CONTAINMENT SYSTEMS

3/4.6.5 SECONDARY CONTAINMENT

SECONDARY CONTAINMENT INTEGRITY

LIMITING CONDITION FOR OPERATION

3.6.5.1 SECONDARY CONTAINMENT INTEGRITY shall be maintained.

APPLICABILITY: OPERATIONAL CONDITIONS 1, 2, 3, and *.

ACTION:

Without SECONDARY CONTAINMENT INTEGRITY:

a. In OPERATIONAL CONDITION 1, 2, or 3, restore SECONDARY CONTAINMENT INTEGRITY within 4 hours or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

b. In OPERATIONAL CONDITION *, suspend handling of irradiated fuel in the secondary containment, CORE ALTERATIONS and operations with a potential for draining the reactor vessel. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.6.5.1 SECONDARY CONTAINMENT INTEGRITY shall be demonstrated by:

a. Deleted ~~Verifying at least once per 24 hours that the pressure within the secondary containment is less than or equal to 0.25 inch of vacuum water gauge.~~

b. Verifying at least once per 31 days that:

1. All secondary containment equipment hatches and blowout panels are closed and sealed.

2. At least one door in each access to the secondary containment is closed.

3. All secondary containment penetrations not capable of being closed by OPERABLE secondary containment automatic isolation dampers/valves and required to be closed during accident conditions are closed by valves, blind flanges, or deactivated automatic dampers/valves secured in position.

c. At least once per 18 months:

1. Verifying that ~~one~~ each required standby gas treatment subsystem will draw down the secondary containment to greater than or equal to 0.25 inch of vacuum water gauge in less than or equal to ~~120 seconds~~ 20 minutes, and

2. Operating ~~one~~ each required standby gas treatment subsystem for 1 hour and maintaining greater than or equal to 0.25 inch of vacuum water gauge in the secondary containment at a flow rate not exceeding 2240 cfm.

*When irradiated fuel is being handled in the secondary containment and during CORE ALTERATIONS and operations with a potential for draining the reactor vessel.

CONTAINMENT SYSTEMS

STAND BY GAS TREATMENT SYSTEM

LIMITING CONDITION FOR OPERATION

3.6.5.3 Two independent standby gas treatment subsystems shall be OPERABLE.

APPLICABILITY: OPERATIONAL CONDITIONS 1, 2, 3 and *.

ACTION:

a. With one required standby gas treatment subsystem inoperable, restore the required inoperable subsystem to OPERABLE status within 7 days, or:

   1. In OPERATIONAL CONDITION 1, 2, or 3, be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

   2. In OPERATIONAL CONDITION *, suspend handling of irradiated fuel in the secondary containment, CORE ALTERATIONS and operations with a potential for draining the reactor vessel. The provisions of Specification 3.0.3 are not applicable.

b. With both required standby gas treatment subsystems inoperable in OPERATIONAL CONDITION *, suspend handling of irradiated fuel in the secondary containment, CORE ALTERATIONS or operations with a potential for draining the reactor vessel. The provisions of Specification 3.0.3. are not applicable.

SURVEILLANCE REQUIREMENTS

4.6.5.3 Each standby gas treatment subsystem shall be demonstrated OPERABLE:

a. At least once per 31 days by initiating, from the control room, flow through the HEPA filters and charcoal adsorbers and verifying that the subsystem operates for a least 10 hours with the heaters OPERABLE.

*When irradiated fuel is being handled in the secondary containment and during CORE ALTERATIONS and operations with a potential for draining the reactor vessel.

CONTAINMENT SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

b. At least once per 18 months or (1) after any structural maintenance on the HEPA filter or charcoal adsorber housings, or (2) following painting, fire, or chemical release in any ventilation zone communicating with the subsystem by:

   1. Verifying that the subsystem satisfies the in-place penetration and bypass leakage testing acceptance criteria of less than 0.05% and uses the test procedure guidance in Regulatory Positions C.5.a, C.5.c, and C.5.d of Regulatory Guide 1.52, Revision 2, March 1978, at a system flow rate of 4457 cfm ± 10%.

   2. Verifying within 31 days after removal that a laboratory analysis of a representative carbon sample obtained in accordance with Regulatory Position C.6.b of Regulatory Guide 1.52, Revision 2, March 1978, meets the laboratory testing criteria of Regulatory Position C.6.a of Regulatory Guide 1.52, Revision 2, March 1978, for a methyl iodide penetration of less than 0.175%; and

   3. Verifying a subsystem flow rate of 4457 cfm ± 10% during system operation when tested in accordance with ANSI N510-1980.

c. After every 720 hours of charcoal adsorber operation by verifying within 31 days after removal that a laboratory analysis of a representative carbon sample obtained in accordance with Regulatory Position C.6.b of Regulatory Guide 1.52, Revision 2, March 1978, meets the laboratory testing criteria of Regulatory Position C.6.a of Regulatory Guide 1.52, Revision 2, March 1978, for a methyl iodide penetration of less than 0.175%.

d. At least once per 18 months by:

   1. Verifying that the pressure drop across the combined HEPA filters and charcoal adsorber banks is less than 8 inches water gauge while operating the filter train at a flow rate of 4457 cfm ± 10%.

   2. Verifying that the filter train starts and isolation dampers open on each of the following test signals:

      a. Manual initiation from the control room, and

      b. Simulated automatic initiation signal.

   3. Verifying that the filter cooling bypass dampers can be manually opened and the fan can be manually started.

   4. Verifying that the heaters dissipate 20.7 ± 2.1 kW when tested in accordance with ANSI N510-1980.

SURVEILLANCE REQUIREMENTS (Continued)

e. After each complete or partial replacement of a HEPA filter bank by verifying that the HEPA filter bank satisfies the inplace penetration and bypass leakage testing acceptance criteria of less than 0.05% in accordance with ANSI N510-1980 while operating the system at a flow rate of ~~4457~~ 5000 cfm ± 10%.

f. After each complete or partial replacement of a charcoal adsorber bank by verifying that.the charcoal adsorber bank satisfies the inplace penetration and bypass leakage testing acceptance criteria of less than 0.05% in accordance with ANSI N510-1980 for a halogenated hydrocarbon refrigerant test gas while operating the system at a flow rate of ~~4457~~ 5000 cfm ± 10%.

DEPRESSURIZATION SYSTEMS (Continued)

In addition to the limits on temperature of the suppression chamber pool water, operating procedures define the action to be taken in the event a safety/relief valve inadvertently opens or sticks open. As a minimum this action shall include: (1) use of all available means to close the valve, (2) initiate suppression pool water cooling, (3) initiate reactor shutdown, and (4) if other safety/relief valves are used to depressurize the reactor, their discharge shall be separated from that of the stuck-open safety/relief valve to assure mixing and uniformity of energy insertion to the pool.

3/4.6.3 PRIMARY CONTAINMENT ISOLATION VALVES

The OPERABILITY of the primary containment isolation valves ensures that the containment atmosphere will be isolated from the outside environment in the event of a release of radioactive material to the containment atmosphere or pressurization of the containment. Containment isolation within the time limits specified ensures for those isolation valves designed to close automatically that the release of radioactive material to the environment will be consistent with the assumptions used in the analyses for a LOCA.

3/4.6.4 VACUUM RELIEF

Vacuum relief breakers are provided to equalize the pressure between the suppression chamber and drywell and between the reactor building and suppression chamber. This system will maintain the structural integrity of the primary containment under conditions of large differential pressures.

The vacuum breakers between the suppression chamber and the drywell must not be inoperable in the open position since this would allow bypassing of the suppression pool in case of an accident. There are nine pairs of valves to provide redundancy and capacity so that operation may continue indefinitely with no more than two pairs of vacuum breakers inoperable in the closed position.

3/4.6.5 SECONDARY CONTAINMENT

Secondary containment is designed to minimize any ground level release of radioactive material which may result from an accident. The reactor building and associated structures provide secondary containment during normal operation when the drywell is sealed and in service. At other times the drywell may be open and, when required, secondary containment integrity is specified.

Establishing and maintaining a vacuum in the reactor building with the standby gas treatment system once per 18 months, along with the surveillance of the doors, hatches, dampers, and valves, is adequate to ensure that there are no violations of the integrity of the secondary containment.

Add Insert 1

TP

SECONDARY CONTAINMENT (Continued) ℙ Add Insert 2

The OPERABILITY of the standby gas treatment systems ensures that sufficient iodine removal capability will be available in the event of a LOCA. The reduction in containment iodine inventory reduces the resulting SITE BOUNDARY radiation doses associated with containment leakage. The operation of this system and resultant iodine removal capacity are consistent with the assumptions used in the LOCA analyses. Continuous operation of the system with the heaters OPERABLE for 10 hours during each 31 day period is sufficient to reduce the buildup of moisture on the adsorbers and HEPA filters. Add Insert 3

3/4.6.6 PRIMARY CONTAINMENT ATMOSPHERE CONTROL

The OPERABILITY of the systems required for the detection and control of oxygen/hydrogen gas ensures that these systems will be available to maintain the oxygen concentration within the primary containment below the lower oxygen limit for oxygen/hydrogen mixture during post-LOCA conditions. Either drywell and suppression chamber oxygen/hydrogen recombiner system is capable of controlling the expected oxygen generation associated with radiolytic decomposition of water. The oxygen/hydrogen control system is consistent with the recommendations of Regulatory Guide 1.7, "Control of Combustible Gas Concentrations in Containment Following a LOCA," September 1976.

Following an accident the inerted primary containment oxygen level is controlled to not exceed 4.8% volume with the catalytic recombiner system. By FSAR Figure 6.2-26 the containment will reach 4.8% oxygen approximately 60 hours after the accident if either recombiner system is operating.

To provide assurance that recombiners are capable of achieving the required oxygen removal, the feed and effluent streams will be sampled during surveillance testing to establish that the effluent hydrogen concentration is less than 25 ppm by volume for a feed of at least 1% hydrogen by volume. This will confirm a minimum efficiency of 99.75% for the expected range of post-accident conditions. This efficiency will be adequate to maintain the post-accident oxygen level below 4.8% by volume.

The CAC system employs a platinum on alumina catalyst to recombine the oxygen and hydrogen flow from the containment. During accident conditions, the gas mixture is preheated to approximately 450 to 550°F prior to entering the catalyst. This preheat increases the effectiveness of the hydrogen/oxygen recombination because it limits the potential for bed poisoning. In the test configuration, the blower is used as the only source of gas stream heating and the catalyst preheaters are not energized. The blowers are capable of heating the gas stream by compression. Temperatures at the blower exit are limited for test purposes to approximately 300°F due to the blower gas exit temperature trip setpoint.

Insert 1

Secondary containment is considered OPERABLE and standby gas treatment (SGT) filtration can be credited when a differential pressure of 0.25 inch of vacuum water gauge is established. The time to establish this differential pressure is a function of SGT flow rate and secondary containment in-leakage, in addition to outside meteorological conditions, initial secondary containment temperature and humidity, standby service water temperature, and a postulated single failure of an electrical division. With an in-leakage of 2240 cfm at static conditions (no wind or temperature effects), the worst case secondary containment drawdown time occurs at 0°F, no wind, a failure of the Division 1 diesel generator, 77°F standby service water temperature, and a secondary containment temperature of 50°F and relative humidity of 0%. The design basis accident dose analysis assumes a secondary containment drawdown time of 20 minutes. No SGT filtration is credited for 20 minutes in the analysis.

The SGT flow rate must be greater than or equal to 5000 cfm within 2 minutes of an initiation signal. This is verified as part of the 18 month surveillance that verifies the filter train starts and the isolation dampers open on a manual and simulated automatic initiation signal. The 2 minute time period includes the time for the emergency diesel generator to start, the SGT start sequence to occur, and an automatic swap-over to the lag subsystem assuming a failure of the lead subsystem. No SGT flow is credited for 2 minutes in the secondary containment drawdown analysis.

The secondary containment in-leakage is primarily a function of seams in the secondary containment superstructure and leakage through doorways. The differential pressure generally increases linearly with flow through the seams and doorways. An equation was derived from correlated performance curves to provide a method for accurately determining secondary containment differential pressure versus SGT flow rate relative to the 2240 cfm in-leakage limit. The equation is as follows (Flow in cfm and ΔP in inches water gauge):

$$\textbf{Flow} = 1988.3 * \Delta P + 3485.85 * \sqrt{\Delta P}$$

The constant for the square root term in the equation is increased such that a differential pressure of 0.25 inch vacuum water gauge would result in a flow rate of 2240 cfm. The constant for the square root term was also conservatively increased to account for any in-leakage due to holes or widening of the seams in secondary containment which would generally result in quadratic losses rather than linear losses. This equation can be used to generate a curve to accurately establish an acceptable region for secondary containment differential pressure versus SGT flow rate relative to the 2240 cfm in-leakage limit. The 2240 cfm in-leakage SURVEILLANCE REQUIREMENT can be satisfied by measuring the secondary containment differential pressure at any SGT system flow rate greater than 2240 cfm and verifying that the measured differential pressure when corrected for outside wind and temperature effects is at a greater vacuum (larger negative pressure) than that shown on the curve for the measured SGT flow rate. A representative curve is included in the appropriate implementing procedures.

Secondary containment must be maintained at a vacuum during normal operation to ensure secondary containment effluent is monitored as well as following an accident for accident mitigation. In the event that the normal secondary containment ventilation system is secured, secondary containment could become pressurized such that the maximum accident design basis pressure of 0 inch water gauge on all surfaces of secondary containment is exceeded. Therefore, the SGT system must be started for secondary containment to be considered OPERABLE when the normal secondary containment ventilation system is secured.

Insert 2

The SGT system is designed to filter the effluent gases from secondary containment through a 99% efficient filter train to mitigate the post accident effects of a severe accident within primary containment or other postulated accidents outside primary containment. A secondary function of the SGT system is to filter the purge exhaust from primary containment whenever radiation levels within the primary containment exceed acceptable levels for direct purge to the environment via the reactor building exhaust system. The SGT system consists of two filter trains. The active system components in each filter train that are required for post-accident operation are redundant and configured in two subsystems to allow for lead/lag operation. The lag subsystem within a train may be considered as a backup to the lead subsystem, with either subsystem being capable of supporting the associated train in the performance of its required functions. In the event that the lead subsystem in a train fails to establish proper air flow within a set time delay from an SGT system start signal, the lead subsystem will automatically shutdown and the lag subsystem will start.

Only the lead fan and heater (including the support equipment and controls), or the lag fan and heater (including the support equipment and controls) in each filter train are required for OPERABILITY of each SGT filter train. However, in order to meet the requirement that two independent SGT subsystems be OPERABLE, both lead subsystems or both lag subsystems are required to be OPERABLE (i.e., the two independent subsystems required by the LCO must be powered from separate buses).

