies (FLEX) (MCR).

The SICS provides the following safety-related functions:

- Manual reactor trip.
- Manual ESF actuation.
- Control of safety-related systems to reach and maintain safe shutdown.
- Indication of Type A, B, and C PAM variables.

2.0 Arrangement

2.1 The location of the SICS equipment is as listed in Table 2.4.2-1—Safety Information and Control System Equipment.

2.2 Deleted.

2.3 Deleted.

2.4 Physical separation exists between Class 1E SICS equipment and non-Class 1E equipment.

2.5 Physical separation exists between Class 1E electrical divisions that power the controls and indications of the SICS as listed in Table 2.4.2-1.

2.6 Physical separation exists between SICS.

3.0 Mechanical Design Features

3.1 Equipment identified as Seismic Category I in Table 2.4.2-1 can withstand seismic design basis loads without a loss of safety function(s).

4.0 I&C Design Features, Displays, and Controls

4.1 The capability to transfer control of the SICS from the MCR to the RSS exists in a fire area separate from the MCR. The transfer switches are each associated with a single division of the safety-related control and allow transfer of control without entry into the MCR.

4.2 Electrical isolation is provided between Class 1E electrical divisions that power the controls and indications of the SICS to prevent the propagation of credible electrical faults.

4.3 Electrical isolation is provided on connections between Class 1E SICS equipment and non-Class 1E equipment to prevent the propagation of credible electrical faults.

4.4 Class 1E SICS equipment listed in Table 2.4.2-1 can perform its safety function when subjected to electromagnetic interference (EMI), radio-frequency interference (RFI), electrostatic discharges (ESD), and power surges.

4.5 Controls on the SICS in the MCR and RSS perform manual actuation of RT.

4.6 Electrical isolation is provided on connections between the RSS and the MCR for the SICS to prevent the propagation of credible electrical faults.

4.7 Controls on the SICS in the MCR perform the functions listed in Table 2.4.2-2—Manually Actuated ESF Functions.

4.8 The SICS provides indications of Type A, B, and C PAM variables in the MCR.

4.9 The SICS provides manual controls and indications necessary to reach and maintain safe shutdown following an AOO or PA.

4.10 The SICS is designed so that safety-related functions required for an AOO or PA are performed in the presence of the following:

- Single failures within the SICS.
- Failures caused by the single failure.
- Failures and spurious system actions that cause or are caused by the AOO or PA requiring the safety function.

4.11 Locking mechanisms are provided on the SICS doors in the MCR and RSS. SICS doors that are not closed are indicated on the PICS operator workstations in the MCR.

4.12 Controls on the SICS in the RSS perform the function listed in Table 2.4.2-3—SICS Manual Controls in the RSS.

4.13 The SICS provides controls in the MCR for blocking the PAS signals in the PACS through a set of operational I&C disable switches.

4.14 The SICS provides manual controls and indications in the MCR necessary to support FLEX mitigation strategies.

4.15 Deleted.

4.16 Deleted.

4.17 Deleted.

5.0 Electrical Power Design Features

5.1 Equipment designated as Class 1E in Table 2.4.2-1 are powered from the Class 1E division as listed in Table 2.4.2-1 in a normal or alternate feed condition.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.4.2-4 lists the SICS ITAAC.

Table 2.4.2-1—Safety Information and Control System Equipment

Description	Tag Number(1)	Location	Seismic Category	IEEE Class 1E(2)
SICS Hardwired I&C, Divison 1	N/A	MCR, RSS	I	1^{N} 2^{A}
SICS Hardwired I&C, Divison 2	N/A	MCR, RSS	I	2^{N} 1^{A}
SICS Hardwired I&C, Divison 3	N/A	MCR, RSS	I	3^{N} 4^{A}
SICS Hardwired I&C, Divison 4	N/A	MCR, RSS	I	4^{N} 3^{A}

1. Equipment Tag numbers are provided for information and are not part of the design certification.

2. ^{N} denotes the division the equipment is normally powered from. ^{A} denotes the division the equipment is powered from when alternate feed is implemented.

