March 24, 2003

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SUBJECT: RESULTS OF THE OYSTER CREEK NUCLEAR GENERATING STATION SDP PHASE 2 NOTEBOOK BENCHMARKING VISIT

During November, 2002, NRC staff and contractors visited the Oyster Creek Nuclear Generating Station (OCNGS) to compare the OCNGS Significance Determination Process (SDP) Phase 2 notebook and licensee's risk model results to ensure that the SDP notebook was generally conservative. The OCNGS PSA did not include external initiating events so no sensitivity studies were performed to assess the 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 OCGNS 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.

The benchmarking visit identified several areas where the SDP notebook needed to be modified. This was mainly due to new insights the licensee obtained in a recent PSA update. The results indicate that the OCGNS Phase 2 notebook was generally more conservative in comparison to the licensee's PSA. The revision 1 SDP notebook will capture 95% of the risk significance of inspection findings. A summary of the results of comparisons of hypothetical inspection findings between SDP notebook and the licensee's PSA are as follows.

5% (2 of 43 cases)	underestimation of risk significance
2% (1 of 43 cases)	overestimation of risk significance by three orders of magnitude
5% (2 of 43 cases)	overestimation by two orders of magnitude
37% (16 of 43 cases)	overestimation by one order of magnitude
42% (18 of 43 cases)	consistence risk significance
9% (4 of 43 cases)	comparable results not available

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The team found two cases of underestimations. Reasons for these underestimations can be summarized as follows:

1. An underestimation by one color was obtained for one of the two EDGs. A match was obtained for the other EDG. At the OCNGS, the combustion turbine cannot be aligned if EDG-2 is operating. The OCNGS PSA did not take this into account.

2. An underestimation by one color was also noted for a diesel fire pump. The diesel fire pump is credited in some small LOCA scenarios outside the containment which are not addressed in the SDP notebook. This is judged to have contributed to the underestimation.

The licensee's PSA staff was very knowledgeable of the plant model and provided very helpful comments during the benchmark visit.

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

Attachments: As stated

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SUMMARY REPORT ON BENCHMARKING TRIP

TO THE OYSTER CREEK NUCLEAR GENERATING STATION

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December 2002

Attachment A

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1. INTRODUCTION

A Benchmarking of the Risk-Informed Inspection Notebook for the Oyster Creek Nuclear Generating Station (OCNGS) was conducted during a plant site visit on October 30 to November 1, 2002. NRC staff (E. Cobey and P. Wilson) and BNL staff (P. Samanta) participated in this Benchmarking exercise.

In preparation for the meeting, BNL staff reviewed the SDP notebook for the Oyster Creek Nuclear Generating Station and evaluated a set of hypothetical inspection findings using the Rev. 0 SDP worksheets. In addition, NRC staff provided the licensee with a copy of the meeting protocol.

The major milestones achieved during this meeting were as follows:

1. Recent modifications made to the OCNGS PSA were discussed for consideration in the Rev. 1 model to be prepared following benchmarking.

2. Importance measures, including the Risk Achievement Worths (RAWs) for the basic events in the internal event model for average maintenance, were obtained from the licensee.

3. Benchmarking was conducted using the Rev. 0 SDP model and the revised SDP model considering the licensee's input and other modifications that were judged necessary based on comparison of the SDP model and the licensee's detailed model.

4. For cases where the color evaluated by the SDP notebook differed from that determined based on the RAW values generated by the updated licensee's PSA, a judgment about the difference was made based on the detailed base case results available for the plant. Minimal cutsets evaluating the impact of the hypothetical inspection findings were not available for comparison or for identifying the reason for the difference.

Significant changes were deemed necessary to the Rev. 0 SDP model to complete the Rev. 1 SDP notebook. This is because significant differences between the Rev. 0 model and the latest plant model, as represented by the dominant cutsets or the risk contributors in the base case core damage frequency model, were noted. As a result of benchmarking, the SDP notebook now reflects the plant-specific characteristics within the framework of the SDP modeling approach considering the latest plant-specific PSA for the plant.

