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10 CFR 50
10 CFR 51
10 CFR 54

March 12, 2014

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

Limerick Generating Station, Units 1 and 2
Facility Operating License Nos. NPF-39 and NPF-85
NRC Docket Nos. 50-352 and 50-353

Subject: Requests for Additional Information for the review of the Limerick Generating Station, Units 1 and 2, License Renewal Application (TAC Nos. ME6555 and ME6556)

References: 1. Exelon Generation Company, LLC letter from Michael P. Gallagher to NRC Document Control Desk, "Application for Renewed Operating Licenses", dated June 22, 2011
2. Letter from Leslie Perkins (NRC) to Michael P. Gallagher (Exelon), "Requests for Additional Information for the Review of the Limerick Generating Station License Renewal Application," dated February 12, 2014

In the reference 1 letter, Exelon Generation Company, LLC (Exelon) submitted the License Renewal Application (LRA) for the Limerick Generating Station, Units 1 and 2 (LGS). In the reference 2 letter the NRC requested additional information to support the staff's review of the LRA.

The Enclosure contains the response to this request for additional information.

If you have any questions, please contact Mr. Al Fulvio, Manager, Exelon License Renewal, at 610-765-5936.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 3-12-2014

Respectfully,

Michael P. Gallagher
Vice President - License Renewal Projects
Exelon Generation Company, LLC

Enclosure: Response to Request for Additional Information

cc: Regional Administrator – NRC Region I
NRC Project Manager (Environmental Review), NRR-DLR
NRC Project Manager (Safety Review), NRR-DLR
NRC Project Manager, NRR- DORL Limerick Generating Station
NRC Senior Resident Inspector, Limerick Generating Station
R. R. Janati, Commonwealth of Pennsylvania

Enclosure
Response to Request for Additional Information

Introduction

Presented below are Exelon Generation's responses to each of the Requests for Additional Information (RAIs) set forth in a letter from Leslie Perkins (NRC) to Michael P. Gallagher (Exelon), "Requests for Additional Information for the Review of the Limerick Generating Station License Renewal Application," dated February 12, 2014. For each RAI, the NRC's question is repeated in its entirety, followed by Exelon Generation's response.

RAI #1

The following table provides a list of Potentially Cost Beneficial SAMAs that have been identified at other Mark II boiling water reactors (BWRs) that have completed license renewal. Additional information regarding these Potentially Cost Beneficial SAMAs is provided in the NRC's final supplemental EIS and the applicants' environmental reports. See References below.

Potential Cost Beneficial SAMAs at other Mark II BWRs

Nine Mile Point 2

- Provide redundant ventilation for residual heat removal (RHR) pump rooms.
- Provide redundant ventilation for high pressure core spray (HPCS) pump room.
- Provide redundant ventilation for reactor core isolation cooling (RCIC) pump room.
- Enhance loss of service water procedure.
- Enhance Station Blackout procedures.
- Use of a portable charger for the batteries.
- Hard pipe diesel fire pump to the reactor pressure vessel.
- Reduce unit cooler contribution to emergency diesel generator (EDG) unavailability by increasing the testing frequency.
- Reduce unit cooler contribution to EDG unavailability by providing redundant means of cooling.
- Improve procedure for loss of instrument air.
- Improve control building flooding scenarios.

Susquehanna

- SAMA 2a - Install minimal hardware changes and modify procedures to provide cross-tie capability between the 4 kilovolt (kV) alternating current (AC) emergency buses.
- SAMA 2b - Improve the cross-tie capability between 4 kV AC emergency buses, i.e., between A or D emergency buses and B or C emergency buses (a more flexible cross-tie option than SAMA 2a).
- SAMA 3 - Modify procedures to stagger RPV depressurization when fire protection system injection is the only available make-up source.
- SAMA 5 - Modify portable station diesel generator to automatically align to 125 V direct current (DC) battery chargers.
- SAMA 6 - Procure an additional portable 480 V AC station diesel generator to power battery chargers in scenarios where AC power is unavailable.