Insert 3

Each required SGT subsystem will be operated for at least one hour every 18 months to ensure the system performs as designed.

ATTACHMENT 3B

ITS and Bases Markup

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.6.1.3.7	Verify each automatic PCIV actuates to the isolation position on an actual or simulated isolation signal.	24 months
SR 3.6.1.3.8	Verify each EFCV actuates to the isolation position on an actual or simulated instrument line break signal.	24 months
SR 3.6.1.3.9	Remove and test the explosive squib from each shear isolation valve of the TIP System.	24 months on a STAGGERED TEST BASIS
SR 3.6.1.3.10	Verify the combined leakage rate for all secondary containment bypass leakage paths is ≤ ~~0.74~~ 18 scfh when pressurized to ≥ P_a.	In accordance with the Primary Containment Leakage Rate Testing Program
SR 3.6.1.3.11	Verify leakage rate through each MSIV is ≤ 11.5 scfh when tested at ≥ 25.0 psig.	In accordance with the Primary Containment Leakage Rate Testing Program
SR 3.6.1.3.12	Verify combined leakage rate through hydrostatically tested lines that penetrate the primary containment is within limits.	In accordance with the Primary Containment Leakage Rate Testing Program

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
C. Secondary containment inoperable during movement of irradiated fuel assemblies in the secondary containment, during CORE ALTERATIONS, or during OPDRVs.	C.1	--------NOTE--------- LCO 3.0.3 is not applicable. --------------------- Suspend movement of irradiated fuel assemblies in the secondary containment.	Immediately
	AND		
	C.2	Suspend CORE ALTERATIONS.	Immediately
	AND		
	C.3	Initiate action to suspend OPDRVs.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
~~SR 3.6.4.1.1~~	~~Verify secondary containment vacuum is ≥ 0.25 inch of vacuum water gauge.~~	~~24 hours~~
SR 3.6.4.1.~~2~~ 1	Verify all secondary containment equipment hatches are closed and sealed.	31 days

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.6.4.1.8 (2)	Verify each secondary containment access inner door or each secondary containment access outer door in each access opening is closed.	31 days
SR 3.6.4.1.4 (3)	Verify each required standby gas treatment (SGT) subsystem will draw down the secondary containment to ≥ 0.25 inch of vacuum water gauge in ≤ 120 seconds 20 minutes.	24 months on a STAGGERED TEST BASIS
SR 3.6.4.1.6 (4)	Verify each required SGT subsystem can maintain ≥ 0.25 inch of vacuum water gauge in the secondary containment for 1 hour at an in-leakage flow rate ≤ 2240 cfm.	24 months on a STAGGERED TEST BASIS

3.6 CONTAINMENT SYSTEMS

3.6.4.3 Standby Gas Treatment (SGT) System

LCO 3.6.4.3 Two [independant] SGT subsystems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3,
During movement of irradiated fuel assemblies in the secondary containment,
During CORE ALTERATIONS,
During operations with a potential for draining the reactor vessel (OPDRVs).

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One [required] SGT subsystem inoperable.	A.1 Restore [required] SGT subsystem to OPERABLE status.	7 days
B. Required Action and associated Completion Time of Condition A not met in MODE 1, 2, or 3.	B.1 Be in MODE 3. AND B.2 Be in MODE 4.	12 hours 36 hours
C. Required Action and associated Completion Time of Condition A not met during movement of irradiated fuel assemblies in the secondary containment, during CORE ALTERATIONS, or during OPDRVs.	------------NOTE------------ LCO 3.0.3 is not applicable. ---------------------------- C.1 Place [required] OPERABLE SGT subsystem in operation. OR	Immediately (continued)

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
C. (continued)	C.2.1	Suspend movement of irradiated fuel assemblies in the secondary containment.	Immediately
	<u>AND</u>		
	C.2.2	Suspend CORE ALTERATIONS.	Immediately
	<u>AND</u>		
	C.2.3	Initiate action to suspend OPDRVs.	Immediately
D. Two required SGT subsystems inoperable in MODE 1, 2, or 3.	D.1	Enter LCO 3.0.3.	Immediately
E. Two required SGT subsystems inoperable during movement of irradiated fuel assemblies in the secondary containment, during CORE ALTERATIONS, or during OPDRVs.	E.1	---------NOTE--------- LCO 3.0.3 is not applicable. --------------------- Suspend movement of irradiated fuel assemblies in the secondary containment.	Immediately
	<u>AND</u>		
	E.2	Suspend CORE ALTERATIONS.	Immediately
	<u>AND</u>		
	E.3	Initiate action to suspend OPDRVs.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.4.3.1	Operate each SGT subsystem for ≥ 10 continuous hours with heaters operating.	31 days
SR 3.6.4.3.2	Perform required SGT filter testing in accordance with the Ventilation Filter Testing Program (VFTP).	In accordance with the VFTP
SR 3.6.4.3.3	Verify each SGT subsystem actuates on an actual or simulated initiation signal.	24 months
SR 3.6.4.3.4	Verify each SGT filter cooling recirculation valve can be opened and the fan started.	24 months

BASES

APPLICABLE SAFETY ANALYSES (continued)	The single failure criterion required to be imposed in the conduct of unit safety analyses was considered in the original design of the primary containment purge valves. Two valves in series on each purge line provide assurance that both the supply and exhaust lines could be isolated even if a single failure occurred. PCIVs satisfy Criterion 3 of the NRC Policy Statement (Ref. 3).
LCO	PCIVs form a part of the primary containment boundary. The PCIV safety function is related to minimizing the loss of reactor coolant inventory and establishing the primary containment boundary during a DBA. The power operated, automatic isolation valves are required to have isolation times within limits and actuate on an automatic isolation signal. While the reactor building-to-suppression chamber vacuum breakers isolate primary containment penetrations, they are excluded from this Specification. Controls on their isolation function are adequately addressed in LCO 3.6.1.6, "Reactor Building-to-Suppression Chamber Vacuum Breakers." The valves covered by this LCO are listed with their associated stroke times in Reference 4. The normally closed PCIVs are considered OPERABLE when manual valves are closed or open in accordance with appropriate administrative controls, automatic valves are de-activated and secured in their closed position, blind flanges are in place, and closed systems are intact. These passive isolation valves and devices are those listed in Reference 4. MSIV and hydrostatically tested valve leakage are exempt from Type C testing limits and must meet specific leakage rate requirements, and secondary containment bypass valves must meet additional leakage rate requirements. Other PCIV leakage rates are addressed by LCO 3.6.1.1, "Primary Containment," as Type B or C testing. This LCO provides assurance that the PCIVs will perform their designed safety functions to minimize the loss of reactor coolant inventory and establish the primary containment boundary during accidents.

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)	Secondary containment satisfies Criterion 3 of the NRC Policy Statement (Ref. 3).
LCO	An OPERABLE secondary containment provides a control volume into which fission products that bypass or leak from primary containment, or are released from the reactor coolant pressure boundary components located in secondary containment, can be diluted and processed prior to release to the environment. For the secondary containment to be considered OPERABLE, it must have adequate leak tightness to ensure that the required vacuum can be established and maintained. Add Insert 6
APPLICABILITY	In MODES 1, 2, and 3, a LOCA could lead to a fission product release to primary containment that leaks to secondary containment. Therefore, secondary containment OPERABILITY is required during the same operating conditions that require primary containment OPERABILITY. In MODES 4 and 5, the probability and consequences of the LOCA are reduced due to the pressure and temperature limitations in these MODES. Therefore, maintaining secondary containment OPERABLE is not required in MODE 4 or 5 to ensure a control volume, except for other situations for which significant releases of radioactive material can be postulated, such as during operations with a potential for draining the reactor vessel (OPDRVs), during CORE ALTERATIONS, or during movement of irradiated fuel assemblies in the secondary containment.
ACTIONS	A.1 If secondary containment is inoperable, it must be restored to OPERABLE status within 4 hours. The 4 hour Completion Time provides a period of time to correct the problem that is commensurate with the importance of maintaining secondary containment during MODES 1, 2, and 3. This time period ensures that the probability of an accident (requiring secondary containment OPERABILITY) occurring during periods where secondary containment is inoperable is minimal.

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.6.4.1.1

This SR ensures that the secondary containment boundary is sufficiently leak tight to preclude exfiltration under expected wind conditions. The 24 hour Frequency of this SR was developed based on operating experience related to secondary containment vacuum variations during the applicable MODES and the low probability of a DBA occurring between surveillances.

Furthermore, the 24 hour Frequency is considered adequate in view of other indications available in the control room, including alarms, to alert the operator to an abnormal secondary containment vacuum condition.

(1) (2)

SR 3.6.4.1.2 and SR 3.6.4.1.3

Verifying that secondary containment equipment hatches and each inner access door or each outer access door in each access opening are closed ensures that the infiltration of outside air of such a magnitude as to prevent maintaining the desired negative pressure does not occur. Verifying that all such openings are closed provides adequate assurance that exfiltration from the secondary containment will not occur. SR 3.6.4.1.2 also requires equipment hatches to be sealed. In this application, the term "sealed" has no connotation of leak tightness. Maintaining secondary containment OPERABILITY requires verifying all inner doors or all outer doors in the access opening are closed. However, each secondary containment access door is normally kept closed, except when the access opening is being used for entry and exit or when maintenance is being performed on an access. The 31 day Frequency for these SRs has been shown to be adequate based on operating experience, and is considered adequate in view of the other indications of door and hatch status that are available to the operator.

(3) (4)

SR 3.6.4.1.4 and SR 3.6.4.1.5

The SGT System exhausts the secondary containment atmosphere to the environment through appropriate treatment equipment. To ensure that all fission products are treated, SR 3.6.4.1.4 verifies that the SGT System will rapidly establish and maintain a pressure in the secondary containment that is less than the lowest postulated pressure

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.6.4.1.4 and SR 3.6.4.1.5 (continued)

external to the secondary containment boundary. This is confirmed by demonstrating that one SGT subsystem will draw down the secondary containment to ≥ 0.25 inches of vacuum water gauge in ≤ 120 seconds. This cannot be accomplished if the secondary containment boundary is not intact. SR 3.6.4.1.5 demonstrates that each SGT subsystem can maintain ≥ 0.25 inches of vacuum water gauge for 1 hour at a flow rate ≤ 2240 cfm. The 1 hour test period allows secondary containment to be in thermal equilibrium at steady state conditions. Therefore, these two tests are used to ensure secondary containment boundary integrity. Since these SRs are secondary containment tests, they need not be performed with each SGT subsystem. The SGT subsystems are tested on a STAGGERED TEST BASIS, however, to ensure that in addition to the requirements of LCO 3.6.4.3, either SGT subsystem will perform this test. Operating experience has shown these components usually pass the Surveillance when performed at the 24 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

REFERENCES

1. FSAR, Sections 15.6.5 and 15.F.6.
2. FSAR, Section 15.7.4.
3. Final Policy Statement on Technical Specifications Improvements, July 22, 1993 (58 FR 39132).

B 3.6 CONTAINMENT SYSTEMS

B 3.6.4.3 Standby Gas Treatment (SGT) System

BASES

BACKGROUND

The SGT System is required by 10 CFR 50, Appendix A, GDC 41, "Containment Atmosphere Cleanup" (Ref. 1). The function of the SGT System is to ensure that radioactive materials that leak from the primary containment into the secondary containment following a Design Basis Accident (DBA) are filtered and adsorbed prior to exhausting to the environment.

The SGT System consists of two fully redundant subsystems, each with its own set of ductwork, dampers, charcoal filter train, and controls.

Each charcoal filter train consists of (components listed in order of the direction of the air flow):

a. A moisture separator;

b. Two electric heater banks (one primary and one backup);

c. A prefilter bank;

d. A high efficiency particulate air (HEPA) filter bank;

e. Two charcoal adsorber banks;

f. A second HEPA filter bank; and

g. Two centrifugal fans (one primary and one backup) each with inlet flow control vanes.

The sizing of the SGT System equipment and components is based on the results of an infiltration analysis, as well as an exfiltration analysis. The internal pressure of the SGT System boundary region is maintained at a negative pressure of 0.25 inch water gauge when the system is in operation, which represents the internal pressure required to ensure zero exfiltration of air from the building using the 95% meteorological data.

(continued)

BASES

BACKGROUND (continued)	The moisture separator is provided to remove entrained water in the air, while the electric heaters reduce the relative humidity of the airstream to less than 70% (Ref. 2). The prefilter removes large particulate matter, while the HEPA filter is provided to remove fine particulate matter and protect the charcoal from fouling. The charcoal adsorber removes gaseous elemental iodine and organic iodides, and the final HEPA filter is provided to collect any carbon fines exhausted from the charcoal adsorber. The SGT System automatically starts and operates in response to actuation signals indicative of conditions or an accident that could require operation of the system. Following initiation, ~~one fan per~~ [the lead fan in each] subsystem starts. ~~SGT System flows are controlled automatically by modulating inlet vanes installed on the SGT fans.~~ [Add Insert 3]
APPLICABLE SAFETY ANALYSES	The design basis for the SGT System is to mitigate the consequences of a loss of coolant accident and fuel handling accidents (Refs. 3 and 4). For all events analyzed, the SGT System is shown to be automatically initiated to reduce, via filtration and adsorption, the radioactive material released to the environment. The SGT System satisfies Criterion 3 of the NRC Policy Statement (Ref. 5).
LCO	Following a DBA, a minimum of one SGT subsystem is required to maintain the secondary containment at a negative pressure with respect to the environment and to process gaseous releases. Meeting the LCO requirements for two OPERABLE [independent] subsystems ensures operation of at least one SGT subsystem in the event of a single active failure. [Add Insert 4] ~~In addition, only the primary electric heater bank and centrifugal fan are required for OPERABILITY of each SGT subsystem.~~
APPLICABILITY	In MODES 1, 2, and 3, a DBA could lead to a fission product release to primary containment that leaks to secondary containment. Therefore, SGT System OPERABILITY is required during these MODES.

(continued)

BASES

APPLICABILITY (continued)

In MODES 4 and 5, the probability and consequences of these events are reduced due to the pressure and temperature limitations in these MODES. Therefore, maintaining the SGT System OPERABLE is not required in MODE 4 or 5, except for other situations under which significant releases of radioactive material can be postulated, such as during operations with a potential for draining the reactor vessel (OPDRVs), during CORE ALTERATIONS, or during movement of irradiated fuel assemblies in the secondary containment.

