July 1, 2003

MEMORANDUM TO: Stuart Richards, Chief
Inspection Program Branch
Division of Inspection Program Management
Office of Nuclear Reactor Regulation

Patrick D. O'Reilly
Operating Experience Risk Applications Branch
Division of Risk Analysis and Applications
Office of Nuclear Regulatory Research

FROM: Mark F. Reinhart, Chief/**RA/** M. Caruso for
Licensing Section
Probabilistic Safety Assessment Branch
Division of Systems Safety and Analysis
Office of Nuclear Reactor Regulation

SUBJECT: RESULTS OF THE OCONEE NUCLEAR STATION SDP PHASE 2 NOTEBOOK BENCHMARKING VISIT

During June, 2002, NRC staff and contractors visited the Duke Energy corporate offices in Charlotte, North Carolina to compare the Oconee Significance Determination Process (SDP) Phase 2 notebook and licensee's risk model results to ensure that the SDP notebook was generally conservative. The current plant probabilistic safety assessment's (PSA's) Rev. 2 internal event core damage frequency (CDF) was 1.63E-5 /reactor-year excluding internal flood events. The Oconee PSA did include external initiating events (e.g. fire, seismic, flood) and therefore sensitivity studies were performed to determine any impact of these initiators on SDP color determinations. In addition, the results from analyses using the NRC's draft Revision 3i Standard Plant Analysis Risk (SPAR) model for Oconee were also compared with the licensee's risk model. The results of the SPAR model benchmarking effort will be documented in the next revision of the SPAR (revision 3) model documentation.

In the review of the Oconee SDP notebook for the benchmark efforts, the team determined that some changes to the SDP notebook were needed to reflect how the Oconee plant is currently designed and operated. Thirty-four hypothetical inspection findings were processed through the SDP notebook and compared with the licensee's related importance measures. Results from this effort indicated that the risk impacts modeled in the SDP notebook were less

CONTACT: Mike Franovich, SPSB/DSSA/NRR
415-3361

conservative by 26 percent, more conservative by 38 percent (with 6 of 13 case over by two colors), consistently estimated by 24 percent, with 12 percent not modeled in the PSA or notebook. Consequently, 48 changes were made to the SDP notebook. Using the revised SDP notebook, the team obtained 9 percent of the cases that were less conservative, 38 percent were more conservative by one color, 47 percent of the cases were consistent with the licensee's results, and 6 percent not modeled. Of the conservative cases, all but two were one order of magnitude greater than the results obtained with the licensee's model and as such are generally consistent with the expectation that the notebooks should be slightly conservative when compared to the licensee's model.

At Oconee, the CDF contribution from internal events was 1.63E-5/yr (excluding internal floods), and the CDF contribution from floods, tornadoes, seismic, and fire, and other was 7.23E-5/yr (82 percent of total CDF). Examination of these external initiators showed that two components had increased importance. These cases were:

- Condenser circulating water (CCW) unavailable for the standby shutdown facility (SSF) auxiliary service water (ASW).
- Primary block valve for the pilot operated relief valve (PORV) fails to close on demand

Based on the licensee's model, the risk importance of these cases would be raised by one order of magnitude if the external initiators were included in the risk significance determination. However, the revised SDP notebook already characterized both cases as one color greater than the internal events case alone. Therefore, staff use of the inspection notebook for these cases would not under-estimate the risk of both internal and external contributors when compared to the licensee's model.

The licensee's PSA staff had substantial knowledge of both the Oconee PSA model and conduct of plant operations. The licensee's comments greatly improved the quality and content of the SDP notebook.

Attachment A describes the process and specific results of the comparison of the Oconee SDP Phase 2 Notebook and the licensee's PSA.

