Attachment 3

Mitigating Systems Performance Index Pilot Working Group Public Meeting October 22, 2003

Ongoing Research Activities

by

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Activities

- Completed Preliminary Draft Report on Pilot Results
- Assessing MSPI PRA Adequacy Issues
  - Sensitivity studies of the effect of PRA model differences on MSPI
  - Development of concept of MSPI pre-implementation checklist
  - Error analysis
- Evaluating various options to account for the effect of common cause on Fussell-Vesely importance
- Future task to benchmark MSPI and SDP results

Plant MSPI Results 4th Quarter 2002

Year 2000 Baselines, 8-hr EDG Mission Time, No CCF, No Risk Cap

Licensees' Plant PRA Model	Mitigating System EAC	HPI	HRS	RHR	SWS/CCW
Braidwood 1	9.60E-08	4.39E-08	2.28E-06	1.51E-08	2.82E-09
Braidwood 2	1.63E-07	2.00E-08	1.22E-07	1.71E-07	4.32E-08
Hope Creek	1.90E-07	5.61E-07	4.88E-07	1.73E-09	8.25E-08
Limerick 1	5.87E-08	5.88E-08	6.60E-08	3.96E-08	1.87E-08
Limerick 2	1.00E-07	6.45E-08	5.74E-08	9.65E-08	1.33E-08
Millstone 2	4.59E-07	2.65E-07	3.91E-07	3.75E-10	6.37E-07
Millstone 3	1.12E-06	5.64E-07	1.72E-06	1.46E-07	7.70E-08
Palo Verde 1	1.10E-07	2.42E-08	5.37E-07	8.30E-09	8.00E-08
Palo Verde 2	5.23E-08	1.35E-08	3.02E-06	6.01E-09	1.02E-07
Palo Verde 3	1.79E-07	2.38E-08	3.59E-07	4.01E-09	1.49E-07
Prairie Island 1	2.04E-07	6.48E-09	1.14E-07	7.65E-08	3.52E-07
Prairie Island 2	3.62E-07	1.03E-08	1.90E-08	2.59E-08	2.65E-07
Salem 1	2.84E-06	8.34E-09	4.03E-07	3.30E-07	1.14E-07
Salem 2	3.18E-06	4.20E-08	2.51E-07	9.79E-08	1.44E-07
San Onofre 2	1.49E-08	2.05E-08	4.35E-07	2.77E-10	9.53E-08
San Onofre 3	3.03E-09	4.73E-07	5.58E-07	4.28E-10	4.81E-07
South Texas 1	1.00E-07	5.71E-08	6.96E-07	4.58E-08	1.07E-08
South Texas 2	6.02E-08	2.02E-07	2.74E-07	5.21E-08	1.66E-07
Surry 1	3.91E-07	5.95E-09	3.16E-08	7.91E-09	1.97E-07
Surry 2	4.00E-07	3.42E-09	3.40E-08	1.92E-10	3.62E-07

Possible Sensitivity Study Outcomes

- Large impact
  - Factor of 10 or more on MSPI numerical result, and
  - Will change color (e.g. WHITE to GREEN, WHITE to YELLOW, etc.)
- Medium impact
  - Affects first significant figure of MSPI numerical result, and change > 1E-7
  - Possible change in color depending on how close to threshold
- Low or no impact
  - Affects second significant figure (or lower) of MSPI numerical result, or change < 1E-7
  - Unlikely to or will not change color

Braidwood Sensitivity Study

Change Set Group	Basic Event Affected or Description of Change	SPAR Enhanced Model Value or Description	Change
1. PORV Success Criterion	PORV success criterion change for feed and bleed	2 of 2 PORVs required for feed and bleed	1 of 2 PORVs required for feed and bleed
2. RCP Seal	RCS-MDP-LK-SEALS	1.9E-1	True
3. DC Bus Initiator	IE-LDCA	2.4E-7/h	7.3E-8/h
	DCP-BDC-LP-1A	9.0E-5	9.0E-6
	DCP-BDC-LP-1B	9.0E-5	9.0E-6
	DCP-BDC-LP-2A	9.0E-5	9.0E-6
	DCP-BDC-LP-2B	9.0E-5	9.0E-6
4. ESW Initiator	IE-LOESW	1.1E-7/h	6.0E-9/h
	ESW-MDP-FS-1A	3.0E-3	1.4E-3
	ESW-MDP-FS-1B	3.0E-3	1.4E-3
	ESW-MDP-FS-2A	3.0E-3	1.4E-3
	ESW-MDP-FS-2B	3.0E-3	1.4E-3
	ESW-MDP-TM-1A	9.8E-3	5.9E-3
	ESW-MDP-TM-1B	9.8E-3	5.9E-3
	ESW-MDP-TM-2B	9.8E-3	5.9E-3