ACTIONS

A.1

With one [required] SGT subsystem inoperable, the inoperable subsystem must be restored to OPERABLE status within 7 days. In this condition, the remaining OPERABLE SGT subsystem is adequate to perform the required radioactivity release control function. However, the overall system reliability is reduced because a single failure in the OPERABLE subsystem could result in the radioactivity release control function not being adequately performed. The 7 day Completion Time is based on consideration of such factors as the availability of the OPERABLE redundant SGT subsystem and the low probability of a DBA occurring during this period.

B.1 and B.2

If the SGT subsystem cannot be restored to OPERABLE status within the required Completion Time in MODE 1, 2, or 3, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours and to MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

C.1, C.2.1, C.2.2, and C.2.3

During movement of irradiated fuel assemblies in the secondary containment, during CORE ALTERATIONS, or during OPDRVs, when Required Action A.1 cannot be completed within the required Completion Time, the [required] OPERABLE SGT subsystem should be immediately placed in operation. This Required

(continued)

ACTIONS

C.1, C.2.1, C.2.2, and C.2.3 (continued)

Action ensures that the remaining {required} subsystem is OPERABLE, that no failures that could prevent automatic actuation will occur, and that any other failure would be readily detected.

An alternative to Required Action C.1 is to immediately suspend activities that represent a potential for releasing radioactive material to the secondary containment, thus placing the unit in a condition that minimizes risk. If applicable, CORE ALTERATIONS and movement of irradiated fuel assemblies must be immediately suspended. Suspension of these activities shall not preclude completion of movement of a component to a safe position. Also, if applicable, action must be immediately initiated to suspend OPDRVs to minimize the probability of a vessel draindown and subsequent potential for fission product release. Action must continue until OPDRVs are suspended.

LCO 3.0.3 is not applicable while in MODE 4 or 5. However, since irradiated fuel assembly movement can occur in MODE 1, 2, or 3, the Required Actions of Condition C have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving irradiated fuel assemblies while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, in either case, inability to suspend movement of irradiated fuel assemblies would not be a sufficient reason to require a reactor shutdown.

D.1

If both {required} SGT subsystems are inoperable in MODE 1, 2, or 3, the SGT System may not be capable of supporting the required radioactive release control function. Therefore, actions are required to enter LCO 3.0.3 immediately.

E.1, E.2, and E.3

When two {required} SGT subsystems are inoperable, if applicable, CORE ALTERATIONS and movement of irradiated fuel assemblies in the secondary containment must be immediately suspended. Suspension of these activities shall not preclude completion of movement of a component to a safe position. Also, if

(continued)

BASES

ACTIONS

E.1, E.2, and E.3 (continued)

applicable, actions must be immediately initiated to suspend OPDRVs to minimize the probability of a vessel draindown and subsequent potential for fission product release. Action must continue until OPDRVs are suspended.

LCO 3.0.3 is not applicable while in MODE 4 or 5. However, since irradiated fuel assembly movement can occur in MODE 1, 2, or 3, Required Action E.1 has been modified by a Note stating that LCO 3.0.3 is not applicable. If moving irradiated fuel assemblies while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, in either case, inability to suspend movement of irradiated fuel assemblies would not be sufficient reason to require a reactor shutdown.

SURVEILLANCE REQUIREMENTS

SR 3.6.4.3.1

Operating (from the control room) each [required] SGT subsystem for ≥ 10 continuous hours ensures that both [required] subsystems are OPERABLE and that all associated controls are functioning properly. It also ensures that blockage, fan or motor failure, or excessive vibration can be detected for corrective action. Operation with the heaters on (automatic heater cycling to maintain temperature) for ≥ 10 continuous hours every 31 days eliminates moisture on the adsorbers and HEPA filters. The 31 day Frequency was developed in consideration of the known reliability of fan motors and controls and the redundancy available in the system.

SR 3.6.4.3.2

This SR verifies that the required SGT filter testing is performed in accordance with the Ventilation Filter Testing Program (VFTP). The SGT System filter tests are in accordance with Regulatory Guide 1.52 (Ref. 6). The VFTP includes testing HEPA filter performance, charcoal adsorber efficiency, minimum system flow rate, and the physical properties of the activated charcoal (general use and following specific operations). Specified test frequencies and additional information are discussed in detail in the VFTP.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.4.3.3

(required) (Add Insert 5)

This SR requires verification that each SGT subsystem starts upon receipt of an actual or simulated initiation signal. The LOGIC SYSTEM FUNCTIONAL TEST in LCO 3.3.6.2, "Secondary Containment Isolation Instrumentation," overlaps this SR to provide complete testing of the safety function. While this Surveillance can be performed with the reactor at power, operating experience has shown these components usually pass the Surveillance when performed at the 24 month Frequency, which is based on the refueling cycle. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

SR 3.6.4.3.4

(required)

This SR requires verification that the ~~primary~~ SGT filter cooling recirculation valve can be opened and the ~~primary~~ fan started. This ensures that the ventilation mode of SGT System operation is available. While this Surveillance can be performed with the reactor at power, operating experience has shown these components usually pass the Surveillance when performed at the 24 month Frequency, which is based on the refueling cycle. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 41.
2. FSAR, Section 6.5.1.2.
3. FSAR, Sections 15.6.5 and 15.F.6.
4. FSAR, Section 15.7.4.
5. Final Policy Statement on Technical Specifications Improvements, July 22, 1993 (58 FR 39132).
6. Regulatory Guide 1.52, Rev. 2.

5.5 Programs and Manuals

5.5.7 Ventilation Filter Testing Program (VFTP) (continued)

after any structural maintenance on the system housing; and, following significant painting, fire, or chemical release in any ventilation zone communicating with the system while it is in operation.

Tests described in Specification 5.5.7.c shall be performed once per 24 months; after 720 hours of system operation; after any structural maintenance on the system housing; and, following significant painting, fire, or chemical release in any ventilation zone communicating with the system while it is in operation.

Tests described in Specification 5.5.7.d and 5.5.7.e shall be performed once per 24 months.

The provisions of SR 3.0.2 and SR 3.0.3 are applicable to the VFTP test Frequencies.

a. Demonstrate for each of the ESF systems that an inplace test of the high efficiency particulate air (HEPA) filters shows a penetration and system bypass < 0.05% when tested in accordance with Regulatory Guide 1.52, Revision 2, Section C.5.c and ANSI N510-1989, Section 10 at the system flowrate specified below:

ESF Ventilation System	Flowrate (cfm)
SGT System	~~4012 to 4902~~ 4500 to 5500
CREF System	900 to 1100

b. Demonstrate for each of the ESF systems that an inplace test of the charcoal adsorber shows a penetration and system bypass < 0.05% when tested in accordance with Regulatory Guide 1.52, Revision 2, Section C.5.d and ANSI N510-1989, Section 11 at the system flowrate specified below:

ESF Ventilation System	Flowrate (cfm)
SGT System	~~4012 to 4902~~ 4500 to 5500
CREF System	900 to 1100

(continued)

5.5 Programs and Manuals

5.5.7 Ventilation Filter Testing Program (VFTP) (continued)

c. Demonstrate for each of the ESF systems that a laboratory test of a sample of the charcoal adsorber, when obtained as described in Regulatory Guide 1.52, Revision 2, Section C.6.b shows the methyl iodide penetration less than the value specified below when tested in accordance with ASTM D3803-1986 (Method B for the SGT System and Method A for the CREF System) at a relative humidity greater than or equal to the value specified below:

ESF Ventilation System	Penetration (%)	RH (%)
SGT System	0.175	70
CREF System	1.0	70

d. Demonstrate for each of the ESF systems that the pressure drop across the combined HEPA filters and the charcoal adsorbers is less than the value specified below when tested at the system flowrate specified below:

ESF Ventilation System	Delta P (inches wg)	Flowrate (cfm)
SGT System	< 8	~~4012 to 4902~~ 4500 to 5500
CREF System	< 6	900 to 1100

e. Demonstrate that the heaters for each of the ESF systems dissipate the nominal value specified below when tested in accordance with ANSI N510-1989, Section 14.5.1:

ESF Ventilation System	Wattage (kW)
SGT System	18.6 to 22.8
CREF System	4.5 to 5.5

5.5.8 Explosive Gas and Storage Tank Radioactivity Monitoring Program

This program provides controls for potentially explosive gas mixtures contained in the Main Condenser Offgas Treatment System and the quantity of radioactivity contained in unprotected outdoor liquid storage tanks.

The program shall include:

(continued)

Insert 1

The time to establish the required vacuum in secondary containment is a function of SGT flow rate and secondary containment in-leakage, in addition to outside meteorological conditions, initial secondary containment temperature and humidity, standby service water temperature, and a postulated single failure of an electrical division. With an in-leakage of 2240 cfm at static conditions (no wind or temperature effects), the worst case secondary containment drawdown time occurs at 0°F, no wind, a failure of the Division 1 diesel generator, 77°F standby service water temperature, and a secondary containment temperature of 50°F and relative humidity of 0%. The design basis accident dose analysis assumes a secondary containment drawdown time of 20 minutes. No SGT filtration is credited for 20 minutes in the analysis.

The secondary containment in-leakage is primarily a function of seams in the secondary containment superstructure and leakage through doorways. The differential pressure generally increases linearly with flow through the seams and doorways. An equation was derived from correlated performance curves to provide a method for accurately determining secondary containment differential pressure versus SGT flow rate relative to the 2240 cfm in-leakage limit. The equation is as follows (Flow in cfm and ΔP in inches water gauge):

$$\text{Flow} = 1988.3 * \Delta P + 3485.85 * \sqrt{\Delta P}$$

The constant for the square root term in the equation is increased such that a differential pressure of 0.25 inch vacuum water gauge would result in a flow rate of 2240 cfm. The constant for the square root term was also conservatively increased to account for any in-leakage due to holes or widening of the seams in secondary containment seams which would generally result in quadratic losses rather than linear losses. This equation can be used to generate a curve to accurately establish an acceptable region for secondary containment differential pressure versus SGT flow rate relative to the 2240 cfm in-leakage limit. SR 3.6.4.1.3 verifies secondary containment boundary integrity by measuring the secondary containment differential pressure at any SGT system flow rate greater than 2240 cfm and verifying that the measured differential pressure when corrected for outside wind and temperature effects is at a greater vacuum (larger negative pressure) than that shown on the curve for the measured SGT flow rate. The measured differential pressure must be greater than the curve in ≤ 20 minutes. A representative curve is included in the appropriate implementing procedures.

Insert 2

The active system components in each filter train that are required for post-accident operation are redundant and configured in two subsystems to allow for lead/lag operation. The lead subsystem of each train is powered from a separate emergency diesel divisional bus (Division 1 or 2) than the lag subsystem. The lag subsystem within a train may be considered as a backup to the lead subsystem, with either subsystem being capable of supporting the associated train in the performance of its required functions.

Insert 3

In the event that the lead subsystem in a train fails to establish proper air flow within a set time delay from an SGT system start, the lead subsystem will automatically shutdown and the lag subsystem will start.

Insert 4

In addition, only the lead fan and heater (including the support equipment and controls), or the lag fan and heater (including the support equipment and controls) in each filter train are required for OPERABILITY of each SGT filter train. However, in order to meet the requirement that two independent SGT subsystems be OPERABLE, both lead subsystems or both lag subsystems are required to be OPERABLE (i.e., the two independent subsystems required by the LCO must be powered from the separate buses).

Insert 5

This Surveillance also ensures that the SGT subsystem fan achieves ≥ 5000 cfm within 2 minutes.

Insert 6

In addition, secondary containment must be maintained at a vacuum during normal operation to ensure secondary containment effluent is monitored as well as following an accident for accident mitigation. In the event that the normal secondary containment ventilation system is secured, secondary containment could become pressurized such that the maximum accident design basis pressure of 0 inch water gauge on all surfaces of secondary containment is exceeded. Therefore, the SGT system must be started for secondary containment to be considered OPERABLE when the normal secondary containment ventilation system is secured.

ATTACHMENT 4

JCO (Revision 5) and Closure Summary

JUSTIFICATION FOR CONTINUED OPERATION (JCO)

NCR 292-171, (JCO Rev. 5)
NCR 292-171, (JCO Rev. 4)
NCR 292-171, (JCO Rev. 3)
NCR 292-171, (JCO Rev. 2)
PER 290-017, (JCO Rev. 1)
NCR 288-357, (JCO Rev. 0)

1.0 Introduction and Component Identification

Niagara Mohawk Corporation filed an LER on NMP-2 with the NRC in mid-1987 following discovery that assumptions used to evaluate secondary containment differential pressure drawdown time following a postulated LOOP/LOCA were not conservative. Upon review of WNP-2 calculations of drawdown time, it was found that the WNP-2 analysis was also nonconservative. Like NMP-2, an assumed failure of certain emergency power buses cause delay in the ability to achieve the negative secondary containment differential pressure. Further, the original WNP-2 analysis does not consider adverse environmental conditions that increase secondary containment leakage.

2.0 Issue

NCR 288-357, (JCO Rev. 0 and Rev. 1) originally documented a problem associated with ability of the standby gas treatment system for WNP-2 to effectively perform its safety function under all postulated post-accident conditions including consideration of adverse environmental conditions. Revision 2 and 3 to the original Rev. 0 and 1 assessments were required to address new issues which have been identified dealing with instrument calibration accuracy and setpoint error. Revision 4 was made to expand the SW temperatures shown in Figure 4 down to 32°F. Revision 4 was done to eliminate any procedure compliance issues at SW temperatures below 40°F.

Revision 5 considers reduced room cooler performance due to fouling to 65% efficiency. A review of open BCO/JCO items (reference IOM SS2-PE-93-260) noted that revision 4 of this JCO considered 100% room cooler efficiency while the BCOs for NCRs 292-0476/0941/0950 use 65% efficiency. To correct the discrepancy, the

Justification for Continued Operation, Rev. 5
NCR 292-171

secondary containment drawdown profile model was run with the reduced efficiency. In Figure 1 the new draw down profile shows that -.25" w.g. is reached in less than 10 minutes. The model was also found to include the running heat load from the REA and ROA fans during the event, although no credit was assumed in analysis for these fans to aid in secondary containment drawdown since they trip on the F, A, and Z signals. The F, A, and Z signals also start SGT. When the heat loads of the REA and ROA fans were removed from the model, the secondary containment drawdown time is still less than ten minutes with the SW pond at 77 °F. Since the SW pond temperature restrictions are no longer necessary, Figure 4 has been removed from this JCO. Plant procedures will reflect this change after JCO approval by POC by removing PPM 2.4.5 rev 23 Attachment 6.4, 7.0.0 rev 27 Att. 9.10, 7.0.1 rev 18 Att. 9.4, and 7.0.2 rev 16 Att. 9.7.

Revision 5 also deletes references to future actions which would preclude single failure of the SGT inlet air valves. A Basic Design Change has been implemented to place the inlet air valves in a normally open condition.