Attachments: As stated

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415-3361

Accession #
G://SPSB/Franovich/OconeeBench.wpd NRR-096

OFFICE	SPSB	SPSB:SC	RII
NAME	MFranovich:nxh2	MReinhart/RA/ M. Caruso for	WRogers
DATE	06/25/03	07/01/03	06/27/03

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SUMMARY REPORT ON BENCHMARKING TRIP

TO THE DUKE ENERGY COMPANY FOR OCONEE NUCLEAR

STATION, UNITS 1, 2, AND 3

Mohamad A. Azarm and Edward J. Grove

Energy Sciences and Technology Department
Brookhaven National Laboratory
Upton, N.Y. 11973-5000

Attachment

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1 INTRODUCTION

A benchmarking of the Oconee Nuclear Station, Units 1, 2, and 3 SDP risk-informed inspection notebook was conducted during a visit to the Duke Energy headquarters in Charlotte, N.C. on June 22-26, 2002. The SDP notebook is specifically tailored to Unit 3 with some major differences among the units footnoted in different worksheets. NRC staff (M. Franovich, W. Rogers, and R. Bernhard), supported by BNL staff (M.A. Azarm and E. J. Grove), participated in this benchmarking exercise.

In preparation for the visit, BNL staff reviewed the Oconee Nuclear Station SDP notebook and evaluated a set of hypothetical inspection findings using the Rev. 0 SDP worksheets, plant system diagrams, and information in the licensee's updated PSA. A copy of the agenda was sent to the licensee by NRC staff (M. Franovich) prior to the meeting.

The major activities performed during the headquarter's visit were:

1. Discussed licensee's comments on the Rev. 0 SDP notebook.

2. Obtained listings of the Risk Achievement Worth (RAW) values for basic events of the internal event PRA for average maintenance model.

3. Identified a target set of basic events for the benchmarking exercise.

4. Performed benchmarking of the Rev. 0 SDP worksheets with considerations of the licensee's proposed modifications to the SDP notebook.

5. Identified areas of discrepancies, requested additional case runs, and reviewed the licensee's PRA model to determine the underlying reasons. Proposed additional changes to the SDP notebook when appropriate.

6. Performed a benchmarking exercise using the revision 3i SPAR model for Oconee Nuclear Station Units 1 and 2 (by Mr. R. Buell from INEEL).

2 SUMMARY RESULTS FROM BENCHMARKING

This section provides the results of the benchmarking exercise. The results of the benchmarking analyses are summarized in Table 1. Table 1 consists of eight column headings. In the first column, the out-of-service components (human and recovery actions) are identified for the case analyses. The second column shows the associated colors based on the Rev. 0 SDP notebook. The third column shows the RAW values based on the licensee's latest PSA model. The site color estimated based on the RAW values are shown in the fourth column. The colors assigned for significance characterization from using the Rev. 0 SDP worksheets after incorporation of the licensee's comments are shown in the fifth column. The comparative results from the SDP notebook after incorporation of the licensee's comments with that of the licensee's RAW values (fourth column) is shown in the parentheses in the fifth column as well. The sixth column shows the internal plus the external events' RAW values. The site colors estimate based on these RAW values are shown in the seventh column. The basic events' name in the licensee's PSA, some notes regarding SDP evaluation schemes, and reasons for differences are noted in the eighth column. The comparative results noted in the fifth column are categorized as “Over,” “Match,” and “Under” standing for cases that were overestimated, matched, and underestimated.

After the initial analysis, it was found that in four cases the SDP notebook underestimates the plant's PSA, and in two cases it overestimates the plant's PSA with two orders of magnitude (two colors). An examination of the reasons behind these cases took place with the help of the licensee's staff. The four cases of underestimates were: Failure of all core flood tanks to inject, the total failure of LPR, failure of EFW cross-tie, and the failure of 1 CCW pump. The two cases that the SDP overestimated the licensee's PSA by two colors were the failure of one train of HPSI, and the failure of a HPSI pump. As it is obvious, these two cases are interrelated.

