E45

[~~PRE-DECISIONAL DRAFT~~, NO FORMAL NRC DOCUMENT]

Risk Evaluation of PWR CRDM Cracking

August 29, 2001

Jin W. Chung

E-6

Information in this record was deleted
in accordance with the Freedom of Information
Act, exemptions 5
FOIA- 2002-229

EXS

Ex 5

Ex 5

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Plant	Initiating Event Frequency, IE(f)	CCDP (Tables 1-6) P[CDP|IE(f)]	MLOCA CDF
Oconee 3	5.8E-3	1.04E-2	6.03E-5
Crystal River 3	1.2E-3	3.34E-3	4.08E-6
D.C. Cook	9.3E-4	4.70E-3	4.37E-6

V. Review Process of Bulletin 2001-01 Responses: PWR CRDM Cracking Issue

A. References

1. Bulletin 2001-01, "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles", August 4, 2001

2. NRC Information Notice 2001-05, "Through-Wall Circumferential Cracking of Reactor Pressure Vessel Head Control Rod Drive Mechanism Penetration Nozzles at Oconee Nuclear Station, Unit 3", August 3, 2001

3. A Letter from Brian W. Sheron to NEI, "Issues to be addressed in a Generic Justification for Continued Operation of PWRs", April, 17, 2001

4. NRC IMC 609, Appendix A "Significance Determination of Reactor Inspection Findings for At-Power Situations", March 15, 2001

5. Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment on Plant-Specific Changes to the Licensing Basis", July, 1998

6. Standard Review Plant 19.0, "Use of Probabilistic Risk Assessment in Plant-Specific, Risk-Informed Decision Making: General Guidance", Revision 0, July, 1998

B. Purpose

The objective is to develop a detailed road map in anticipation of the licensee responses to Bulletin 2001-01. The road map includes routine review items that should be included in general, and those unexpected responses requiring special attention. It also identifies areas that may need cooperative efforts with other organizations and disciplines.

Table 1. MLOCA Mitigation Failure Sequence CCDP leading to Core Damage - B&W DESIGN

PLANT Commercial Operation (PRA Code)	MLOCA Success Paths	SOURCE	TOTAL CDF (/RY)	MLOCA EVENT TREE CDF(/RY)	MLOCA INITIATOR FREQUENCY (/RY)	CCDP (Given Initiation of MLOCA)
ANO-1 /74 (CAFTA)		IPE	4.67E-5			
		SPAR-3i				
CRYSTAL RIVER 3 /77 (CAFTA)	(2) 1/3HPI /HPR, 1/2LPR or 1/2 LPR(S)	IPE	1.53E-5	1.67E-6	5.00E-4	3.34E-3
		SPAR-3i				
DAVIS-BESSE / 78 (CAFTA)	(1)1/2HPI, 1/2 LPI/LPR (Human))	IPE	6.60E-5	2.06E-6	3.00E-4	6.87E-3
		SPAR-3i	4.03E-5	1.02E-7	4.03E-5	2.53E-3
OCONEE 1,2,&3 / 73/74/74 (CAFTA)	(2)1/3HPI/HPR, 1/3LPR(S) (or with1/3FC)	IPE	2.30E-5	7.30E-6	7.00E-4	1.04E-2
		SPAR-3i				
TMI-1 / 74 (RISKMAN)	(2)1/3HPI, 1/3LPI/LPR, (or with 2/3FC)	IPE	4.49E-5	2.07E-6	3.61E-4	7.48E-3
		SPAR-3i	1.69E-5	1.37E-7	4.03E-5	3.40E-3

