REV 0 EDMS/RIMS NO.	EDMS TYPE:	EDMS ACCESSION NO (N/A for REV. 0)
B87 01829 001	calculations(nuclear)	

Calc Title: EVALUATION OF THE RISK SIGNIFICANCE OF DECREASED CONTAINMENT INTEGRATED LEAK RATE TEST FREQUENCY

CALC ID	TYPE	PLANT	BRANCH	NUMBER	CUR REV	NEW REV	REVISION APPLICABILITY
CURRENT	CN	SQN	NTB	SQS20211	0	1	Entire calc ☒ Selected pages ☐
NEW	CN						

ACTION	NEW ☐ REVISION ☒	DELETE ☐ RENAME ☐	SUPERSEDE ☐ DUPLICATE ☐	CCRIS UPDATE ONLY ☐ (D. V. & Approval Signatures Not Required)	No CCRIS Changes ☒ (For calc revision, CCRIS been reviewed and no CCRIS changes required)

UNITS	SYSTEMS	UNIDS
1 & 2	088	N/A

DCN,EDC,N/A	APPLICABLE DESIGN DOCUMENT(S)	CLASSIFICATION
N/A	N/A	E

QUALITY RELATED?	SAFETY RELATED? (If yes, QR = yes)	UNVERIFIED ASSUMPTION	SPECIAL REQUIREMENTS AND/OR LIMITING CONDITIONS?	DESIGN OUTPUT ATTACHMENT?	SAR/TS AFFECTED
Yes ☐ No ☒	Yes ☐ No ☒	Yes ☐ No ☒	Yes ☐ No ☒	Yes ☐ No ☒	Yes ☐ No ☒

PREPARER PHONE NO	PREPARING ORG (BRANCH)	DESIGN VERIFICATION METHOD
843-8318	M/NE	Design Review

PREPARER SIGNATURE	DATE	CHECKER SIGNATURE	DATE
Christopher Carey		Anne E. Silber	
DESIGN VERIFIER SIGNATURE	**DATE**	**APPROVAL SIGNATURE**	**DATE**
Anne E. Silber		John F. Thomas	

STATEMENT OF PROBLEM/ABSTRACT

This calculation determines the effect on release frequency and population dose as a result of a decrease in the frequency of performing containment integrated leak rate testing (ILRT). The results of this evaluation are to be used for justifying a change to the requirements for ILRT as administratively controlled by Technical Specification 6.8.4(h).

The effect of a decrease in the frequency of performing an ILRT is that the probability of a pre-existing leak in the containment shell increases. This results in an increase in the frequency of both large and small (fission product) releases to the environment which correlates to an increase in population dose. Revision 1 of the PSA is used to determine the increase in the frequency of large and small releases for ILRT frequencies of between 3/10 years and 1/20 years. Using information from Level III PSA analyses, the increase in population dose due to the increase in large and small release frequency due to a pre-existing leak is determined.

The results of this calculation demonstrate that decreasing the ILRT frequency from 3/10 ry to 1/15 ry results in an increase in:

- LERF of ~ 2.0E-7/ry,
- all releases (small, large, early and late) of about 8.14E-7/ry and
- the entire region population dose of 36.1 person-rem.

The increase in LERF is *small* per RG 1.174 and the increase in all releases and the population dose are also *small and non-risk-significant.*

MICROFICHE/EFICHE Yes ☐ No ☒ FICHE NUMBER(S)

☐ LOAD INTO EDMS AND DESTROY
☒ LOAD INTO EDMS AND RETURN CALCULATION TO CALCULATION LIBRARY. ADDRESS: OPS 1B-SQN
☐ LOAD INTO EDMS AND RETURN CALCULATION TO:

TVA CALCULATION RECORD OF REVISION

CALCULATION IDENTIFIER: SQS20211

Title: EVALUATION OF THE RISK SIGNIFICANCE OF DECREASED CONTAINMENT INTEGRATED LEAK RATE TEST FREQUENCY

Revision No.	DESCRIPTION OF REVISION
0	Initial Issue (Total Pages = 21) SAR Section 6.2 has been reviewed by the preparer of this calculation and this calculation is in compliance. Tech Specs have been reviewed and determined not to be affected.
1	This revision: increased the maximum leakage due to a pre-existing leak from 35La to 100La; added a calculation of the CCFP; and an estimate of LERF from both internal and external events. Pages added: None Pages deleted: None Pages changed: 1, 3, 6, 19 & 21. This calculation has no successor documents. SAR Section 6.2 has been reviewed by the preparer of this calculation and this calculation is in compliance. Tech Specs have been reviewed and determined not to be affected.

Table-5 (continued)

Class	Description	ILRT Frequency (ILRT/month)			
		1/40	1/120	1/180	1/240
	Conditional Containment Failure Probability (CCFP)[5]	0.5379	0.5493	0.5580	0.5667
	ΔCCFP (%)	-1.16	0.00	0.87	1.74

Notes:

1. Base value calculated as the sum of *intact frequency* from Table-2 and the *intact -not analyzed in level-2*, the total *small isolation failures -analyzed in level II*, the total *large isolation failures - analyzed in level II* from Table-2. Minus the sum of the *small dependent isolation failures*, the *large dependent isolation failures*, the *small preexisting leaks* and the *large preexisting leaks* from Table-2.
2. Calculated as the base value (1.84E-5) plus class 9 & 10 for the ILRT/40 month column minus class 9 & 10 from the column of interest.
3. Invariant to changes in ILRT frequency.
4. See Table-1 for the multiplier used on the frequency of these leaks given in Table-2 (e.g., for a ILRT/120 months, the multiplier for small preexisting leak frequency is 1.14 and the base frequency is 2.56E-06).
5. The CCFP is the probability of containment failure given that core damage has occurred and is defined as: 1 - (frequency of class 1 + frequency of class 2)/CDF.