2. SUMMARY RESULTS FROM BENCHMARKING

Summary of Benchmarking Results

Benchmarking of the SDP Notebook for the Oyster Creek Nuclear Generating Station (OCNGS) was conducted comparing the order-of-magnitude results obtained using the notebook with that obtained using the plant-specific PSA. Cases for which SDP notebook results were under or overestimated as compared to the OCNGS PSA were identified. One case of a conservative result by three orders of magnitude (i.e., the significance obtained using the notebook is three colors higher than that to be obtained using the plant PSA) and two cases of conservative results by two orders of magnitude were noted. In addition, two cases of underestimation by one color were noted. A summary of the results of the risk characterization of hypothetical inspection findings is as follows:

5% (2 of 43 cases)	underestimation of risk significance
2% (1 of 43 cases)	overestimation of risk significance by three orders of magnitude
5% (2 of 43 cases)	overestimation by two orders of magnitude
37% (16 of 43 cases)	overestimation by one order of magnitude
42% (18 of 43 cases)	consistent risk significance
9% (4 of 43 cases)	comparable results not available

Detailed results of Benchmarking are summarized in Table 1. Table 1 consists of seven columns. The first column identifies the components or the case runs. The assigned colors from the SDP Rev. 0 worksheets without incorporating any modification from the Benchmarking exercise are shown in the second column. The third column gives the basic event name in the plant PSA used to obtain the risk achievement worth (RAW) for the component out of service or the failed operator action. The fourth and fifth columns respectively show the licensee's internal RAW value and the color to be defined based on the RAW values, from the latest PSA model. The sixth column presents the colors for the inspection findings based on the Rev. 1 version of the notebook. The Rev. 1 version of the notebook was prepared considering the revisions to the Rev. 0 version of the SDP notebook judged applicable during Benchmarking. The last column provides comments identifying the difference in results between the SDP Rev. 1 notebook and the plant PSA, and the applicable rules in obtaining the color of the inspection finding using the SDP notebook.

Table 2 presents a summary of the comparisons between the results obtained using the OCNGS Notebook and the plant PSA. It also shows a comparison of the results using the Rev. 0 and Rev. 1 versions of the notebook. The results show that underestimations by the notebook were significantly reduced through revisions to the notebook implemented as a result of Benchmarking. However, overestimations also increased. The underestimations reduced from 33% to 5%, overestimations increased from 16% to 44% and the matches remained at 42%.

Discussion of Non-conservative Results or Underestimations by the Notebook

Two cases of underestimations were noted during the Benchmarking. They were related to one of the EDGs, and 1 diesel fire pump. Reasons for these underestimations can be summarized as follows:

1. An underestimation by one color was obtained for one of the two EDGs. A match was obtained for the other EDG. At the Oyster Creek plant, when EDG-2 is working, the combustion turbine will not be aligned. However, when EDG-1 is working, then the combustion turbine will be aligned through the other bus. This difference in plant-specific operational procedure was taken into consideration in determining the color using the SDP notebook. This resulted in different colors for the two EDGs (Yellow for EDG-1 and White for EDG-2). The plant PSA model does not take into account this difference at this time resulting in similar RAW values for both the EDGs.

2. An underestimation by one color was also noted for a diesel fire pump. The diesel fire pump is credited in some small LOCA scenarios outside the containment which are not addressed in the SDP notebook. This is judged to have contributed to the underestimation.

Discussion of Conservative Results by the Notebook

Nineteen cases of overestimation (one case by three colors, two cases by two colors, and sixteen cases by one color) were noted during Benchmarking. We first make some general observations regarding the overestimations by the SDP notebook and then discuss the overestimations by more than one color.

