Table 2.3-4 Example Calculation 1

input	# of SGs	4
input	# of tubes/SG	3300
input	Total # of SG tubes	13200
input	Tube material	600TT
input	Nth outage at EFPY	23
input	N-1th outage at EFPY	21.7
	# of flaws created from K 21 to K 22	52
	# of flaws created from K 22 to K 23	53
Calc-1	Total # of flaws created from K 21.7 to 23	68
Calc-2	# of large flaws expected in K 21.7 to K 23	0.05
Calc-3	# of pluggable flaws expected in K 21.7 to K 23	8
Calc-4	A quick estimate of conditional C-SGTR probability p(CSGTR)	0.024

The fraction, 0.12 of tubes expected to be plugged is taken from Table 2.3-1 a
0.30 deep or deeper, as represented by the yellow and blue areas in the table

The probability of a large flaw is 6.98E-04 as defined in Table 2.3-1 by the flav

Calc-2	Large flaws are shown bu blue and yellow areas in Table 2.3-1.
Calc-3	For information only. It is not used in the above estimates for p(
Calc-4	Calc-4 = p(CSGTR) = Calc-2 / 2

CAUTION	Number of flaws from Tables 2.3-2 and 2.3-3 MUST BE CHANGI
	The equation for Calc-1 in cells C12 and E12 MUST BE ADJUS
	Other calculations are hard-wired.
	This EXCEL worksheet allows changing number of SGTs, duratic
Note:	Although this EXCEL workbook can also be used to calculate p(CSGTR) for different number of SG tubes, it is recommended that the p(SGTR) values given in Tables 2.4-1 and 2.4-2 be used as is for LERF estimates, regardless of the number of tubes or loops in a plant of interest.

Transferred to tabs "600TT" and "690TT" as input.

	690TT
From tables 2.3-2 and 2.3-3: adjust as needed	25
From tables 2.3-2 and 2.3-3: adjust as needed	26
Adjust this equation as needed	34
= Calc-1 * 6.98E-04	0.02
= Calc-1 * 0.12	4
assuming any large flaw leads to C-SGTR and accident occur in the middle of the time period	0.012

ıs the probability of flaws that are
:.

ws in the blue area.

CSGTR), which is given by Calc-4.

ED if EFPY input is changed.
TED by the user if the EFPY input is changed.

on between refueling, and SGT age.

Table 2.3-5 Example Calculation 2 - RASP Ha

input	# of SGs	4
input	# of tubes/SG	3300
input	Total # of SG tubes	13200
input	Tube material	600TT
input	Nth outage at EFPY	16
input	N-1th outage at EFPY	15
	# of flaws created from K 15 to K 16	47
Calc-1	Total # of flaws created from K 15 to 16	47
Calc-2	# of large flaws expected in K 15 to K 16	0.03
Calc-3	# of pluggable flaws expected in K 15 to 16	6
Calc-4	A quick estimate of conditional C-SGTR probability p(CSGTR)	0.016

The fraction, 0.12 of tubes expected to be plugged is taken from Table 2.3-1 a
0.30 deep or deeper, as represented by the yellow and blue areas in the table

The probability of a large flaw is 6.98E-04 as defined in Table 2.3-1 by the flav

Calc-2	Large flaws are shown bu blue and yellow areas in Table 2.3-1.
Calc-3	For information only. It is not used in the above estimates for p(C
Calc-4	Calc-4 = p(CSGTR) = Calc-2 / 2

CAUTION	Number of flaws from Tables 2.3-2 and 2.3-3 MUST BE CHANGI
	The equation for Calc-1 in cells C12 and E12 MUST BE ADJUS
	Other calculations are hard-wired.

This EXCEL worksheet allows changing number of SGTs, duratic

andbook EXCEL-2.xlsx

Transferred to tabs "600TT" and "690TT" as input.

	690TT
From tables 2.3-2 and 2.3-3: adjust as needed	21
Adjust this equation as needed	21
= Calc-1 * 6.98E-04	0.01
= Calc-1 * 0.12	2
assuming any large flaw leads to C-SGTR and accident occur in the middle of the time period	0.007

as the probability of flaws that are
.

ws in the blue area.

