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UK ABWR

Document ID	:	GA91-9101-0101-16002
Document Number	:	SE-GD-0130
Revision Number	:	A

UK ABWR Generic Design Assessment

Generic PCSR Sub-chapter 16.2 : Process Auxiliary Systems

Hitachi-GE Nuclear Energy, Ltd.

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Table of Contents

16.2.1 Compressed Air System

16.2.1.1 Instrument Air System

16.2.1.1.1 System Summary Description

This section is a general introduction to the Instrument Air System (IA) where the system roles, system functions, system configuration and modes of operation are briefly described.

16.2.1.1.1.1 System Roles

The IA is designed to supply clean, dry and oil-free compressed air to the plant instrumentation, control components and pneumatic valves.

16.2.1.1.1.2 Functions Delivered

The IA supplies compressed air to satisfy the requirements of plant instruments, controllers, pneumatic valves, etc. Main users of compressed air are shown in Table 16.2-1.

Table 16.2-1 : Main users of Instrument Air

Facility	Main users
Reactor Building	Instrumentation
	Control valves
	Air-operated solenoid valves
Turbine Building	Instrumentation
	Control valves
	Air-operated solenoid valves
Radwaste Building	Instrumentation
	Control valves
	Air-operated solenoid valves
Control Building	Instrumentation
	Control valves
	Air-operated solenoid valves
Heat Exchanger Building	Instrumentation
	Control valves
	Air-operated solenoid valves

16.2.1.1.1.3 Basic Configuration

(1) The supply of compressed air for plant instrumentation and controls is provided by two compressors in parallel. Compressed air from the compressors is transferred to the air reservoir, and, through two dryers (one unit as backup) arranged in parallel trains (one unit as backup), is supplied to the respective pneumatic components.

(2) Normal operation of the IA is independent from the Station Service Air System (SA). However, in case of failure or abnormal pressure drop, the SA is capable of automatic operation to back up the IA through the piping and the valve connecting the two systems.

(3) Piping connecting to the High Pressure Nitrogen Gas Supply System (HPIN) is provided upstream of the valve isolating the IA since the instrumentation, controllers and devices for driving pneumatic valves inside the Primary Containment Vessel (PCV) are normally operated by nitrogen gas during normal plant operation.

(4) The IA consists of the following components equipment. The outline of IA configuration is shown in Figure 16.2-1.

(a)	IA Compressor	2 units (1 as a backup)
(b)	IA Air Reservoir	1 unit
(c)	IA Dryer Pre Filter	2 units (1 as a backup)
(d)	IA Dryer Tower	2 sets/unit x 2units (1 as a backup)
(e)	IA Dryer After Filter	2 units (1 as a backup)

16.2.1.1.1.4 Modes of Operation

The IA can deliver the following operation modes by switching the position of the valves.

16.2.1.1.1.4.1 Normal Operation Mode

Compressed air is supplied by one of the IA Compressors which is selected as the driving unit to operate during normal operation.
Nitrogen gas is supplied from the Atmospheric Control System (AC) after reducing the pressure through the HPIN.

16.2.1.1.1.4.2 Backup Operation Mode

The standby compressor automatically starts if a pressure drop is detected in the IA Air Reservoir due to a failure in the driving compressor or insufficient air supply to satisfy an increase in the air consumption with just one unit.
Furthermore, in the event the gas pressure decreased more, the isolation valve on the line connecting with the SA automatically opens to receive compressed air from the SA.
Besides, the IA supplies air to the pneumatic components inside the PCV in the event that the capability of supplying nitrogen decreased or a failure occurred.

16.2.1.1.1.4.3 Plant Periodic Inspection Mode

The IA provides compressed air to the pneumatic components inside the PCV instead of nitrogen gases during the periodic inspections by manually-operated switch.

16.2.1.1.2 Design Bases

The IA is designed such that compressed air can be continuously supplied to prevent inoperability of the pneumatic components required for plant continuous operation to all the loads important for plant continuous operation described as notes below. From this perspective of safety function in normal operation, the IA delivers a Category C function, and the components necessary to deliver compressed air supply are classified as Class 3 safety components according to the safety categorisation and classification of UK ABWR.

*Notes; The loads important for plant continuous operation is shown in indicated below.
Turbine Building: Feedwater System (FDW), Off-Gas System (OG)
Reactor Building: Control Rod Drive System (CRD), Main Steam System (MS)
Heat exchanger Building: Reactor Building Cooling Water System (RCW)

This system has the function to supply the air required to maintain the normal operation of safety class 3 systems which contributes to reducing radiation exposure from radioactive material. From this perspective of safety function in normal operation, the IA delivers a Category C function, and the components necessary to deliver compressed air supply function are classified as Class 3 safety components according to the safety categorisation and classification of UK ABWR.

Part of the IA forms the Primary Containment Vessel Boundary (PCV Boundary).
Therefore, the components within the PCV boundary form a barrier to maintain the integrity of the boundary and thus prevent the dispersion of radioactive substances. From this perspective, the IA delivers a Category A safety function (confinement) and the components necessary to deliver this function are classified as Class 1 safety components according to the safety categorisation and classification of UK ABWR. This function is developed and justified in the section related to the Containment Isolation System in PCSR chapter 13.

The HPIN supplies dust removed nitrogen to drive the instruments, controllers and pneumatic valves during plant normal operation. The IA is capable of automatically supplying compressed air in the event that the HPIN supply pressure dropped. From this perspective of HPIN supporting function, the IA delivers a Category C function, and the components necessary to deliver this function are classified as Class 3 safety components according to the safety categorisation and classification of UK ABWR.

16.2.1.1.3 System Design

16.2.1.1.3.1 Overall Design and Operation

The supply of compressed air for plant instrumentation and controls is provided by two compressors in parallel. Compressed air from the compressors is transferred to the air reservoir, and finally, through two dryers (one unit as backup) arranged in parallel trains (one unit as backup), is supplied to the respective pneumatic components.

16.2.1.1.3.1.1 Normal Operation Mode

Compressed air is supplied by one of the IA Compressors which is selected as the driving unit to operate during normal operation. Nitrogen gas is supplied from the AC after reducing the pressure through the HPIN.

16.2.1.1.3.1.2 Backup Operation Mode

The standby compressor automatically starts if a pressure drop is detected in the IA Air Reservoir due to a failure in the driving compressor or insufficient air supply to satisfy an increase in the air consumption with just one unit. Furthermore in the event the gas pressure decreased more, the isolation valve on the line connecting with the SA automatically opens to receive compressed air from the SA. Besides, the IA supplies air to the pneumatic components inside the PCV in the event that the capability of supplying nitrogen decreased or a failure occurred.

16.2.1.1.3.2 Equipment Design and Operation

16.2.1.1.3.2.1 System Design Specification

The IA is designed to satisfy the following conditions.

Table 16.2-2 : General Requirements for IA Design

Item	Contents
Air flow rate	The adequate flow to sufficiently supply the total air consumption of the facilities
Air pressure	The adequate pressure to satisfy the maximum necessary pressure among all pneumatic components
Air quality	The adequate quality to not offer any impediment to the pneumatic components
Air humidity	The adequate humidity to not offer any impediment to instruments and controllers
Air temperature	The adequate temperature to not offer any impediment to the dryer
Dust particles size	The adequate diameter to not offer any impediment to instruments and controllers

16.2.1.1.3.2.2 IA Compressor

(1) The IA Compressors are capable of sufficiently supplying the consumption of compressed air with only one unit. The IA Compressor consists of two 100%-capacity units where one is in operation and the other is on standby.

(2) The IA Compressor supplies oil-free air in order to provide the pneumatic components with air without affecting their performance.

(3) The IA Compressor supplies air to satisfy the maximum pressure required among all loads.

(4) The specification of IA Compressor is shown below.