At the Oyster Creek plant, it was noted that small LOCA and stuck-open relief valves were important contributors. Stuck-open relief valve followed by either the failure of the core spray pumps or the failure to depressurize leads to core damage. These scenarios can occur as part of different transient initiators and they were important contributors for many different transient initiators. To account for this important characteristic of the risk analyses for the plant, we deviated from the standard SDP approach to modeling and modeled stuck-open relief valve for each of the transient initiators. In the standard approach, stuck-open relief valve is separated from transients and is modeled in a single, separate worksheet. However, in the Oyster Creek PSA, the likelihood of a stuck-open relief valve is approximately 1E-3, but in the SDP model it is considered a single train with a credit of 2, which is equivalent to 1E-2. This resulted in many sequences of an order of magnitude higher contribution in the SDP notebook contributing to many of the overestimations noted here.

An overestimation by three colors was noted for 1 circulating water pump. An overestimation by two colors was noted for 1 IA compressor and failure to inhibit ADS in an ATWS.

1. Inspection finding on a circulating water pump is assessed changing the initiator likelihood rating for TPCS from 1 to 0. However, in the plant PSA, the loss of a circulating water pump has minimal impact on the loss of circulating water initiator frequency, and also, the loss of circulating water frequency is estimated at 2.2E-2/reactor-yr. This difference in frequency, along with the difference in credit for a

stuck-open relief valve, as discussed above, is judged to have contributed to the overestimation.

2. Inspection finding on an instrument air compressor is overestimated by two colors. Again, the loss of an instrument air compressor has a minimal impact on the loss of instrument air frequency. However, in SDP evaluation, the initiator likelihood rating is changed by 1. This contributes to the overestimation along with the effect of the stuck-open relief valve discussed above.

3. Failure to inhibit ADS in an ATWS is overestimated by two colors. This is attributed to the difference in ATWS frequency. The ATWS frequency as calculated by the plant PSA was not available, but it is considered to be lower than the generic value assumed in the SDP notebook. Also, there were two basic events associated with the failure to inhibit, and a RAW combining both the actions was not determined. The overestimation by two colors is based on the RAW for one of the basic events.

Changes Incorporated Following Benchmarking Resulting in Updating of Benchmarking Results

Following Benchmarking, some changes were decided based on further review of the available information and to be consistent with the SDP modeling approach. This resulted in differences in colors for some of the inspection findings. The major changes and differences in colors for the inspection findings are discussed below.

1. The mitigation capability for containment heat removal (CHR) includes “1/2 containment spray loops with 1/2 pumps and associated 2/2 heat exchangers for that loop”. This capability was assigned a credit of “operator action = 3". On review of the human error probability (HEP), it was noted that the HEP is 1.3E-2 and accordingly, the credit was changed to operator action = 2 for all applicable cases.

2. For the late inventory (LI), the notebook credited “1/3 (1 diesel driven and the redundant motor driven) fire water pumps (operator action = 2)”. It was learned that fire pumps were not credited as late injection sources. However, aligning core spray to CST suction is used as late injection. The HEP for aligning late injection is 1.3E-2. The mitigation capability for LI is modified to remove the credit for fire water pumps and include credit for aligning core spray to the CST.

3. For loss of instrument air, CST spill valves will fail open resulting in loss of CST. Accordingly, credit for LI which involves aligning core spray to the CST is not applicable in such situations.

4. In the loss of instrument air worksheet, feedwater injection was credited during benchmarking. In such situations, feedwater injection will not be available and it is removed.

5. In the ATWS worksheet, Recirculation Pump Trip (RPT) is assigned a credit of “1 multi-train system”. It is noted that in the plant PSA, RPT was modeled as requiring all five recirculation pumps to trip. RPT credit was changed to “1 train”.

These changes resulted in the following differences in color for the Rev. 1 SDP notebook.

1. 1 SDC pump/train changed from Green to Yellow resulting in an overestimation by one color compared to the plant PSA.

2. 1 IA compressor changed from White to Yellow resulting in an overestimation by two colors.

3. 1 RPT train changed from Green to Yellow resulting in an overestimation by 1 color from an underestimation by 1 color.

