6B SRP 6.5.1, Table 6.5.1-1 Compliance Assessment

The following provides a comparison between the instrumentation specified in SRP 6.5.1, Table 6.5.1-1, and the instrumentation provided in the ABWR SGTS design. Justification is provided for those items that deviate from the SRP.

The selection and location of instrumentation for the ABWR SGTS was reexamined during system design to rationalize the operator interface. Instrumentation strictly required for monitoring the operation of the SGTS to mitigate offsite releases is provided in the main control room (MCR) on panel displays designed for that purpose. Monitoring, of course, is a fundamental plant requirement specified in GDC 13. Instrumentation used for testing or maintenance is located at the local instrument rack.

There are two redundant SGTS trains located in two adjacent rooms. Per Regulatory Guide 1.52, each train, as a part of a maintenance program, should be operated 10 hours per month with space heaters on. This surveillance testing provides indications of the component malfunctions and the inefficient components may be promptly replaced. An effective surveillance testing and prompt replacement of inefficient components will assure the proper functioning of the SGTS. Refer to Technical Specification, Standby Gas Treatment System.

There are two basic parameters that are important to assure SGTS function: (1) secondary containment pressure and (2) charcoal adsorber inlet relative humidity. If the secondary containment pressure is less than the ambient pressure, any release from the plant passes through and is treated and monitored by the SGTS. If the inlet relative humidity to the charcoal adsorber is less than or equal to 70%, then credit for a 99% efficiency may be taken (although charcoal performance at higher humidities provides significant decontamination factors). If an operator confirms that the secondary containment pressure is negative with respect to ambient on all faces of the building and the relative humidity is less than 70% entering the adsorber, then the system is functioning as intended to mitigate calculated offsite doses.

The ABWR SGTS design provides four divisional differential pressure transmitters with high and low alarms monitoring secondary containment pressure with respect to ambient pressure outside each of the four walls of the reactor building. In addition, single divisions of moisture measurement with high alarms are provided in the filter housing upstream of the charcoal adsorber, providing a direct measurement of relative humidity. As a secondary indication of relative humidity, a single division of inlet temperature (upstream of the process electric heaters) and a single division of temperature indication (upstream of charcoal adsorber) are also provided. The maximum possible relative humidity may be calculated based on the temperature rise across the heater. These basic parameters each have main control room indication and alarm.

Unit Inlet or Outlet

	Local Panel	Main Control Room
SRP Table 6.5.1-1	Flow rate (indication)	Flow rate (recorded indication, high alarm and low alarm signals)
ABWR SGTS	F(1) 018B(C)	Inlet flow rate (recorded indication, low alarm); FRS618B(C), FI618B(C). Inlet temperature (indication); TI602B(C)

Local: ABWR design is in compliance with SRP Table 6.5.1-1.

MCR: SRP Table 6.5.1-1 includes a high alarm signal to detect high flow rate at the system inlet or outlet. The ABWR SGTS does not have this high alarm. A flow rate higher than the design value may indicate a potential failure in the fan or an increase in secondary containment leakage. However, as long as a negative pressure is maintained in the secondary containment, SGTS function is accomplished. Low negative secondary containment pressure is alarmed in the main control room. Operation of the SGTS to mitigate offsite releases will not be affected by the absence of the high flow alarm at the MCR.

In addition, the ABWR SGTS design provides inlet temperature indication which is used in concert with downstream temperature measurement as a second means to determine relative humidity in the process stream to the charcoal adsorber. Direct moisture measurement is the primary means to determine charcoal adsorber inlet relative humidity and is discussed in a later section of this response.

Moisture Separator

	Local Panel	Main Control Room
SRP Table 6.5.1-1	Pressure drop (indication) (optional high alarm signal)	None
ABWR SGTS	Pressure drop (indication); DPI003B(C), DPI103B(C)	Pressure drop (indication); DPI603B(C)

The ABWR design is in compliance with SRP Table 6.5.1-1.

Electric Heater

	Local Panel	Main Control Room
SRP Table 6.5.1-1	Status indication	None
ABWR SGTS	Hand switch, status indication	Hand switch, status indication

Local: The ABWR design exceeds the local panel requirements of SRP Table 6.5.1-1.

MCR: The ABWR design exceeds the control room requirements specified in SRP Table 6.5.1-1.

Space Between Heater and Prefilter

	Local Panel	Main Control Room
SRP Table 6.5.1-1	Temperature (indication, high alarm and low alarm signals)	Temperature (indication, high alarm, low alarm, trip alarm signals)
ABWR SGTS	None	Temperature (high alarm, low alarm and trip signals); TS005B(C)

Local: Temperature indication required for testing is available from the control room. Operation of the SGTS to mitigate offsite releases will not be affected by the absence of temperature indication or the high and low alarms at the local panel.

