

## **2.4.9 Process Automation System**

### **Design Description**

#### **1.0 System Description**

The Process Automation System (PAS) is the main automation and control system for the plant. The PAS provides controls for both safety-related and non-safety-related equipment. The system is implemented with a digital, industrial I&C platform. The PAS is composed of three subsystems: Nuclear Island, Turbine Island and Balance of Plant. The Nuclear Island subsystem is organized into four redundant, independent divisions. The Turbine Island and Balance of Plant subsystems are organized into two redundant, independent trains. The PAS is non-safety-related.

#### **2.0 Arrangement**

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

#### **3.0 I&C Design Features, Displays, and Controls**

3.1 Critical control functions and non-critical control functions are segmented in the PAS control units (CUs).

3.2 The PAS design is accomplished through a phased approach which includes the following (or equivalent) phases:

1. Software Basic Design Phase.
2. Software Detailed Design Phase.
3. Software Integration and Validation Phase.
4. Site Acceptance Test and Commissioning Phase.

3.3 PAS equipment listed in Table 2.4.9-1 can perform its safety function when subjected to electromagnetic interference (EMI) and radio-frequency interference (RFI).

3.4 The PAS provides self-diagnostic features for a real-time representation of system status.

#### **Inspections, Tests, Analyses, and Acceptance Criteria**

Table 2.4.9-2 lists the PAS ITAAC.

**Table 2.4.9-1—Process Automation System Equipment**

Description	Location
PAS Cabinets Division 1	Safeguard Building 1
PAS Cabinets Division 2	Safeguard Building 2
PAS Cabinets Division 3	Safeguard Building 3
PAS Cabinets Division 4	Safeguard Building 4
PAS Cabinets Division 1	Emergency Power Generating Building 1
PAS Cabinets Division 2	Emergency Power Generating Building 2
PAS Cabinets Division 3	Emergency Power Generating Building 3
PAS Cabinets Division 4	Emergency Power Generating Building 4
PAS Cabinets Division 1	Essential Service Water Pump Building 1
PAS Cabinets Division 2	Essential Service Water Pump Building 2
PAS Cabinets Division 3	Essential Service Water Pump Building 3
PAS Cabinets Division 4	Essential Service Water Pump Building 4
PAS Cabinets Division 4	Nuclear Auxiliary Building
PAS Cabinets Division 4	Radioactive Waste Building
PAS Cabinets Train 1	Switchgear Building
PAS Cabinets Train 2	Switchgear Building
PAS Cabinets Trains 1	Circulating Water Cooling Tower Structure
PAS Cabinets Trains 2	Circulating Water Cooling Tower Structure

**Table 2.4.9-2—Process Automation System ITAAC  
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<b>Commitment Wording</b>		<b>Inspections, Tests, Analyses</b>	<b>Acceptance Criteria</b>
2.1	The location of the PAS equipment is as listed in Table 2.4.9-1.	An inspection of the location of the as-built PAS equipment will be performed.	The PAS equipment listed in Table 2.4.9-1 is located as listed in Table 2.4.9-1.
3.1	Critical control functions and non-critical control functions are segmented in the PAS CUs.	An analysis will be performed to verify that critical control functions and non-critical control functions will be systematically located so that only one critical control function as well as different non-critical control functions are processed on each CU pair.	A report concludes that non-critical control functions are systematically located so that only one critical control function as well as different non-critical control functions are processed on each CU pair.
3.2	The PAS design is accomplished through a phased approach which includes the following (or equivalent) phases: 1. Software Basic Design Phase. 2. Software Detailed Design Phase. 3. Software Integration and Validation Phase. 4. Site Acceptance Test and Commissioning Phase.	a. Analyses will be performed to verify that the outputs for the PAS Software Basic Design Phase conform to the requirements of that phase. b. Analyses will be performed to verify that the outputs for the PAS Software Detailed Design Phase conform to the requirements of that phase. c. Analyses will be performed to verify that the outputs for the PAS Software Integration and Validation Phase conform to the requirements of that phase. d. Analyses will be performed to verify that the outputs for the PAS Site Acceptance Test and Commissioning Phase conform to the requirements of that phase.	a. A report concludes that the outputs for the PAS Software Basic Design Phase conform to the requirements of that phase. b. A report concludes that the outputs for the PAS Software Detailed Design Phase conform to the requirements of that phase. c. A report concludes that the outputs for the PAS Software Integration and Validation Phase conform to the requirements of that phase. d. A report concludes that the outputs for the PAS Site Acceptance Test and Commissioning Phase conform to the requirements of that phase.

**Table 2.4.9-2—Process Automation System ITAAC**  
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	<b>Commitment Wording</b>	<b>Inspections, Tests, Analyses</b>	<b>Acceptance Criteria</b>
3.3	PAS equipment listed in Table 2.4.9-1 can perform its safety function when subjected to EMI and RFI.	Type tests or type tests and analyses will be performed to demonstrate that the PAS equipment listed in Table 2.4.9-1 can perform its safety function when subjected to EMI and RFI.	PAS equipment listed in Table 2.4.9-1 can perform its safety function when subjected to EMI and RFI.
3.4	The PAS provides self-diagnostic features for a real-time representation of system status.	A test will be performed that confirms that PAS performs self-diagnosis functions.	A report concludes that PAS software execution and hardware are monitored and switch-over to a redundant, standby CU is initiated upon detection of a software or hardware failure.