Table 2.4.2-2—Manually Actuated ESF Functions

Containment Isolation (Stage 1)
Containment Isolation (Stage 2)
CVCS Charging Isolation
CVCS Isolation on Anti-Dilution Mitigation
EDG Actuation
EFWS Actuation
EFWS Isolation
Extra Borating System Isolation
Hydrogen Mixing Dampers Opening
CRACS Isolation and Filtering
Main Feedwater (MFW) Full Load Isolation
Main Steam Isolation
MSRIV Opening
MSRT Isolation
Partial Cooldown Actuation
PSRV Opening
RCP Trip
SG Isolation
SIS Actuation
Turbine Trip

Table 2.4.2-3—SICS Manual Controls in the RSS

Reactor Trip
P12 Permissive Validation
P14 Permissive Inhibition
P15 Permissive Validation
P17 Permissive Validation
SIS Actuation Reset
EFWS Actuation Reset
EFWS Isolation Reset
MSRIV Opening Reset
MSRT Isolation Reset
SG Isolation Reset

Table 2.4.2-4—Safety Information and Control System ITAAC
Sheet 1 of 6

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
2.1	The location of the SICS equipment is as listed in Table 2.4.2-1.	An inspection of the location of the as-built SICS equipment will be performed.	The SICS equipment listed in Table 2.4.2-1 is located as listed in Table 2.4.2-1.
2.2	Deleted.	Deleted.	Deleted.
2.3	Deleted.	Deleted.	Deleted.
2.4	Physical separation exists between Class 1E SICS equipment and non-Class 1E equipment.	a. An analysis will be performed to determine the required safety-related structures, separation distance, barriers, or any combination thereof to achieve physical separation between as-built Class 1E SICS equipment and as-built non-Class 1E equipment. b. An inspection will be performed to verify that the required safety-related structures, separation distance, barriers, or any combination thereof exist between as-built Class 1E SICS equipment and as-built non-Class 1E equipment.	a. A report defines the required safety-related structures, separation distance, barriers, or any combination thereof to achieve physical separation between Class 1E SICS equipment and non-Class 1E equipment. b. The required safety-related structures, separation distance, barriers, or any combination thereof exist between Class 1E SICS equipment and non-Class 1E equipment.
2.5	Physical separation exists between Class 1E electrical divisions that power the controls and indications of the SICS as listed in Table 2.4.2-1.	An inspection will be performed to verify that the as-built Class 1E electrical divisions that power the controls and indications of the SICS are located in separate Safeguard Buildings.	The Class 1E electrical divisions that power the controls and indications of the SICS as listed in Table 2.4.2-1 are located in separate Safeguard Buildings.

Table 2.4.2-4—Safety Information and Control System ITAAC
Sheet 2 of 6

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
2.6	Physical separation exists between SICS.	An inspection will be performed to verify that the as-built Class 1E electrical divisions that power the controls and indications of the SICS are located in separate Safeguard Buildings.	The Class 1E electrical divisions that power the controls and indications of the SICS as listed in Table 2.4.2 1 are located in separate Safeguard Buildings.
3.1	Equipment identified as Seismic Category I in Table 2.4.2-1 can withstand seismic design basis loads without a loss of safety function(s).	a. Type tests, analyses, or a combination of type tests and analyses will be performed on the equipment identified as Seismic Category I in Table 2.4.2-1 using analytical assumptions, or under conditions, which bound the Seismic Category I design requirements. b. An inspection will be performed of the as-built equipment identified as Seismic Category I in Table 2.4.2-1 to verify that the equipment, including anchorage, are installed in a condition bounded by the tested or analyzed condition.	a. Test/analysis reports conclude that the equipment identified as Seismic Category I in Table 2.4.2-1 can withstand seismic design basis loads without a loss of safety function(s). b. Inspection reports conclude that the equipment identified as Seismic Category I in Table 2.4.2-1, including anchorage, are installed in a condition bounded by the tested or analyzed condition.
4.1	The capability to transfer control of the SICS from the MCR to the RSS exists in a fire area separate from the MCR. The transfer switches are each associated with a single division of the safety-related control and allow transfer of control without entry into the MCR.	a. An inspection will be performed to verify that as-built controls exist for transfer of control of the SICS from the MCR to the RSS. b. Tests will be performed to verify that control of the SICS can be transferred from the MCR to the RSS.	a. Controls exist in a fire area separate from the MCR for transfer of control of the SICS from the MCR to the RSS. b. Transfer switches are each associated with a single division of the safety-related control, and perform the transfer of the SICS from the MCR to the RSS without entry into the MCR.