(a) Number 2 units (1 driving unit, 1 standby unit)
(b) Capacity(suction air flow) Approx. 20 m^3/min/unit[normal]

16.2.1.1.3.2.3 IA Air Reservoir

(1) The IA Air Reservoir is designed to absorb and mitigate the pulsations caused by the discharge of compressed air and offer a stable supply. In addition, it is capable of supplying compressed air for 10 minutes at the required pressure after failure of all systems supplying air (IA and SA) in the event of loss of power supply.

(2) The specification of IA Air Reservoir is shown below.
(a) Number 1 unit
(b) Capacity Approx.48m^3

16.2.1.1.3.2.4 IA Dryer

The IA dryer consists of two 100%-capacity units, in which two 100%-capacity IA Dryer Tower are installed, capable of drying the air to the dew point, sufficiently low temperature to not interfere with the operating conditions of instruments and controllers. One unit operates as the driving unit and the other operates as the standby unit. If the driving unit failed, the standby unit is initiated automatically to continue supplying air at the same conditions.

16.2.1.1.3.2.5 IA Dryer Pre Filter

The IA Dryer Pre Filter is installed at the inlet of the IA Dryer Tower to remove dust particles contained in the compressed air and prevent adhesion to the desiccant and thus preserve its performance. Two 100%-capacity switchable units are installed.

16.2.1.1.3.2.6 IA Dryer After Filter

The IA Dryer After Filters are installed at the outlet of the IA Dryer Tower to remove desiccant particles and other dust substances that might be in the dried air and thus protect the pneumatic components. Two 100%-capacity switchable units are installed.

16.2.1.1.3.3 Main Support Systems

16.2.1.1.3.3.1 Instrumentation and Control

(1) The IA Compressors are continuously switching between loaded operation and unloaded operation depending on the pressure in the IA Air Reservoir to control and maintain it within the determined range. If the pressure in the IA Air Reservoir drops below the specified value, the standby IA Compressor automatically starts and operates in parallel with the driving unit. Once the standby compressor has been initiated, shutoff can be implemented by the operation switch.

(2) Nitrogen gas supply is automatically switched to compressed air supply if the nitrogen gas supply pressure to the components within the PCV drops.

(3) The isolation valve connecting the SA to the IA is automatically opens to initiate the backup operation if the pressure in the IA Air Reservoir drops.

16.2.1.1.3.3.2 Power Supply System

The Emergency Diesel Generator is capable of supplying power to the IA Compressors and the IA dryer units in the event of loss of offsite power supply.

16.2.1.1.3.3.3 Reactor Building Cooling Water System (RCW)

The cooling water sources for the driving and standby compressors are separated to prevent simultaneous loss of cooling water supply. The cooling water supply is from a separated division of the RCW.

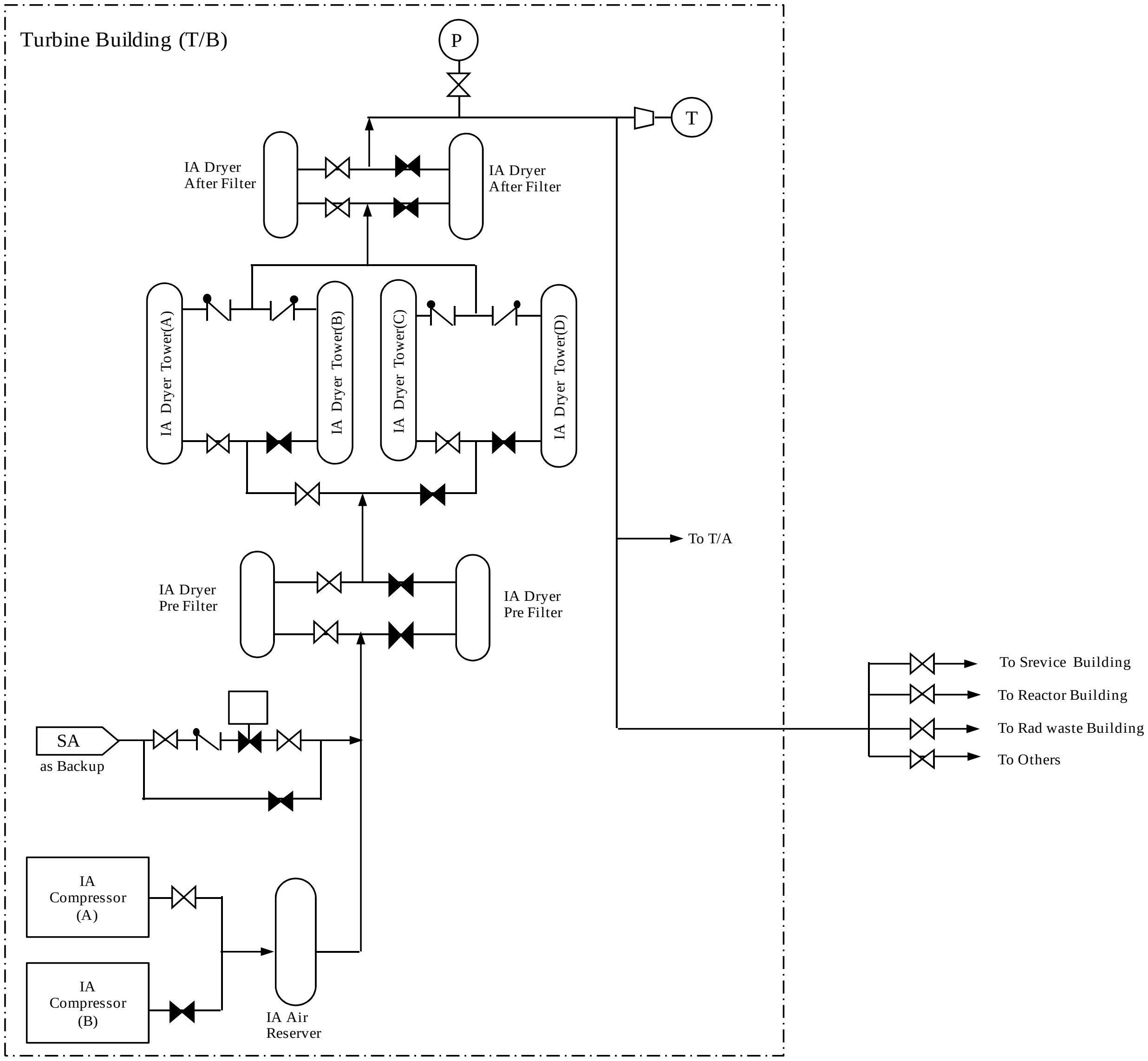

Figure 16.2-1 : Outline of IA configuration

16.2.1.2 Station Service Air System

16.2.1.2.1 System Summary Description

This section is a general introduction to the Station Service Air System (SA) where the system roles, system functions, system configuration and modes of operation are briefly described.

16.2.1.2.1.1 System Roles

The SA is designed to supply compressed air for equipment purging, filter backwashing and fluid agitation as well as compressed air for pneumatic components and tools. The SA is compressed air source for miscellaneous purposes independently from the Instrument Air System (IA).

16.2.1.2.1.2 Functions Delivered

The SA supplies the compressed air for equipment purging, filter backwashing, fluid agitation and operation of pneumatic components and tools. Main users of compressed air are shown in Table 16.2-3.

