2.4.9 Process Automation System

1.0 Description

The process automation system (PAS) is a non-safety related digital I&C system. The PAS consists of the following four subsystems:

- Nuclear island subsystem.
- Turbine island subsystem.
- Balance of plant subsystem.
- Diverse actuation subsystem (DAS).

The PAS provides the following non-safety related functions:

- Automatic anticipated transient without scram (ATWS) mitigation functions.
- Automatic software common cause failure mitigation functions.
- Automatic station blackout (SBO) mitigation functions.
- Automatic primary plant limitation functions.
- Automatic operational functions.
- Manual control of non-safety functions.
- Processing of information for display.

2.0 Arrangement

2.1 The location of the PAS equipment is as listed in Table 2.4.9-1—Process Automation System Equipment.

2.2 Physical separation exists between the four divisions of the DAS.

3.0 I&C Design Features, Displays and Controls

3.1 The DAS hardware and software are developed using a design process composed of five life cycle phases with each phase having design outputs which must conform to the requirements of that phase. The five life cycle phases are the following:

1. Basic design phase.
2. Detailed design phase.
3. Manufacturing phase.

4. Testing phase.

5. Installation and commissioning phase.

3.2 The system hardware and system software in the PAS is diverse from the system hardware and system software in the protection system (PS) and the safety automation system (SAS).

3.3 The DAS generates signals for automatic actuation of the functions identified in Table 2.4.9-2—Functions Automatically Actuated by the DAS.

4.0 System Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.4.9-3 lists the PAS ITAAC.

Table 2.4.9-1—Process Automation System Equipment

Equipment Description	Equipment Location
PAS Units Division 1	Safeguard Building 1
PAS Units Division 2	Safeguard Building 2
PAS Units Division 3	Safeguard Building 3
PAS Units Division 4	Safeguard Building 4
PAS Units	Turbine Switchgear Building

Table 2.4.9-2—Functions Automatically Actuated by the DAS

Reactor trip on high steam generator (SG) pressure
Reactor trip on low SG pressure
Reactor trip on low SG level
Reactor trip on low reactor coolant system (RCS) flow (two loops)
Reactor trip on low-low RCS flow (one loop)
Reactor trip on high neutron flux (power range)
Reactor trip on low hot leg pressure
Reactor trip on high pressurizer (PZR) pressure
Reactor trip on safety injection system (SIS) actuation
Reactor trip on emergency feedwater system (EFWS) actuation
Turbine trip on reactor trip
EFWS actuation on low SG level
SIS actuation on low PZR pressure
Main steam isolation on low SG pressure
Containment isolation on SIS actuation

Table 2.4.9-3—Process Automation System ITAAC
(2 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
2.1	The PAS equipment is located as listed in Table 2.4.9-1.	Inspections will be performed of the location of the PAS equipment.	The equipment listed in Table 2.4.9-1 is located as listed in Table 2.4.9-1.
2.2	Physical separation exists between the four divisions of the DAS.	Inspections will be performed to verify that the divisions of the DAS are located in separate buildings.	The four divisions of the DAS are located in separate buildings.
3.1	The DAS hardware and software are developed using a design process composed of five life cycle phases with each phase having design outputs which must conform to the requirements of that phase. The five life cycle phases are the following: 1) Basic design phase. 2) Detailed design phase. 3) Manufacturing phase. 4) Testing phase. 5) Installation and commissioning phase.	a. Inspections will be performed to verify that the DAS basic design phase process has design outputs. b. Inspections will be performed to verify that the DAS detailed design phase process has design outputs. c. Inspections will be performed to verify that the DAS manufacturing phase process has design outputs. d. Inspections will be performed to verify that the DAS testing phase process has design outputs. e. Inspections will be performed to verify that the DAS installation and commissioning phase process has design outputs.	a. A report exists and provides the design outputs for the basic design phase of the DAS hardware and software design process. b. A report exists and provides the design outputs for the detailed design phase of the DAS hardware and software design process. c. A report exists and provides the design outputs for the manufacturing phase of the DAS hardware and software design process. d. A report exists and provides the design outputs for the testing phase of the DAS hardware and software design process. e. A report exists and provides the design outputs for the installation and commissioning phase of the DAS hardware and software design process.
3.2	The system hardware and system software in the PAS is diverse from the system hardware and system software in the protection system (PS) and safety automation system (SAS)	An analysis will be performed to demonstrate that the system hardware and system software in the PAS is diverse from the system hardware and system software in the PS and SAS.	A report exists and concludes that the system hardware and system software in the PAS is diverse from the system hardware and system software in the PS and SAS.

Table 2.4.9-3—Process Automation System ITAAC
(2 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
3.3	The DAS generates signals for automatic actuation of the functions identified in Table 2.4.9-2.	Tests will be performed on the as-built DAS using test signals.	The DAS generates signals for automatic actuation of the functions identified in Table 2.4.9-2.

Next File