secondary leakage would result in site boundary doses within a small fraction of the 10 CFR part 100 guidelines. A separate analysis has determined this allowable SLB leakage limit to be 4.3 gallons per minute (gpm) in the faulted loop. This limit uses the TS reactor coolant system (RCS) Iodine-131 activity level of 1.0 microcuries per gram dose equivalent Iodine-131 and the recommended Iodine-131 transient spiking values consistent with NUREG–0800. The analysis method is WCAP–14277, which is consistent with the guidance of the NRC draft generic letter (GL) and will be used to calculate EOC leakage. Because of the relatively low number of indications at SQN, it is expected that the actual leakage values will be far less than this limit. Additionally, the current Iodine-131 levels at SQN range from about 25 to 100 times less than the TS limit.

Application of the criteria requires the projection of postulated SLB leakage, based on the projected EOC voltage distribution for Cycle 8 operation. Projected EOC voltage distribution is developing using the most recent EOC eddy current results and a voltage measurement uncertainty. Data indicates that a threshold voltage of 2.8 volts would result in throughwall cracks long enough to leak at SLB condition. The draft GL requires that all indications to which the APC are applied must be included in the leakage projection. Tube pull results from another plant with ⅞-inch tubing with a substantial voltage growth database have shown that tube wall degradation of greater than 40 percent throughwall was readily detectable either by the bobbin or RPC probe.

The tube with maximum throughwall penetration of 56 percent (42 average) had a voltage of 2.02 volts. The SQN Unit 1 pulled tube had a 1.93-volt indication with a maximum depth of 91 percent and did not leak at SLB condition. Based on the SQN pulled tube and industry pulled tube data supporting a lower threshold for SLB leakage of 2.8 volts, inclusion of all APC intersections in the leakage model is quite conservative. The ODSCC occurring at SQN is in its earliest stages of development. The conservative bounding growth estimations to be applied to the expected small number of indications for the upcoming inspection should result in very small levels of predicted SLB leakage. Historically, SQN has not identified ODSCC as a contributor to operational leakage.

I order to assess the sensitivity of an indication's BOC voltage to EOC leakage potential, a Monte Carlo simulation was performed for a 2.0-volt BOC indication. The maximum EOC voltage (at 99.8 percent cumulative probability) was found to be 4.8 volts. The leakage component from an indication of this magnitude, using either the NUREG–1477 or EPRI leakage models, is 0.12 or 0.028 gpm, respectively.

Therefore, as implementation of the 2.0-volt APC does not adversely affect steam generator (S/G) tube integrity and implementation will be shown to result in acceptable dose consequences, the proposed amendment does not result in significant increase in the probability or consequences of an accident previously evaluated.

2. Create the possibility of a new or different kind of accident from any previously analyzed.

Implementation of the proposed S/G tube APC does not introduce any significant changes to the plant design basis. Use of the criteria does not provide a mechanism that could result in an accident outside of the region of the TSP elevations; no ODSCC is occurring outside the thickness of the TSP. Neither a single or multiple tube rupture event would be expected in a S/G in which the plugging criteria is applied (during all plant conditions).

TVA will implement a maximum leakage rate limit of 150 gallon per day per S/G to help preclude the potential for excessive leakage during all plant conditions. The SQN TS limits on primary-to-secondary leakage at operating conditions include a maximum of 0.42 gpm (600 gallons per day [gpd]) for all S/Gs, or, a maximum of 150 gpd for any one S/G. The RG 1.121 criterion for establishing operational leakage rate limits that require plant shutdown is based upon leak-before-break considerations to detect a free-span crack before potential tube rupture during faulted plant conditions. The 150-gpd limit should provide for leakage detection and plant shutdown in the event of the occurrence of an unexpected single crack resulting in leakage that is associated with the longest permissible crack length. RG 1.121 acceptance criteria for establishing operating leakage limits are based on leak-before-break considerations such that plant shutdown is initiated if the leakage associated with the longest permissible crack is exceeded. The longest permissible crack is the length that provides a factor of safety of 1.43 against bursting at faulted conditions maximum pressure differential. A voltage amplitude of 8.82 volts for typical ODSCC corresponds to meeting this tube burst requirement at a lower 95 percent prediction limit on the burst correlation coupled with 95/95 lower tolerance limit material properties. Alternate crack morphologies can correspond to 8.82 volts so that a unique crack length is not defined by the burst pressure versus voltage correlation. Consequently, typical burst pressure versus through-wall crack length correlations are used below to define the ''longest permissible crack'' for evaluating operating leakage limits.