Table 2.4.2-4—Safety Information and Control System ITAAC
Sheet 3 of 6

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
4.2	Electrical isolation is provided between Class 1E electrical divisions that power the controls and indications of the SICS to prevent the propagation of credible electrical faults.	a. Type tests, analyses, or a combination of type tests and analyses will be performed on the electrical isolation devices between Class 1E electrical divisions that power the controls and indications of the SICS. b. An inspection will be performed on connections between the as-built Class 1E electrical divisions that power the controls and indications of the SICS.	a. A report concludes that the Class 1E isolation devices used between Class 1E electrical divisions that power the controls and indications of the SICS prevent the propagation of credible electrical faults. b. Class 1E electrical isolation devices exist on connections between Class 1E electrical divisions that power the controls and indications of the SICS.
4.3	Electrical isolation is provided on connections between Class 1E SICS equipment and non-Class 1E equipment to prevent the propagation of credible electrical faults.	a. Type tests, analyses, or a combination of type tests and analyses will be performed on the electrical isolation devices between Class 1E SICS equipment and non-Class 1E equipment. b. An inspection will be performed on connections between as-built Class 1E SICS equipment and non-Class 1E equipment.	a. A report concludes that the Class 1E isolation devices used between Class 1E SICS equipment and non-Class 1E equipment prevent the propagation of credible electrical faults. b. Class 1E electrical isolation devices exist on connections between Class 1E SICS equipment and non-Class 1E equipment.
4.4	Class 1E SICS equipment listed in Table 2.4.2-1 can perform its safety function when subjected to EMI, RFI, ESD, and power surges.	Type tests or type tests and analyses will be performed to demonstrate that the Class 1E SICS equipment listed in Table 2.4.2-1 can perform its safety function when subjected to EMI, RFI, ESD, and power surges.	Equipment identified as Class 1E in Table 2.4.2-1 can perform its safety function when subjected to EMI, RFI, ESD, and power surges.

Table 2.4.2-4—Safety Information and Control System ITAAC
Sheet 4 of 6

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
4.5	Controls on the SICS in the MCR and RSS perform manual actuation of RT.	a. Tests will be performed to verify manual actuation of RT using SICS controls in the MCR. b. Tests will be performed to verify manual actuation of RT using SICS controls in the RSS.	a. The reactor trip breakers and reactor trip contactors are opened following manual RT actuation from SICS in the MCR. b. The reactor trip breakers and reactor trip contactors are opened following manual RT actuation from SICS in the RSS.
4.6	Electrical isolation is provided on connections between the RSS and the MCR for the SICS to prevent the propagation of credible electrical faults.	a. Type tests, analyses, or a combination of type tests and analyses will be performed on the electrical isolation devices between the RSS and the MCR for the SICS. b. An inspection will be performed on connections between the as-built RSS and the MCR for the SICS.	a. A report concludes that the Class 1E isolation devices used between the RSS and the MCR for the SICS prevent the propagation of credible electrical faults. b. Class 1E electrical isolation devices exist on connections between the RSS and the MCR for the SICS.
4.7	Controls on the SICS in the MCR perform the functions listed in Table 2.4.2-2.	Tests will be performed using controls on the SICS in the MCR.	Controls on the SICS in the MCR perform the function listed in Table 2.4.2-2.
4.8	The SICS provides indication of Type A, B, and C PAM variables in the MCR.	Tests will be performed to verify SICS provides indication of Type A, B and C PAM variables in the MCR.	Type A, B, and C PAM variables are indicated on SICS in the MCR.