CSGTR), which is given by Calc-4.

ED if EFPY input is changed.
TED by the user if the EFPY input is changed.

on between refueling, and SGT age.

FROM THE NUREG WORD FILE

Table 7-5. Probability that a Detected Flaw Belongs to a

		Length of Flaw				
		0 to 1 cm	**1 to 2 cm**	**2 to 3 cm**	**3 to 4 cm**	**4 to 5 cm**
Flaw Depth $/100	0 to 0.1	2.74E-03	4.62E-02	2.23E-02	5.38E-03	1.04E-03
	0.1 to 0.2	1.86E-02	3.14E-01	1.52E-01	3.66E-02	7.08E-03
	0.2 to 0.3	9.59E-03	1.62E-01	7.81E-02	1.89E-02	3.64E-03
	0.3 to 0.4	3.09E-03	5.21E-02	2.52E-02	6.07E-03	1.17E-03
	0.4 to 0.5	8.47E-04	1.43E-02	6.90E-03	1.66E-03	3.22E-04
	0.5 to 0.6	2.14E-04	3.61E-03	1.74E-03	4.21E-04	8.13E-05
	0.6 to 0.7	5.14E-05	8.67E-04	4.19E-04	1.01E-04	1.95E-05
	0.7 to 0.8	1.19E-05	2.01E-04	9.73E-05	2.35E-05	4.54E-06
	0.8 to 0.9	2.71E-06	4.57E-05	2.21E-05	5.32E-06	1.03E-06
	0.9 to 1.0	small				
	Total	3.52E-02	5.93E-01	2.86E-01	6.91E-02	1.34E-02

WHEN NUREG WORD FILE IS IMPORTED INTO EXCEL AND RC

Table 2.3-1. Probability that a Detected Flaw Belongs to a

		Flaw Length				
		0 to 1 cm	**1 to 2 cm**	**2 to 3 cm**	**3 to 4 cm**	**4 to 5 cm**
Flaw Depth %/100	0 to 0.1	2.74E-03	4.62E-02	2.23E-02	5.38E-03	1.04E-03
	0.1 to 0.2	1.86E-02	3.14E-01	1.52E-01	3.66E-02	7.08E-03
	0.2 to 0.3	9.59E-03	1.62E-01	7.81E-02	1.89E-02	3.64E-03
	0.3 to 0.4	3.09E-03	5.21E-02	2.52E-02	6.07E-03	1.17E-03
	0.4 to 0.5	8.47E-04	1.43E-02	6.90E-03	1.66E-03	3.22E-04
	0.5 to 0.6	2.14E-04	3.61E-03	1.74E-03	4.21E-04	8.13E-05
	0.6 to 0.7	5.14E-05	8.67E-04	4.19E-04	1.01E-04	1.95E-05
	0.7 to 0.8	1.19E-05	2.01E-04	9.73E-05	2.35E-05	4.54E-06
	0.8 to 0.9	2.71E-06	4.57E-05	2.21E-05	5.32E-06	1.03E-06
	0.9 to 1.0	small				
	Total =	3.51E-02	5.93E-01	2.87E-01	6.92E-02	1.34E-02

6.98E-04	total probability of blue area
1.20E-01	total probability of yellow + blue areas
1.19E-01	total probability of yellow area
1.00E+00	total probability of table bins

Bin Size

	Total	
5 to 6 cm		
1.80E-04	7.78E-02	
1.23E-03	5.29E-01	
6.31E-04	2.73E-01	
2.03E-04	8.78E-02	8.78E-02
5.57E-05	2.41E-02	2.41E-02
1.41E-05	6.08E-03	6.08E-03
3.38E-06	1.46E-03	1.46E-03
7.86E-07	3.39E-04	3.39E-04
1.78E-07	7.70E-05	7.70E-05
2.31E-03	~1	
	1.00E+00	1.20E-01