The single through-wall crack lengths that result in tube burst at 1.43 times the SLB pressure differential and the SLB pressure differential alone are approximately 0.57 inch and 0.84 inch, respectively. A leak rate of 150 gpd will provide for detection of 0.4-inch-long cracks at nominal leak rates and 0.6-inch-long cracks at the lower 95 percent confidence level leak rates. Since tube burst is precluded during normal operation because of the proximity of the TSP to the tube and the potential exists for the crevice to become uncovered during SLB conditions, the leakage from the maximum permissible crack must preclude tube burst at SLB conditions. Thus, the 150-gpd limit provides for plant shutdown before reaching critical crack lengths for SLB conditions. Additionally, this leak-before-break evaluation assumes that the entire crevice area is uncovered during blowdown. Partial uncover will provide benefit to the burst capacity of the intersection.

As S/G tube integrity upon implementation of the 2.0-volt APC continues to be maintained through in-service inspection and primary-to-secondary leakage monitoring, the possibility of a new or different kind of accident from any accident previously evaluated is not created.

3. Involve a significant reduction in a margin of safety.

The use of the voltage based APC at SQN is demonstrated to maintain S/G tube integrity commensurate with the criteria of RG 1.121. RG 1.121 describes a method acceptable to the NRC Staff for meeting General Design Criteria (GDC) 14, 15, 31, and 32 by reducing the probability or the consequences of S/G tube rupture. This is accomplished by determining the limiting conditions of degradation of S/G tubing, as established by in-service inspection, for which tubes with unacceptable cracking should be removed from service. Upon implementation of the criteria, even under the worst-case conditions, the occurrence of ODSCC at the TSP elevations is not expected to lead to a S/G tube rupture event during normal or faulted plant conditions. The EOC distribution of crack indications at the TSP elevations will be confirmed to result in acceptable primary-to-secondary leakage during all plant conditions and radiological consequences are not adversely impacted.

In addressing the combined effects of loss-of-coolant accident (LOCA), plus safe shutdown earthquake (SSE) on the S/G component (as required by GDC 2), it has been determined that tube collapse may occur in the S/Gs at some plants. This is the case as the TSP may become deformed as a result of lateral loads at the wedge supports at the periphery of the plate because of the combined effects of the LOCA rarefaction wave and SSE loadings. Then, the resulting pressure differential on the deformed tubes may cause some of the tubes to collapse.

There are two issues associated with S/G tube collapse. First, the collapse of S/G tubing reduces the RCS flow area through the tubes. The reduction in flow area increases the resistance to flow of steam from the core during a LOCA, which in turn, may potentially increase peak clad temperature (PCT). Second, there is a potential that partial through-wall cracks in tubes could progress to through-wall cracks during tube deformation or collapse.

Consequently, since the leak-before-break methodology is applicable to the SQN reactor coolant loop piping, the probability of breaks in the primary loop piping is sufficiently low that they need not be considered in the structural design of the plant. The limiting LOCA event becomes either the accumulator line break or the pressurize surge line break. LOCA loads for the primary pipe breaks were used to bound the conditions at SQN for smaller breaks. The results of the analysis using the larger break inputs show that the LOCA loads were found to be of insufficient magnitude to result in S/G tube collapse or significant deformation. The LOCA, plus SSE tube collapse evaluation performed for another plant with Series 51 S/Gs using