Table 16.2-3 : Main users of Service Air

Main user	Purpose
Standby Liquid Control Tank	Mixing
CUW Filter/Demineraliser	Backwashing
FPC Filter/Demineraliser	Backwashing
Condensate Filter	Backwashing
Condensate Demineraliser	Mixing
Off gas Exhaust Gas Ejector	Driving Force
LCW Filter	Backwashing
LCW Demineraliser	Transfer
HCW Demineraliser	Transfer
Instrument Air System	Backup

16.2.1.2.1.3 Basic Configuration

The SA is comprised of two parallel compressors. Compressed air from each compressor is collected and flows through the SA Air Reservoir to the respective air supply points.
The SA normally operates separately from the IA. However, if the supply pressure of the IA abnormally drops, the SA is actuated as a backup of the IA. Connecting piping and valves are provided to automatically back up the IA.
The SA consists of the following components equipment. The outline of SA configuration is shown in Figure 16.2-2.

(1) SA Compressor 2 units (50%-capacity/unit)
(2) SA Air Reservoir 1 unit
(3) Piping and Valves 1 set

(4) Instruments and Controllers 1 set
(5) Hose Connections and Fittings 1 set

16.2.1.2.1.4 Modes of Operation

The SA can deliver the following operation modes by switching the position of the valves.

16.2.1.2.1.4.1 Normal Operation Mode

This is the basic operation mode for of the SA which supplies compressed air to the different equipments requiring it.

16.2.1.2.1.4.2 IA Back-up Operation Mode

The valve on the line connecting the SA with the IA automatically opens and the supply of compressed air from the SA to the IA is initiated in the event that the pressure in the IA abnormally dropped.

16.2.1.2.2 Design Bases

The SA has the function which supplies the purge air to the Off-Gas System (OG) required to the normal operation. From this perspective of supporting function in normal operation, the SA delivers a Category C function, and the components necessary to deliver compressed air supply function are classified as Class 3 safety components according to the safety categorisation and classification of UK ABWR.

Part of the SA forms the Primary Containment Vessel Boundary (PCV Boundary).
Therefore, the components within the PCV boundary form a barrier to maintain the integrity of the boundary and thus prevent the dispersion of radioactive substances. From this perspective, the SA delivers a Category A safety function (confinement) and the components necessary to deliver this function are classified as Class 1 safety components according to the safety categorisation and classification of UK ABWR. This function is developed and justified in the section related to the Containment Isolation System in PCSR chapter 13.

The SA is designed so that the supply of compressed air from the SA to the IA is initiated as a backup of the IA in the event that the pressure in the IA abnormally dropped.

16.2.1.2.3 System Design

16.2.1.2.3.1 Overall Design and Operation

The SA is comprised of two parallel compressors. Compressed air from each compressor is collected and flows through the SA Air Reservoir to the respective air supply points.
The SA normally operates separately from the IA. However, if the supply pressure of the IA abnormally drops, the SA is actuated as a backup of the IA. Connecting piping and valves are provided to automatically back up the IA.

16.2.1.2.3.1.1 Normal Operation Mode

(1) This mode is the basic operation mode of the SA which supplies compressed air to the different equipments requiring it.

(2) One compressor is normally operating loaded or unloaded as repeatedly as the driving unit.

(3) The other compressor is on standby condition during normal operation. In the event the air consumption exceeded the capacity of the driving unit or the compressor operating could not maintain the required pressure due to any failure, the standby compressor is initiated automatically and operated loaded or unloaded as the auxiliary unit.

16.2.1.2.3.1.2 IA Backup Operation Mode

(1) The valve on the line connecting the SA with the IA automatically opens and the supply of compressed air from the SA to the IA is initiated in the event that the pressure in the IA abnormally dropped.

(2) The operational procedure for the compressors is the same as the normal operating mode.

16.2.1.2.3.2 Equipment Design and Operation

16.2.1.2.3.2.1 System Design Specification

The SA is designed to satisfy the following conditions.

Table 16.2-4 : General Requirements for Air Supply

Item	Requirement
Air flow rate	Sufficient to satisfy the supply to all components.
Air pressure	Sufficient to satisfy the highest pressure among all components requiring air supply.
Air quality	The necessary quality to supply to the components without hindrance.

16.2.1.2.3.2.2 SA Compressor

(1) Two compressors with 50%-capacity per unit are provided, which are capable of supplying the continuous consumption of air, as well as of sufficiently cover the cumulative consumption of the maximum intermittent loads. One compressor is normally operating and the standby compressor initiates starts operating to assure the necessary supply if the capacity of the driving compressor is exceeded due to cumulative consumption from the intermittent loads.

(2) The SA Compressors supply oil-free air in order to satisfy the consumption of the different loads without affecting their performance.

(3) The discharge pressure of the compressors is set at 0.72MPa [gauge] to satisfy the maximum air load.

(4) The specification of SA Compressor is shown below.
   (a) Number 2 units
   (b) Suction Air Flow Approx.12m^3/min /unit [normal]

16.2.1.2.3.2.3 SA Air Reservoir

(1) The SA Air Reservoir is designed to mitigate pulsations and prevent rapid pressure drops during load variations, and thus, supplies' compressed air in a stable way.

(2) The specification of SA Air Reservoir is shown below.
   (a) Number 1 unit
   (b) Capacity Approx.11m^3

16.2.1.2.3.3 Main Support Systems

16.2.1.2.3.3.1 Instrumentation and Control

(1) The driving compressor is switched from load operation to unload operation depending on the pressure in the SA Air Reservoir to maintain the pressure within the determined range. The standby compressor is automatically initiated and operated in parallel with the driving compressor if the pressure in the SA Air Reservoir drops to a determined value. However, if the unload operation time of the standby compressor exceeds the set point of the timer, the compressor is automatically shut off. The timer is provided to prevent frequent initiation/shutoff of the standby compressor.

(2) The connection valve between the SA and the IA opens automatically to initiate air supply from the SA if the pressure in the IA Air Reservoir drops.

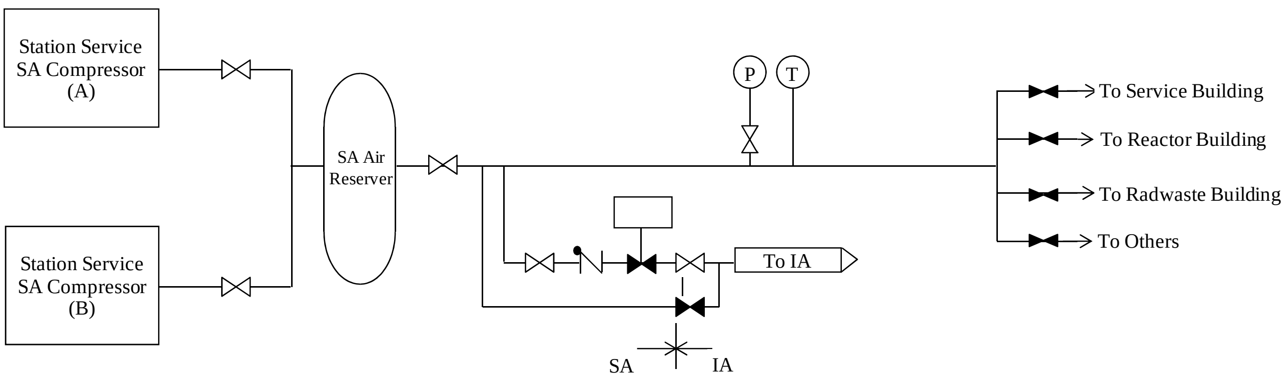

Figure 16.2-2 : Outline of SA configuration

16.2.1.3 High Pressure Nitrogen Gas Supply System

16.2.1.3.1 System Summary Description

This section is a general introduction to the High Pressure Nitrogen Gas Supply System (HPIN) where the system roles, system functions, system configuration and modes of operation are briefly described.

16.2.1.3.1.1 System Roles

The purpose of the HPIN is to supply clean, dry and oil-free nitrogen gas to all the accumulators of the Main Steam Safety Relief Valves (SRVs) and other pneumatic valve actuators which need high pressure nitrogen gas.