6.3 Effect of a Preexisting Containment Leak on Population Dose

The release classes determined in Section 6.2 are assigned a leakage rate in Table-6, consistent with reference 3, except for Class 10 which uses a maximum leak rate of 100 -instead of 35.

Table-6

Class	Description	Maximum Leak Rate (in L_a)[1]
1	Containment Intact	2
2	Small Containment Penetration Isolation Failures	35
3	Large Containment Penetration Isolation Failures	35
4	Small Early Containment Failures Due Severe Accident Progression	100
5	Large Early Containment Failures Due to Severe Accident Progression	100
6	Late Containment Failures (Small & Large) Due to Severe Accident Progression	100
7	Small Containment Bypasses[2]	N/A
8	Large Containment Bypasses[2]	N/A
9	Small Preexisting Leaks	10
10	Large Preexisting Leaks	100

Notes:

1. L_a is 0.25%/day
2. These sequences involve containment bypasses so their leak rate is not quantified in terms of L_a. These sequences are not effected by changes in ILRT frequency.

The dose to the surrounding population from severe accidents was determined for SQN in reference 4. The results of that study are summarized in Table-7.

Table-7

Risk Measure[1]	Dose (person-rem/ry)
Population Dose 50 miles	12
Population Dose Entire Region[2]	81[3]

Notes:
1. From Table 5.1-1 of reference 4.
2. The entire region is the area within 1000 miles of SQN (Section 4.2 of reference 4).
3. This is the same value used in reference 2.
4. The reference 4 study determined the CDF for SQN to be 5.60E-5/ry.

The population dose for the entire region is used in reference 2 as the dose from a leak rate of 1 L_a. Consistent with reference 3, the population dose is increased linearly with L_a to determine the population dose for a given class of containment releases. The effect on population dose as ILRT frequency is decreased is calculated in Table-8.

Table-8

Class	Description	Population Dose at an ILRT Frequency (1/month) of:[1]			
		1/40	1/120	1/180	1/240
1	Containment Intact	5.33E+01	5.20E+01	5.10E+01	5.00E+01
2	Small Containment Penetration Isolation Failures	7.58E+00			
3	Large Containment Penetration Isolation Failures	3.33E-01			
4	Small Early Containment Failures Due Severe Accident Progression	6.18E+00			
5	Large Early Containment Failures Due to Severe Accident Progression	7.79E+01			
6	Late Containment Failures (Small & Large) Due to Severe Accident Progression	1.96E+03			
7	Small Containment Bypasses	Not Quantified			
8	Large Containment Bypasses	Not Quantified			
9	Small Preexisting Leaks	3.71E+01	4.21E+01	4.59E+01	4.97E+01
10	Large Preexisting Leaks	1.22E+02	1.39E+02	1.51E+02	1.64E+02
	Total Dose (person-rem)[2]	2.26E+03	2.28E+03	2.30E+03	2.32E+03
	Change in Population Dose for Entire Region[3]	-20.64	0.00	15.48	30.96

Table-8

Notes:

1. This is calculated as the product of the frequency of the described sequences from Table-5, the magnitude of the release (in La) from Table-5 and dose to the entire region which is calculated as the dose to the entire region which is calculated based on the information in Table-7, specifically, 81 person-rem/ry divided by the CDF of 5.60E-05 or 1.45E6 person-rem.

2. Sum of classes 1 through 6, 9 & 10.

3. Change based on an ILRT/120 months.

7.0 Summary of Results:

Description	ILRT 1/10ry to 1/15ry	ILRT 3/10ry to 1/15ry
ΔLERF	8.79E-8/ry	2.05E-7/ry
Δ All Releases	3.49E-7/ry (1.6%)	8.14E-7/ry (3.7%)
ΔCCFP (%)	0.87%	2.0%
Population Dose (person-rem)	15.5	36.1

8.0 Supporting Graphics: None.

9.0 Conclusions:

The increase in LERF when the frequency of an ILRT is decreased from 3/10 ry to 1/15 ry is ~2.0E-7/ry which is *a small increase in LERF* per Regulatory Guide 1.174 (reference 5). Small increases in LERF are usually acceptable provided the total LERF from internal and external events is less than 1.0E-5 (see reference 5). The internal events LERF with a 1/15ry ILRT is 5.68E-6/ry.

An IPEEE was performed to identify severe accident vulnerabilities from external events (reference 6). In the IPEEE the risk from all external events met the screening criteria in NUREG-1407 (references 7). The IPEEE methodology and conclusions were approved by the NRC (reference 8). Based on no vulnerabilities being identified in the IPEEE, the increase in CDF from external events is estimated to be < 1.0E-6/ry. Should all core damage events as the result of an external event initiator also go to LERF, the LERF from external events could be no more than 1.0E-6/ry.

Therefore, a conservative estimate of LERF from both internal and external events, including an ILRT frequency of 1/15ry is: 5.68E-6/ry + 1.0E-6/ry ~ 7.0E-6/ry.

10.0 Appendices and Attachments: None.