Table 2. MLOCA INITIATING EVENT AND CCDP - CE DESIGN

PLANT /Commercial Operation (PRA Code)	MLOCA Success Paths	SOURCE	TOTAL CDF (/RY)	MLOCA EVENT TREE CDF(/RY)	MLOCA INITIATOR FREQUENCY (/RY)	CCDP (Given Initiation of MLOCA)
ANO-2 / 80 (CAFTA)	(2) 1/3HPI/HPR	IPE	3.40E-5	1.74E-6	1.00E-3	1.74E-3
		SPAR-3i				
Calvert Cliffs 1&2 / 75/77 (CAFTA)*	(2)1/3HPI/ HPR,3/4 ACC,1/2CS R or 2/4 FC	IPE	2.40E-4	3.59E-6	4.62E-4	7.77E-3
		SPAR-3i	1.98E-5	4.90E-8	4.03E-5	1.22E-3
Fort Calhoun 1 / 73 (CAFTA)	(1) 1/3HPI/HPR	IPE	1.36E-5	1.22E-7	1.00E-4	1.22E-3
		SPAR-3i				
Millstone 2 / 75 (CAFTA)	(4)1/3HPI/ HPR or 2/2 HPI&1/2CS R orCSI	IPE	3.42E-5	1.27E-6	7.10E-4	1.79E-3
		SPAR-3i	3.50E-5	7.29E-8	4.03E-5	1.81E-3
Palisades /71 CAFTA)	(14)HPI/HP R/LPI/LPR/ AD/SV/SUP UMP	IPE	5.07E-5	4.40E-7	4.00E-4	1.10E-3
		SPAR-3i	6.25E-5	5.06E-8	4.03E-5	1.26E-3
Palo Verde 1, 2 ,& 3 / 86/86/88 (CRYSTAL)	(2)1/2LPI/ LPR(H)/1/2 CSI orCSR	IPE	9.00E-5	2.26E-6	4.50E-4	5.02E-3
		SPAR-3i				
SONG 2&3 /83/84 (NUPRA)	(2)1/3HPI/ HPR or 1/3LPI/LPR &1/2CSI/CS R/1/4FC	IPE	3.00E-5	4.00E-6	1.00E-3	4.00E-3
		SPAR-3i	3.71E-5	4.28E-8	4.03E-5	1.06E-3
St. Lucie 1 / 76 (CAFTA)		IPE	2.30E-5			
		SPAR-3i				
St. Lucie 2 /83 (CAFTA)		IPE	2.62E-5			
		SPAR-3i				
Waterford 3 /85 (CAFTA)	(2)1/3HPI/ HPR/1/2CSI or1/4FC	IPE	1.80E-5	1.14E-6	1.00E-3	1.14E-3
		SPAR-3i				