Specifically, standby gas treatment flow indicator/recorders (SGT-FR-2A1, 2A2, 2B1, 2B2) are calibrated to read flow in SCFM when flow is at 212°F, 2 psig and 0% relative humidity. During any event in which SGT is initiated, these conditions are never reached. Consequently, for the range of conditions under which SGT is designed to operate, the actual standard flow through the SGT trains will be 5% lower to 10% higher than indicated on the flow recorder.

In addition to this calibration correction factor, the SGT fan flow controller (limiter) loop has a conservatively calculated accuracy of ±10%. Removing conservatism could lead to an accuracy of between ±5 and ±7%.

The effect of these two corrections is that the surveillance test results for system flow and building leakage could have been 20% higher than previously believed.

This new information poses two problems. First, the higher total system flow (up to 20% higher) could have resulted in a trip of the SGT fan motors on thermal overloads if the fans had been called upon to operate under degraded voltage conditions. And second, the building leakage could have been up to 20% higher than

assumed in the secondary containment drawdown analysis resulting in potentially under predicting the time to reach a -.25" w.g. building pressure.

In light of the above considerations, additional constraints must be placed on the plant to maintain the JCO basis. The analysis for JCO Rev 0 and Rev 1 required the SGT flow limiter to be set at 5600 CFM to achieve a building drawdown to -0.25" w.g. within ten minutes to meet 10CFR100 and GDC 19 dose limits.

With the new information available, a new flow limiter setpoint (based on setpoint calculation E/I-02-91-1066) has been established which considers degraded voltage, charcoal bed residence time and adverse environmental conditions. A summary of the setpoint calculation is provided below:

Analytical limit = 5812 ICFM (indicated cubic feet per minute = ICFM)

Correction for setpoint accuracy (nominal setpoint) = 5378 ICFM (rounded to 5380 ICFM)

Correction for flow element ICFM to ACFM (nominal inlet conditions[1], 90°F, 0% R.H., 0.2 psig) = 5857 ACFM

Lower setpoint limit = 4944 ICFM correction for flow element ICFM to ACFM[1] (90°F, 0% RH, 0.2 psig) = 5385 ACFM

From the setpoint calculation, the correction factor for flow limiter accuracy considers the effect of calibration error, instrument drift and environmental effects. Calibration error and drift make up approximately 50% of the total loop setpoint

[1] 90°F inlet is based on a 15°F temperature rise across the SGT heater coils and a 75°F nominal secondary containment temperature at the beginning of the accident. This condition represents the expected minimum building temperature during normal full power operation. 0% RH and 14.89 psia represent the most limiting combination of expected SGT operating conditions at the SGT flow element and their use results in the most conservative correction factor (i.e., lowest flow) per Calculation NE-02-92-06 for converting ICFM to ACFM.

accuracy with the remaining 50% attributed to environmental effects and other uncertainties.

Taking these accuracies into account in establishing limits on building leakage and available SGT system flow results in the following two limiting combinations of leakage and system flow:

	Case 1 (ACFM)	Case 2 (ACFM)	Case 3 (ACFM)
SGT fan flow =	5850 (rounded from 5857)	5385	5385
Leakage =	1625[2]	1475	1625

The Case 1 combination assumes the controller error is causing the flow limiter to control flow higher than the nominal setpoint. Case 2 assumes the controller error is causing the flow limiter to control and indicate flow lower than the nominal setpoint. In both these cases, the system flow capacity and associated leakage are derived based on the assumption that typically the total loop calibration and drift portion of the setpoint error act in only one direction for a given calibration period. On the other hand, environmental portion is assumed to act in the direction which provides the worse condition for the drawdown analysis; i.e., the error acts to reduce total system flow capacity and increase total building leakage[2]. The assumption on calibration and drift error is considered valid based on historical trends observed during instrument calibration.

As a final consideration, Case 3 (Figure 3) was run assuming all instrument errors act to provide the worse case combination of building leakage and available SGT flow; i.e., 5385 ACFM SGT flow with the building leakage test inaccuracy in the opposite direction of 1625 ACFM. Even for this case, the SGT system is able to achieve building drawdown with single train SGT operation maintaining a negative 0.25" w.g. pressure differential and limiting dose consequences to less than

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[2]This assumption is taken since building leakage is verified annually to be less than 1475 CFM (adjusted for flow element calibration and standard conditions) and the accuracy of the flow limiter/indicator could be as much as 10% high or low during the test. Subsequent system initiation during an accident (at some later time) could result in a different environmental error being introduced into the system.

10CFR100 limits. Case 3 is not considered a credible combination of SGT flow and building leakage, but is included to demonstrate acceptable consequences even in this unlikely condition. Cases 1 and 2 represent the worse case expected range of flow and leakage for the SGT and secondary containment.

Figures 1 and 2 (Case 1 and 2 respectively) present the revised drawdown analysis results and include consideration for the new flow limiter setting and range of possible secondary containment leakages.

3.0 Component Safety Function

The SGT system and secondary containment act to minimize and control radiological releases from the plant. Unfiltered release of primary containment leakage, and other radioactive gasses and particulates resulting from accidents outside the primary containment, is prevented by maintaining the secondary containment pressure negative 0.25" w.g. with respect to atmospheric pressure, and by filtering the effluent gasses from the secondary containment. Secondary containment pressure boundary integrity is assured by periodically testing in-leakage and SGT capability.
The SGT system is required to have the flow and pressure head capacity to maintain secondary containment at a -0.25" w.g. differential pressure. High efficiency filters and charcoal bed filters process the SGT flow. This capability must be maintained assuming a post-accident single active failure and design allowance to accommodate expected building accident environment and external meteorology.

WNP-2 Technical Specification requirements is secondary containment in-leakage maintained below 2240 cfm at -0.25" w.g. differential. The SGT is also used under certain conditions to filter primary containment purge gasses.

4.0 Justification For Continued Operation

The critical parameters related to accomplishing the safety function of the SGT system and secondary containment are summarized in Table 1 for the original licensing bases, the 288-357 JCO, Rev. 1 and 2 and the new JCO (Revision 5 to NCR 292-171). As identified in the Rev. 1 to the 288-357 JCO, standby gas treatment, secondary containment, standby service water, and weather modeling show that during post-LOCA, under certain adverse weather conditions, differential

pressure of the secondary containment does not always meet the original licensing commitments. Certain combinations of post-LOCA single active failures and winter weather conditions act to minimize SGT performance, and increase secondary containment leakage. Wind increases the demand on the SGT to hold the leeward side of the Reactor Building sufficiently negative while simultaneously increasing the differential pressure, and thus the in-leakage, on the windward side of the building. Differential temperature between the inside and outside of the building creates a differential pressure gradient from the bottom to the top of the secondary containment due to the density difference of the air inside and outside the building. As a result, the lower portion of the building must be held at a high differential pressure (up to -0.75" w.g.) to assure that a negative 0.25" w.g. differential exists at the building roof line. This overall greater differential pressure proportionally increases building in-leakage. The net result of wind and winter temperatures is the inability to hold the upper portion of the secondary containment at a -0.25" w.g. differential in cold weather, and to lengthen the time required to reach -0.25" w.g. differential in moderate weather.

Steady state secondary containment pressure is established when building in-leakage is equal to standby gas treatment system (SGT) flow and secondary containment temperature transients have stabilized. Analysis shows that the time required to reach the steady state condition is a function of the assumed meteorological conditions at the time of a postulated LOCA, the assumed type of single active failure coincident with the LOCA, and the standby service water (SW) temperature. The transient analysis clearly indicates that the limiting single active failure is the assumed loss of one SGT train. Based upon single train design basis SGT flow and maximum Technical Specification allowable secondary containment leakage, the upper-most surface areas of the reactor building cannot be maintained at a quarter-inch water gage negative pressure with respect to atmospheric pressure. High SW water temperature acts to extend the time required to reach a steady state condition, but does not effect the final steady state pressure. However, there is no added restriction to maximum Tech Spec SW pond temperature as a result of this JCO (Tech Spec maximum temperature remains at 77°F).

Both SGT trains are redundantly powered by both divisions of standby emergency power. Consequently, the SGT is not susceptible to most of the single active failures that have relatively high probability of occurrence (e.g.; failure of an emergency diesel generator to start.) System design reviews completed since the

issuance of the Revision 1 JCO indicate that SGT is vulnerable to only a few single failures; specifically,

1) Electrical separation - hot shorts disabling active function of SGT valves and fans simultaneous in both divisions (14 valves and 2 fans affected).

2) A failure of either SGT train due to a single failure opening of the associated fire protection water deluge supply valve.

3) Lack of control logic to detect and transfer SGT operation to the redundant division on failure of a heater coil (i.e., SGT humidity control).

Thus, from a failure analysis perspective, the SGT has features that provide more reliable operation than minimum design requirements would normally dictate. However, even in the event only one SGT train is available, the new flow limiter setting of 5380 ICFM (5850 ACFM to 5385 ACFM) coupled with maintaining SW at or below 77°F and low secondary containment leakage ensures secondary containment drawdown within ten minutes and limit dose releases to within the 10CFR100 and 10CFR50 GDC 19 limits.

Testing conducted for SGT flow/differential pressure capability, and testing of secondary containment integrity show that the SGT is capable of performing beyond design basis requirements, and that the secondary containment is significantly more leak-tight than required by Technical Specifications. Actions have been taken since this issue was first identified to further tighten the secondary containment boundary against leakage. Building leakage tests conducted over the last five years have measured building leakage at less than the 1475 ACFM.

Since the issuance of the original NCR 288-357 JCO, there has been a significant amount of engineering analyses and several engineering evaluations completed on the SGT performance and design. The intent of these further studies was to establish a long-term solution to the SGT issue and address concerns raised on the original JCO bases. This further work has resulted in a better building drawdown model, a plan to make the SGT system single failure proof (elimination of the three single failures identified above) and more accurate dose projection computer model. These enhanced calculation models and the aspect that SGT has limited susceptibility to single failures, have been integrated with the original analysis provided in the Rev. 0 and Rev. 1 JCOs of NCR 288-357. More detailed discussions of each of the changes from the original Rev. 0 and 1 JCOs bases are provided below.

Justification for Continued Operation, Rev. 5
NCR 292-171

4.1 Building Drawdown Model Differences

The WNP-2 secondary containment JCOs submitted to NRC on 9/89, discussed in 1/16/90 NRC staff meeting, and summarized in LER 89-040-01, had a number of basic assumptions that have been modified during the development of a change to the SGT design basis as new knowledge was added to this issue. Specifically,

4.1.1 Leakage Assumption: At the NRC meeting on 1/16/90, the NRC staff expressed concern on the assumption of uniform leakage over all secondary containment surfaces in calculating the drawdown time to a achieve -1/4" w.g. at all secondary containment surfaces. Due to NRC concern, WNP-2 created a revised model which splits secondary containment leakage into two portions. The first leakage parameter is leakage at grade elevation while the second leakage parameter is leakage at the sheet metal siding. Due to the relative small number of penetrations through the WNP-2 concrete secondary containment structure (441' Elevation to 606'10" Elevation) the portion of leakage from these areas is expected to be small. Due to the large number of siding seams (over 30,000 feet) in the upper WNP-2 secondary containment structure (Elevation 606'10" to Elevation 669'), the portion of leakage from the siding is expected to be the majority of WNP-2 Technical Specification allowable leakage.

A special series of tests (PPM 8.3.177) were conducted during the WNP-2 R-5 outage to characterize leakage. The results of these tests indicate that the majority of the leakage was at the upper siding seams.

For this JCO a high leakage at grade during winter (the most limiting design condition) was used and is conservative with regard to building drawdown calculation. The grade leakage in the analysis was set at 40% of the total leakage (although actual test data does not support significant leakage at grade).

4.1.2 Environment Temperature: At the NRC meeting on 1/16/90, the environment temperature assumptions in the analysis were discussed. The JCO submitted on 9/89 used the lowest average monthly temperature recorded in the WNP-2 FSAR. At the 1/16/90 NRC meeting, WNP-2 presented the concept of using 95% joint frequency meteorology data of wind and temperature as a design basis for secondary containment design. Since offsite dose consequences are based on 95% joint frequency meteorology of wind and stability, per R.G. 1.145, it seemed justified to apply a similar approach to secondary containment design. The NRC staff did not voice concern or criticism with that approach in the

1/16/90 meeting or in response to information submitted on the docket, therefore WNP-2 has included the 95% meteorology of wind and temperature into the analysis assumptions.

4.2 Single Failure Design

As discussed above, there are very few single failures which could result in the loss of a SGT train. Consequently, we believe for all credible accident conditions, both SGT trains will be operable, providing more than adequate flow to achieve a rapid building drawdown. Nevertheless this JCO basis is single SGT train operation.

In addition, to improve SGT performance capability, operating procedures have been revised to provide guidance to detect and switch heaters upon detection of high SGT humidity. These actions will compensate for the lack of automatic control logic to detect and transfer SGT operation to the redundant division on failure of a heater coil. An alarm and indication of SGT humidity is available in the control room to provide necessary information for operator action.

4.3 Dose Projection Model

The original WNP-2 dose calculation model has been enhanced and expanded to support evaluations associated with the development of a change to the SGT design basis.

4.3.1 Building Drawdown Time: The original WNP-2 model had limited ability to evaluate the dose impact of various drawdown times to achieve -1/4" w.g. (i.e., time interval when SGTs filtering efficiency was equal to zero). The new dose analysis model is a FORTRAN code, PADD, (Post-Accident Design Dose Model) which allows the user to specify the loss of SGT filtering efficiency for any time interval during the initial radioactivity release assumed to occur for an accident.

The PADD computer code is also a more precise calculation of dose due to improvements made in the method for calculating total dose (i.e., exact numerical solution versus average dose over large time steps).

4.3.2 Off-site Dose Impacts: The PADD computer code also calculates off-site dose consequences (whole body and thyroid) for the exclusion area, low population zone, and control room as a result of changes in secondary

containment drawdown times. The PADD code was revised to include the off-site dose calculations.

4.4 Standby Service Water Temperature Limitation

The normal Technical Specification limit on Standby Service Water pond temperature is 77°F. During development of revision 5, the model was found to assume that the REA and ROA fans continued to run during the event, however, these fans trip on the F, A, and Z signals. The F, A and Z signals also start SGT. When the heat loads of the REA and ROA fans were removed from the model, it was shown that the secondary containment drawdown time is still less than ten minutes with the SW pond at 77 °F. Since the SW pond temperature restrictions are no longer necessary, Figure 4 is being removed from this JCO. WNP-2 is removing the added restrictions placed on the Tech Spec SW pond temperature.