4. Failure to SDC changed from Green to Yellow resulting in an overestimation by one color.

5. Failure to CV changed from changed from White to Yellow resulting in a match.

6. Failure to IC makeup changed from Yellow to Red resulting in an overestimation by 1 color.

Table 1: Summary of Benchmarking Results for Oyster Creek Nuclear Generating Station

Internal Event CDF (including internal flooding): 6.27E-6/reactor-year; Truncation limit: 1E-13

RAW thresholds are W = 1.16, Y = 2.59, and R = 16.95.

Item Out of Service or Failed Operator Action	SDP Worksheet Result (Before)	Oyster Creek Basic Event	Oyster Creek RAW Ratio	Color by Oyster Creek RAW	Mod. (Rev. 1) SDP Worksheets Color	Comments
Component						
1 MDMFW pump (PCS)	G	PM002002AR	1.03	G	G	
1 MD Cond. pump (PCS)	G	PM002001AR	1.08	G	G	
1 Circwater pump	W	PM003002R	1.09	G	R	**Over (triple)** Evaluation included changing TPCS IEL from 1 to 0.
1 Cond. Trans. pump	G	PM0110001R	1.0	G	G	
1 EMRV (FTO)	W	RV0NR108AD	1.30	W	Y	**Over**
1 EMRV (FTC)	W	RV0NR108AR	8.69	Y	R	**Over**
1 SDC pump/train	G	PM0170001R	1.24	W	Y	**Over**
1 CS loop	Y	MV0200018T	15.86	Y	R	**Over**
1 CS pump	W	PM0200001AX	1.28	W	Y	**Over**

Item Out of Service or Failed Operator Action	SDP Worksheet Result (Before)	Oyster Creek Basic Event	Oyster Creek RAW Ratio	Color by Oyster Creek RAW	Mod. (Rev. 1) SDP Worksheets Color	Comments
1 Cont. Spray loop	G	HX02101ABP	2.03 for A or B;1.42 for C or D	W	Y	**Over**
1 Cont. Spray pump	G	PM021001AS	1.01	G	W	**Over**
AC Bus: 4160 V 1C	Y	CB4KV001CT	90.81	R	R	
AC Bus: 4160V 1D	R	CB4KV001DT	98.01	R	R	
EDG-1	G	DGEDG0001S	3.25	Y	Y	
EDG-2	G	DGEDG0002S	3.31	Y	W	**Under** [(1)]
2 EDGs	W	CCFDG1DG2S	32.3	R	R	
1 Combustion Turbine	G	CT52G001R	1.25	W	W	
DC Bus C	R	BT062B001D	386	R	R	
Battery C	R	BT062B001D	386	R	R	Assuming battery charger cannot carry SI loads
Battery Charger C1	Y	BC062C0C1R BC062C0C1R	386	R	R	
DC Bus B	R		506	R	R	
1 CRD pump	G	PM0NC008AR	1.0	G	G	
1 IA compressor	W	CP0060001R	1.02	G	Y	**Over (double)**

Item Out of Service or Failed Operator Action	SDP Worksheet Result (Before)	Oyster Creek Basic Event	Oyster Creek RAW Ratio	Color by Oyster Creek RAW	Mod. (Rev. 1) SDP Worksheets Color	Comments
1 Isolation Condenser (IC)	Y	MV0140034D	1.24	W	Y	**Over**
1 SLC pump	G	PM019001AS	1.02	G	G	
1 RBCCW pump	G	PM0050001R	1.00	G	G	
1 RPT train	G	BKRPT0MGAO	2.17	W	Y	**Over**
1 TBCCW pump	W	PM0050004S	1.0	G	W	**Over**
1 ESW loop	G	PM02101APB	2.03	W	Y	**Over**
1 SW pump	G	PM0030001AR	1.08	G	G	
Cont. Vent valve	G		NA		Y	Assumed only hardened vent path [(2)]
1 Diesel Fire pump	G	PD0090001S	1.62	W	G	**Under**
Operator Actions						
Fails to control FW	G		1.33	W	Y	**Over**
IC Makeup	R	OHEMU1/OHEMU2	7.92 &1.14	Y	R	**Over** [(3)]
Fails to DEP	R	OHEAD3	44.01	R	R	
Fails to SDC	G	HAOHESD1	1.24	W	Y	**Over**
Fails to CV	G	OHEV1	9.03	Y	Y	
Operator fail to align Core Spray to CST	G	HAOS1	1.02	G	W	**Over**