MCR: The high alarm and trip in the ABWR SGTS design is used to alert the operator and shut down the electric heater should the heater temperature increase above 110°C. This is slightly above the 107°C referenced in ASME N509, Subsection 5.5.1, but well within the available margin. Per ASME N509, Section 4.9, higher temperatures (above 150°C) may lead to significant desorption of iodine from the charcoal. Potential ignition of the charcoal occurs at a much higher temperature (290°C per ERDA 76-21, Subsection 3.4.2) and is also not a concern. Note that the ABWR SGTS charcoal will meet the more stringent physical property specification of ASME N509, Table 5-1, for ignition temperature (330°C) [see also the response to Position C.3.i, Appendix 6.5A].

Relative humidity is maintained by controlling the temperature across the heater. A low temperature alarm indicates a potential failure such that the relative humidity in the process stream may not be maintained. Under these circumstances, the operator should stop the malfunctioning train and initiate the redundant train to mitigate the offsite releases. Additional temperature and relative humidity indication and high alarms are provided between the first HEPA filter and the charcoal adsorber and are described in a later section of this response. The

ABWR design meets the intent of SRP 6.5.1-1. See the discussion of basic parameters at the beginning of this response for an understanding of ABWR SGTS instrumentation design.

Prefilter

	Local Panel	Main Control Room
SRP Table 6.5.1-1	Pressure drop (indication, high alarm signal)	None
ABWR SGTS	Pressure drop (indication); DPI007	Pressure drop (indication); DPI607B(C)

The SRP includes a high alarm signal for monitoring pressure drop across the prefilter. A higher than designed differential pressure indicates filter clogging reducing the flow across the filter. This condition is alarmed in the MCR via the low flow (flowmeter) alarm. The redundant SGTS train is available to mitigate any potential offsite release. The ABWR design does not have this alarm. Local instrumentation for prefilter pressure drop measurement is used for testing purposes. A high alarm signal would not be appropriate during testing given the direct indication available on the instrument rack and main control room (MCR). Low system flow is alarmed in the control room should fan runback occur from any cause. Operation of the SGTS to mitigate any potential offsite release will not be affected by the absence of the alarm on the local panel.

First HEPA Filter (Pre-HEPA)

	Local Panel	Main Control Room
SRP Table 6.5.1-1	Pressure drop (indication, high alarm signal)	Pressure drop (recorded indication)
ABWR SGTS	Pressure drop (indication); DPI008	Pressure drop (indication); DPI608B(C)

Local: The local panel has indication for confirming the proper pressure drop across the HEPA filter during testing. Like the prefilter, a high alarm signal would not be appropriate during testing given the direct indication available on the instrument rack. Low system flow is alarmed in the control room should fan runback occur. Operation of the SGTS to mitigate any potential offsite release will not be affected by the absence of a local high alarm. During system operation, it is not expected that the HEPA filter would exhibit an excessively high pressure drop by virtue of the periodic testing for pressure drop and filter efficiency performed in accordance with the schedules specified in the Technical Specifications.

MCR: ABWR design complies with SRP Table 6.5.1-1.

Space between First HEPA Filter and Adsorber

	Local Panel	Main Control Room
SRP Table 6.5.1-1	None	None
ABWR SGTS	None	Moisture (single division of redundant indication MI611, MI612 each with high alarm). Temperature (single division of indication, control and trip, high alarm); TI610, TS009, TS610. Space heater hand switch and status indication.

As mentioned previously, direct moisture indication is provided to assure relative humidity is less than 70% in the gases entering the charcoal adsorber. Relative humidity is a fundamental parameter for system function and has been emphasized in instrumentation design. Space heaters with related temperature and status instrumentation are provided both upstream and downstream of the charcoal. Discussion of this instrumentation is provided in a later section, "Space between Adsorber and Second HEPA Filter."

The ABWR SGTS design exceeds the requirements of SRP Table 6.5.1-1 and ASME N509, Table 4-1.

Adsorber

	Local Panel	Main Control Room
SRP Table 6.5.1-1	None	None
ABWR SGTS	Pressure drop (indication); DPI022	Temperature (two-stage high alarm); TS013B(C) Pressure drop (indication); DPI612, DP1622

The intent of the SRP MCR position, judging from Footnote 3 of Table 4-1 of ASME N509, is to provide an alarm on high temperature and a signal for manual deluge actuation on a high-high temperature alarm. The ABWR SGTS design provides single division of high and high-high temperature alarms directly downstream of the charcoal adsorber. The purpose of the high alarm is to alert the operator to the potential for desorption of iodine from the charcoal (if the SGTS is operating post-accident) and to alert the operator to increasing temperature caused by radioactive iodine decay heat. The nominal setting for the high alarm signal is 155°C. The purpose of the high-high alarm is to permit manual deluge actuation by the operator. The need for deluge actuation is discussed in a later section of this appendix, "Deluge Valves," and also

in Subsection 6.5.1.3.3, "SGTS Filter Train". Pressure drop is provided at a local rack (for testing) and in the MCR.