Figure 1 presents the drawdown analysis for a SW pond temperature of 77°F.

4.5 Plant Actions to Support JCO Basis

1) Maintain SGT flow limiter setting of 5380 ICFM (5850 to 5385 ACFM) to account for inaccuracies in SGT flow element and SGT flow element limiter loop and achieve secondary containment drawdown within ten minutes (see Table 2 for dose projections).
2) Maintain operator action to protect against heater coil failure (i.e., switch to lag fan if lead heater coil is inoperable).

5.0 Conclusion

Given the current state of secondary containment integrity, the SGT can provide adequate differential pressure control with an adequate margin applied for variations in secondary containment leak-tightness and SGT flow performance. The flow limiter setting of SGT (5380 ICFM) will ensure, even assuming a single failure, that secondary containment drawdown to -0.25" w.g. can be achieved within ten minutes. The secondary containment pressure differential will remain greater than -0.25"

under the 95% meteorological conditions. Calculations[3] show that both off-site and on-site post-accident doses remain well below 10CFR100 limits, 10CFR50 GDC 19, and are not significantly different than the results documented in the WNP-2 JCO which the NRC has reviewed and approved (1/3/90). Results of the drawdown model building response and the new dose projections are provided in Figure 1 and Table 2, respectively.

Scott D. Wood 6-6-94
Originator/Date

SRKuykendall 6/13/94
Manager/Date

94-36
POC Meeting Number

G Smith 9/7/94
POC Chairman/Date

[3]The parameter was qualitatively considered in the safety evaluation to have no impact on the operability of SGT under all design basis accident conditions. However, this evaluation was not documented.

Justification for Continued Operation, Rev. 5
NCR 292-171

Additional Reviewers

Engineering

Mechanical	PW Harness	Date 6/15/94
PSE	LD Sharp (signed for LDS)	Date 5/17/94
	GW Brastad	Date 5-25-94
Safety Analysis	RO Vosburgh	Date 6/14/94
Licensing	PR Bemis	Date 8/30/94
Technical Staff	JE Bekhazi	Date 6/14/94
Operations	KL Farabaugh	Date

Table 1

Key Parameters	Rev. 0, JCO & Original Design	(Rev. 2) Rev. 1, JCO	Rev 5 JCO
R.G. 1.3 Release Assumptions	Yes	Yes	Yes
Secondary Containment RB Pressure	-.25" W.G.	-.25" W.G. (worse location)	-.25" W.G. (worse location)
Drawdown Time	2 ½ minutes	10 minutes	10 minutes
Secondary. Containment Leakage	2240 CFM	1475 CFM	1475 ACFM to 1625 ACFM
Location of Leakage	Not Specified	Uniform Across Bldg. Elev.	40% - Bottom RR doors 60% - Top - Siding
SW Temp	77°F	75°F	77°F (70°F per PPM 2.4.5)
Initial Bldg. Temperature	100°F	75°F	75°F
Outside Temp	Not Specified (NCR issue)	12°F (lowest monthly avg.)	20°F (95% wind/temp meteorology)
Wind Conditions	Not Specified (NCR issue)	10.3 MPH (avg. monthly wind Jan)	95% Met. Data
SGT Flow	4457 ACFM	5600 ACFM	5385 ACFM to 5850 ACFM
Flow Limiter Accuracy	Not Specified	Qualitatively Considered[4]	8.0% (Calc E/I-02-91-1066)
Degraded Voltage	80%	Qualitatively Considered[4]	87% (Based on degraded voltage Calc E/I-02-90-01)
Flow Element Calib. Error	Not Considered	Not Considered	-5 to +10% (Ref Calc NE-02-92-06 bldg. temperature)
Assumed Single Failure	SGT	SGT or SW	SGT

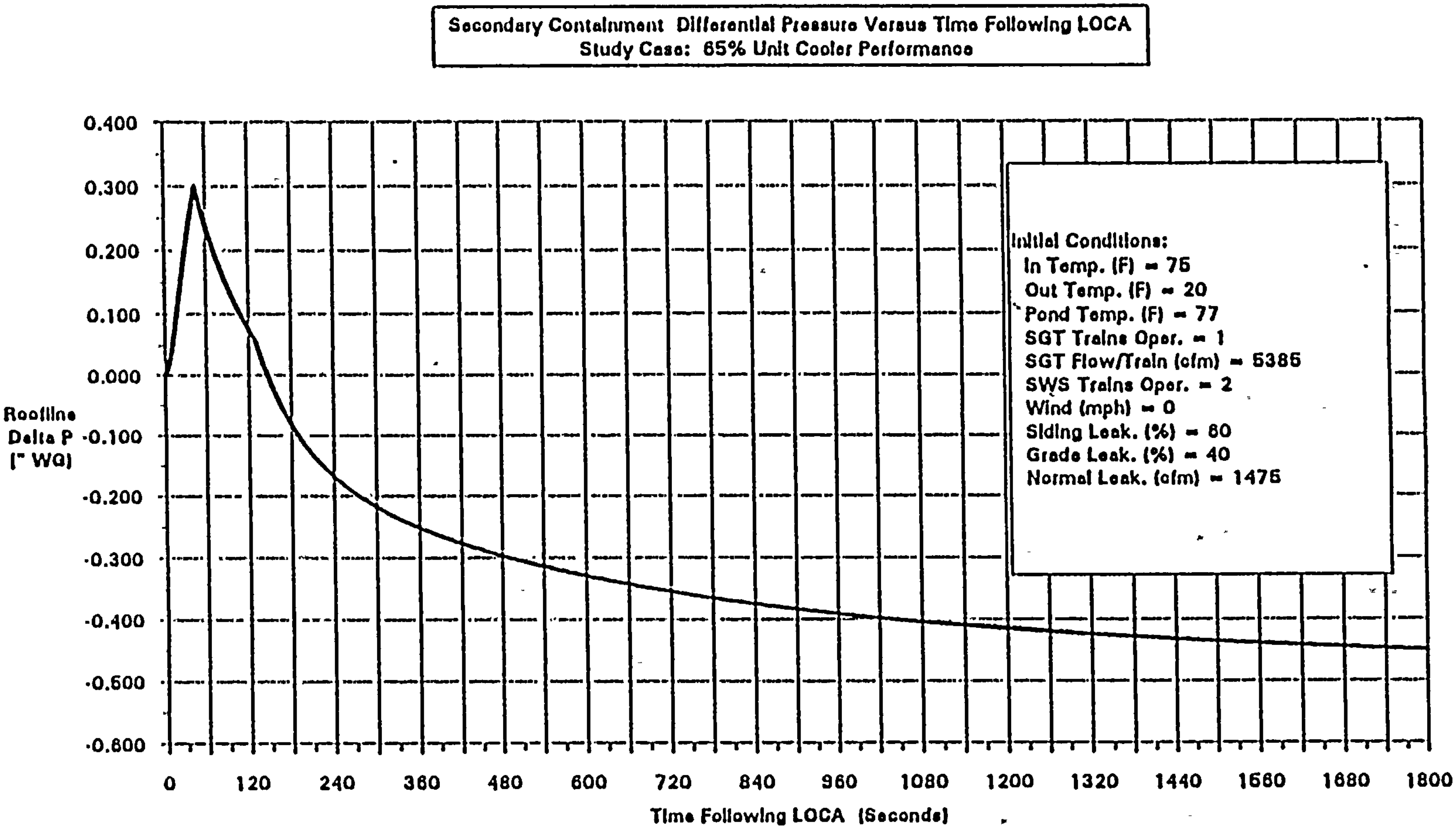
[4] The parameter was qualitatively considered in the safety evaluation to have no impact on the operability of SGT under all design basis accident conditions. However, this evaluation was not documented.

Table 2

Parametric Dose Results for NCR 288-357 (JCO Rev 2)

	SGT Flow (ACFM)	Time for -.25 W.G. (minutes)	Control Room Dose (REM)			Exclusion Area Dose (REM)		LPZ Dose (REM)	
			Thyroid	Whole Body	Beta	Whole Body	Thyroid	Whole Body	Thyroid
JCO Rev. 2									
2 SGT Trains	10600	10	25.3	0.2	5.4	4.8	134.9	3.7	116.4
1 SGT Train	5850	10	25.3	0.2	5.4	4.7	131.9	3.7	115.2
1 SGT Train	5385	10	25.3	0.2	5.4	4.7	131.3	3.7	115.0
1 SGT Train	5385	17	25.9	0.3	5.4	5.0	208.7	3.8	146.5
FSAR Chapter 6, 15.6	4457	2	5.8	0.1	2.7	1.3E-7	8.3E-7	6.3E-7	3.1E-5
JCO Rev 2***	5600	10	19.3	--	--	--	104	--	84
10CFR 100.11 10CFR50 Appx A GDC 19 Limits	--	--	30	5	30	25**	300***	25*	300***

NOTES
* Dose determined for entire accident
** Dose determined after first two hours of accident
*** Preliminary Analysis



Attachment 4
Page 15 of 23

STANDBY GAS TREATMENT JCO CLOSEOUT ITEM PUNCHLIST

<u>JCO, Rev. 0</u>

1. FSAR Sections 6.5.1 and 9.4.2 and Technical Specification 3/4.6.5 do not clearly reflect Branch Technical Position CSB 6-3, Page 6.2.3.8, which states that "a positive pressure is defined as only pressure greater than -0.25" W.G., to account for wind loads and the uncertainty in the pressure measurements," and the original intent to assure a negative pressure in the Reactor Building.

The JCO addressed this concern by not crediting SGT system filtration until -0.25" w.g. was established in the reactor building. The current LOCA dose analysis (NE-02-88-27) does not credit SGT system filtration for 20 minutes post-accident. This change to the design basis is reflected in the proposed amendment to the secondary containment and SGT system Technical Specifications.

2. TER 88-0362-0 requests a redesign of the SGT sensor ΔP instrument loop to replace the four sensors with one ΔP sensor on the Reactor Building roof.

The four ΔP sensors incorporate an auctioneering circuit and measure pressure at the 572' elevation. There is no need to pursue the design change requested in the TER. The current secondary containment drawdown analysis (NE-02-94-19) is based on the existing design and the results of the analysis are reflected in the proposed amendment to the secondary containment and SGT system Technical Specifications.

3. Actions required to support JCO, Rev. 0 bases.

   - Evaluate the results of a future capacity test of SGT (TP 8.3.108) to determine system capability.

   SGT system flow capacity is demonstrated as part of the monthly SGT surveillance test (PPM 7.4.6.5.3.1). The results of these tests are evaluated for acceptability consistent with the surveillance test program.

   - Evaluate potential design changes to minimize impact, i.e., relocate ΔP sensors to the roof, evaluate need for setpoint change.

   The ΔP sensors are located on the 572' elevation of the reactor building. The evaluation of the need to relocate the ΔP sensors concluded that no design change or setpoint changes were necessary. The current secondary containment drawdown analysis (NE-02-94-19) is based on the existing design and the results of the analysis are reflected in the proposed amendment to the secondary containment and SGT system Technical Specifications.

   - Consider revising licensing basis to specifically identify design basis parameters of temperature, humidity, and wind with respect to SGT for both surveillance testing and post-LOCA operation.

A change to the FSAR has been prepared that addresses the impact of temperature, humidity, and wind on SGT system surveillance testing and post-LOCA operation. The changes to the design basis parameters are reflected in the proposed amendment to the secondary containment and SGT system Technical Specifications. The changes to the FSAR cannot be incorporated until the NRC approves the proposed amendment to the Technical Specifications.

JCO, Rev.1

1. Recent analysis (Calculation ME-02-89-09), based upon Standby Gas Treatment, Secondary Containment, Standby Service Water, and weather modeling shows that, during post-LOCA or adverse weather, differential pressure of the Secondary Containment may not always meet the FSAR commitments to be maintained at -0.25" W.G. and be established within two minutes following a LOCA.

This analysis was used to defend the 10 minute drawdown time used in the JCO by incorporating meteorology and service water conditions to determine the time to reach -0.25" w.g. Calculation NE-02-94-19 supersedes ME-02-89-09 as the basis for the changes to the FSAR and the proposed amendment to the secondary containment and SGT system Technical Specifications.

2. Based upon single Train design basis SGT flow and maximum Technical Specification allowable Secondary Containment leakage, the upper-most surface areas of the Reactor Building cannot be maintained at -0.25" W.G. pressure with respect to atmospheric pressure during low temperature and high wind conditions.

Calculation NE-02-94-19 determined that all surfaces of the reactor building can be maintained at -0.25" w.g. under 95% meteorological data considerations. This is based upon 5000 cfm SGT system flow (one fan) and 2240 cfm reactor building leakage at -0.25" w.g.

3. Reviews have uncovered a problem in the meteorology data presented in FSAR Amendment 36. In changing from the Hanford Dispersion Model used for initial licensing basis to the PAVAN methodology consistent with Regulatory Guide 1.145, incorrect input resulted in erroneous X/Q values being submitted in the FSAR. If these X/Q values were used in revising the Chapter 15 events, the resultant offsite doses are nonconservative with respect to R.G. 1.145 guidance.

An FSAR change has been prepared which revises the Chapter 15 tables consistent with the X/Q values established in Calculation NE-02-88-27 based on Murphy-Campe methodology. The revised X/Q values are consistent with R.G. 1.145 guidance. The changes to the FSAR cannot be incorporated until the NRC approves the proposed amendment to the secondary containment and SGT system Technical Specifications.

4. The performance criteria stipulated in the SGT LCOs and surveillance requirements do not specify environmental conditions or specifically permit application of any compensation for wind, temperature differential, etc. Verbatum compliance with the existing Technical Specification requirements would not require testing under the most adverse weather conditions or require adjustment to compensate for them.

The current surveillance procedure (PPM 7.4.6.5.1.2) provides for engineering to evaluate the data to determine whether the SGT system capacity is sufficient to meet the secondary containment drawdown requirements (10 minutes for the current JCO) using 95% meteorology data. Upon NRC approval of the proposed amendment to the secondary containment and SGT system Technical Specifications, the surveillance procedure will be revised to incorporate the changes to the surveillance requirements. Since the changes to the surveillance requirements simplify SGT system capacity determination, it is presumed that the test data will no longer require engineering review for acceptablility. Completion of the revised surveillance procedure will ensure that the SGT system capability to drawdown secondary containment consistent with design basis assumptions even under adverse weather conditions.

5. A design review of the SGT system to determine the susceptibility of an SGT Train to single failure has not been performed.

Evaluations (EANF-90-0167) were performed by the Supply System Safety and Reliability Analysis Group to assess the reliability of the SGT system. The results of the evaluations confirm that each train of the SGT system is single failure proof.