The results of our examination of the underestimates are discussed below:

Two of the underestimates were the importance of the core flood tanks and the operator failure to initiate the low pressure recirculation. Both of these events are important for the large LOCA initiator. The total initiating event frequency for large LOCA in the licensee's PSA is 3.38E-4 per reactor-year which is an order of magnitude higher than the SDP generic value. The PSA models two mechanisms for large LOCA to occur, one due to pipe break and the other due to loss of RCP seal in multiple pumps. The conditional probability of a large LOCA due to seal failures in multiple pumps is estimated as 2.5E-3 in the licensee's PSA. The generic SDP value for the LLOCA initiator will not be changed pending NRC's approval. Therefore, these two underestimates will be noted in Rev. 1 of the SDP notebook.

The EFW cross-tie between the units would perform exactly the same function as the use of ASW for secondary heat removal. The operator action for both of these events is dependent and treated as such in both the SDP notebook and the licensee's PSA. So, it is not surprising that the licensee's PSA provides similar RAW values for both components as examined by the PSA's minimal cutsets. However, the SDP notebook indicates that the ASW is more important than the EFW cross-tie. The reason behind this difference stems from the fact that the LOOP initiator in the SDP notebook is modeled as a site LOOP rather than a unit LOOP. Therefore, SDP does not credit the use of EFW cross-tie from the sister units in the LOOP scenarios. As a result, the EFW cross-tie would be less important than the ASW system. Since this assumption appears to be

reasonable, albeit conservative, and has been used consistently in all SDP notebooks, no change was proposed.

The fourth case of underestimation was the failure of one CCW pump. Further examination of the basic event “NCW0125VVT” showed that the impact of this event is more than the loss of one CCW pump, and it would result in loss of the SSF system. The failure of one CCW pump could not be found in the RAW table and it was shown to be green. Therefore, this case should be actually recorded as “Matched.” For the sake of record-keeping, we have not changed that in Table 1 even though we would treat this case as a “Match” in the remainder of this report.

The results of our examination for two cases of overestimations are elaborated below:

The SDP overestimations for one HPSI train or one HPSI pump are driven by the sequences in SLOCA, SORV, and MLOCA. The major contributors to these overestimations are from the sequences in SLOCA. The SLOCA event tree and worksheet were extensively modified per the licensee’s comments during the site visit. The licensee indicated that during the SLOCA, when the HPSI actuates, the primary pressure would increase such that it would open the PORVs/SRVs. Therefore, the operation of EFW or Feed and Bleed should not be questioned in the SLOCA event tree. Incorporating this comment would make the SLOCA accident progression exactly similar to that of MLOCA. The SLOCA initiating event frequency is one order of magnitude higher than the MLOCA initiating event frequency. Therefore, if the HPSI fails during SLOCA, it would result in a core damage. In reality, if the HPSI fails but EFW and PORVs are available, an operator could perform a fast depressurization followed by use of LPI. This success path, albeit difficult to perform, was not credited per the licensee’s comments; however, it is included as a recovery path in the licensee’s PSA. This is the underlying reason that the Rev.1 SDP notebook will generate overestimations in these cases. To be consistent with the licensee’s comments, the SLOCA worksheet will reflect the licensee’s proposed position; however, a footnote will be added to allow the inspector to apply a recovery action with a credit of 1 for evaluating the inspection findings associated with HPSI. By addition of this footnote, an overestimation by one color would be expected from the SDP Rev.1 notebook.

In conclusion, with the issuance of the Rev.1 SDP notebook and the discussion given above, we expect three cases of underestimates with the underlying reasons discussed above, and no cases of overestimation by two colors.

The summary statistics of the benchmarking results is provided in Table 2. This table shows the summary results obtained through benchmarking for both the Rev. 0 SDP and the revised notebooks. Examination of Table 2 shows that the revised SDP notebook should provide either similar or slightly more conservative significance characterization than the licensee’s PRA model in about 91% of the cases analyzed excluding NM (Not Modeled) cases . The three cases (9%) that the SDP underestimated the licensee’s RAW value were discussed earlier. Table 2 also shows the significant improvement that resulted from the benchmarking trip and would be gained from the future issuance of the Rev. 1 SDP notebook.