The ABWR SGTS design exceeds the requirements of SRP Table 6.5.1-1.

Space between Adsorber and Second HEPA Filter (Post-HEPA)

	Local Panel	Main Control Room
SRP Table 6.5.1-1	Temperature (two-stage high alarm signal)	Temperature (indication, two-stage high alarm signal)
ABWR SGTS	None	Temperature (single division of indication, control and trip, high alarm); TI616, TS015, TS616 Space heater hand switch and status indication.

Local: Local temperature alarms are not provided since the area is not continuously manned. Appropriate alarms and indication are provided in the control room along with the necessary controls to respond to a high temperature signal.

MCR: The space heaters are operational only when SGTS is on standby. High temperature gives an alarm in the MCR and cuts power to the heaters. The space heaters will restart when low temperature coincident with space heater operation (i.e., not of service) is detected. The temperature instrument attached to the adsorber has a two-stage high alarm function instead of an instrument in the space between the adsorber and second HEPA filter.

Each space heater heating element is provided with status indication. Each space heater fan is provided with a hand switch and status indication.

Second HEPA (Post-HEPA)

	Local Panel	Main Control Room
SRP Table 6.5.1-1	Pressure drop (indication, high alarm signal)	None
ABWR SGTS	Pressure drop (indication); DPI017, DPI027	Pressure drop (indication); DPI627, DPI617

Local: The local panel has indication for confirming the proper pressure drop across the HEPA filter during testing. Like the prefilter and first HEPA filter, a high alarm signal would not be appropriate during testing given the direct indication on the rack. Low system flow is alarmed in the control room should fan runback occur. Operation of the SGTS to mitigate any potential offsite release will not be affected by the absence of a local high alarm.

MCR: Pressure drop indication is provided.

[Process] Fan

	Local Panel	Main Control Room
SRP Table 6.5.1-1	(Optional hand switch and status indication)	Hand switch, status indication
ABWR SGTS	None	Hand switch, status indication (run/stop)

The ABWR design complies with SRP Table 6.5.1-1.

Cooling Fan

	Local Panel	Main Control Room
SRP Table 6.5.1-1	(Optional hand switch, status indication)	Hand switch, status indication
ABWR SGTS	None	Hand switch, status indication (run/stop)

Cooling fan will automatically start following the signal of the filter train stoppage for the adsorber. The ABWR SGTS design complies with SRP Table 6.5.1-1.

Valve/Damper Operator

	Local Panel	Main Control Room
SRP Table 6.5.1-1	(Optional status indication)	Status indication
ABWR SGTS	None	Hand switch, status indication (Open/closed), position indication; POI601

The ABWR SGTS design exceeds the requirements of SRP Table 6.5.1-1. Valve position indication (and control) is provided on the inlet dampers, F002B(C).

Deluge Valves

	Local Panel	Main Control Room
SRP Table 6.5.1-1	Hand switch, status indication	Hand switch, status indication
ABWR SGTS	None	None

Manual deluge capability is provided on the ABWR SGTS with local indication at valves. Inadvertent wetting of the charcoal has led to system unavailability in operating plants. Remote deluge control, either from a local panel or the main control room is not provided. Whenever the deluge capability is required, an operator has to connect the fire hose connection to the SGTS deluge connection and manually open both valves. As such status indication (open/closed) is not required. System availability is improved without compromising fire protection requirements. ASME N509 shows a move away from remote-operated valves. Hand switches and status indications are required only for power actuated valves.

System Inlet to Outlet

	Local Panel	Main Control Room
SRP Table 6.5.1-1	None	Summation of pressure drop across total system, high alarm signal
ABWR SGTS	None	None

Per ASME N5099 $\Sigma\Delta P$ across the entire system is not required if each component whose pressure drop is subject to change over time has individual alarm or indication in main control room. Each component whose pressure drop is subject to change over time has pressure drop indication in the MCR. The ABWR SGTS design meets the requirements of SRP Table 6.5.1-1.

Other—Secondary Containment Differential Pressure

	Local Panel	Main Control Room
SRP Table 6.5.1-1	None	None
ABWR SGTS	None	Differential pressure (four divisions of indication and high and low alarms)

The ABWR SGTS design exceeds the requirements of SRP Table 6.5.1-1. Measurement of secondary containment pressure with respect to the environs is a fundamental system parameter which is specified within, and is under the control of, the ABWR SGTS design.

Other—Loop Seals

	Local Panel	Main Control Room
SRP Table 6.5.1-1	None	None
ABWR SGTS	None	Level (two divisions of low alarm)

Loop seals are provided within the dryer and in the piping downstream of the filter train discharge block valves. Redundant low level alarms are provided to assure loop seal level is maintained. The loop seals function to continuously and passively drain any accumulation of water in the SGTS. Accumulation of water in piping to the stack has been a problem in operating plants.