6. The current condition of the SGT system and Secondary Containment do not meet the FSAR description under all reasonable environmental conditions; however, the resultant doses are within the 10CFR100 and GDC 19 requirements in 10CFR50, Appendix A.

An FSAR change has been prepared which revises the appropriate SGT system and secondary containment descriptions to reference the current design basis assumptions related to environmental conditions. The changes to the FSAR cannot be incorporated until the NRC approves the proposed amendment to the secondary containment and SGT system Technical Specifications.

7. Actions required to support JCO, Rev. 1 bases.

   - Resolve SGT operating mode and setpoint issues.

   This action resulted from PER 290-0017 and was incorporated into the long term resolution as described in NCR 288-0357 and 292-0171. Final closure of this issue and the associated corrective actions occurred on December 31, 1992.

   - Review and propose modification recommendations for the plant operating procedures.

   This action was addressed by NCR 292-0171. Operating procedures 2.3.1 and 2.3.5, as well as annunciator response procedures 4.811.K2 and 4.827.K1 were changed to incorporate the NCR recommended actions.

   - Reportability review.

   A reportability evaluation was completed on May 14, 1990 which determined that post-accident doses remained within the 10 CFR 100 guidelines. Therefore, it was concluded that the condition was not reportable since the plant remained within its design basis.

- Communication with the NRC.

A meeting was held between the NRC staff and Supply System staff on January 16, 1990 to discuss the issues addressed in NCR 288-0357 and PER 290-0017.

JCO, Rev. 2

1. For the range of conditions under which the SGT flow indicator/recorders (SGT-FR-2A1, 2A2, 2B1, and 2B2) are designed to operated, the actual standard flow through the SGT Trains will be 5% lower to 10% higher than indicated on the indicator/recorders. In addition, the SGT fan controller (limiter) has a conservatively calculated accuracy of +/-10%. The effect of these two conditions is that the surveillance test results for SGT system flow and Reactor Building leakage could have been 20% higher than previously believed.

This condition was reported to the NRC via the ENS on March 1, 1992 and was followed up on March 31, 1992 by LER 92-008. This condition was reported as a condition alone that could have prevented the fulfillment of the structures and systems that are needed to control the release of radioactive material. The actions to resolve the condition are described in NCR 292-0171. Final closure of this issue and the associated corrective actions occurred on October 20, 1992.

2. A higher total SGT system flow (up to 20% higher) could have resulted in a trip of the SGT fan motors on the thermal overloads if the fans had been called upon to operate under degraded voltage conditions.

See No. 1 above.

3. The Reactor Building leakage could have been up to 20% higher than assumed in the Secondary Containment drawdown analysis which could have resulted in under predicting the time to reach a building pressure of -0.25" W.G..

See No. 1 above.

4. SGT system design reviews indicate that the system is vulnerable to the following single failures:

   - Electrical separation - hot shorts disabling the active functions of SGT valves and fans in both Divisions simultaneously (14 valves and 2 fans affected).

   The current secondary containment drawdown analysis (Calculation NE-02-94-19) only credits one fan in one train during design basis accident conditions. This is reflected in the proposed amendment to the secondary containment and SGT system Technical Specifications.

   - A failure of either SGT Train due to a single failure opening of the associated fire protection water deluge supply valve.

   These valves are maintained normally closed. This configuration satisfies the single failure criteria for the current design basis and is reflected in the proposed amendment to the secondary containment and SGT system Technical Specifications.

- A single failure of the SGT inlet air valve to open in either Train.

These valves are maintained normally open. This configuration satisfies the single failure criteria for the current design basis and is reflected in the proposed amendment to the secondary containment and SGT system Technical Specifications.

- Lack of control logic to detect and transfer SGT operation to the redundant division upon failure of a heater coil (i.e., SGT humidity control).

Annunciator response procedures (PPMs 4.811.K2 and 4.827.K1) were changed to include a high moisture/humidity annunciator response action to energize the lag heater when it is determined that the lead heater has failed. In addition, the long term reactor building analysis (NE-02-94-71) indicates that the humidity will remain within the capability of the SGT system heaters.

5. Basic assumptions used in the Reactor Building drawdown model and presented to the NRC were changed without NRC review.

A 10 CFR 50.59 evaluation (Control No. 92-07) was performed for the changes to the basic assumptions used in the analysis. The analysis concluded that the changes did not involve an unreviewed safety question and NRC review and approval was not required.

6. To improve SGT performance capability, operating procedures will be revised to provide guidance to detect and switch heaters upon detection of high SGT humidity.

See No. 4 (fourth bullet) above.

7. The WNP-2 dose calculation model has been enhanced and expanded to support evaluations associated with the development of changes to the SGT design basis.

Calculation NE-02-88-27 provides the basis for the development of the dose model.

8. Actions required to support JCO, Rev. 2 bases.

- Reduce the SGT flow limiter setting to 5380 ICFM (5850 to 5385 ACFM) to account for inaccuracies in SGT flow elements and loops and to achieve Secondary Containment drawdown within ten minutes.

Calculation E/I-02-91-1066 provided the basis for an instrument setpoint change (ISCR 1107) that was incorporated into PPMs 7.4.6.5.1.2, 7.4.6.5.3.2A & 2B, 7.4.6.5.3.5A & 5B, 7.4.6.5.3.6A & 6B, 7.4.6.5.3.1, 7.4.6.5.3.4, 2.3.1, 2.3.5, 4.811.K2, 4.827.K1, and 7.0.0.

- Maintain SW temperature at or below 72°F to achieve Secondary Containment drawdown within ten minutes.

The appropriate procedures were changed to maintain SW at or below 72°F, but were subsequently changed back to the Technical Specification limit of 77°F. See Nos. 3 & 4 of JCO, Rev. 5.

- Add operator action to protect against heater coil failure (i.e., switch to lag fan if lead heater coil is inoperable).

See No. 4 (fourth bullet) of JCO, Rev. 2.

JCO, Rev. 3

1. The Technical Specification limit on the Standby Service Water spray pond is 77°F. However, in order to assure Secondary Containment drawdown time is ten minutes or less, the spray pond temperature must be maintained below 72°F when outside temperature is at or near the minimum temperature associated with the 95% meteorology envelope (i.e., 20°F).

The appropriate procedures were changed to maintain SW at or below 72°F, but were subsequently changed back to the Technical Specification limit of 77°F. See Nos. 3 & 4 of JCO, Rev. 5.

2. The Standby Service Water spray pond temperature restriction of 72°F must be maintained until SGT modifications are complete.

The appropriate procedures were changed to maintain SW at or below 72°F, but were subsequently changed back to the Technical Specification limit of 77°F. See Nos. 3 & 4 of JCO, Rev. 5.

3. Actions required to support JCO, Rev. 3 bases.

- Reduce the SGT flow limiter setting to 5380 ICFM (5850 to 5385 ACFM) to account for inaccuracies in SGT flow elements and loops and to achieve Secondary Containment drawdown within ten minutes.

Same as No. 8 (first bullet) of JCO, Rev. 2.

- Maintain SW pond temperature in accordance with Figure 4 to ensure that Secondary Containment drawdown to -0.25" W.G. can be achieved within ten minutes.

Same as No. 8 (second bullet) of JCO, Rev. 2.

- Add operator action to protect against heater coil failure (i.e., switch to lag fan if lead heater coil is inoperable).

Same as No. 8 (third bullet) of JCO, Rev. 2.

JCO, Rev. 4

1. Expand the Standby Service Water spray pond temperatures shown in Figure 5 to 32°F to eliminate potential procedure compliance problems when the spray pond temperature falls below 40°F (previous minimum temperature addressed).

The SW spray pond temperatures shown in Figure 4 of JCO, Rev. 3 were expanded to 32°F (Figure 5 of JCO, Rev. 4). However, the Figure was subsequently removed from procedures when SW temperature was changed back to the Technical Specification limit of 77°F. See Nos. 3 & 4 of JCO, Rev. 5.

2. Actions required to support JCO, Rev. 4 bases.

   - Reduce the SGT flow limiter setting to 5380 ICFM (5850 to 5385 ACFM) to account for inaccuracies in SGT flow elements and loops and to achieve Secondary Containment drawdown within ten minutes.

   Same as No. 8 (first bullet) of JCO, Rev. 2.

   - Maintain SW pond temperature in accordance with Figure 4 to ensure that Secondary Containment drawdown to -0.25" W.G. can be achieved within ten minutes.

   Same as No. 8 (second bullet) of JCO, Rev. 2.

   - Add operator action to protect against heater coil failure (i.e., switch to lag fan if lead heater coil is inoperable).

   Same as No. 8 (third bullet) of JCO, Rev. 2.

JCO, Rev. 5

1. A review of open BCO/JCO items (reference IOM SS2-PE-93-260) noted that Revision 4 of the JCO considered 100% room cooler efficiency. The BCOs for NCRs 292-0476, 292-0941, and 292-0950 used 65% room cooler efficiency.

The current secondary containment drawdown calculation (NE-02-94-19) conservatively credits a 50% room cooler efficiency while maintaining the drawdown limits.

2. The Secondary Containment drawdown profile model was found to include the running heat load from the REA and ROA fans during a LOCA event, although no credit was assumed in the analysis for these fans to aid in drawdown since they trip on the F, A, and Z signals.

The addition of these heat loads was conservative since they resulted in an increase in the drawdown time. See Nos. 3 & 4 below.

3. When the heat loads of the REA and ROA fans were removed from the Secondary Containment drawdown model, the drawdown time is less that ten minutes with the Standby Service Water spray pond temperature at 77°F. Thus, spray pond temperature restrictions are no longer necessary and Figure 4 was removed from the JCO.

Current procedures reflect the restoration of the SW temperature to 77°F.

4. Plant procedures will reflect the restoration of the Standby Service Water spray pond temperature limit to 77°F (original Technical Specification limit) after JCO approval by POC by removing Attachment 6.4 from PPM 2.4.5, Revision 23; Attachment 9.10 from PPM 7.0.0, Revision 27; Attachment 9.4 from PPM 7.0.1, Revision 18; and Attachment 9.7 from PPM 7.0.2, Revision 16.

See No. 3 above (indicated attachments contained Figure 4).

5. A Basic Design Change has been implemented to place the SGT system inlet air valves in a normally open condition. References to future actions related to the inlet air valves were removed from the JCO.

BDC 92-0301-0A has been implemented to lock open the SGT system inlet air valves.

6. Actions required to support JCO, Rev. 5 bases.

   - Reduce the SGT flow limiter setting to 5380 ICFM (5850 to 5385 ACFM) to account for inaccuracies in SGT flow elements and loops and to achieve Secondary Containment drawdown within ten minutes.

   Same as No. 8 (first bullet) of JCO, Rev. 2.

   - Add operator action to protect against heater coil failure (i.e., switch to lag fan if lead heater coil is inoperable).

   Same as No. 8 (third bullet) of JCO, Rev. 2.

ATTACHMENT 5

GOTHIC Model Comparison Information

GOTHIC Comparison

The purpose of this section is to document the applicability of the GOTHIC code for use in the secondary containment drawdown analysis. GOTHIC was developed as a general purpose thermal-hydraulic analysis tool for design, licensing, safety, and operating analysis of nuclear power plant containment and other confinement buildings. GOTHIC was developed by Numerical Applications, Inc. (NAI) with support through EPRI and many sponsors via a tailored collaboration project. The result is a state-of-the-art best estimate compartment analysis code that was verified by independent review and validated against experimental results. GOTHIC was used for WNP-2 secondary containment analysis because of its flexibility, ease of use, and applicability. Justification for its use is based on work performed by both the Supply System and NAI in combination with the GOTHIC users group.

Qualification of GOTHIC was performed by comparison of the code output with experimental data for containment applications and solutions to analytic problems. The qualification basis was the use of GOTHIC as a best estimate containment analysis code. The qualification report[1] concluded that GOTHIC provides representative results when model situations fall within the range of analyzed problems. The valid range of GOTHIC was considered in selecting it for modeling the secondary containment and High Energy Line Break (HELB) evaluations for WNP-2.

Westinghouse has independently developed and submitted the AP600 containment design analysis, using a version of GOTHIC, for staff review. The Westinghouse version of the GOTHIC code differs only in that the steam and non-condensable properties were extended to encompass the required design parameters of the AP600.

Verification and validation of the GOTHIC containment analysis package was performed under an approved QA program. The Supply System has independently validated the vendor QA program and verified compliance with 10 CFR 50, Appendix B, requirements. Therefore, the code has been approved for use at WNP-2 as a vendor verified code. The code is currently maintained by the vendor QA program. GOTHIC was installed at WNP-2 under the Supply System's QA program which included running a series of test problems to assure proper code installation and performance as designed by the vendor.

In addition to the qualification of GOTHIC based on comparison with analytic and experimental results, a comparison with other thermal-hydraulic codes has been performed. Several participants of the GOTHIC users group have made comparisons with other containment codes, including CONTEMPT and RELAP4, and presented their findings at Users Group meetings. The findings verify a reasonable correlation in results. NAI has developed a white paper[2] describing the numerical and modeling differences between GOTHIC and CONTEMPT-LT/028. The Supply System has developed comparisons of GOTHIC with RELAP4 for various HELB analyses.

The Supply System has been using GOTHIC over the past six years for various analyses. Confidence in the appropriate use of the code has been developed through attendance at regular

users group meetings, seminars, and comparison with previous analyses. One of the codes used previously at the Supply System for design basis analysis was the RELAP4 computer code. RELAP4 was used to determine secondary containment response to various HELBs. To assure that GOTHIC would be properly used as an analysis tool, the results were compared with previous analyses performed with RELAP4. The following is a discussion of one of these comparisons.

GOTHIC was used in support of the WNP-2 power uprate to revise HELB environmental profiles. Prior to performing the final power uprate calculations, a benchmark case was prepared between GOTHIC and RELAP4 to assure that the code was being properly applied. A Reactor Water Clean Up (RWCU) line break was selected for the benchmark case. Figure 1 of this attachment presents a schematic of the model nodalization used for both the GOTHIC and RELAP4 runs. Both model inputs were essentially identical with only minor changes due to input requirement differences between the two codes. Some of the major differences between RELAP4 and GOTHIC are in the way heat transfer coefficients and condensation are evaluated. Since RELAP4 was developed as a licensing basis code for use in evaluating reactor response to a LOCA, it employs fixed heat transfer coefficients to assure compliance with 10 CFR 50, Appendix K, "ECCS Evaluation Models." However, GOTHIC has a selection of heat transfer and condensation options available which permits versatility in the type of problem being analyzed.