Table 2.4.2-4—Safety Information and Control System ITAAC
Sheet 5 of 6

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
4.9	The SICS provides manual controls and indications necessary to reach and maintain safe shutdown following an AOO or PA in the MCR.	a. An analysis will be performed to determine the manual controls and indications necessary to reach and maintain safe shutdown in the MCR following an AOO or PA. b. Tests will be performed using controls on the SICS in the MCR. c. Tests will be performed in the MCR.	a. A report identifies the manual controls and indications necessary to reach and maintain safe shutdown in the MCR following an AOO or PA. b. Controls on the SICS in the MCR are verified to be functional. c. Displays on the SICS are indicated in the MCR.
4.10	The SICS is designed so that safety-related functions required for an AOO or PA are performed in the presence of the following: ● Single failures within the SICS. ● Failures caused by the single failure. ● Failures and spurious system actions that cause or are caused by the AOO or PA requiring the safety function.	A failure modes and effects analysis will be performed on the SICS at the level of replaceable modules and components.	A report concludes that the SICS is designed so that safety-related functions required for an AOO or PA are performed in the presence of the following: ● Single failures within the SICS. ● Failures caused by the single failure. ● Failures and spurious system actions that cause or are caused by the AOO or PA requiring the safety function.
4.11	Locking mechanisms are provided on the SICS doors in the MCR and RSS. SICS doors that are not closed are indicated on the PICS operator workstations in the MCR.	a. A test will be performed to verify that the locking mechanisms on the SICS cabinet doors operate properly. b. A test will be performed to verify that SICS cabinet doors that are not closed are indicated on the PICS operator workstations in the MCR.	a. The locking mechanisms on the SICS cabinet doors operate properly. b. SICS cabinet doors that are not closed are indicated on the PICS operator workstations in the MCR.
4.12	Controls on the SICS in the RSS perform the function listed in Table 2.4.2-3.	Tests will be performed using controls on the SICS in the RSS.	Controls on the SICS in the RSS perform the function listed in Table 2.4.2-3.

Table 2.4.2-4—Safety Information and Control System ITAAC
Sheet 6 of 6

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
4.13	The SICS provides controls in the MCR for blocking the PAS signals in the PACS through a set of operational I&C disable switches.	Tests will be performed to verify that the operational I&C disable switches block the PAS signals in the PACS.	The operational I&C disable switches perform their function to block the PAS signals in the PACS.
4.14	The SICS provides manual controls and indications in the MCR necessary to support FLEX mitigation strategies.	a. An analysis will be performed to determine the manual controls and indications in the MCR necessary to support FLEX mitigation strategies. b. Tests will be performed using controls on the SICS in the MCR. c. Tests will be performed in the MCR using test input signals.	a. A report identifies the manual controls and indications in the MCR necessary to support FLEX mitigation strategies. b. Controls on the SICS in the MCR are verified to be functional. c. Displays on the SICS are indicated in the MCR.
4.15	Deleted.	Deleted.	Deleted.
4.16	Deleted.	Deleted.	Deleted.
4.17	Deleted.	Deleted.	Deleted.
5.1	Equipment designated as Class 1E in Table 2.4.2-1 are powered from the Class 1E division as listed in Table 2.4.2-1 in a normal or alternate feed condition.	a. Testing will be performed by providing a test input signal in each normally aligned division. b. Testing will be performed by providing a test input signal in each division with the alternate feed aligned to the divisional pair.	a. The test input signal provided in the normally aligned division is present at the respective Class 1E equipment identified in Table 2.4.2-1. b. The test input signal provided in each division with the alternate feed aligned to the divisional pair is present at the respective Class 1E equipment identified in Table 2.4.2-1.

Next File