Braidwood Sensitivity Study (cont.)

5. Feed & Bleed Initiation	HPI-XHE-XM-FB2	1.6E-1	5.1E-1
6. AFW Basic Events	AFW-MDP-FS-1A	2.8E-3 (*0.21 nonrecovery)	1.6E-3
	AFW-MDP-FR-1A	7.6E-4 (*0.75 nonrecovery)	3.2E-3
	AFW-MDP-TM-1A	1.1E-3	5.2E-3
	AFW-DDP-FS-1B	2.3E-2 (*0.25 nonrecovery)	1.3E-2
	AFW-PMP-CF-ALL	6.2E-8	3.3E-4
	AFW-XHE-XL-MDPFS	2.1E-1	True
	AFW-XHE-XL-MDPFR	7.5E-1	True
	AFW-XHE-XL-EDPFS	2.5E-1	True
	AFW-XHE-XL-EDPFR	7.5E-1	True
7. MFW/PCS	MFW-SYS-UNAVAIL	1.0E-1	Ignore
	MFW-XHE-ERROR	1.0E-2	5.3E-3
	PCS-XHE-XO-SEC	2.0E-1	True
	PCS-XHE-XO-SECL	3.4E-1	True

Preliminary Results for Braidwood - 1
(4th QTR 2002 Pilot results)

Large impact
- PORV success criterion: HRS changes from WHITE to YELLOW

Medium impact
- loss of DC initiator frequency: HRS becomes a higher WHITE
- AFW basic events: HRS becomes higher WHITE

Low or no impact
- RCP seal model
- ESW initiator frequency
- feed & bleed HRA (special case)
- MFW/PCS values
- effect on all other MSPI systems

MSPI Pre-Implementation Checklist

	Attribute	Expectation	Bases/Staff Guidance	List Value Used and Any Reasons for Significant Deviation	For NRC Staff Review and Disposition
1	LOOP Occurrences	List and describe site-specific LOOP initiating events considered in the PRA	Provides insight as to the appropriate LOOP frequency. No events tend to reduce estimated LOOP frequency. Occurrence of LOOP events would tend to increase frequency.		
2	Loss of Offsite Power (LOOP) Frequency	1.71E-02/yr	Latest from Industry Trends Program		
3	Emergency Diesel Mission Time	24 hours	ASME PRA Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications, Supporting Requirement SC-A5.		
4	Failure Data: EDG Fails to Start EDG Fails to Run	 1E-02 2E-4/hr	From MSPI Baseline data. Significant deviations shall be explained.		
5	EDG Unavailability	0.0049 to 0.0196	Range from MSPI Pilot (1999-2002)		
N	Birnbaum for EDG FTS -Two EDGs -Three EDGs -Four EDGs	 1E-5 to 1E-4 5E-6 to 5E-5 1E-6 to 1E-5	Highly dependent on numerous factors such as Alternate AC, battery life, CCF modeling, RCP seal failure model, AC-independent heat removal systems, and so on.		

Alternate Approach To Account for Common Cause

- Use of generic multipliers on FV based on observed ratios

$$[\Sigma FV_{Ind} + FV_{CC}] / \Sigma FV_{Ind}$$

- Preliminary values from SPAR model results for Pilot Plants:

2 EDG trains	~ 1.25x
3 EDG trains	~ 2.0x
4 EDG trains	~ 5x

- Diverse alternate power supplies would lower these factors
- Develop multipliers for the various component failure modes
- Consolidate as appropriate.

Another Alternate Approach To Account for Common Cause