For the benchmark comparison, the GOTHIC analysis selected heat transfer coefficients consistent with RELAP4 methodology. Figures 2 through 9 of this attachment provide the results of the comparison between GOTHIC and RELAP4 for a RWCU HELB. The comparisons are favorable for both temperature and pressure in the various compartments. Based on this comparison, it was demonstrated that GOTHIC will produce results comparable to RELAP4 and supports the use of GOTHIC for applications involving compartment type analysis such as the secondary containment analysis presented in this submittal.

In summary, GOTHIC is a versatile best estimate containment analysis code to accurately evaluate containment response to any number of transient or steady state conditions. The code was installed by the Supply System consistent with current approved procedures. Appropriate use of the code has been controlled by the use of vendor training and validation against previously performed analyses. The code was used within the allowable ranges of correlations and thermodynamic data. The Supply System considers that the qualification and verification and validation performed adequately justifies the use of GOTHIC for the secondary containment drawdown analysis.

[1]Numerical Applications Inc., "GOTHIC Containment Analysis Package Qualification Report," NAI 8907-09 rev 2, (EPRI report RP3048-1).

[2]George, T. L., "A Comparison of the GOTHIC-4.1 and CONTEMPT-LT/028-A Computer Programs," Numerical Applications, Inc., December 1994.

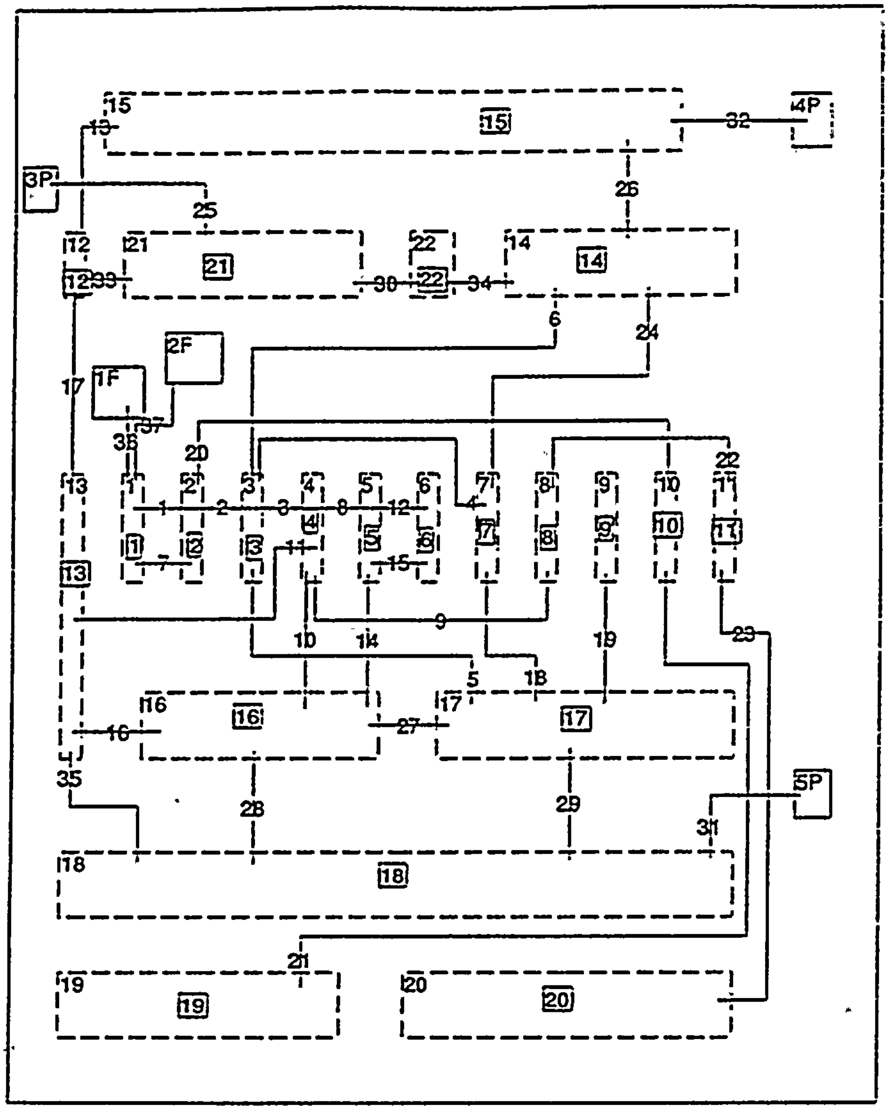


Figure 1. GOHTIC and RELAP4 Nodalization Scheme

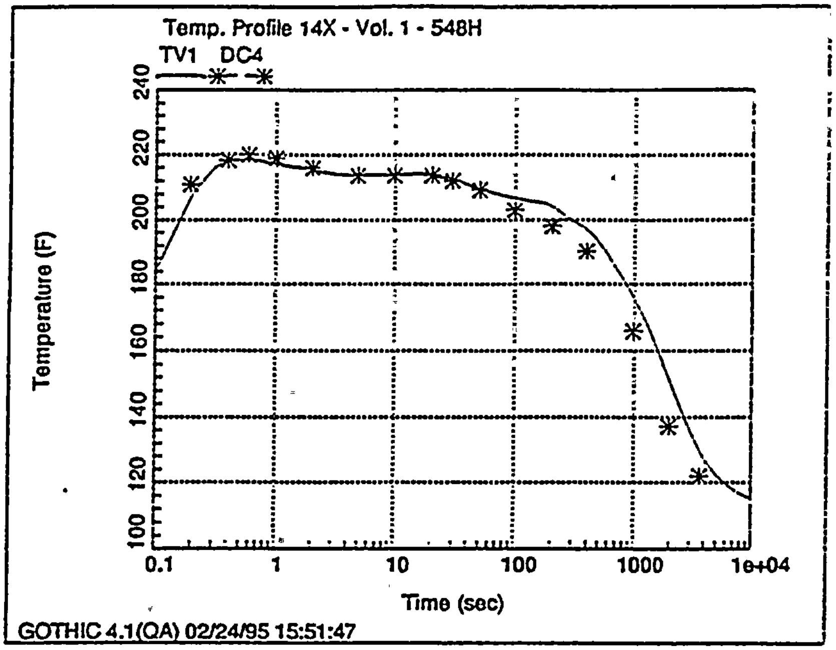


Figure 2. Volume 1 Temperature Profile Comparison (DC4 RELAP4 Data)

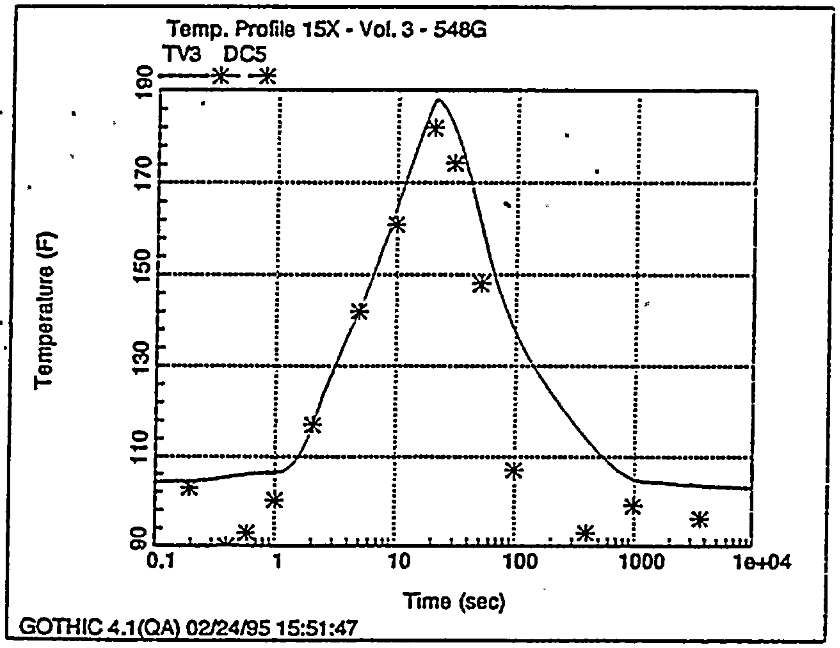


Figure 3. Volume 3 Temperature Profile Comparison (DC5 RELAP4 Data)

548hbench-Benchmark w/RELAP4-HELB-R511a
Mon Jul 31 12:06:51 1995
GOTHIC Version 4.1(QA)-b - December 1994

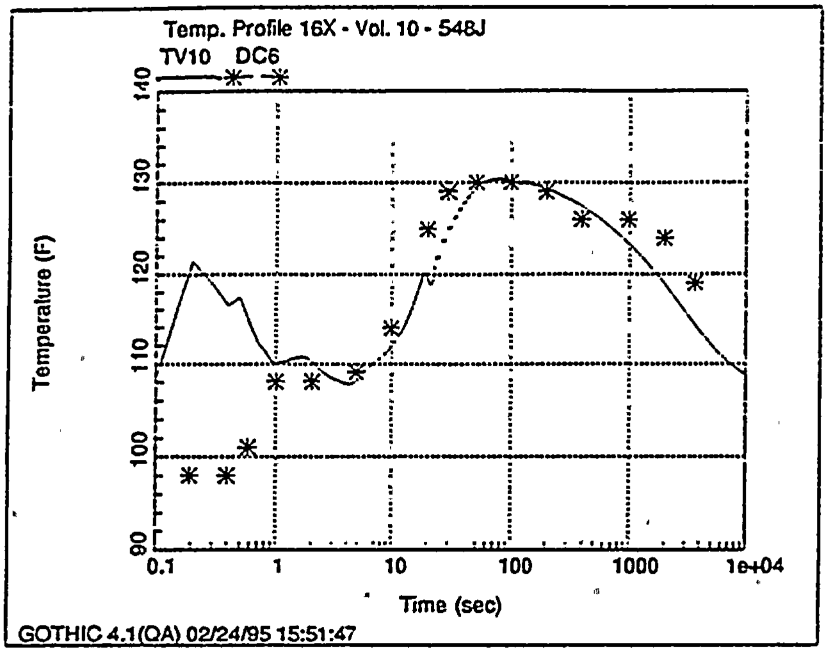


Figure 4. Volume 10 Temperature Profile Comparison (DC6 RELAP4 Data)

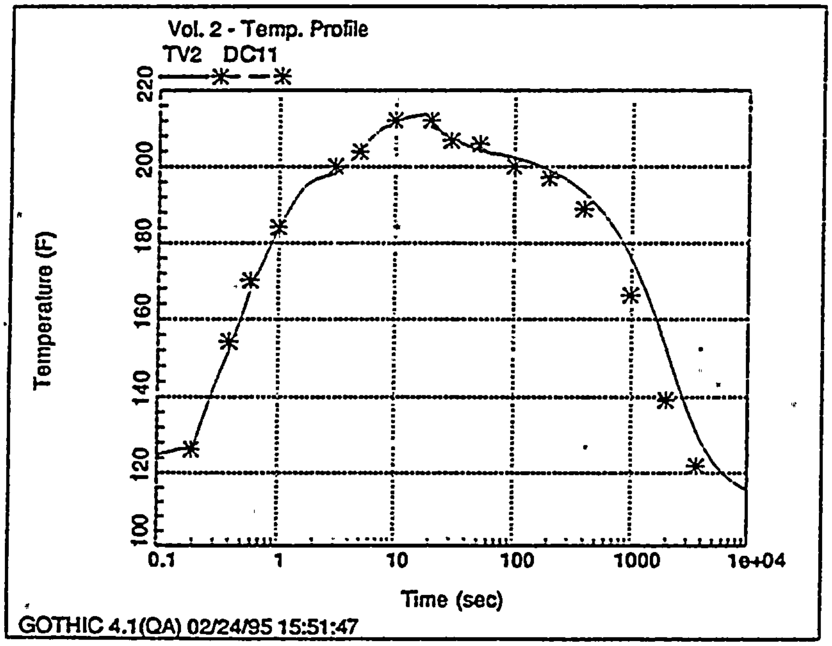


Figure 5. Volume 2 Temperature Profile Comparison (DC11 RELAP4 Data)

548hbench-Benchmark w/RELAP4-HELB-R511a
Mon Jul 31 09:51:07 1995
GOTHIC Version 4.1(QA)-b - December 1994

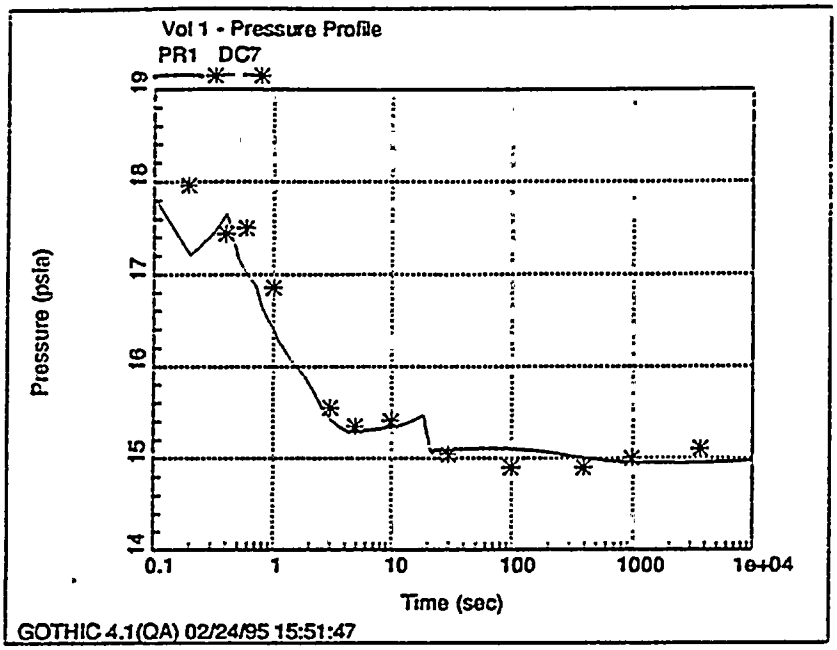


Figure 6. Volume 1 Pressure Profile Comparison (DC7 RELAP4 Data)

