NRC STAFF FEEDBACK RE: DRAFT TSTF-568, REVISION 1, "CLARIFY APPLICABILITY OF BWR/4 TS 3.6.2.5 AND TS 3.6.3.2"

CURRENT Standard Technical Specification (STS) 3.6.3.2

3.6.3.2 Primary Containment Oxygen Concentration

LCO 3.6.3.2 The primary containment oxygen concentration shall be < 4.0 volume percent.

Applicability: Mode 1 during the time period:

a. From [24] hours after THERMAL POWER is > [15]% RTP following startup, to

b. [24] hours prior to reducing THERMAL POWER to < [15]% RTP prior to the next scheduled reactor shutdown.

In the current STS, the [15] percent reactor thermal power (RTP) and [24] hours were chosen considering the low risk associated with the short periods of startup and shutdown. There is no deterministic (quantitative) analysis to validate that in a de-inerted condition in Mode 1, with thermal power ≤ [15] percent RTP, the hydrogen generation would not result in an uncontrolled hydrogen/oxygen recombination in the containment, or that the plant could withstand the consequences of uncontrolled hydrogen/oxygen recombination without loss of safety function or containment structural integrity under the design basis (DB)-loss of coolant accident (LOCA) because of less decay heat.

The reason for allowing a de-inerted containment during the short periods is to facilitate scheduled startup and shutdown. The inerting of containment is an operational challenge because it prevents personnel access without an appropriate breathing apparatus. Therefore in Mode 1, the STS allows the containment to be inerted as late as possible, and de-inerted as soon as possible during scheduled startup and shutdown respectively. A de-inerted containment under these conditions is allowed for limited time for personnel convenience for routine maintenance work. Since startup and shutdown periods (with a de-inerted containment) are small fraction of the cycle time, the risk of an accident is minimized compared to the containment in a de-inerted state for an indefinite time with thermal power ≤ [15] percent RTP.

PROPOSED STS 3.6.3.2

3.6.3.2 Primary Containment Oxygen Concentration

LCO 3.6.3.2 The primary containment oxygen concentration shall be < 4.0 volume percent.

Applicability: MODE 1 with THERMAL POWER > [15]% RTP

4.3 Surveillance Requirement Change

Revise Surveillance Requirement (SR) 3.6.2.5.1 and 3.6.3.2.1 by incorporating the following notes:

1. Not required to be met until 24 hours after THERMAL POWER > [15]% RTP.

2. Not required to be met 24 hours prior to THERMAL POWER being reduced ≤ [15]% RTP.

EVALUATION OF PROPOSED STS 3.6.3.2

The proposed change, in the case of a forced shutdown, or reactor trip, or for a repair/modification activity at any time during Mode 1, would allow the licensee to lower the thermal power below [15] percent RTP, de-inert the containment, and permit personnel access for repair or modification work for an extended and unspecified time. The proposed STS 3.6.3.2 is significantly different from its current version because it allows a de-inerted containment in Mode 1 for an indefinite or unspecified time during the cycle with thermal power ≤ [15] percent RTP. This change also eliminates surveillances (3.6.2.5.1 and 3.6.3.2.1) that would currently be performed at an oxygen concentration >4% volume, at power < 15% RTP.

Allowing indefinite operation at [15] percent RTP is not consistent with the Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.44(b)(2) *Combustible gas control,* requirement that all BWRs with Mark I or Mark II type containments have an inerted atmosphere. Allowing an unspecified duration of operation at thermal power up to [15] percent RTP makes it a normal operating condition rather than a temporary, transitory condition where a somewhat higher risk might be acceptable to accommodate the practical operation of the reactor plant. It is recognized that this regulatory provision implemented via a TS requirement was established to reduce the conditional probability of Mark I and II containment failure due to hydrogen ignition/detonation in the very unlikely chance that an accident result in significant core damage. The existing tie to reactor startup and prior to scheduled shutdown in the mode of applicability was considered sufficient to limit this to a transitory operating condition.

In addition, the NRC staff has reviewed SANDIA lab reports documenting research on low power shutdown (LPSD) risk. The following reasons lead the NRC staff to conclude the proposed changes would make the STS non-conservative:

- The significance of human actions is less for an inerted containment (because the containment is closed with no personnel inside containment) than for a de-inerted containment with possibility of personnel inside the containment at thermal power ≤ 15% RTP.

- There would be a greater reliance on administrative procedures at thermal power ≤ [15] percent RTP assuming the containment is de-inerted with personnel inside containment.

- The safety systems necessary for the mitigation of a LOCA would not be in the required configuration when needed. For example, the residual heat removal (RHR) containment spray system for containment cooling and fission product removal during a LOCA would not be available when needed and therefore fission products would bypass the suppression pool without being scrubbed. Also the configuration would have to be qualified to provide containment isolation should a LOCA occur.

- In the absence of nitrogen, with air inside the containment, there would be a greater possibility of formation of a combustible gas mixture.

CONCLUSION

Based on the above evaluation, the NRC staff finds the proposed change unacceptable because it would have a greater risk of a Mode 1 low power LOCA leading to severe accident.

As stated in 10 CFR 50.44(b)(2) (68 *Federal Register* 54123), for a de-inerted containment the risk of containment failure would increase should a severe accident occur. The NRC staff also believes the proposed change is more than administrative, and that the TSTF has failed to provide a technical justification for not requiring an SR to be performed every 7 days for reasons other than a scheduled reactor shutdown.