Item Out of Service or Failed Operator Action	SDP Worksheet Result (Before)	Oyster Creek Basic Event	Oyster Creek RAW Ratio	Color by Oyster Creek RAW	Mod. (Rev. 1) SDP Worksheets Color	Comments
Fails to initiate SLC	Y	OHEBI1	1.32	W	Y	**Over**
Fails to INH	Y	HAOL2	1.07	G	Y	**Over (double)** (4)
RLOOP30MIN	G		NA		G	OYST recovery includes Gas Turbine (5)
RLOOP 1 HR.	G		NA		G	OYST recovery includes Gas Turbine (5)
REC8			NA		W	OYST recovery includes Gas Turbine (5)

Notes:

1. As noted in the LOOP worksheet, for one of the EDGs, combustion turbine is not aligned. SDP evaluation was carried out considering this difference. PSA model does not take into account this difference resulting in similar RAW values for both the EDGs.

2. In the SDP evaluation, only hardened vent is credited. In the Oyster Creek PSA, other vent paths were credited. No directly comparable basic event was identified. A comparable basic event will be the operator failure to vent with a RAW of 9.03. That will imply a match for this finding.

3. In the plant PSA, two separate basic events were used to describe IC makeup. A comparable RAW should be obtained assuming failure of both the basic events. In the SDP notebook evaluation, both functions were failed. The comparable plant RAW will be higher than the individual RAWs for each of the basic events listed here.

4. In the plant PSA, two separate basic events HAOL2 and HAOL3 were used. A RAW considering failure of both the actions is not available.

5. In the plant PSA, a single basic event combines both the recovery of offsite power and aligning of the combustion generator. In the SDP model, these two actions were separated and the credits were assigned separately. A separate RAW for the comparable recovery action of offsite power was not available.

Table 2. Comparative Summary of Oyster Creek Benchmarking Results

Comparisons	Rev. 0 SDP Notebook		Following Benchmarking	
	Total Number of Cases Compared = 43			
	Number of Cases	Percentage	Number of Cases	Percentage
SDP: Less Conservative	14 (1)	33	2	5
SDP: More Conservative	7 (2)	16	19 (3)	44
SDP: Matched	18	42	18	42
Comparable RAW not available	4	9	4	9

Notes:

1. 4 cases by two colors and remaining 10 cases by a single color.

2. 1 case by two colors and remaining 6 cases by a single color.

3. 1 case by three colors and two cases by two colors. Others are by a single color.

3. PROPOSED MODIFICATIONS TO THE REV. 0 SDP NOTEBOOK

A set of modifications are proposed for the Rev. 0 SDP notebook as a result of the site visit. These proposed modifications are driven by the licensee's revisions to the plant's PSA, better understanding of the current plant design features, revised Human Error Probabilities (HEPs), modified initiator frequencies, and the results of Benchmarking.

3.1 Specific Changes to the Rev. 0 SDP Notebook for the Oyster Creek Generating Station

The following changes were made based on the licensee's inputs and evaluations conducted as part of Benchmarking:

Summary of Changes to Oyster Creek following Benchmarking

1. Changes to Table 1

    1.1. Five new initiating events were added. They were Loss of Instrument Air (LOIA), Loss of Reactor Building Closed Cooling Water (RBCCW), Loss of 125 VDC Bus B (LDCB), Loss of 4.16kV Bus 1C (L4VC) and Loss of 4.16kV Bus 1D (L4VD). LOIA was assigned to Row II based on its frequency of 5.27E-2/reactor-year. RBCCW was assigned to Row III based on its frequency of 4.41E-3/reactor-year. LDCB was assigned to Row III based on its frequency of 1.74E-3/reactor-year. L4VC and L4VD were assigned to Row IV based on their frequency of 6.55E-4/reactor-year.