Table 1: Summary of Benchmarking Results for Oconee 3

Internal Events CDF is 1.63E-5/reactor-yr excluding internal flood at 1.0E-8 truncation limit
RAW Thresholds are W = 1.06, Y = 1.61, and R = 7.13

External & Internal Events CDF is 8.86E-5/reactor-yr,
RAW Thresholds are W = 1.011, Y = 1.11, and R = 2.13

Component Out-Of-Service	SDP Workshe et Results (Before)	Internal RAW	Site Color (Internal Event)	SDP Worksheets Results (After)	Internal + External RAW/ delta CDF	Site Color (Internal + External Event)	Comments
2/2 Core Flood Tank	Y	21.78	R	Y (UNDER)	7.83	R	PSA LLOCA frequency for Rev. 2 is 3.38E-4 **JCFTRABCOM**
1/2 Core flood Tank	G	1.0	G	G (MATCH)	1.0	G	**Truncated**
MD EFW Pump	G	1.13 (2.16E-6)	W	W (MATCH)	1.02 (2.16E-6)	W	3 A PUMP FTS FEFMDPAMPS
TD EFW Pump FTS	Y	1.13	W	Y (OVER)	1.02	W	FEFTDFPTPS
ASW Pump	R	1.15	W	Y (OVER)	1.79	Y	**NSFPU02APS** SSF ASW PUMP (FTS)
1 CCW Pump	G	1.3	W	G (MATCH) (see discussion)	2.06	Y	CCW-125 MANUAL VALVE LEFT CLOSED (this disables SSF not CCW) **NCW0125VVT**
LPSW Standby Pump FTS	R	NM	NM	R	NM	NM	**WLSPU3BWPS (TM contribution modeled in PSA)**
LPSW RUNING Pump	G	2.77	Y	Y (MATCH)	1.32	Y	**WLSPU3AWPR**
1 HPSW Pump	Y	1.01 (2.25E-7)	G	W (OVER)	1.004 (2.3E-7)	G	**WHSPU1BPPS**
1 HPI Train	Y	1.12 (2.05E-6)	W	R (OVER by 1 color see discussion)	1.02 (2.05E-6)	W	Surrogate event /Caserun **HLP0015MOV**

Component Out-Of-Service	SDP Workshe et Results (Before)	Internal RAW	Site Color (Internal Event)	SDP Worksheets Results (After)	Internal + External RAW/ delta CDF	Site Color (Internal + External Event)	Comments
1 HPI Pump	Y	1.01 (1.34E-7)	G	Y (OVER by 1 color see discussion)	1.01	G	**HHPPU3BHPS**
125V Battery 3CA fails		1.21	W	W (MATCH)	1.04	W	In SBO no TDEFW, and in LOOP no control power for one emergency AC
1 Keowee Hydro Unit	Y	1.14 (2.25E-6)	W	W (MATCH)	1.03	W	**PKTUNITHYS PKIUNITHYS**
Both Keowee Units	R	3.14	Y	R (OVER)	1.39	Y	**KK1B0THHYM**
1 SSF DG	Y	1.92	Y	Y (MATCH)	1.17	Y	**NACSFDGDGS**
RCM Pump FTS	Y	2.07	Y	Y (MATCH)	1.9	Y	**NSF3PU1DPS**
1 Air Compressor	Y	1.0	G	W (OVER)	1.0	G	**AIA0CPACMS**
1 PORV- 3RC66 FTO	G	1.13	W	W (MATCH)	1.04	W	**RRC0066PRO**
1 Block Valve	W	1.03	G	W (OVER)	1.08	W	**RRC0004DEX**
1 LPI - 3B or 3A (FTS)	Y	1.41	W	Y (OVER)	1.08	W	**LLPPU3ALPS**
1 Loop of RCW	G	1.0	G	W (OVER)	1.	G	**ARWU1FIDEX**
BWST Makeup	G	1.0	G	G (MATCH)	NM	NM	**Truncated**
Operator fails to initiate HPR	R	110	R	R (MATCH)	21.96	R	**HHPHPR0DHE**
Operator fails to initiate LPR	Y	21.8	R	Y (UNDER)	4.81	R	**LLPLPRODHE**
ISO/Equaliza-tion	R	1.18 (3.0E-6)	W	W (MATCH)	1.05 (3.95E-6)	W	**RRCDEPRDHE**
Operator fails to align EFW from other unit	NM	1.7	Y	W (UNDER)	1.13	Y	**FEFEFW1DHE**

