PLANT SYSTEMS

TURBINE CYCLE

SPECIFIC ACTIVITY

LIMITING CONDITION FOR OPERATION

3.7.1.4 The specific activity of the secondary coolant shall be less than or equal to 0.1 µCi/gm DOSE EQUIVALENT I-131.

APPLICABILITY: MODES 1, 2, 3, and 4*.

ACTION:

With the specific activity of the secondary coolant greater than 0.1 µCi/gm DOSE EQUIVALENT I-131, be in at least HOT STANDBY within 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.7.1.4 At least once every 31 days, verify the specific activity of the secondary coolant is less than or equal to 0.1 µCi/gm DOSE EQUIVALENT I-131.

* The provisions of Specification 4.0.4 are not applicable for entry into MODE 4, however, once steam generator pressure exceeds 100 psig, the requirements of Specification 4.7.1.4 must be met within 12 hours if not performed within the past 31 days.

TABLE 4.7-1

(THIS TABLE NUMBER IS NOT USED)

3/4.7.1 TURBINE CYCLE (Continued)

3/4.7.1.2 AUXILIARY FEEDWATER SYSTEM

The OPERABILITY of the Auxiliary Feedwater System ensures that the Reactor Coolant System can be cooled down to less than 350°F from normal operating conditions in the event of a total loss-of-offsite power.

The electric motor-driven emergency feedwater pump is capable of delivering a total feedwater flow of 650 gpm at a pressure of 1221 psig to the entrance of the steam generators. The steam-driven emergency feedwater pump is capable of delivering a total feedwater flow of 650 gpm at a pressure of 1221 psig to the entrance of the steam generators. The startup feedwater pump serves as the third auxiliary feedwater pump and can be manually aligned to be powered from an emergency bus (Bus 5). The startup feedwater pump is capable of taking suction on the dedicated emergency feedwater volume of water in the condensate storage tank and delivering a total feedwater flow of in excess of 650 gpm at a pressure of 1221 psig to the entrance of the steam generator via either the main feedwater header or with manual alignment to the emergency feedwater flow path. This capacity is sufficient to ensure that adequate feedwater flow is available to remove decay heat and reduce the Reactor Coolant System temperature to less than 350°F when the Residual Heat Removal System may be placed into operation.

3/4.7.1.3 CONDENSATE STORAGE TANK

The OPERABILITY of the condensate storage tank with the indicated minimum water volume ensures that sufficient water is available to cool the RCS to a temperature of 350°F. The OPERABILITY of the concrete enclosure ensures this availability of water following rupture of the condensate storage tank by a tornado generated missile. The contained water volume limit includes an allowance for water not usable because of instrument uncertainty, tank discharge line location, or other physical characteristics.

3/4.7.1.4 SPECIFIC ACTIVITY

BACKGROUND

Activity in the secondary coolant results from Reactor Coolant System leakage through the steam generator tube(s). Under steady state conditions, the activity is primarily iodines with relatively short half-lives and, thus, indicates current conditions. During transients, I-131 spikes have been observed as well as increased releases of some noble gases. Other fission product isotopes, as well as activated corrosion products in lesser amounts, may also be found in the secondary coolant.

A limit on secondary coolant specific activity during power operation minimizes releases to the environment because of normal operation, anticipated operational occurrences, and accidents.

This limit is lower than the activity value that might be expected from a 1 gpm tube leak (LCO 3.4.6.2, "Reactor Coolant System Leakage - Operational Leakage") of primary coolant at the limit of 1.0 µCi/gm (LCO 3.4.8, "Reactor Coolant System Specific Activity"). The steam line failure is assumed to result in the release of the noble gas and iodine activity contained in the steam generator inventory, the feedwater, and the reactor coolant LEAKAGE. Most of the iodine isotopes have short half-lives (i.e., < 20 hours).

3/4.7.1 TURBINE CYCLE (Continued)

With the specified activity limit, the resultant 2-hour thyroid dose to a person at the SITE BOUNDARY would be a small fraction of the 10 CFR 100 (Ref. 1) limits if the main steam safety valves (MSSVs) were open for 2 hours following a trip from full power.

Operating a unit at the allowable limits could result in a 2 hour SITE BOUNDARY exposure of a small fraction of the 10 CFR 100 (Ref. 1) limits, or the limits established as the NRC staff approved licensing basis.

APPLICABLE SAFETY ANALYSES

The accident analysis of the main steam line break (MSLB), as discussed in the UFSAR, Chapter 15 (Ref. 2) assumes the initial secondary coolant specific activity to have a radioactive isotope concentration of 0.10 µCi/gm DOSE EQUIVALENT I-131. This assumption is used in the analysis for determining the radiological consequences of the postulated accident. The accident analysis, based on this and other assumptions, shows that the radiological consequences of an MSLB do not exceed a small fraction of the unit SITE BOUNDARY limits (Ref. 1) for whole body and thyroid dose rates.

With the loss of offsite power, the remaining steam generators are available for core decay heat dissipation by venting steam to the atmosphere through the MSSVs and steam generator atmospheric dump valves (ADVs). The Emergency Feedwater System supplies the necessary makeup to the steam generators. Venting continues until the reactor coolant temperature and pressure have decreased sufficiently for the Residual Heat Removal System to complete the cooldown.