)W AND COLUMN SUMS ARE MADE

a Bin Size

	Total	
5 to 6 cm		
1.80E-04	7.78E-02	
1.23E-03	5.30E-01	
6.31E-04	2.73E-01	
2.03E-04	8.78E-02	8.78E-02
5.57E-05	2.41E-02	2.41E-02
1.41E-05	6.08E-03	6.08E-03
3.38E-06	1.46E-03	1.46E-03
7.86E-07	3.39E-04	3.39E-04
1.78E-07	7.70E-05	7.70E-05
2.32E-03	1.00E+00	
	1.00E+00	1.20E-01

Table 2.3-2 Flaw Estimates - 600TT **600TT**

h(k) = mu*K + sigma = Hazard Rate
Nflaws = (# of tubes) * [1.0 - exp[-{(1/2) * μ * k2 + Ω * k}]] = NFlaws-Avg

# of tubes 13200 K = EFPY mu =
sigma =

K EFPY	Flaws generated since last EFPY Volumetric	Axial	Circumf.	Total	K EFPY
15	30	0	0	30	15
16	31	3	13	47	16
17	32	3	13	48	17
18	33	3	13	49	18
19	34	3	13	49	19
20	34	3	13	50	20
21	35	3	13	51	21
22	36	3	13	52	22
23	37	3	13	53	23
24	38	3	13	54	24
25	39	3	13	54	25
26	39	3	13	55	26
27	40	3	13	56	27
28	41	3	13	57	28
29	42	3	13	58	29
30	43	3	13	59	30
31	44	3	13	60	31
32	45	3	13	60	32
33	45	3	13	61	33
34	46	3	13	62	34
35	47	3	13	63	35

(1) Total is not adjusted for # of flaws that are already plugged.

6.42E-05	0	0
1.32E-03	2.00E-04	1.00E-03

TOTAL # of flaws detected at EFPY (1)

Volumetric	Axial	Circumf.	Total (1)
357	0	0	357
388	3	13	403
419	5	26	451
451	8	40	499
484	11	53	547
518	13	66	597
552	16	79	647
588	18	92	699
624	21	106	751
661	24	119	804
699	26	132	857
737	29	145	912
777	32	158	967
817	34	172	1023
858	37	185	1080
900	40	198	1137
942	42	211	1196
986	45	224	1255
1030	48	238	1315
1075	50	251	1376
1120	53	264	1437

Table 2.3-3 Flaw Estimates - 690TT 690TT

h(k) = mu*K + sigma = Hazard Rate
Nflaws = (# of tubes) * [1.0 - exp[-{(1/2) * μ * k2 + Ω * k}]] = NFlaws-Avg

# of tubes 13200 K = EFPY mu =
sigma =

K EFPY	Flaws generated since last EFPY Volumetric	Axial	Circumf.	Total	K EFPY
15	20	0	0	20	15
16	21	0	0	21	16
17	22	0	0	22	17
18	22	0	0	22	18
19	23	0	0	23	19
20	24	0	0	24	20
21	25	0	0	25	21
22	25	0	0	25	22
23	26	0	0	26	23
24	27	0	0	27	24
25	27	0	0	27	25
26	28	0	0	28	26
27	29	0	0	29	27
28	30	0	0	30	28
29	30	0	0	30	29
30	31	0	0	31	30
31	32	0	0	32	31
32	33	0	0	33	32
33	33	0	0	33	33
34	34	0	0	34	34
35	35	0	0	35	35

(1) Total is not adjusted for # of flaws that are already plugged.

5.58E-05	0.00E+00	0.00E+00
6.86E-04	0.00E+00	0.00E+00

TOTAL # of flaws detected at EFPY (1)

Volumetric	Axial	Circumf.	Total (1)
219	0	0	219
239	0	0	239
260	0	0	260
282	0	0	282
304	0	0	304
328	0	0	328
352	0	0	352
376	0	0	376
402	0	0	402
428	0	0	428
455	0	0	455
482	0	0	482
510	0	0	510
539	0	0	539
569	0	0	569
599	0	0	599
630	0	0	630
662	0	0	662
694	0	0	694
727	0	0	727
761	0	0	761