Table 3. MLOCA INITIATING EVENT AND CCDP - W DESIGN

PLANT CommercialOperation (PRA Code)	MLOCA Success Paths	SOURCE	TOTAL CDF (/RY)	MLOCA EVENT TREE CDF(/RY)	MLOCA INITIATOR FREQUENCY (/RY)	CCDP (Given Initiation of MLOCA)
Beaver Valley 1 / 76 (RISKMAN)	(3) 2/3ACC, 1/3 CHP,1/2 HPI (or1 LPR or CPSP)	IPE	2.14E-4	1.87E-6	4.61E–4	4.05E-3
		SPAR-3i				
Beaver Valley 2 /87 (RISKMAN)	(3) 1/3HPI, 2/3ACC, LPI/LPR	IPE	1.92E-5	<1.00E-7	4.64E-4	<1.0E-4
		SPAR-3i				
Braidwood 1&2 / 88/88 (RISKMAN)	(18)1/2HPI or CHPI/HPR or LPR or AD/ MFW/AFW/FC	IPE	2.74E-5	1.24E-7	8.00E-4	1.55E-4
		SPAR-3i	9.11E-5	9.55E-8	4.03E-5	2.37E-3
Byron 1&2 /85/87 (GRAFTER)	(18)1/2HPI or CHPI/HPR or LPR or AD/ MFW/AFW/FC	IPE	3.09E-5	1.49E-7	8.00E-7	1.86E-4
		SPAR-3i				
Callaway / 84 (NUPRA)	(32)1/2HPI/HPR orCHPI/CHPR/ LPR or Ad or TBor2S G/ AFWS/2FC	IPE	5.85E-5	4.32E-6	1.00E-3	4.32E-3
		SPAR-3i				
Catawba 1&2 / 85/86 (CAFTA)	(1)1/3HPI/HPR/1/2LPR	IPE	5.80E-5	7.10E-7	3.00E-4	2.37E-3
		SPAR-3i				
Comnache Peak 1&2 /90/93 (CAFTA)	(9)1/2CHPI orHPI,2/4ACC or AltI/ CHPRorHPR orLPR	IPE	5.72E-5	1.02E-6	4.65E-4	2.19E-3
		SPAR-3i				
D.C. Cook 1&2 /75/78 (CAFTA)*	(4)1/2CHPI/HPI,3/4ACC/CHR/HPR/LPR ,2/4POV/AF	IPE	6.26E-5	4.31E-6	9.16E-4	4.70E-3
		SPAR-3i				
Diablo Canyon 1&2 /85/86 (RISKMAN)	(2)2/2HPI,1/2 LPR,1/2CSI/ CSR or2/5FC (H)	IPE	8.80E-5	4.70E-6	4.6-E-4	1.02E-2
		SPAR-3i				
Farley 1&2 /77/81 (CAFTA)**	(5)1/2LPI/LPR or1/3CHPI /CHPR,2AC 2AD,AFWS	IPE	1.30E-4	2.67E-6	7.70E-4	3.47E-3
		SPAR-3i				
Ginna /70 (CAFTER)*	(2)1/2HPI/HPR/LPR,CSI/CSR orFC	IPE	8.74E-5	5.75E-6	4.00E-4	1.44E-2
		SPAR-3i				

(W design continued)

PLANT Commercial Operation (PRA Code)	MLOCA Success Paths	SOURCE	TOTAL CDF (/RY)	MLOCA EVENT TREE CDF(/RY)	MLOCA INITIATOR FREQUENCY (/RY)	CCDP (Given Initiation of MLOCA)
Robinson 2 / 71 (CAFTA)	(1)1/2HPI, 1/2HPR,1/2LPR	IPE	3.20E-4	5.23E-5	2.60E-3	2.01E-2
		SPAR-3i				
Indian Point 2 / 74 (RISKMAN)	(6)1/3HPI/HPR,3/4ACC, SG,AFW,FC	IPE	1.90E-4	1.90E-6	4.61E-6	4.13E-3
		SPAR-3i				
Indian Point 3 / 76 (CAFTA)	(30)1CHPI,2PORV,PAD, 2ACC,1HPR/LPR,2AD,2SG,1AFW,3/5FC	IPE	4.40E-5	3.92E-5	9.14E-4	4.29E-2
		SPAR-3i				
Kewaunee / 74 (GRAFTER)	(6)1/2HPI/LPI/ACC,HPR/LPR,1AD,TB,SG,MF	IPE	6.65E-5	7.59E-6	2.36E-3	3.22E-3
		SPAR-3i				
McGuire 1&2 /81/84 (CAFTA)	(2)1/2HPI,1/2HPR	IPE	4.00E-5	1.60E-6	3.00E-4	5.33E-3
		SPAR-3i				
Millstone 3 / 86 (CAFTA)	(6)1/2CHPI/ACC/HPR/CHPR/AD/SG/AFW/CSR	IPE	5.61E-5	1.03E-5	6.11E-4	1.69E-2
		SPAR-3i				
North Anna 1&2 / 78/80 (NUPRA)	(10)HPI or LPI or ACC/LPR/HPR/AD/SG/AFW/CSR/FC	IPE	7.16E-5	6.64E-6	1.00E-3	6.64E-3
		SPAR-3i				
Point Beach 1&2 / 70/72 (NUPRA)	(3)1/2HPI/HPR/ACC/LPRPORV/ADSG/AFWS	IPE	1.15E-4	1.07E-5	1.00E-3	1.07E-2
		SPAR-3i				
Prairie Island 1&2 / 73/74 (CAFTA)	(6)1/2HPI/HPR/CSR(H) or 1/2LPR or 2/4FC	IPE	5.00E-5	4.60E-6	8.00E-4	5.75E-3
		SPAR-3i				
Salem 1&2 /77/81 (NUPRA)	(8)2HPI/ACC/AI/HPR/LPR/AR/CSI/CSR/3FC	IPE	6.25E-5 6.35E-5	3.10E-6 4.10E-6	1.00E-3	3.10E-3 4.10E-3
		SPAR-3i	3.26E-5	1.93E-7	4.03E-5	4.78E-3