    1.2. Loss of Turbine Building Closed Cooling Water (TBCCW) was moved to Row III based on the revised plant-specific frequency of 1.56E-3/reactor-year.

    1.3. Stuck-open relief valve (SORV) was deleted because of the different modeling approach used for this plant. SORV sequences were included in the respective transient worksheets. (Please refer to discussions below).

    1.4. Small LOCA (SLOCA) was moved to Row III based on the plant-specific frequency of 9.8E-4/reactor-year.

    1.5. Large LOCA (LLOCA) was moved to Row IV based on the plant-specific frequency of ~ 7E-4/reactor-year. LLOCA at Oyster Creek includes medium LOCA (MLOCA) and MLOCA was not modeled separately. (Please refer to the discussions below)

2. Changes to Table 2

    2.1 For condensate transfer pumps, it was noted that backup accumulators were available for loss of IA.

    2.2 For MSIV, Instrument N_2 was removed from the Support Systems column. A footnote was added stating that Instrument N_2 is backup only for inside MSIVs.

2.3 For Turbine Bypass valves, DC was removed from the Support Systems column and Turbine Control System was added.

2.4 For EMRVs, ESFAS and CS (permissive signal) were removed from the Support Systems column.

2.5 For Containment Spray System, Major Components Column was modified to read “two heat exchangers operating in series per loop”. ESFAS was removed from the Support Systems column.

2.6 For Combustion Turbines, Major Components column was modified to read “starting Diesel, SBO Transformer, Switchgear”. In the Support Systems column, Natural Gas was noted as the Support system with Fuel Oil as the backup.

2.7 For DC Power, Switchgear was included as part of the Major Components.

2.8 For Control Rod Drive, TBCCW was removed from Support Systems.

2.9 For Instrument Air, Major Components was modified to 3 Air Compressors.

2.10 For Isolation Condenser, CT was removed from Support Systems.

2.11 For RBCCW, MOV was removed from the Major Components and Non-Vital AC was changed to Vital AC in the Support Systems.

2.12 For Circulating Water System, Intake Water was added as Support System.

2.13 For Emergency Service Water (ESW), Intake Water was added and ESFAS was removed from the Support Systems column.

2.14 For Service Water, Intake Water was added and AC was changed to Vital AC in the Support Systems column.

2.15 For Containment Venting, DC in Support Systems column was replaced with AC (rotary inverter). DC was backup with automatic switchover.

2.16 For Fire Protection Pumps, Major Components column was revised to read “2 Diesel-driven pumps, 1 Redundant MDP and Redundant Fire Water Tank, Self-Contained batteries”. In the Support Systems column, DC and CS (flow path) were removed, and Ac was changed to Non-Vital AC.

2.17 Footnotes were modified reflecting the above changes.

2.18 Initiating Event Scenarios column was revised to reflect the additional initiating events modeled and other changes defined here.

3. Changes to the Worksheets

3.1 ICMU mitigation capability was revised to “IC makeup with (1/2 condensate transfer pumps or 1/1 motor-driven fire pump or 1/2 diesel fire pumps)” from “1/2 condensate transfer pumps or 1/3 motor-driven fire pumps” with an operator action credit of 3. In cases where condensate transfer pumps were not available, only applicable fire pumps were credited with a credit of “1 train”.

3.2 Operator action credit was changed from 2 to 3 for DEP in all applicable worksheets.

3.3 For the CHR function, the mitigation capability relating to the use of SDC was changed from “2/3 Shutdown Cooling (SDC) trains (operator action = 3)” to “1/1 SDC train (3/3 pumps) (1 train)”. It was noted in the footnote that the plant’s engineering analysis assesses a success criteria of 2/3 pumps, but the success criteria of 3/3 was based on the modeling in the plant PSA.