Columbia

- AC/DC-28 - Reduce common cause failures (CCFs) between EDG-3 and EDG-1/2.
- CC-03b - Raise RCIC backpressure trip set points.
- FR-07a - Improve the fire resistance of critical cables for containment venting.
- FR-07b - Improve the fire resistance of critical cables for transformer E-TR-S.
- FR-08 - Improve the fire resistance of cables to RHR and standby SW.
- HV-02 - Provide a redundant train or means of ventilation.
- SR-05R - Improve seismic ruggedness of MCC-7F and MCC-8F.
- FL-05R - Clamp on flow instruments to certain drain lines in the control building of the radwaste building and alarm in the control room.
- FL-04R - Add one isolation valve in the SW, turbine SW, and fire protection lines in the control building area of the radwaste building.
- FL-06R - Additional nondestructive evaluation (NDE) and inspections (in the control building).
- CC-24R - Backfeed the HPCS system with SM-8 to provide a third power source for HPCS.
- CC-25R - Enhance alternate injection reliability by including RHR, SW and fire water cross-tie in the maintenance program.
- OT-07R - Increase operator training on systems and operator actions determined to be

Potential Cost Beneficial SAMAs at other Mark II BWRs
important from the Probabilistic Safety Assessment. • FW-05R - Examine the potential for operators to control reactor feedwater (RFW) and avoid a reactor Trip. • OT-09R - For the non-Loss of Coolant Accident initiating events, credit the Z (power conversion system recovery) function. • FR-11R - Install early fire detection in the following analysis units: RC-02, RC-03, RC-04, RC-05, RC-07, RC-08, RC-11, RC-13, RC-14, and RC-1A

Exelon's ER does not specifically discuss whether these potentially cost beneficial SAMAs constitute new and significant information pertaining to the 1989 SAMDA analysis. Please provide a discussion of how, if at all, Exelon considered whether these potentially cost beneficial SAMAs impact the conclusions in the 1989 SAMDA regarding the risk and environmental impacts of severe accidents at LGS. Please indicate whether these SAMAs were discussed in Table A of Exelon's December 14, 2012, Counter Affidavit (ADAMS Accession No. ML12349A328). If so, what is the basis for Exelon's conclusions with respect to those SAMAs in Table A? If not, please provide the basis for why these SAMAs are not new and significant information with respect to the 1989 SAMDA.

Exelon Response

In the License Renewal Environmental Report for Limerick [7], Exelon used a process for identifying "new information" that considered information related to plant functions (e.g., plant changes or new severe accident challenges) that contribute to the consequences of a severe accident. Five plant functions were identified and an assessment was performed of new information that has become known concerning these functions. The assessment was focused on Limerick-specific information and general industry experience rather than specific SAMAs from other plants. For completeness, all of the SAMAs from other plants that are listed in RAI #1 are evaluated in this response to determine if they represent new and significant information with respect to the 1989 Limerick SAMDAs.

Since the definition of "significant" is not well established in the context of SAMA analysis, a review of PRA standards and relevant guidance documents has been performed to develop a basis for what is significant in the SAMA context. For the reasons stated below, Exelon has selected a 50% reduction in the maximum averted cost-risk (MACR) as the threshold for what may be "significant."

There are a few notable documents that provide numerical criteria that may be applied to determine the threshold for significance. The first one is the American Society of Mechanical Engineers (ASME)/American Nuclear Society (ANS) PRA Standard [8] which includes the following definition of a significant basic event.

> *significant basic event:* a basic event that contributes significantly to the computed risks for a specific hazard group. For internal events, this includes any basic event that has an FV [Fussell-Vesely] importance greater than 0.005 or a RAW [Risk Achievement Worth] importance greater than 2.

Similar numerical criteria also appear in NUMARC 93-01 [9], which includes the following guidance.

> An SSC would probably be considered risk significant if its Risk Reduction Worth exceeds 0.5 percent of the overall Core Damage Frequency (Risk Reduction Worth >1.005).
>
> […]
>
> An SSC [structure, system or component] would probably be considered risk significant if its Risk Achievement Worth shows at least a doubling of the overall Core Damage Frequency and should be provided to the expert panel as an input in risk determination.

Finally, NEI 00-04 [10] provides detailed guidance on categorizing structures, systems and components for licensees that choose to adopt 10 CFR § 50.69, *Risk-Informed Categorization and Treatment of Structures, Systems and Components for Nuclear Power Reactors*. In the discussion of using risk analyses for SSC categorization, the following guidance is provided.