Component Out-Of-Service	SDP Workshe et Results (Before)	Internal RAW	Site Color (Internal Event)	SDP Worksheets Results (After)	Internal + External RAW/ delta CDF	Site Color (Internal + External Event)	Comments
SRV Failure to Open (ATWS)	W	1.0	G	W (OVER)	NM	NM	NOT MODELED ATWS
PORV Failure to Reclose	R	1.39	W	Y (OVER)	1.07	W	**RRC0066PRC**
ISOSG (Isolate MSLB)	R	NM	NM	R	NM	NM	
XLPSW (in LLPSW)	G	1.67	Y	Y (MATCH)	1.12	Y	**WLSLPSWDHE**
BUS 3TC	Y	15.0 (2.29E-4)	R	R (MATCH)	3.66 (2.36E-4)	R	**PACX3TCBHF**
BUS 3TD	G	16.7 (2.56E-4)	R	R (MATCH)	3.93 (2.6E-4)	R	**PACX3TDBHF**
BUS 3 TE	G	3.5 (4E-5)	Y	R (OVER)	1.45 (4.28E-5)	Y	**PACX3TEBHF**
HPSW VALVE 555 TRANSFER CLOSED	NM	12.61	R	R (MATCH)	3.13	R	**HHS055VVT**

Table 2: Comparative Summary of Benchmarking Results

Total Number of Cases Compared	SDP Notebook Before (Rev. 0)		SDP Notebook After (Rev. 1)	
	Number of Cases (34)	Percentage	Number of Cases (34)	Percentage
SDP: Less Conservative	9	26	3	9
SDP: More Conservative	13 (6 over by 2 colors)	38	13	38
SDP: Matched	8	24	16	47
PSA or notebook: Not modeled	4	12	2	6

SDP Notebook After: Breakdown of Results

SDP Less Conservative - One Color: Core flood tanks, EFW cross-tie, and LPI system

SDP More Conservative - One Color: TDEFW, ASW, 1 HPSW, 1 HPSI, 2/2 Keowee units, 1 air compressor, one LPI pump, one RCW loop, Bus 3TE, PORV failure to re-close, and Block valve fail to close

Two Colors: None

3 PROPOSED REVISIONS TO REV. 0 SDP NOTEBOOK

Based on insights gained from the headquarters visit, a set of revisions is proposed for the Rev. 0 SDP notebook. The proposed revisions are based on the licensee's comments on the Rev. 0 SDP notebook, better understanding of the current plant design features, consideration of additional recovery actions, use of revised Human Error Probabilities (HEPs) and initiator frequencies, and the results of benchmarking.

3.1 Specific Changes to the Rev. 0 SDP Notebook for Oconee Nuclear Station, Units 1, 2, and 3

The licensee provided several comments for minor revisions to the SDP Notebook. The suggested changes dealt mainly with the initiating event frequencies, the dependency matrix, updated footnotes associated with the worksheets, and revised HEP values. These changes will be incorporated in the SDP worksheets. In addition, several major revisions that directly impacted the color assignments by the SDP evaluation were discussed with the licensee and their resolutions were identified in the meeting. The proposed revisions are discussed below:

Table 1:

1. Moved LOOP from Row I to Row II.
2. Moved LIA from Row III to Row II.
3. Moved LLPSW from Row III to Row II.
4. Moved LBUS3TC, LBUS3TD, and LBUS3TE from Row III to Row II.