16.2.1.3.1.2 Functions Delivered

(1) The HPIN supplies nitrogen gas to the following components from the nitrogen gas supply machine via the Atmospheric Control System (AC) during normal plant operation.

  (a) SRV Accumulators for relief function and the Automatic Depressurization System (ADS) function
  (b) Instrumentation and pneumatic valves in the Primary Containment Vessel (PCV)
  (c) Equipment requiring nitrogen gas supply in the Reactor /Building (R/B)

(2) The HPIN is capable of supplying nitrogen gas from the nitrogen gas evaporator to the SRV Accumulators for ADS function in the event of Loss of Coolant Accident (LOCA). Furthermore, nitrogen cylinders are provided to assure the supply in case of loss of the nitrogen supply.

16.2.1.3.1.3 Basic Configuration

The HPIN consists of one high pressure nitrogen gas supply division to provide nitrogen from the nitrogen gas supply machine via AC during normal operation, and two high pressure nitrogen gas supply divisions (emergency gas supply line A and B) to provide nitrogen from the nitrogen cylinders during in case of an emergency. The basic components are as follows. The outline of HPIN configuration is shown in Figure 16.2-3.

(1) Nitrogen Gas Cylinder Rack	2 racks (10 cylinders per rack)
(2) Piping and Valves	1 Set
(3) Instruments and Controllers	1 Set
(4) Control Panels	1 Set

16.2.1.3.1.4 Modes of Operation

The HPIN can deliver the following operation modes by switching the position of the valves.

16.2.1.3.1.4.1 Normal Operation Mode

All nitrogen-operated components are provided with nitrogen gas during normal plant operation. The supply is through the IA except for the SRV Accumulators.

16.2.1.3.1.4.2 Emergency Operation Mode

The motor-operated valves at the outlet of the nitrogen gas cylinders are automatically opened to supply nitrogen gas to the SRV Accumulators for the ADS function if the pressure in the inlet line to the accumulators drops below the determined pressure.

16.2.1.3.2 Design Bases

This system is supplying the nitrogen gas required to the SRV Accumulators to operate the SRV for the ADS function and relief function. This system is also supplying the nitrogen gas to the nitrogen-operated equipment installed in the reactor building (including in the PCV). From this perspective of supporting function in normal operation, the HPIN delivers a Category C function, and the components necessary to deliver nitrogen gas supply function are classified as Class 3 safety components according to the safety categorisation and classification of UK ABWR.

Part of the HPIN forms the Primary Containment Vessel Boundary (PCV Boundary).
Therefore, the components within the PCV boundary form a barrier to maintain the integrity of the boundary and thus prevent the dispersion of radioactive substances. From this perspective, the HPIN delivers a Category A safety function (confinement) and the components necessary to deliver this function are classified as Class 1 safety components according to the safety categorisation and classification of UK ABWR.

This system is supplying the nitrogen gas required to maintain opening the SRV operated as the ADS at the long term cooling operation after LOCA. From this perspective of supporting function in accident condition, the HPIN delivers a Category C function, and the components necessary to deliver nitrogen gas supply function are classified as Class 3 safety components according to the safety categorisation and classification of UK ABWR. This function is developed and justified in the section related to the Containment Isolation System in PCSR chapter 13.

16.2.1.3.3 System Design

16.2.1.3.3.1 Overall Design and Operation

16.2.1.3.3.1.1 Normal Operation Mode

(1) The system is supplying the nitrogen gas to the equipment described below from the nitrogen gas supplying device via the AC.
   (a) SRV Accumulator (for the ADS function and relief function)
   (b) The nitrogen gas-operated equipment used in PCV
   (c) The nitrogen gas-operated equipment used in R/B
   The supply for (b) (c) is conducted via the Instrument Air System (IA)

(2) The nitrogen gas supplied to each equipment is supplied by depressing from the pressure control device which sets up in the supply line.

(3) The supply of the nitrogen gas to equipment installed at R/B and PCV switches to the IA automatically in case of the pressure in supplying piping being less than the prescribed value.

16.2.1.3.3.1.2 Emergency Operation Mode

(1) Supplying the nitrogen gas from its supplying device, the HPIN is designed to supply the nitrogen gas to the SRV Accumulator for the ADS function from the nitrogen gas cylinder by automatically opening the motor-operated valves at the outlet of the nitrogen gas cylinders and closing the isolation valves installed at the nitrogen supply connection line between emergency gas supply line A and B and normal gas supply line if the nitrogen gas supply stops or the nitrogen gas pressure is less than the prescribed value in the supply piping.

(2) The nitrogen cylinders are provided to assure the supply in case of loss of the nitrogen supply. The supply through the cylinders can be ensured for 7 days without replacement after an eventual accident.

(3) The supply piping from the nitrogen gas cylinder to the SRV Accumulator for the ADS function is divided into two lines to supply the nitrogen gas independently the each SRV (separating two groups of the ADS function) because half of the SRVs for the ADS function can be operated even if the nitrogen gas supply piping is blocked and broken.

(4) The nitrogen gas to supply the SRV Accumulator for the ADS function is supplying by depressing the pressure control device setting up the supply line.

16.2.1.3.3.2 Equipment Design and Operation

16.2.1.3.3.2.1 System Design Specification

The HPIN is designed to satisfy the following conditions.

- Normal nitrogen gas supply pressure from the AC
- Nitrogen gas cylinder pressure
- Supply pressure to pneumatic components

16.2.1.3.3.2.2 Components Design Specification

13.2.2.3.3.2.2.1 HPIN Nitrogen Gas Cylinder

- The racks of nitrogen gas cylinders are divided into A and B.
- Each division of cylinder racks contains cylinders.

16.2.1.3.3.3 Main Support Systems

16.2.1.3.3.3.1 Instrumentation and Control

(1) Operating the valve and monitoring the valve position are conducted in the main control room (MCR)

(2) Supplying the nitrogen gas from its supplying device, it is designed to supply the nitrogen gas to the SRV Accumulator for the ADS function from the nitrogen gas cylinder by automatically changing the valve position if the nitrogen gas supply stops or the nitrogen gas pressure is less than the prescribed value in the supply piping.

(3) The instrumentation and control requirements are as indicated in Table 16.2-5.

Table 16.2-5 : List of Monitored Items

Monitored Item	Signal	Application
Pressure at HPIN nitrogen gas cylinder outlet	Low pressure	Alarm
Pressure at HPIN ADS accumulator inlet	Low pressure	Alarm
		Interlock
	High pressure	Interlock

16.2.1.3.3.3.2 Power Supply System

The power to emergency lines A and B is supplied from different divisions of emergency power sources.