> The risk importance process uses two standard PRA importance measures, risk achievement worth (RAW) and Fussell-Vesely (F-V), as screening tools to identify candidate safety-significant SSCs. The criteria chosen for safety significance using these importance measures are based on previously accepted values for similar applications.
>
> […]
>
> The importance measure criteria used to identify candidate safety significance are:
> - Sum of F-V for all basic events modeling the SSC of interest, including common cause events > 0.005
> - Maximum of component basic event RAW values > 2

In summary, an F-V value > 0.005 and a RAW value > 2 are well established indicators of PRA significance. This can be extended to apply to not just internal events core damage frequency (CDF) and large early release frequency (LERF), but to external events CDF and LERF, and other integrated key output figures of merit. In the context of license renewal, the accepted key output figure of merit for decision making is “potential averted cost risk.”

When averted cost risks are analyzed, the F-V importance measure would be highly dependent on the assumed reliability of the system once it is installed. This is illustrated in Figure 1 which shows an example of how the F-V value changes with assumed failure probability values given a case where a 50% reduction in the measured parameter is estimated assuming perfect reliability. In this example, a 0.005 F-V value would be obtained when the failure probability is ~0.005. This failure probability represents a system or component that is 99.5% reliable, which is fairly representative of many components modeled in typical PRA analyses.

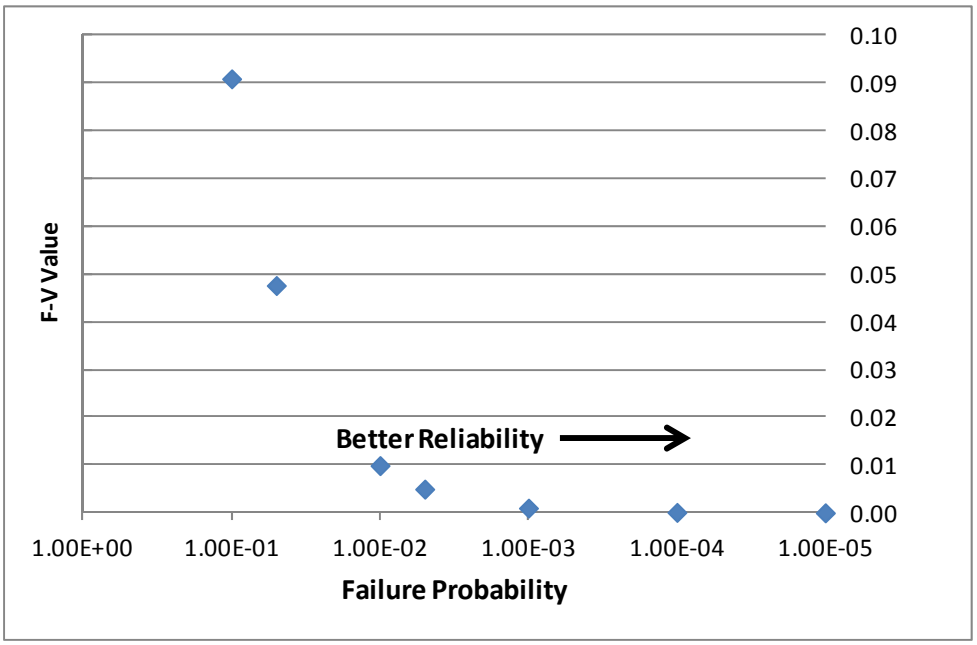

Figure 1
F-V AS A FUNCTION OF FAILURE PROBABILITY

On the other hand, as the reliability of the system increases (i.e., as the likelihood of system failure decreases), the RAW importance measure would asymptotically approach a RAW of 2 if 50% of the measured parameter can be averted. This is illustrated in Figure 2, which shows an example of how the RAW changes with assumed failure probability values when a 50% reduction in the measured parameter is estimated assuming perfect reliability. Therefore, a correlation to a RAW > 2 as the acceptance threshold for "significance" is established and a 50% reduction in the maximum averted cost-risk (MACR) is chosen for the "significance" threshold.