Table 2:

1. Removed HVAC for AC Power, changed the IE column from All to LOOP; added a footnote 2 that HVAC is not needed for 72 hours.
2. Deleted Aux Air from the support for EFW MDEFW. Added a footnote 3 indicating that N2 backup exists for flow control valves, EFW can be cross-connected across units, and steam admission valves fail open on loss of DC. Excluded SLOCA and SORV from the IE column for EFW.
3. Deleted Aux Air from the support for TDEFW. Added a footnote reflecting that LPSW cooling from HPSW is available for TDEFW but not for MDEFW.
4. Added AC to support systems for UST.
5. For SSF: Added lake water through Unit 2 from CCW underground piping, and SSF auxiliary service water to support systems. Excluded SORV and SLOCA from the IE column.
6. For CCW: Changed the IE column to TPCS.
7. LPSW: Added 'CCW pathway' and 'ESAS' to support systems. Footnoted the operation of essential siphon vacuum (ESV) and Siphon seal water and indicated in footnote 4 that on low lake level LPSW requires success of ESV and SSW.
8. HPSW: Added 'Elevated Water Storage Tank' as a major component and added footnote 5 indicating that the head of the elevated service water tank is sufficient to provide HPSW flow without any pumps. Changed the IE column to LIA, LLPSW, and LBUS3TC.

9. Condensate/MFW: Added 'steam supply for MFW' to the support system column, and deleted Aux IA. Changed the IE column to TPCS.
10. DC Power System: Added a footnote 6 reflecting that HVAC is not needed for DC, and Chargers can carry SI (DC) loads without battery since the DC panel boards are cross-connected (auctioneered diodes).
11. Added a footnote 8 describing the importance of the N series breakers.
12. Added a footnote 9 describing the appropriate features of the SSF and ASW systems important to the SDP evaluation.
13. IA: Added 3 automatic backup, 2 manual AC driven service air, and one manual diesel driven pump compressors to the major components.
14. Main Steam: Added two main steam stop valves and 2 turbine bypass valves to major components. Excluded SLOCA and SORV from the IE column.
15. Pressurizer Pressure Relief: Added 120 VAC and RCP to support systems.
16. RCP: Identified the types of seals.
17. RCW: Changed the IE to TPCS and LIA.
18. BWST Makeup: Changed CAST to CBAST.
19. Added a new row for EWST with major components to be a 100,000 gallon tank, and support systems of 120 VAC and instrument for level instrumentation, the IE column of LLPSW.
20. Footnoted the following information: Plant internal event CDF excluding flood = 1.63E-5 per reactor-year, Internal flood = 9.4E-6 per reactor-year, fire = 4.5E-6 per reactor-year, seismic = 3.9E-5 per reactor-year, and tornadoes = 2.5E-5 per reactor-year.
21. Added description of of MD EFW mini-flow pump protection "self-contained Automatic Recirculation Control (ARC) valve with related pump suction strainer. A strainer was located in the suction piping from the hotwell to each MDEFW pump in order to prevent small foreign matter from the condenser from entering the Automatic Recirculation Control valve (located on the pump discharge) (UFSAR description). Potential fouling of the ARC valves with debris could degrade the MDEFW due to pump dead-heading if EFW flow is throttled back after OTSG refill.
22. Added description of TDEFW pump's minimum flow protection (continuous flow path with orifice).
23. Added description of AMSAC based on UFSAR writeup and that AMSAC is used in the ATWS worksheet.

Table 3.1: Credited ASW and EFW cross-tie each with an operator action = 1. Footnoted the success criteria for EIHP as 2 out 3 HPI pumps in either one train or 2 trains when the PORV is used for FB.

Table 3.2: Similar to Table 3.1.

Table 3.3: Removed EFW and FB from SLOCA worksheet.