3.4 For the CHR function, credit for the mitigation capability relating to the use of containment spray was changed from “1 multi-train system” to “operator action = 2". Operator action was required for containment spray and the human error probability (HEP) in the PSA was 1.3E-2.

3.5 For the LI function, fire pumps were not credited, because based on the PSA assumption, sufficient water was not available to prevent core damage. However, aligning core spray to take suction from the CST was credited, consistent with the plant PSA.

3.6 TPCS worksheet and event tree were modified to include the likelihood of stuck-open relief valve (SORV). Additional sequences for SORV were added.

3.7 SLOCA worksheet and event were modified to remove credit for using feedwater injection (FWI). Depressurization and use of core spray was needed for successful termination of a SLOCA.

3.8 SORV worksheet was deleted since the likelihood of SORV was directly included in applicable transient worksheets.

3.9 LLOCA worksheet: success criteria for EC was changed from 4/4 vacuum breakers to 14/14 vacuum breakers

3.10 In the LOOP worksheets, no credit was given for recovery of offsite power within 30 minutes consistent with notebooks for other BWR plants.

3.11 In the LOOP worksheet and the event tree, likelihood of RCP Seal LOCA was directly modeled similar to a SORV.

3.12 In the LOOP worksheet, a footnote was added regarding the use of combustion turbine depending on which EDG was operating.

3.13 The ATWS worksheet and the event tree were modified to reflect the need for feedwater injection in an ATWS. Without feedwater in an ATWS, core damage was assumed, consistent with the plant PSA. This is a deviation from the SDP modeling approach where loss of feedwater is assumed to be the transient for the ATWS. This deviation was needed to capture the significance of feed pumps in an ATWS.

3.14 In the ATWS worksheet, the mitigation capability for INH function was modified to include “level control”. In addition, the mitigation credit for RPT was changed from 1 multi-train system to 1 train since the pant PAR assumes that all pumps should be tripped.

3.15 In the TIW worksheet, the mitigation capability for CRD was changed to 1/2 CRD pumps.

3.16 New worksheet and event tree were added for the loss of Instrument Air (LOIA)

3.17 New worksheet and event tree were added for the loss of Reactor Building Closed Cooling Water (RBCCW)

3.18 New worksheet and event tree were added for the loss of 125 VDC Bus B.

3.19 New worksheet and event tree were added for the loss of 4kV Bus 1C.

3.20 New worksheet and event tree were added for the loss of 4kV Bus 1D.

3.2 Generic Change in 0609 for Inspectors

None identified.

3.3 Generic Change to the SDP Notebook

In completing the Oyster Creek Rev. 1 notebook, some changes were needed to characterize the risk insights from the plant PSA which can be considered deviations from the standard approach. This may apply to some other plants and is noted here.

1. As noted earlier, a dominant contributor for the Oyster Creek plant was the stuck-open relief valve with failure of the core spray or the failure to depressurize. This required the modeling of the stuck-open relief valve as part of the individual transient initiators as opposed to modeling this in a separate, single worksheet which is the standard practice for the SDP notebooks. This situation may apply to some other plants.

2. At Oyster Creek, recirculation pump seal LOCA is an important contributor in a LOOP scenario. Usually, recirculation pump seal LOCA was not modeled for BWR plants. This contributor may apply to some other plants of similar designs and may need to be considered.

3. At Oyster Creek, feedwater injection was needed in an ATWS. Without feedwater, a core damage was assumed in the plant PSA. To capture the significance of the

feedwater system, ATWS does not consider that the loss of feedwater resulted in the ATWS situation. In the SDP modeling, usually feedwater is not credited assuming loss of feedwater is the transient resulting in the ATWS.

4. DISCUSSION ON EXTERNAL EVENTS

Integrated external event PSA model was not available for the Oyster Creek plant. No evaluation was conducted for the external event risk during the Benchmarking exercise.

5. LIST OF PARTICIPANTS

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