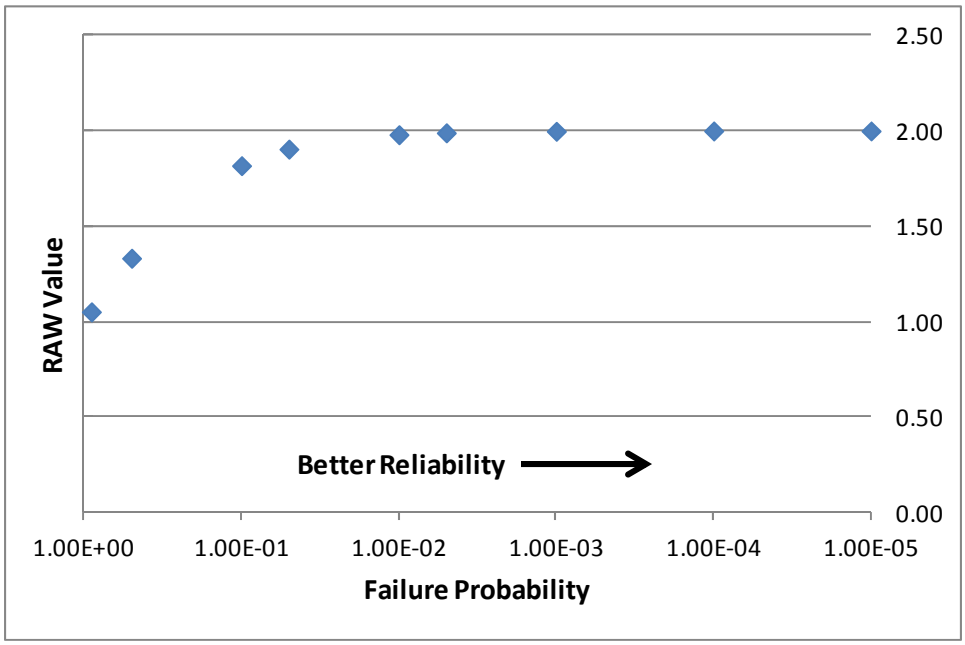

Figure 2
RAW AS A FUNCTION OF FAILURE PROBABILITY

In other words, the 50% MACR threshold would be equivalent to a highly reliable system leading to doubling the cost risk when it is taken out of service for maintenance. This correlates to a well-established threshold for determining risk significance in the PRA applications discussed above.

In summary, a RAW value of 2 is selected as the key acceptance criterion for determining the significance of a potential plant enhancement in this context. This is consistent with a well-established threshold for determining risk significance in various PRA applications, and correlates well with a 50% reduction in the MACR for a SAMA that is implemented. Therefore, a 50% reduction in the MACR is chosen for the significance threshold.

Table 1 summarizes Exelon's evaluation of each potentially cost beneficial SAMA identified in RAI #1. The evaluation identifies and eliminates from further consideration SAMAs that have already been implemented at Limerick. Then, the percent change in the MACR from implementing each remaining SAMA at the plant for which it was potentially cost-beneficial is estimated using cost-benefit information from the ER from which the SAMA was taken and/or the GEIS. To determine whether the SAMA should be considered "new and significant information" with respect to the 1989 Limerick SAMDA analysis, the percent change in the MACR was compared with the definition above of "significant." Changes at Limerick that are functionally equivalent but not identical to those named in a SAMA are also identified in Table 1. However, no SAMAs to which this situation applies were determined to be "new and significant." Hence, further assessment of such information was not needed.

As can be seen in Table 1, given that all of the items identified in RAI #1 have either already been implemented at Limerick or were not considered to be significant in the plants for which they were determined to be potentially cost-beneficial, there is no evidence to suggest that the SAMAs would be "new and significant" for Limerick.

TABLE 1
EVALUATION OF POTENTIALLY NEW AND SIGNIFICANT INFORMATION FOR LIMERICK

Item #	Short Description	Implemented at Limerick?	Base Case MACR	Base Case Averted Cost Risk	Percent Change	Evaluation
Nine Mile Point 2 (NMP2) – Information obtained from References [1] and [4]						
23a	Provide redundant ventilation for residual heat removal (RHR) pump rooms	No	$3.79M	$210K	5.5%	Not a significant SAMA for NMP2.
23b	Provide redundant ventilation for high pressure core spray (HPCS) pump room	No	$3.79M	$264K	7.0%	Limerick has HPCI not HPCS. Not a significant SAMA for NMP2.
23c	Provide redundant ventilation for reactor core isolation cooling (RCIC) pump room	No	$3.79M	$77.5K	2.0%	Not a significant SAMA for NMP2.
213	Enhance loss of service water procedure	No	$3.79M	$264K	7.0%	Station procedure S.10.7A (Abnormal Service Water System Operation) directs appropriate actions for Limerick given a total loss of SW event. Not a significant SAMA for NMP2.