Table 3.4 SORV: Removed EFW and FB from SLOCA worksheet.

Table 3.6: Removed unnecessary footnote 4.

Table 3.7 LOOP: Deleted SORV, REC 5, and FB2 and modified the worksheet and removed unnecessary footnotes. Added Footnote about Lee station (offsite) used as substitute power for Keowee hydro units.

Table 3.8 SGTR: Modified the event tree and the worksheet consistent with licensee's PSA.

Table 3.9: ATWS: Reflected the latest licensee's success criteria.

Table 3.10 MSLB: Modified the event tree and worksheet per licensee's input.

Table 3.11 LIA: Revised the mitigation capability for Secondary Heat Removal.

Table 3.12 LLPSW: Credited an operator action of 1 for flow through EWST for HPSW.

Table 3.13 Added RCP trip to safety functions and modified the worksheet and the event tree accordingly.

Additional changes made as a result of Case runs: (Tuesday June 25, 2002)

Table 1: Added ESF to line 6, added footnote about performance issues related to spurious ESF actuations should be referred to regional SRA.

Table 2:

1. Excluded LLPSW from IE for EFW MDP.
2. Changed the IE column for EFWTDP to All except SLOCA, SORV, MLOCA, MSLB, and LLOCA.
3. Added LBUS3TC to IE for LPSW.
4. Deleted TPCS from the IE column for HPSW.
5. Added LLPSW to IE column for pressurizer pressure relief.
6. Modified footnote 3 for ESW system reflecting that it also requires re-alignment to hotwell.

Table 3.4: Changed BLK credit from operator action to one train.

Table 3.8: Changed ISO operator action from 1 to 2.
Changed BWSTMU operator action from 1 to 2.
Changed first scenario to SGTR-ISO-DHR-BWSTMU.

Table 3.10: Revised value for EFW to 3 from 4.

Table 3.11 Deleted "and loss of LPSW flow control valves to the RHR heat exchanges" from footnote. The plant was modified to eliminate dependency on the AOVs (AOVs fail open); they now use MOVs to control SW flow to the LPI coolers

Table 3.12: Changed credit for XLPSW from 1 train to operator action = 1.

Table 3.13: Defined HPSW.

Table 3.15: In title, changed LBUS3TD to LBUS3TE.

3.2 Generic Change in IMC 0609 for Guidance to NRC Inspectors

No specific recommendation for changes to IMC 0609 was identified as a result of this benchmarking exercise.

3.3 Generic Change to the SDP Notebook

No generic change is currently identified. The generic lessons from the B&W plants will be compiled at a later date pending additional site visits.

4. DISCUSSION ON EXTERNAL EVENTS

The overall CDF contributions from both internal and external events is estimated around 8.86E-5 per reactor-year based on the PSA for Oconee Unit 3. The internal events excluding fire and flood account for about 20% of this contribution or 1.63E-5 per reactor-year. The CDF contributions of seismic, tornadoes, and fire are 3.9E-5, 2.5E-5, and 4.5E-6 per reactor-year respectively. The inclusions of the external events in risk characterizations would increase the importance of ASW and SSF from "W" to "Y," and the importance of block valves from "G" to "W." For the limited number of case runs conducted, the importance of all other components in terms of delta CDF would increase but not sufficient enough to change their color assignments.

5. LIST OF PARTICIPANTS

Mohamad Ali Azarm	BNL
Edward Grove	BNL
Mike Barrett	Duke Energy
Tom Baumgardner	Duke Energy
Duncan Brewer	Duke Energy
Julius Bryant	Duke Energy
Rudy Hart	Duke Energy
Mike Kitlan	Duke Energy
Steve Nader	Duke Energy
George Strickland	Duke Energy
Michael Weiner	Duke Energy
Robert Buell	INEEL
Mike Franovich	NRC-NRR
Rudolph Bernhard	NRC-Region II
Walter Rogers	NRC-Region II