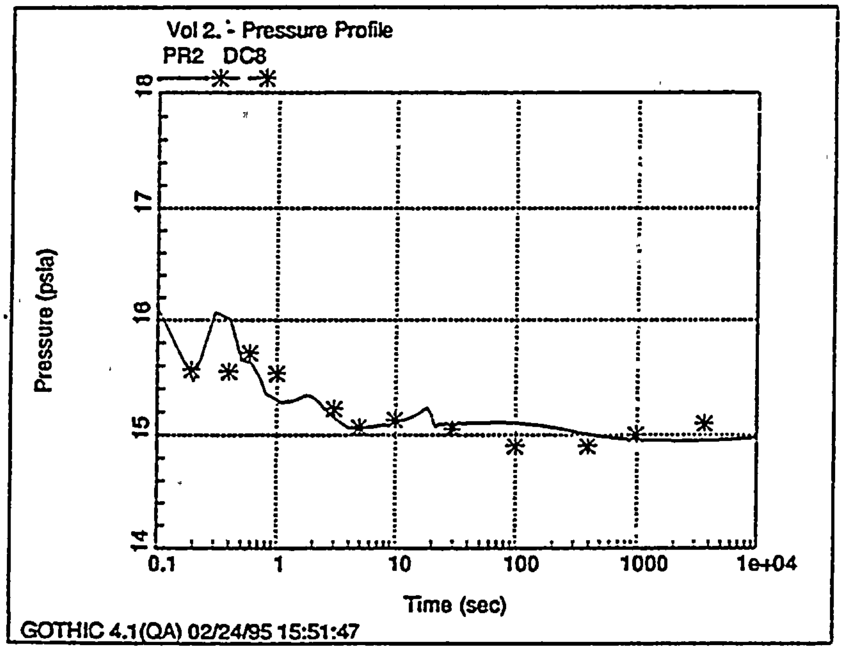


Figure 7. Volume 2 Pressure Profile Comparison (DC8 RELAP4 Data)

548hbench-Benchmark w/RELAP4-HELB-R511a
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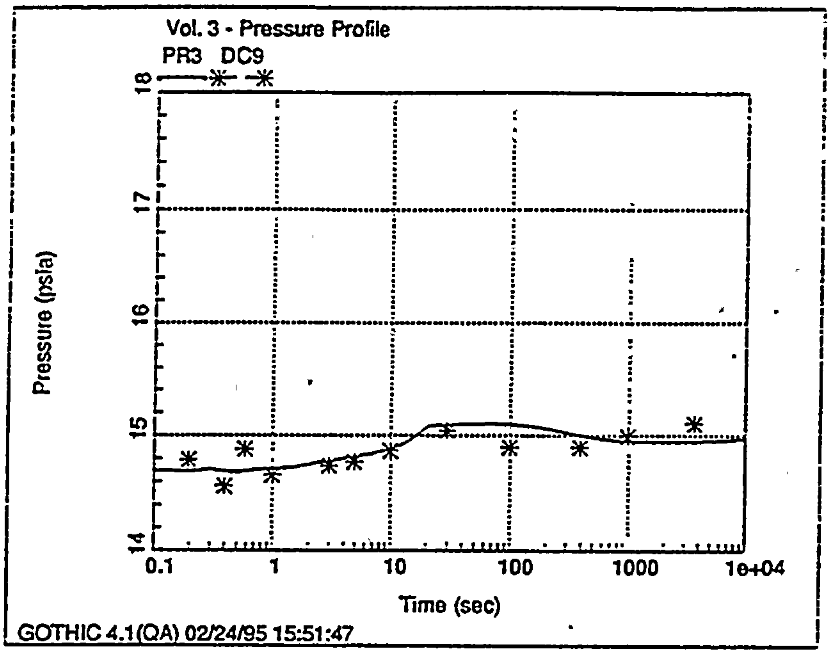

Figure 8. Volume 3 Pressure Profile Comparison (DC9 RELAP4 Data)

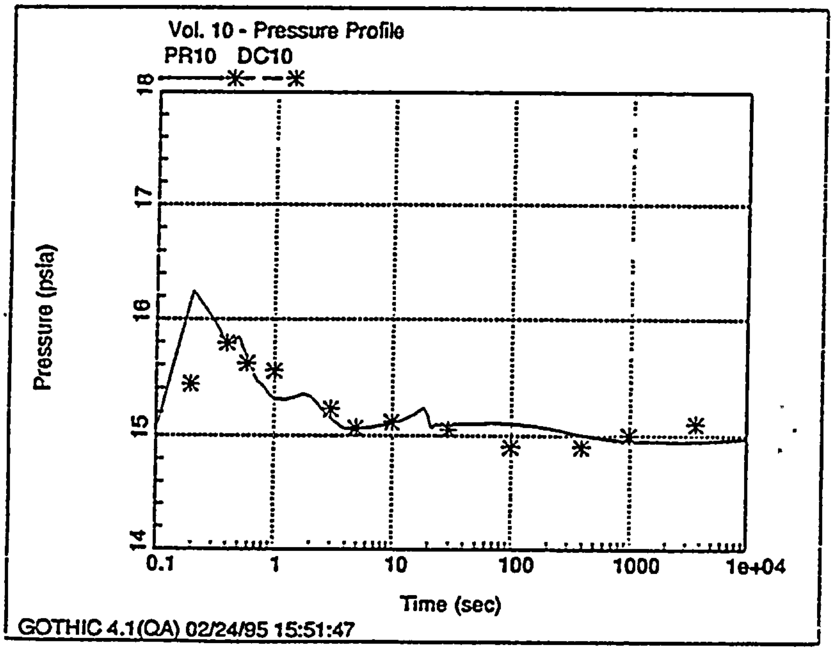

Figure 9. Volume 10 Pressure Profile Comparison (DC10 RELAP4 Data)

ATTACHMENT 6

No Significant Hazards Consideration and Environmental Considerations Evaluations

NO SIGNIFICANT HAZARDS CONSIDERATION

In accordance 10 CFR 50.91, a licensee must provide to the NRC its analysis of a proposed amendment to the operating license using the standards in 10 CFR 50.92 concerning the issue of no significant hazards consideration. The Supply System has evaluated the proposed amendment to the Technical Specifications and determined that the amendment does not involve a significant hazards consideration. This determination has been performed using the criteria set forth in 10 CFR 50.92. The following evaluation is provided for the three categories of no significant hazards consideration standards:

Operation of WNP-2 in accordance with the proposed amendment will not involve a significant increase in the probability or consequences of an accident previously evaluated.

Secondary containment and the Standby Gas Treatment (SGT) system are not initiators or precursors to any accident. The SGT system acts as part of secondary containment to minimize and control airborne radiological releases from the plant following a design basis accident. Therefore, operation of WNP-2 in accordance with the proposed changes will not cause a significant increase in the probability of an accident previously evaluated.

The proposed amendment to the Technical Specifications impacts the capability to demonstrate that the secondary containment and SGT system designs will maintain radioactive releases within 10 CFR 100 guidelines and 10 CFR 50, Appendix A, General Design Criteria 19 limits. As a result, a new (current) design basis accident dose analysis was performed using the source term criteria outlined in Regulatory Guide 1.3, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for Boiling Water Reactors," to evaluate the proposed changes. The new analysis provides a conservative representation of the timing and release of radioactivity during a design basis accident.

The proposed amendment also deletes the normal (nonsafety-related) secondary containment ventilation system surveillance requirement to verify every 24 hours that the pressure within secondary containment is ≤ 0.25 inch of vacuum water gauge. This surveillance requirement is not necessary as current Technical Specification Limiting Conditions for Operation (LCOs) as well as the WNP-2 Final Safety Analysis Report (FSAR) adequately address secondary containment integrity requirements and ensure secondary containment effluent is monitored. Deletion of the surveillance requirement has no impact on the secondary containment drawdown analysis or the design basis dose analysis. Thus, the analyses assumptions and conclusions remain valid.

The secondary containment and SGT system designs must accommodate a post-accident single failure and remain operable. In addition, certain plant specific parameters, such as SGT capacity, secondary containment in-leakage, outside meteorological conditions, secondary containment heat loads, available cooling capacity, emergency diesel start time and loading sequence, and drawdown time for secondary containment must be considered in the design analyses and dose assessments. The current design in conjunction with an assumed secondary containment leakage of 2240 cfm and a drawdown time of 20 minutes provide assurance that the

radiological doses for a design basis accident are maintained below the 10 CFR 100 guidelines and 10 CFR 50, Appendix A, General Design Criteria 19 limits.

The dose analysis supporting the proposed amendment to the Technical Specifications includes analytical changes to the SGT flow rate, secondary containment drawdown time, mixing, and bypass leakage, and establishes a 95% meteorological basis. These analytical changes, in combination, result in a calculated increase in the offsite thyroid dose values and a decrease in the whole body dose values. Although the calculated offsite thyroid dose values are higher than previously calculated, they remain within the 10 CFR 100 guidelines and 10 CFR 50, Appendix A, General Design Criteria 19 limits. In accordance with Standard Review Plan (NUREG-0800), Section 15.6.5, "Loss-of-Coolant Accidents Resulting From a Spectrum of Postulated Piping Breaks Within the Reactor Coolant Pressure Boundary," the radiological consequences of a design basis accident are considered acceptable if they are within the guidelines of 10 CFR 100. Since the offsite thyroid dose values remain within these acceptance criteria, and since there is no increase in the control room thyroid dose values or any of the whole body dose values, the changes are considered acceptable and operation of WNP-2 in accordance with the proposed amendment to the Technical Specifications will not cause a significant increase in the consequences of an accident previously evaluated.

<u>Operation of WNP-2 in accordance with the proposed amendment will not create the possibility of a new or different kind of accident from any accident previously evaluated.</u>

Secondary containment and the SGT system are not initiators or precursors to any accident. The SGT system acts as part of secondary containment to minimize and control airborne radiological releases from the plant following a design basis accident.

The dose analysis supporting the proposed amendment to the Technical Specifications includes analytical changes to the SGT flow rate, secondary containment drawdown time, mixing, and bypass leakage, and establish a 95% meteorology basis. These analytical changes do not alter any safety-related equipment or functions or create any new failure modes. The changes will improve the capability of secondary containment and the SGT system to mitigate the consequences of a design basis accident by ensuring that secondary containment pressure can be drawn down from 0 inches water gauge to at least 0.25 inch of vacuum water gauge during the most adverse environmental conditions. The proposed changes reflect consideration of SGT capacity, secondary containment in-leakage, outside meteorological conditions, secondary containment heat loads, available cooling capacity, emergency diesel start time and loading sequence, and drawdown time for the limiting secondary containment elevation. Required instrumentation have been evaluated to ensure proper operation under normal and accident environmental conditions, including but not limited to pressure, humidity, seismic, temperature, and radiation. The evaluation method is based on American National Standards Institute/Instrument Society of America (ANSI/ISA) Standard S67.04-1988, "Setpoints for Nuclear Safety-Related Instrumentation," and guidelines in ISA draft Recommended Practice RP67.04, "Methodologies for the Determination of Setpoints for Nuclear Safety-Related Instrumentation."

The proposed amendment to the Technical Specification does not change plant equipment or functions, but serves to clarify and credit existing design features. Fault tree and single failure analyses were performed to ensure that the SGT system design, including the equipment and components, credited in the licensing basis for the proposed amendment meet the single failure criteria for credible failure modes. The proposed amendment also deletes the normal (nonsafety-related) secondary containment ventilation system surveillance requirement to verify every 24 hours that the pressure within secondary containment is ≤ 0.25 inch of vacuum water gauge. Deletion of this surveillance requirement does not invalidate existing analyses or change plant equipment or functions. Thus, no new failure modes are created.

Based on equipment failure and qualification analyses performed and the above conclusions, the proposed amendment to the Technical Specifications does not change any safety-related equipment or functions, or create any new failure modes. Therefore, operation of WNP-2 in accordance with the proposed amendment to the Technical Specifications will not create the possibility of a new or different kind of accident from any accident previously evaluated.

<u>Operation of WNP-2 in accordance with the proposed amendment will not involve a significant reduction in a margin of safety.</u>

Consistent with the current Bases for the Technical Specifications and the WNP-2 FSAR, secondary containment and the SGT system act to minimize and control airborne radiological releases from the plant to within 10 CFR 100 guidelines and 10 CFR 50, Appendix A, General Design Criteria 19 limits following a design basis accident.

The proposed amendment to the Technical Specifications impacts the capability to demonstrate that the secondary containment and SGT system designs will maintain radioactive releases within 10 CFR 100 guidelines and 10 CFR 50, Appendix A, General Design Criteria 19 limits. As a result, a new (current) design basis accident dose analysis was performed using the source term criteria outlined in Regulatory Guide 1.3 to evaluate the proposed changes. The new analysis provides a conservative representation of the timing and release of radioactivity during a design basis accident.

The proposed amendment also deletes the normal (nonsafety-related) secondary containment ventilation system surveillance requirement to verify every 24 hours that the pressure within secondary containment is ≤ 0.25 inch of vacuum water gauge. This surveillance requirement is not necessary as current Technical Specification LCOs as well as the WNP-2 FSAR adequately address secondary containment integrity requirements and ensure secondary containment effluent is monitored. Deletion of the surveillance requirement has no impact on the secondary containment drawdown analysis or the design basis dose analysis. Thus, it follows that deletion of the surveillance requirement will not impact the offsite and control room dose safety margins established by these analyses.

The dose analysis includes analytical changes which increase SGT system flow rate and secondary containment drawdown time, credit mixing within secondary containment, increase bypass leakage, and establish a 95% meteorological basis. The combined effect of these

analytical changes results in an increase in the calculated offsite thyroid dose values. The calculated control room thyroid dose values and all of the whole body dose values are shown to decrease. Although the new thyroid dose values are higher than previously calculated, they remain within the 10 CFR 100 guidelines and 10 CFR 50, Appendix A, General Design Criteria 19 limits. The calculated thyroid dose values at the plant exclusion area boundary (EAB) (1.2 miles) increased from 72 Rem to 114.2 Rem and the calculated thyroid dose at the low population zone (LPZ) (3 miles) increased from 251 Rem to 275.6 Rem.

The LPZ is defined as all land within a 3 mile radius of the plant site and 0 persons reside within this area. The nearest residence is 4.1 miles from the plant site. There are no schools or hospitals within 5 miles of the plant site and the nearest population center is at 12 miles. Considering the low population density in the area immediately surrounding the plant site, the increase in thyroid dose will have a small impact on the health and safety of the public.

Since the offsite thyroid dose values remain within the 10 CFR 100 guidelines and 10 CFR 50, Appendix A, General Design Criteria 19 limits, and since there is a small impact on the health and safety of the public, the increase in the offsite thyroid dose values are considered acceptable and operation of WNP-2 in accordance with the proposed amendment to the Technical Specifications will not cause a significant reduction in the margin of safety.

ENVIRONMENTAL CONSIDERATIONS

Based on the above evaluation, this proposed amendment to the secondary containment and SGT system Technical Specifications does not result in a significant hazards consideration. In addition, the proposed amendment does not create a potential for a significant change in the types or a significant increase in the amount of any effluents that may be released offsite, nor does the amendment involve a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the amendment meets the eligibility criteria for a categorical exclusion as set forth in 10 CFR 51.22(c)(9). Therefore, in accordance with 10 CFR 51.22(b), an environmental assessment of this amendment is not required.