TABLE 1
EVALUATION OF POTENTIALLY NEW AND SIGNIFICANT INFORMATION FOR LIMERICK

Item #	Short Description	Implemented at Limerick?	Base Case MACR	Base Case Averted Cost Risk	Percent Change	Evaluation
214	Enhance Station Blackout procedures	No	$3.79M	>$100K	>2.6%	Station procedure E1 (Loss of all AC power (Station Blackout)) directs appropriate actions for Limerick given an SBO event. Note that this SAMA was qualitatively assessed in NMP2 ER as providing greater than $100K of benefit. However, a best estimate or upper bound estimate was not provided. The actual benefit should be no more than that provided by SAMA 215 below, which is also applicable to SBO scenarios. Therefore, this is not a significant SAMA for NMP2.
215	Use of a portable charger for the batteries	No	$3.79M	$507K	13.4%	Not a significant SAMA for NMP2.
216	Hard pipe diesel fire pump to the reactor pressure vessel	No	$3.79M	$800K	21.1%	Not a significant SAMA for NMP2.
221a	Reduce unit cooler contribution to emergency diesel generator (EDG) unavailability by increasing the testing frequency	No	$3.79M	$342K	9.0%	Not a significant SAMA for NMP2.
221b	Reduce unit cooler contribution to EDG unavailability by providing redundant means of cooling (via procedure guidance to open EDG control panel room doors)	No	$3.79M	$872K	23.0%	Not a significant SAMA for NMP2.
222	Improve procedure for loss of instrument air	No	$3.79M	$273K	7.2%	Station Procedure ON-119 (Loss of Instrument Air) directs appropriate actions for Limerick given an LOIA event. Not a significant SAMA for NMP2.

TABLE 1
EVALUATION OF POTENTIALLY NEW AND SIGNIFICANT INFORMATION FOR LIMERICK

Item #	Short Description	Implemented at Limerick?	Base Case MACR	Base Case Averted Cost Risk	Percent Change	Evaluation
223	Improve control building flooding scenarios	No	$3.79M	$86.7K	2.3%	Limerick has implemented a change to permanently throttle a valve supplying the fire header in the 4 kV corridor area to substantially reduce flooding risk in the control enclosure. Not a significant SAMA for NMP2.
Susquehanna (SSES) - Information obtained from References [2] and [5]						
2a	Install minimal hardware changes and modify procedures to provide cross-tie capability between the 4 kilovolt (kV) alternating current (AC) emergency buses	Yes	N/A	N/A	N/A	Limerick already has full 4 kV emergency bus cross-tie capabilities from the main control room.
2b	Improve cross-tie capability between 4 kV AC emergency buses, i.e. between A or D emergency buses and B or C emergency buses (a more flexible cross-tie option than SAMA 2a)	Yes	N/A	N/A	N/A	Limerick already has full 4 kV emergency bus cross-tie capabilities from the main control room.
3	Modify procedures to stagger RPV depressurization when fire protection system injection is the only available make-up source	No	$1.09M	$138K	12.7%	Not a significant SAMA for SSES.
5	Modify portable station diesel generator to automatically align to 125 V direct current (DC) battery chargers	No	$1.09M	$368K	33.9%	Not a significant SAMA for SSES.
6	Procure an additional portable 480 V AC station diesel generator to power battery chargers in scenarios where AC power is unavailable	No	$1.09M	$267K	24.5%	Not a significant SAMA for SSES.