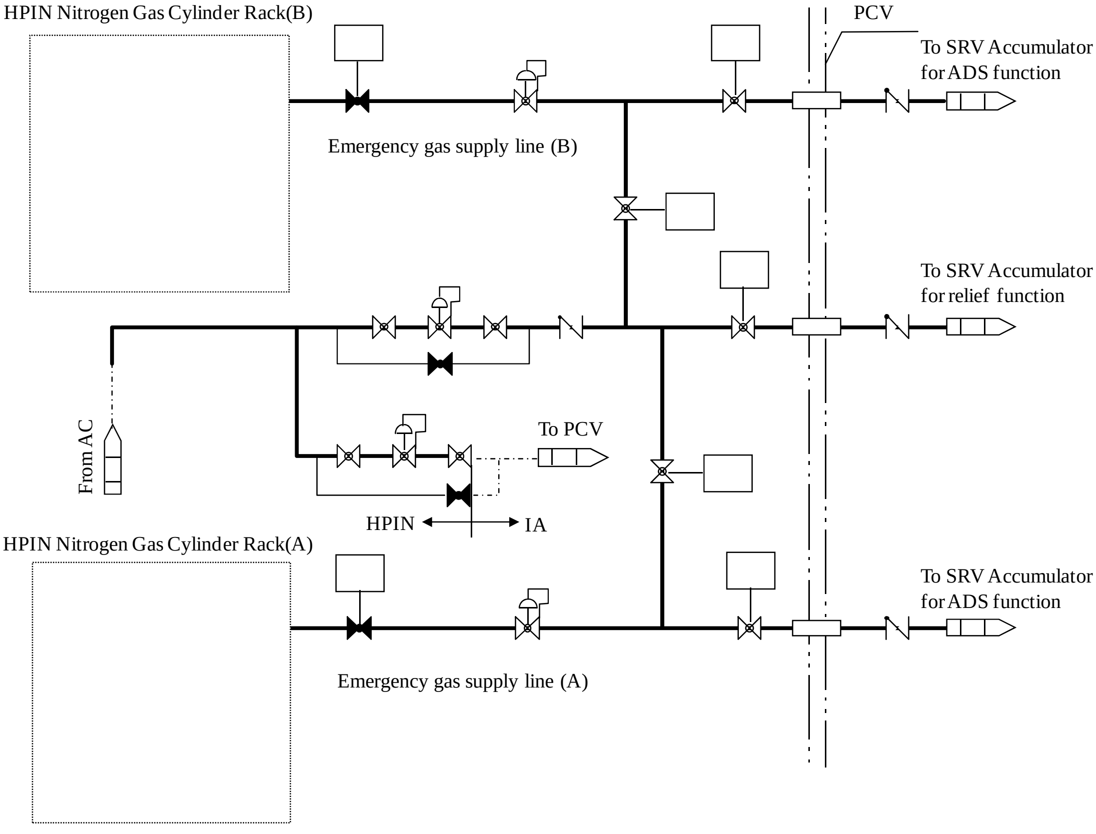

Figure 16.2-3: Outline of HPIN configuration

16.2.2 Drain System

16.2.2.1 Plumbing and Drainage System

16.2.2.1.1 System Summary Description

This section is a general introduction to the Plumbing and Drainage System (P&D) where the system roles, system functions, system configuration and modes of operation are briefly described.

16.2.2.1.1.1 System Roles

The system role of P&D is to collect and transfer the drain generated from each areas in the building.

16.2.2.1.1.2 Functions Delivered

The drain generated from each area in the building is classified and collected corresponding to its property and divisional area, and transferred to the drain sump of the Radioactive Drain Transfer System (RD), the Miscellaneous Non-Radioactive Drain Transfer System (MSC) or outside the system (intake fore bay and discharge fore bay).

16.2.2.1.1.3 Drain Categories

The drains of the nuclear power plant are basically divided into three categories, for radioactive liquid waste (waste generated in controlled areas with possibility of radioactive contamination), for non-radioactive liquid waste and for special liquid waste.

(1) Radioactive Liquid Waste
- (a) Low Conductivity Waste (LCW)
- (b) High Conductivity Waste (HCW)
- (c) Laundry Drain (LD)
- (d) Hot Shower Drain (HSD)
- (e) Controlled Area Drain (CAD)

(2) Non-Radioactive Liquid Waste
- (a) Non-Radioactive Storm Drain (NSD)
- (b) Service Water Storm Drain (SWSD)

(3) Special Liquid Waste
- (a) Standby Liquid Drain (SLD)
- (b) Decontamination Drain (DD)
- (c) Non-Radioactive Oil Drain (NOD)

16.2.2.1.2 Design Bases

Liquid waste is divided into subcategories, and collected in the corresponding sumps based on the liquid properties due to precisely treat in the Radioactive Waste (RW) facilities. From this perspective of reducing the radioactive material, the P&D delivers a Category C function, and the components necessary to deliver this function are classified as Class 3 safety components according to the safety categorisation and classification of UK ABWR.

16.2.2.1.3 System Design

16.2.2.1.3.1 Overall Design and Operation

16.2.2.1.3.1.1 Treatment principles depending on drain properties

The different range of collected drained waste is treated in accordance with the following principles.

(1) Radioactive Liquid Waste
The Waste is collected by the sumps through the drain funnel or directly transferred to the specific collection tank, etc. in the RW facility. After treatment at the Radioactive Waste (RW) facilities, the waste is recollected at the Condensate Storage Tank as recycled water for plant operation or exhausted out of the system as plant extra water after verifying the water quality.

(2) Non-Radioactive Liquid Waste
(a) Non-Radioactive Storm Drain
The Waste is collected by the NSD sumps (fresh water) in the non-controlled areas and discharged outside the system. The discharge point is switched to the CAD collection tank to treat the liquid waste at the RW facility if the NSD sump is contaminated by radioactivity or waste containing rust preventing agents which may not satisfy the drain discharge requirements regarding water quality was collected.
(b) Service Water Strom Drain
The Waste is collected at the NSD sumps (service water) in the non-controlled areas and drained outside the system.

(3) Special Liquid Waste
(a) Standby Liquid Drain
Drained boric-acid solution is completely separated from other waste and collected by exclusive containers to prevent treatment in the RW Facility.
(b) Decontamination Drain
The decontamination liquid waste is collected through the P&D piping or the Decontamination System piping depending on its properties.
(c) Non-Radioactive Oil Drain
The non-radioactive oil liquid waste is collected and treated at location where it is generated.

16.2.2.1.3.1.2 Collection principles depending on the area

The treatment principles after collecting and processing the waste generated in each building and the connecting trenches is as follows.

(1) Drains in the Drywell (Primary containment Vessel)
Drains inside the drywell are connected to the Low Conductivity Waste System (LCW) or the High Conductivity Waste System (HCW) in the drywell. Leakage whose source can be precisely identified is collected by the LCW sumps whereas leakage whose source cannot be precisely identified is collected by the HCW sumps.

(2) Drains in the Secondary Containment Vessel
Drains in the secondary containment vessel side are collected by the different sumps set up in the secondary containment to ensure the air tightness in containment.

(3) Drains in the Emergency Equipment Rooms

Drains are collected through the drainage piping of the independently configured Emergency Core Cooling System (ECCS) divisions depending on the area where the leak is generated to prevent simultaneous overflow in several ECCS divisions.
Area Divisions:
(a) Division I; Reactor Core Isolation Cooling System (RCIC), Residual Heat Removal System (RHR) (A) Pump Room
(b) Division II; High Pressure Core Flooder System (HPCF) (B), RHR (B) Pump Room
(c) Division III; HPCF (C), RHR (C) Pump Room

(4) Waste generated in the service water heat exchangers area (non-controlled area) are divided into non-radioactive storm drains and service water storm drains according to the collection division. Floor drains in areas where there is the possibility of service water intrusion are connected to the NSD sumps (service water).

(5) Sumps and drainage piping of non-controlled areas and controlled areas are separated to prevent contamination of the atmosphere in clean areas through the drainage piping.

16.2.2.1.3.2 Equipment Design and Operation

(1) The standard diameter of the main transfer piping is designed considering flow rate of the drainage funnels.

(2) Drains and vents of components and piping are connected to component drain funnels.

(3) As a general rule, overflow from tanks storing radioactive fluid waste is directly transferred to the corresponding sump according to the collection division.

(4) Drains containing resins are directly conducted to the sumps or tanks without transfer through funnels. In addition, flashing is implemented.

(5) Piping from the process side to component drain funnels are arranged with a continuous inclination downwards and routed such that there is no obstruction to the access and transportation into components, piping, etc. Piping from component floor drain funnels to the respective sumps is arranged with a continuous inclination downwards as well.

(6) Drains and vent piping connected to sludge and slurry pipes are arranged with an inclination downwards and discharge into the High Conductivity Waste Collection Tank or the sumps without connection to drain funnels.