In the evaluation of the radiological consequences of this accident, the activity released from the steam generator connected to the failed steam line is assumed to be released directly to the environment. The unaffected steam generator is assumed to discharge steam and any entrained activity through the MSSVs and ADVs during the event. Since no credit is taken in the analysis for activity plateout or retention, the resultant radiological consequences represent a conservative estimate of the potential integrated dose due to the postulated steam line failure.

Secondary specific activity limits satisfy Criterion 2 of 10 CFR 50.36(c)(2)(ii).

LIMITING CONDITION FOR OPERATION (LCO)

As indicated in the Applicable Safety Analyses, the specific activity of the secondary coolant is required to be $\leq$ 0.10 µCi/gm DOSE EQUIVALENT I-131 to limit the radiological consequences of a Design Basis Accident (DBA) to a small fraction of the required limit (Ref. 1).

Monitoring the specific activity of the secondary coolant ensures that when secondary specific activity limits are exceeded, appropriate actions are taken in a timely manner to place the unit in an operational MODE that would minimize the radiological consequences of a DBA.

3/4.7.1 TURBINE CYCLE (Continued)

APPLICABILITY

In MODES 1, 2, 3, and 4, the limits on secondary specific activity apply due to the potential for secondary steam releases to the atmosphere.

MODE 4 is conditioned by a footnote to recognize that sampling in MODE 4 is limited by the steam generator conditions necessary to obtain a sample. Upon entering MODE 4 from MODE 5, there is not enough steam pressure in the steam generator to provide a sample through the normal sample point. Due to plant limitations, a representative sample can be obtained with greater than 100 psig steam pressure in the steam generator. By requiring the sample to be taken within 12 hours of achieving the 100 psig steam pressure, adequate time for obtaining and analyzing a sample are ensured.

In MODES 5 and 6, the steam generators are not being used for heat removal. Both the RCS and steam generators are depressurized, and primary to secondary LEAKAGE is minimal. Therefore, monitoring of secondary specific activity is not required.

ACTIONS

DOSE EQUIVALENT I-131 exceeding the allowable value in the secondary coolant, is an indication of a problem in the RCS and contributes to increased post accident doses. If the secondary specific activity cannot be restored to within limits within the associated completion time, the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in at least HOT STANDBYwithin 6 hours, and in COLD SHUTDOWN within the following 30 hours. The ACTION completion times are reasonable, based on operating experience, to reach the required unit shutdown conditions from full power in an orderly manner and without challenging unit systems.

SURVEILLANCE REQUIREMENTS (SR)

SR 4.7.1.4

This SR verifies that the secondary specific activity is within the limits of the accident analysis. A gamma isotopic analysis of the secondary coolant, which determines DOSE EQUIVALENT I-131, confirms the validity of the safety analysis assumptions as to the source terms in post accident releases. It also serves to identify and trend any unusual isotopic concentrations that might indicate changes in reactor coolant activity or LEAKAGE. The 31-day frequency is based on the detection of increasing trends of the level of DOSE EQUIVALENT I-131, and allows for appropriate action to be taken to maintain levels below the LCO limit.

REFERENCES

1. 10 CFR 100.11.
2. UFSAR, Chapter 15.

3/4.7.1.5 MAIN STEAM LINE ISOLATION VALVES

The OPERABILITY of the main steam line isolation valves ensures that more than one steam generator will blow down in the event of a steam line rupture. This restriction is required to: (1) minimize the positive reactivity effects of the Reactor Coolant System cooldown associated with the blowdown, and (2) limit the pressure rise within containment in the event the steam line rupture occurs within containment. The OPERABILITY of the main steam isolation valves within the closure times of the Surveillance Requirements are consistent with the assumptions used in the safety analyses.

3/4.7.1.6 ATMOSPHERIC RELIEF VALVES

The OPERABILITY of the Atmospheric Relief Valves (ARVs) ensures the controlled removal of reactor decay heat during reactor cooldown, plant startup, and after a turbine trip, when the condenser and/or the turbine bypass system are not available. When available, the ARVs can be used to reduce main steam pressure for both hot shutdown and cold shutdown conditions. The ARVs provide a method for cooling the plant to residual heat removal entry conditions should the turbine bypass system to the condenser be unavailable. This is done in conjunction with the Auxiliary Feedwater System providing cooling water from the condensate storage tank (CST).

One ARV line for each of the four steam generators is provided. Each ARV line consists of one ARV and an associated block valve. The ARVs are provided with upstream block valves to provide an alternate means of isolation.

The ARVs are equipped with pneumatic controllers to permit control of the cooldown rate. The ARVs are provided with a pressurized gas supply of bottled nitrogen that, on a loss of pressure in the normal instrument air supply, automatically supplies nitrogen to operate the ARVs. The nitrogen supply is sized to provide sufficient pressurized gas to operate the ARVs for the time required for Reactor Coolant System cooldown to RHR entry conditions. The ARVs are OPERABLE with only a DC power source available. In addition, handwheels are provided for local manual operation.