(W design continued)

PLANT Commercial Operation (PRA Code)	MLOCA Success Paths	SOURCE	TOTAL CDF (/RY)	MLOCA EVENT TREE CDF(/RY)	MLOCA INITIATOR FREQUENCY (/RY)	CCDP (Given Initiation of MLOCA)
Seabrook / 90 (RISKMAN)	(14)1PORV/CHPI/HPI/LPI/LPR/AD/TB/SG/AFW/CSR	IPE	6.70E-5	1.00E-6	4.65E-4	2.15E-3
		SPAR-3i	1.26E-4	9.99E-8	4.03E-5	2.48E-3
Sequoyah 1&2 /81/82 (RISKMAN)	(6)CHPI/HPI//CHPR/HPR/LPRCSI/CSR(H)/FC	IPE	1.70E-4	1.67E-6	4.62E-4	3.63E-3
		SPAR-3i				
Shearson Harris 1 /87 (CAFTA)	(1)1/2HPI, 1/2LPR(H)	IPE	7.00E-5	3.50E-6	6.00E-4	5.83E-3
		SPAR-3i	5.55E-5	2.41E-4	4.03E-5	5.98E-3
South Texas Project 1&2 / 88/89 (RISKMAN)	(2)1/3HPI,1/3LPR(H),3/4ACC,1CSR or 2FC	IPE	4.27E-5	1.26E-6	4.63E-4	2.66E-3
		SPAR-3i				
Summer / 84 (GRAFTER)	(6)1/3HPI,1/2LPI,2/3ACC,HPR/LPRAD,SG/AFW/FC	IPE	2.00E-4	7.62E-6	8.00E-4	9.52E-3
		SPAR-3i				
Surry 1&2 / 72/73 (NUPRA)	(30)HPI/LPI/LPR/SG/AFW/CSI/CSR	IPE	1.17E-3 7.40E-5 (internal)	5.30E-6	1.00E-3	5.30E-3
		SPAR-3i		1.09E-7	4.03E-5	2.70E-3
Turkey Point 3&4 /72/73 (CAFTA)	(1)2/4HPI, 1/2LPI, 2/3ACC	IPE	4.62E-4	4.65E-6	1.00E-4	4.65E-2
		SPAR-3i				
Vogtle 1&2 / 87/89 (CAFTA)**	(16)2HPI/1LPI/3ACC/2AI/HPR/LPR/AD/SG/AFW/4FC	IPE	4.90E-5	4.37E-6	8.00E-4	5.46E-3
		SPAR-3i				
Watts Bar 1 / 96 (RISKMAN)	(2)2CHPI or HPI/2ACC/HPR/LPR	IPE	3.30E-4	1.79E-6	4.65E-4	3.85E-3
		SPAR-3i				
Wolf Creek / 85 (NUPRA)	(8)HPI/LPI/3ACC/AI/HPR/LPR/AR/AD/SG/AF	IPE	4.20E-5	1.85E-6	1.10E-3	1.68E-3
		SPAR-3i				
Zion /73 (GRAFTER)	(3)PORV/HPI/LPI/HPR/LPR/AD/SG/AFWS	IPE	4.00E-6	3.97E-7	1.10E-3	3.61E-4
		SPAR-3i				

NOTE:

* The Original PRA was Riskman with Large Event Tree/Small Fault tree model
** The Original PRA was Grafter model from Westinghouse
- CAFTA and NUPRA are Large Fault tree/Small Event tree models, and majority of licensee are using CAFTA, and many current GRAFTER and Riskman ;users are converting to CAFTA.