16.2.2.2 Miscellaneous Non-Radioactive Drain Transfer System

16.2.2.2.1 System Summary Description

This section is a general introduction to the Miscellaneous Non-Radioactive Drain Transfer System (MSC) where the system roles, system functions, system configuration and modes of operation are briefly described.

16.2.2.2.1.1 System Roles

The objective of MSC is to collect and transfer the non-radioactive liquid wastes (Non-Radioactive Storm Drain (NSD) and Service Water Storm Drain (SWSD)) generated in the radiation non-controlled areas during reactor operation and shutdown of this power plant.

16.2.2.2.1.2 Functions Delivered

(1) The NSD and the SWSD are collected in the sump pits and transferred outside the system of this power plant through the sump pumps.

(2) The NSD and the SWSD generated in each building to be transferred are indicated as follows.

(a) Reactor Building (R/B)
The NSD in the sump pit is transferred to the Discharge Fore Bay or the Controlled Area Drain (CAD) Collection Tank in the Radwaste Building (Rw/B) through Radioactive Drain Transfer System (RD). The transfer of the NSD is switched from the Discharge Fore Bay to the CAD Collection Tank when the drainage containing antirust products from the Reactor building Cooling Water (RCW) surge tank, Heating Ventilation and Air Conditioning (HVAC) cooling system, etc. are collected to the NSD sump pit during inspection.

(b) Turbine Building (T/B)
The NSD in the sump pit is transferred to the Discharge Fore Bay or the CAD Collection Tank in the Rw/B through the RD. The transfer of the NSD is switched from the Discharge Fore Bay to the CAD Collection Tank when the drainage containing antirust products from the Turbine building Cooling Water (TCW) surge tank, HVAC cooling system, etc. are collected to the NSD sump pit during inspection.

(c) Radwaste Building (Rw/B)
The NSD generated in the Rw/B is collected into the NSD sump pit of the Control Building (C/B).

(d) Control Building (C/B)
The NSD in the sump pit is transferred to the Discharge Fore Bay or the CAD Collection Tank in the Rw/B through the RD. The transfer of the NSD is switched from the Discharge Fore Bay to the CAD Collection Tank when the drainage containing antirust products from the HVAC Emergency Cooling Water System (HECW), etc. are collected to the NSD sump pit during inspection.

(e) Heat Exchanger Building (Hx/B)
The NSD in the sump pit is transferred to the Discharge Fore Bay or the CAD Collection Tank in the Rw/B through the RD. The transfer of the NSD is switched from the Discharge Fore Bay to the CAD Collection Tank when the drainage containing antirust

products from the RCW or TCW, HVAC cooling system, etc. are collected to the NSD sump pit during inspection. The SWSD collected in the sump pit is transferred to the Discharge Fore Bay since the drainage is not contaminated radioactive fluids.

16.2.2.2.1.3 Basic Configuration

(1) In principle, each sump pit is provided with 1 sump pump with sufficient capacity to transfer the determined drains. However a sump pit is provided with 2 sump pumps in the following cases:
   (a) If a sump pit receives drainage continuously such as condensate water from the HVACs in the non-controlled areas.

(2) Each sump is provided with level switches in order to automatically transfer the drains by automatic initiation and shutoff of the pumps.

(3) The materials of the sump pump, transfer piping and valves for the SWSD are selected with resistance to sea water.

(4) The sump pits are located at the radiation non-controlled areas since normally there is no risk of collecting drain water with radioactivity.

16.2.2.2.1.4 Modes of Operation

(1) The sump pumps are automatically initiated and shut off by level switches depending on the water level of sump pit. The pumps start operation upon increase of water level and when the water level of sump pit sufficiently drops, automatic shutoff is implemented.

(2) The transfer of the NSD in the T/B is switched from the Discharge Fore Bay to the CAD Collection Tank in the following cases:
   (a) If water including antirust products or radioactive substances is collected by the sump pit
   (b) If water which does not meet the water quality requirements for discharge outside is collected by the sump pit

16.2.2.2.2 Design Bases

16.2.2.2.2.1 Safety Function

The purpose of MSC is to collect and transfer the non-radioactive liquid wastes. From this perspective, the function of MSC is not safety-categorised according to the safety categorization and classification of UK ABWR described in Sub-chapter 5.4: Categorisation and Classification of Structures, Systems and Components.

16.2.2.3 Radioactive Drain Transfer System

16.2.2.3.1 System Summary Description

Radioactive drain (RD) transfer system shall transfer drains generated in controlled areas to collection tanks in individual subsystems installed in the Radwaste building. Laundry drains and radioactive shower drains are transferred to laundry drain collection tanks, which are installed in the Service building. RD transfer system is comprised of sump tanks, sump pumps, piping, valves, and instrumentation devices. The schematic drawing of RD transfer system in R/B is given in Figure 16.2-4.

16.2.2.3.2 Design Bases

16.2.2.3.2.1 Safety Function

The RD transfer system is designed to meet the following safety functions:

16.2.2.3.2.1.1 Normal operation

The RD transfer system provides sufficient capacity to transfer liquid wastes to the Liquid Waste Management System for normal operation including start-up, shut-down, and outage.

16.2.2.3.2.1.2 Faults

(1) In the event of a LOCA signal, all lines from drywell sumps are automatically isolated to preclude the uncontrolled release of primary coolant outside the primary containment.

(2) In the event of a fault condition which resulted in excessive inflow rate of liquid waste into drywell sump, an alarm is actuated.

16.2.2.3.3 System Design

16.2.2.3.3.1 System design for normal operation

This section describes the system design for normal operation.

(1) All sumps which receive radioactive wastes are equipped with two pumps. The pump is sized to handle the maximum anticipated flow into the sump. When one pump is operating, another pump is on standby.

(2) High and low water level switches are provided on each sump to start and stop the sump pump automatically.

(3) A separate high-high water level switch is installed to start the second pump and to actuate an alarm in the main control room simultaneously.

16.2.2.3.3.2 System design for faults

This section describes the system design for faults.

(1) In the event of a LOCA signal, all drywell sump pumps are automatically stopped and the isolation valves are automatically closed.

(2) The isolation valves are motor-operated valves supplied by emergency power.

(3) The inflow rate into drywell sump is monitored by checking the rise rate of water level, and the frequency and duration of pump runs.

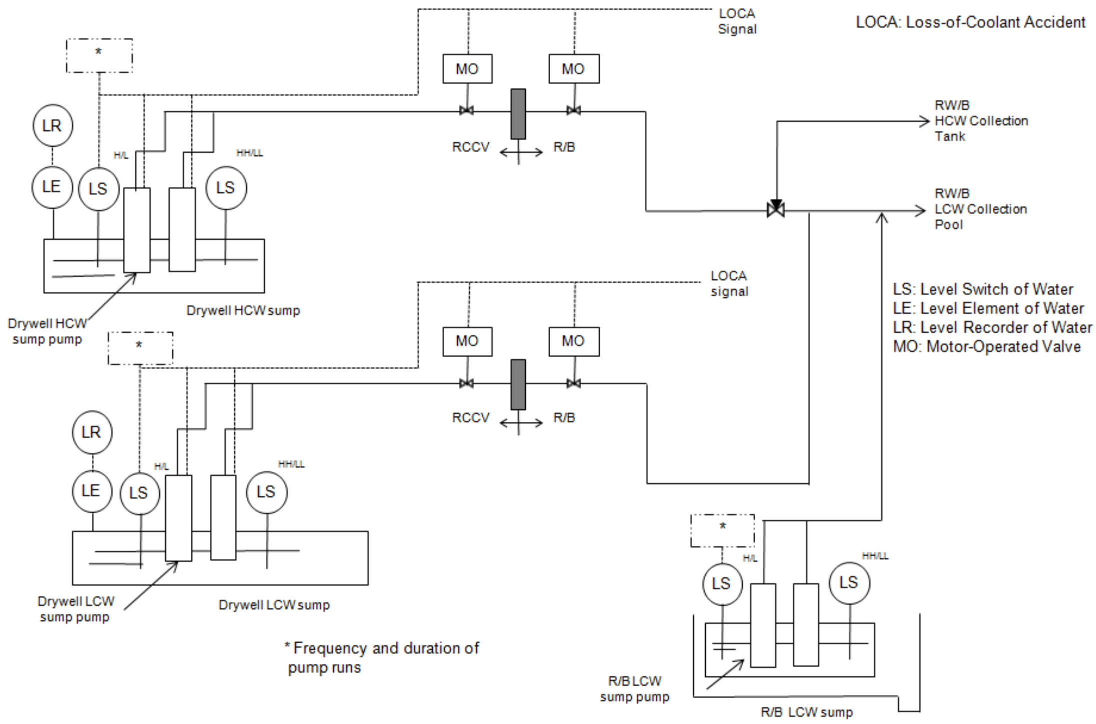

Figure 16.2-4: Outline of Radioactive drain transfer system in R/B

16.2.3 Sampling System

16.2.3.1 Process Sampling System

16.2.3.1.1 System Summary Description

This section is a general introduction to the Process Sampling System (SAM) where the system roles, system functions and system configuration are briefly described.

16.2.3.1.1.1 System Roles

The roles of the SAM are to collect and analyse fluid process streams associated with plant operation for providing the analytical information for each system and component to be monitored and maintained during normal operation and transient condition.

16.2.3.1.1.2 Functions Delivered

The SAM is designed to safely collect principal fluid process streams under the operational conditions during normal operations and transient conditions, and to measure parameters of the fluid process streams directly such as conductivity, hydrogen ion concentration and dissolved oxygen as necessary.

16.2.3.1.1.3 Basic Configuration

SAM consists of the following components of:
(1) Sampling piping
(2) Sampling nozzle
(3) Sampling racks
(4) Sampling hoods
(5) Sampling sink
(6) Filter sampling rack

16.2.3.1.1.4 Modes of Operation

Process fluid and other items requiring continuous monitoring are continuously sampled and measured by process analysis instruments such as conductivity meters, pH meters, dissolved oxygen meters. Samples of process fluids subjected to intermittent water quality monitoring are extracted from the process line and analyzed by grab sampling. Process instrumentation or grab sampling is determined based on the necessary sampling frequency and the importance of the data. Grab samples are manipulated in sampling hoods or sampling sinks after cooling or reducing the pressure as necessary.

16.2.3.1.2 Design Bases

The SAM collects representative fluid process streams for analysis and provides the analytical data required to monitor plant and equipment performance and changes to operating parameters under the environmental and operational conditions during normal operations and transient conditions. From this perspective, the SAM delivers a Category C safety function, the components necessary to deliver this function streams are classified as Class 3 safety components according to the safety categorisation and classification of UK ABWR.

16.2.3.1.3 System Design

16.2.3.1.3.1 Overall Design and Operation

16.2.3.1.3.1.1 Sampled Process Streams and Analysed Parameters

Table 16.2-6 provides a list of main samples, their locations and purposes.

Table 16.2-6 : Summary of Main Samples

Item	Sampling point	Purpose
Reactor water	Reactor Pressure Vessel (RPV) bottom	Monitoring of reactor cooling water quality when the CUW is isolated
Reactor Water Clean-up System Filter-Demineraliser (CUW F/D) inlet and outlet water	F/D inlet F/D outlet	Monitoring of reactor cooling water quality Monitoring of F/D performance
Suppression Pool (S/P) water	RHR Heat Exchanger outlet	Monitoring of corrosion and radioactivity
Boric acid solution	Standby Liquid Control (SLC) Storage Tank	Monitoring of boron concentration
Residual Heat Removal System (RHR) water	RHR Heat Exchanger outlet	Monitoring of water quality
Main Steam (MS)	MS piping	Monitoring of carry over
Off-Gas (OG)	OG Recombiner inlet OG Cooler Condenser outlet	Monitoring of hydrogen concentration Monitoring of performance
Main Condenser	Hotwell outlet Condensate Demineraliser inlet Condensate Demineraliser outlet	Detection of leakage from condenser tubes Monitoring of water quality Monitoring of demineraliser performance
Discharge water	Discharge canal	Monitoring of discharged water radioactivity

16.2.3.1.3.1.2 Sampling methodology

Sampling methods are divided into the following three; depending on required sampling frequencies and impacts of the obtained data on plant operation safety;

(1) Process stream collection with recycling line
A line to recirculate part of the process fluid from piping or components via a pump or blower is configured with instrumental detectors mounted on it to continuously obtain data (e.g. RPV dew point sampling).

(2) Process stream collection with a sampling line
Samples are continuously taken from the process line through a sampling pipe with instrumental detectors mounted on it to continuously obtain data (e.g. reactor water conductivity rate meters).

(3) Local grab sampling
Process samples are intermittently taken from the process piping through the sampling pipes and analyzed in the laboratory where data is obtained.

16.2.3.1.3.2 Equipment Design and Operation

16.2.3.1.3.2.1 Sampling Piping

(1) Depressurisation valves and stop valves are provided for grab sampling lines.

(2) Piping for extraction of high temperature or high pressure samples is provided with coolers or depressurisation devices to cool and reduce the pressure when sampling.

(3) In principle, samples which required to be continuously extracted are returned to the process line after measuring through the sampling collection pipes connected to the process lines. Sampling is automatically shut off when the process system operations are not stopped.

16.2.3.1.3.2.2 Sampling Nozzle

(1) In principal, sampling nozzles are mounted on the pipe side surface of horizontal and straight sections of process piping. Particularly, samples of fluids containing crud should not be taken from the bottom of horizontal pipes.

(2) Stainless steel is provided for the material of sampling nozzles.

16.2.3.1.3.2.3 Sampling Racks

Sampling racks are provided to prepare samples for measurements with analytical instruments. In addition, constant temperature devices are provided on pH sampling lines to maintain the temperature of the samples constantly and guarantee the precision of the measurements.

16.2.3.1.3.2.4 Sampling Hoods

(1) Radioactive and frequently sampled fluids of each system are collected and transferred to one sampling hood.

(2) The exhaust lines of the sampling hoods are connected to HVAC in order to always maintain the hood upon negative pressure inside and to prevent exposure to radioactive material generated during sampling.

(3) Components installed inside the hoods are limited to the minimum number (basically, only flow control valves and sampling valves) in order to reduce the sources of radiation exposure.

16.2.3.1.3.2.5 Sampling Sink

Sampling sinks are provided near grab sampling points for auxiliary cooling water etc. in the following conditions.

(1) Sampling points located in areas with high radioactivity levels (the sink is installed facing a passage).

(2) Sampling points for samples such as cooling water which requires a periodic and relatively high frequent analysis (more than once a month).

16.2.3.1.3.2.6 Filter Sampling Rack

Filter sampling racks are provided to sampling points when it is necessary to measure the concentration of metal elements in the water.

(1) Filters are mounted upstream of the depressurisation devices in order to improve the precision of the measured concentration of indissoluble crud.

(2) Integral flow meters are mounted on the outlet of the filters in order to check the total volume of samples through the filter.

16.2.3.1.3.3 Main Support Systems

16.2.3.1.3.3.1 Instrumentation and Control

(1) Conductivity meters, oxygen meters, hydrogen meters, pH meters and humidity meters are constantly monitoring the process status. The measurements are monitored in the Main Control Room (MCR) where alarms are initiated if the standard values are exceeded. However, the data necessary for local operation is locally monitored and also monitored in the MCR if necessary.

(2) Process sampling, including alarms, is displayed in the MCR and the data recorded as necessary.