SUCCESS PATHS

- The first number is the number of success paths
- ACC: Accumulator
- AD: Steam Generator Atmospheric Dump Valve
- AFW: Auxiliary Feedwater System
- AI: Alternate Injection
- AR: Alternate Recirculation
- CHPI: Normal Makeup or Charging Injection
- CHPR: Recirculation during normal makeup
- CSI: Containment Spray Injection
- CSR: Containment Spray Recirculation
- FC: Fan Cooler
- (H): Requires Operator/human actions
- HPI: High Paressur Injection
- HPR: High Pressure Recirculation
- PORV: Power Operated Relief Valve
- SG: Steam Generator
- SV: Steam Generator Safety Valve
- TB: Turbine Bypass (Stop) Valve

Table 4. Mitigation Failure Sequence CCDP leading to Core Damage - B&W DESIGN

PLANT Commercial Operation (PRA Code)	TOTAL CDF (/RY)	LOCA Sequence CDF (without CRDM Ejection Sequences)			CCDP of LOCA Sequence (given Initiation of LOCA)		
		SLOCA	MLOCA	LLOCA	SLOCA	MLOCA	LLOCA
ANO-1 /74 (CAFTA)	4.67E-5	1.49E-5		7.52E-7	2.98E-3		7.52E-3
CRYSTAL RIVER 3 /77 (CAFTA)	1.53E-5	7.20E-6	1.67E-6	1.18E-7	3.60E-3	3.34E-3	2.36E-3
DAVIS-BESSE / 78 (CAFTA)	6.60E-5	2.10E-6	2.06E-6	1.08E-6	5.83E-4	6.87E-3	1.08E-2
OCONEE 1,2,&3 / 73/74/74 (CAFTA)	2.30E-5	3.70E-7	7.30E-6	1.90E-6	9.25E-5	1.04E-2	2.71E-3
TMI-1 / 74 (RISKMAN)	4.49E-5	7.85E-6	2.07E-6	1.43E-6	3.38E-3	7.48E-3	1.97E-2

Table 5. Mitigation Failure Sequence CCDP leading to Core Damage - CE DESIGN

PLANT Commercial Operation (PRA Code)	TOTAL CDF (/RY)	LOCA Sequence CDF (without CRDM Ejection Sequences)			CCDP of LOCA Sequence (given Initiation of LOCA)		
		SLOCA	MLOCA	LLOCA	SLOCA	MLOCA	LLOCA
ANO-2 / 80 (CAFTA)	3.40E-5	1.71E-6	1.74E-6	1.39E-6	1.39E-2	1.74E-3	3.43E-4
Calvert Cliffs 1&2 / 75/77 (CAFTA)*	2.40E-4	2.08E-5	3.59E-6	5.61E-6	4.12E-3	7.77E-3	2.78E-2
Fort Calhoun 1 / 73 (CAFTA)	1.36E-5	8.15E-7	1.22E-7	1.35E-7	8.15E-4	1.22E-3	1.35E-2
Millstone 2 / 75 (CAFTA)	3.42E-5	1.63E-6	1.27E-6	1.65E-6	7.24E-4	1.79E-3	2.58E-3
Palisades /71 CAFTA)	5.07E-5	1.50E-5	4.40E-7	1.80E-7	2.50E-3	1.10E-3	9.00E-4
Palo Verde 1, 2 ,& 3 / 86/86/88 (CRYSTAL)	9.00E-5	3.43E-6	2.26E-6	9.20E-7	4.29E-4	5.02E-3	4.38E-3
SONG 2&3 /83/84 (NUPRA)	3.00E-5	2.90E-6	4.00E-6	3.30E-6	2.90E-3	4.00E-3	6.60E-3
St. Lucie 1 / 76 (CAFTA)	2.30E-5	1.60E-6		3.49E-6	3.94E-3		1.31E-2
St. Lucie 2 /83 (CAFTA)	2.62E-5	2.11E-6		3.30E-6	5.20E-3		1.24E-2
Waterford 3 /85 (CAFTA)	1.80E-5	5.30E-6	1.14E-6	1.82E-7	1.19E-3	1.14E-3	3.64E-3