(3) As a general rule, process calculators are fed back with input to manage water quality.

16.2.3.1.3.4 System Interfaces

Sampling lines branching from the respective systems and components are provided with separation valves. In principle, the design conditions of the SAM conform to the process systems into which they are connected.

16.2.3.2 Post-Accident Sampling System

16.2.3.2.1 System Summary Description

This section is a general introduction to the Post-Accident Sampling System (PASS) where the system roles, system functions and system configuration are briefly described.

16.2.3.2.1.1 System Role

The role of the PASS is to collect radioactive liquid and gaseous samples from inner RPV and PCV, respectively, under the post-DBA condition in order to obtain detail information of the accident.

16.2.3.2.1.2 Functions Delivered

The PASS is designed to collect radioactive liquid and gaseous samples under the post-DBA condition. During DBA, process monitoring system continuously measures necessary parameters for appropriate accident management. In addition, the PASS collects samples to obtain further detail information as well as to ensure those measurements after the accident ceases. Reactor coolant is sampled from RPV and gas from PCV. The sample is collected at the outer secondary containment.

16.2.3.2.1.3 Basic Configuration

The PASS consists of the following components;
(1) Sampling pipe
(2) PCV isolation valve
(3) Sampling rack which contains a pump
(4) Sampling bottle.

16.2.3.2.2 Design Base

The purpose of the post-accident sampling is not originated by safety requirement. Adequate accident monitoring is achieved by the plant process monitoring system which provides essential information for accident management. The PASS provides supplementary information for detail analysis of the accident. From this perspective, the sampling function is not safety-categorised except PCV boundary is A1 according to the safety categorisation and classification of UK ABWR described in Sub-chapter 5.4: Categorisation and Classification of Structures, Systems and Components.

The system is designed as radioactive substance contained in the PCV is only transferred to outer during sampling sequence. Occupational dose during the sampling sequence is minimised as low as reasonably practicable.

16.2.4 Steam Supply System

16.2.4.1 House Boiler System

16.2.4.1.1 System Summary Description

This section is a general introduction to the House Boiler System where the system roles, system functions, system configuration and modes of operation are briefly described.

16.2.4.1.1.1 System Roles

The House Boiler System is designed to supply clean steam generated by the House Boiler to the equipments operating with house steam and collect the condensed water from the steam usage equipments.

16.2.4.1.1.2 Functions Delivered

The House Boiler System consists of Heating Steam System (HS) and Heating Steam Condensate Water Return System (HSCR).

(1) The HS supplies the clean steam with the necessary volume at the required pressure (saturated steam) to the components operating with steam within the power plant.

(2) The HSCR collects the condensed water from each component and the piping and return it to the House Boiler facility. The HSCR recovers as much condensed water as possible from the respective loads and the piping to recycle it as feed-water for the House Boiler.

16.2.4.1.1.3 Basic Configuration

(1) The House Boiler facility consists of the House Boiler, water supplying system, instrumentation, etc.

(2) The steam generated by the House Boiler is transferred to the respective components using steam in the power plant through the piping in the HS.

(3) The Condensed Water Recovery Facility, which is installed in HSCR, consists of a Heating Steam Receiver Tank, a Heating Steam Condenser and Heating Steam Drain Recovery Pumps through which the condensed water is returned to the water supply tank in the House Boiler Facility.

(4) The HS and HSCR consist of the following components equipment.
  (a) House Boiler Facility
    ・House Boiler: 2 units
  (b) Condensed Water Recovery Facility
    ・Heating Steam Receiver Tank: 1 unit
    ・Heating Steam Condenser: 1 unit
    ・Heating Steam Drain Recovery Pump: 2 units
  (c) Piping and Valves: 1 set
  (d) Instruments and Controllers: 1 set

16.2.4.1.1.4 Modes of Operation

This system supplies clean steam generated by the House Boiler to the equipments operating with house steam during normal operation, start-up, shut down and refuelling outage.

16.2.4.1.2 Design Bases

This system has the function of supplying the steam required to maintain the normal operation of safety class 3 systems which contributes to reducing radiation exposure from radioactive materials. From this perspective of safety function in normal operation, the HS/HSCR delivers a Category C function, and the components necessary to deliver steam supply function are classified as Class 3 safety components according to the safety categorisation and classification of UK ABWR.

This system has function of supplying the steam required to maintain the plant condition during the winter (Heating). From this perspective of supporting function in normal operation, the HS/HSCR delivers a Category C function, and the components necessary to deliver steam supply function are classified as Class 3 safety components according to the safety categorisation and classification of UK ABWR.

16.2.4.1.3 System Design

16.2.4.1.3.1 Overall Design and Operation

The steam generated by the House Boiler is transferred to the respective components using steam in the power plant through the piping in the HS, where it is condensed into water by the heat exchanged with the steam loads. Most of the condensed water is returned to the water supply tank in the House Boiler Facility through the Condensed Water Recovery Facility in the HSCR, and finally supplied to the House Boiler, where it is converted into the steam again to repeat the cycle.

16.2.4.1.3.2 Equipment Design and Operation

16.2.4.1.3.2.1 System Design Specification

The HS/HSCR is designed to satisfy the following conditions.
Steam Capacity Approx.50 t/h

16.2.4.1.3.2.2 House Boiler Facility

(1) The House Boiler Facility is arranged in the House Boiler Building (HB/B) in the Power Plant.

(2) The House Boiler is the oil-fired boiler and it has the sufficient capacity to supply steam of the required amount for the steam use equipments in the power plant.

(3) The specification of House Boiler Facility is shown below.
Number 2 units
Capacity Approx.25 t/h/unit

16.2.4.1.3.2.3 Condensed Water Recovery Facility

(1) The Condensed Water Recovery Facility consists of a Heating Steam Receiver Tank, a Heating Steam Condenser and Heating Steam Drain Recovery Pumps.

(a) Heating Steam Receiver Tank
The Heating Steam Receiver Tank is provided with the necessary gaseous space for gas-liquid separation of the in-flow of condensed water and for prevention of steam suction by the Heating Steam Drain Recovery Pumps. Moreover, the Heating Steam Receiver Tank is employed as a water reservoir for control operation of the Heating Steam Drain Recovery Pumps.

(b) Heating Steam Condenser
The Heating Steam Condenser is capable of condensing all the re-flushed steam flowing in from the Heating Steam Receiver Tank by cooling water. The Heating Steam Condenser condenses the re-evaporated steam to maintain the temperature below 100 °C (water boiling point at atmospheric pressure) and prevent re-evaporation.

(c) Heating Steam Drain Recovery Pump
The Heating Steam Drain Recovery Pump transfers the condensed water from the Heating Steam Receiver Tank to the water supply tank in the House Boiler Facility. HSCR is equipped with two Heating Steam Drain Recovery Pumps which has 100%-capacity for flow rate and total head.

(2) The Condensed Water Recovery Facility is arranged in the Turbine Building (T/B) in the power plant.

16.2.4.1.3.2.4 Steam Trap

(1) The steam traps are selected appropriate trap type.

(2) A bypass line is provided for traps maintainability.

16.2.4.1.3.2.5 Piping and Valves

As a general rule, the piping of the HS and the HSCR is arranged downwards with inclinations to ensure no drain accumulation on the piping routes.

The HS piping is provided with traps for draining water accumulated at the bottom of rising pipes and drain pots, the inlet of control valves, and other points.

16.2.4.1.3.3 Main Support Systems

16.2.4.1.3.3.1 Instrumentation and Control

(1) House Boiler Facility is designed to provide the monitor to measure the operation condition and the protective device to stop the House Boiler safely at an emergency.

(2) The water level in the Heating Steam Receiver Tank is controlled by the level switch installed in it, which sends signals to initiated and shut off the Heating Steam Drain Recovery Pumps.