Table 6. Mitigation Failure Sequence CCDP leading to Core Damage - W DESIGN

PLANT Commercial Operation (PRA Code)	TOTAL CDF (/RY)	LOCA Sequence CDF (without CRDM Ejection Sequences)			CCDP of LOCA Sequence (given Initiation of LOCA)		
		SLOCA	MLOCA	LLOCA	SLOCA	MLOCA	LLOCA
Beaver Valley 1 / 76 (RISKMAN)	2.14E-4 (3-LOOP)	1.80E-5	1.87E-6		9.70E-4	4.05E-3	
Beaver Valley 2 /87 (RISKMAN)	1.92E-5 (3-LOOP)	4.21E-5	<1.00E-7		1.77E-3	<1.0E-4	
Braidwood 1&2 / 88/88 (RISKMAN)	2.74E-5 (4-LOOP)	5.66E-7	1.24E-7	3.66E-7	9.51E-5	1.55E-4	1.22E-3
Byron 1&2 /85/87 (GRAFTER)	3.09E-5 (4-LOOP)	7.64E-7	1.49E-7	4.11E-7	1.25E-4	1.86E-4	1.37E-3
Callaway / 84 (NUPRA)	5.85E-5 (4-LOOP)	4.29E-6	4.32E-6	2.17E-6	4.29E-3	4.32E-3	4.34E-3
Catawba 1&2 / 85/86 (CAFTA)	5.80E-5 (4-LOOP)	5.40E-6	7.10E-7	4.20E-7	1.35E-3	2.37E-3	1.40E-3
Comnache Peak 1&2 /90/93 (CAFTA)	5.72E-5 (4-LOOP)	1.65E-6	1.02E-6	2.85E-6	2.83E-4	2.19E-3	1.4-E-2
D.C. Cook 1&2 /75/78 (CAFTA)*	6.26E-5 (4-LOOP)	2.96E-5	4.31E-6	9.52E-7	4.35E-3	4.70E-3	3.17E-3
Diablo Canyon 1&2 /85/86 (RISKMAN)	8.80E-5 (4-LOOP)	9.00E-7	4.70E-6	2.40E-6	4.66E-4	1.02E-2	1.20E-2
Farley 1&2 /77/81 (CAFTA)**	1.30E-4 (3-LOOP)	1.74E-5	2.67E-6	3.76E-6	3.70E-3	3.47E-3	1.25E-2
Ginna /70 (CAFTER)*	8.74E-5 (2-LOOP)	4.96E-6	5.75E-6	3.09E-6	1.34E-2	1.44E-2	1.72E-2

(W design continued)

PLANT /Commercial Operation (PRA Code)	TOTAL CDF (/RY)	LOCA Sequence CDF (without CRDM Ejection Sequences)			CCDP of LOCA Sequence (given Initiation of LOCA)		
		SLOCA	MLOCA	LLOCA	SLOCA	MLOCA	LLOCA
H.B. Robinson 2 / 71 (CAFTA)	3.20E-4 (3-LOOP)	7.00E-6	5.23E-5	1.59E-5	4.67E-4	2.01E-2	3.18E-2
Indian Point 2 / 74 (RISKMAN)	1.90E-4 (4-LOOP)	5.66E-6	1.90E-6	2.56E-6	3.36E-4	4.13E-3	1.27E-2
Indian Point 3 / 76 (CAFTA)	4.40E-5 (4-LOOP)		3.92E-5			4.29E-2	
Kewaunee / 74 (GRAFTER)	6.65E-5 (2-LOOP)	1.25E-5	7.59E-6	1.84E-6	2.44E-3	3.22E-3	3.68E-3
McGuire 1&2 /81/84 (CAFTA)	4.00E-5 (4-LOOP)	1.10E-5	1.60E-6	1.90E-6	2.75E-3	5.33E-3	6.33E-3
Millstone 3 / 86 (CAFTA)	5.61E-5 (4-LOOP)	3.63E-6	1.03E-5	8.03E-6	4.00E-4	1.69E-2	2.07E-2
North Anna 1&2 / 78/80 (NUPRA)	7.16E-5 (3-LOOP)	1.01E-5	6.64E-6	4.09E-6	4.81E-4	6.64E-3	8.18E-3
Point Beach 1&2 / 70/72 (NUPRA)	1.15E-4 (2-LOOP)	1.96E-6	1.07E-5	2.58E-5	6.53E-4	1.07E-2	5.16E-2
Prairie Island 1&2 / 73/74 (CAFTA)	5.00E-5 (2-LOOP)	4.10E-6	4.60E-6	4.60E-6		5.75E-3	
Salem 1&2 /77/81 (NUPRA)	6.25E-5	2.50E-6	3.10E-6	1.20E-6	2.50E-3	3.10E-3	2.40E-3
	6.35E-5	2.30E-6	4.10E-6	1.00E-6	2.30E-3	4.10E-3	2.00E-3

(W design continued)

PLANT /Commercial Operation (PRA Code)	TOTAL CDF (/RY)	LOCA Sequence CDF (without CRDM Ejection Sequences)			CCDP of LOCA Sequence (given Initiation of LOCA)		
		SLOCA	MLOCA	LLOCA	SLOCA	MLOCA	LLOCA
Seabrook / 90 (RISKMAN)	6.70E-5 (4-LOOP)	3055E-6	1.00E-6	1.35E-6	1.98E-4	2.15E-3	6.65E-3
Sequoyah 1&2 /81/82 (RISKMAN)	1.70E-4 (4-LOOP)		1.67E-6			3.63E-3	
Shearson Harris 1 /87 (CAFTA)	7.00E-5 (3-LOOP)	2.30E-5	3.50E-6	3.10E-6	1.15E-2	5.83E-3	6.20E-3
South Texas Project 1&2 / 88/89 (RISKMAN)	4.27E-5 (4-LOOP)	2.42E-6	1.26E-6		1.15E-4	2.66E-3	
Summer / 84 (GRAFTER)	2.00E-4 (3-LOOP)	2.72E-5	7.62E-6	3.14E-6	3.40E-3	9.52E-3	1.05E-2
Surry 1&2 / 72/73 (NUPRA)	1.17E-3 7.40E-5 (internal) (3-LOOP)	1.14E-5	5.30E-6	4.57E-6	5.43E-4	5.30E-3	9.14E-3
Turkey Point 3&4 /72/73 (CAFTA)	4.62E-4 (3-LOOP)	2.58E-6	4.65E-6	1.66E-6	2.58E-2	4.65E-2	1.66E-1
Vogtle 1&2 / 87/89 (CAFTA)**	4.90E-5 (4-LOOP)	3.33E-6	4.37E-6	1.54E-6	5.05E-4	5.46E-3	5.13E-3
Watts Bar 1 / 96 (RISKMAN)	3.30E-4 (4-LOOP)	1.85E-5	1.79E-6	2.32E-6	6.42E-4	3.85E-3	1.14E-2
Wolf Creek / 85 (NUPRA)	4.20E-5 (4-LOOP)	6.67E-7	1.85E-6	1.37E-6	2.67E-4	1.68E-3	2.74E-3
Zion /73 (GRAFTER)	4.00E-6 (4-LOOP)	1.54E-7	3.97E-7	1.32E-6	2.26E-5	3.61E-4	4.40E-3