TABLE 1
EVALUATION OF POTENTIALLY NEW AND SIGNIFICANT INFORMATION FOR LIMERICK

Item #	Short Description	Implemented at Limerick?	Base Case MACR	Base Case Averted Cost Risk	Percent Change	Evaluation
Columbia (CGS) - Information obtained from References [3] and [6] (1)						
AC/DC-28	Reduce common cause failures (CCFs) between EDG-3 and EDG-1/2	No	$1.89M	$73K	3.9%	Not a significant SAMA for CGS.
CC-03b	Raise RCIC backpressure trip set points	No	$1.89M	$54K	2.9%	Not a significant SAMA for CGS.
FR-07a	Improve the fire resistance of critical cables for containment venting	No	$1.89M	$330K	17.5%	Not a significant SAMA for CGS.
FR-07b	Improve the fire resistance of critical cables for transformer E-TR-S	No	$1.89M	$75K	4.0%	Not a significant SAMA for CGS.
FR-08	Improve the fire resistance of cables to RHR and standby SW	No	$1.89M	$520K	27.6%	Not a significant SAMA for CGS.
HV-02	Provide redundant train or means of ventilation	No	$1.89M	$210K	11.1%	Not a significant SAMA for CGS.
SR-05R	Improve seismic ruggedness of MCC-7F and MCC-8F	No	$1.89M	$57K	3.0%	Not a significant SAMA for CGS.
FL-05R	Clamp on flow instruments to certain drain lines in the control building of the radwaste building and alarm in the control room	No	$1.89M	$250K	13.3%	Not a significant SAMA for CGS.
FL-04R	Add one isolation valve in the SW, turbine SW, and fire protection lines in the control building area of the radwaste building	No	$1.89M	$260K	13.8%	Not a significant SAMA for CGS.
FL-06R	Additional nondestructive evaluation (NDE) and inspections (in the control building)	No	$1.89M	$130K	6.9%	Not a significant SAMA for CGS.

TABLE 1
EVALUATION OF POTENTIALLY NEW AND SIGNIFICANT INFORMATION FOR LIMERICK

Item #	Short Description	Implemented at Limerick?	Base Case MACR	Base Case Averted Cost Risk	Percent Change	Evaluation
CC-24R	Backfeed the HPCS system with SM-8 to provide a third power source for HPCS	No	$1.89M	$170K	9.0%	Limerick has HPCI, not HPCS. Not a significant SAMA for CGS.
CC-25R	Enhance alternate injection reliability by including RHR, SW and fire water cross-tie in the maintenance program	No	$1.89M	$12K	0.6%	Not a significant SAMA for CGS.
OT-07R	Increase operator training on systems and operator actions determined to be important from the Probabilistic Safety Assessment	No	$1.89M	$200K	10.6%	Not a significant SAMA for CGS.
FW-05R	Examine the potential for operators to control reactor feedwater (RFW) and avoid a reactor Trip	No	$1.89M	$72K	3.8%	Not a significant SAMA for CGS.
OT-09R	For the non-Loss of Coolant Accident initiating events, credit the Z (power conversion system recovery) function	No	$1.89M	$130K	6.9%	Not a significant SAMA for CGS. This SAMA appears to represent a PRA modeling change rather than a plant enhancement that would reduce plant risk.
FR-11R	Install early fire detection in the following analysis units: RC-02, RC-03, RC-04, RC-05, RC-07, RC-08, RC-11, RC-13, RC-14, and RC-1A	No	$1.89M	$510K	27.0%	Not a significant SAMA for CGS.

(1) The information from the Columbia ER [3] was superseded in the GEIS [6]. The GEIS shows two sets of PRA results for the first six SAMAs. In those cases, the higher averted cost risk is shown in this table. In all cases for Columbia, the lower base case MACR value is shown in this table. These two choices ensure that the maximum percent change is conservatively reported for this assessment.

RAI #2

On page 5-6 of the ER, Exelon provides a history of the reductions in core damage frequency (CDF). Exelon further states that "the reduction in CDF reflects improvements in reliability data, improvements in procedural guidance and plant capabilities, and a reduction in the number of reactor trips." Furthermore Exelon states, "Reductions in CDF reflect implementation of the IPE, IPEEE, and CPI program."

What is the status of these improvements and mitigation measures? Please indicate which have been implemented and when. Describe other mitigation activities that have been implemented at LGS to substantially reduce the CDF or Large Early Release Frequency since the 1989 SAMDA.

Exelon Response

Table 6.2-2 of the Limerick IPE [11] listed four improvement items that were planned as part of the IPE and which were implemented prior to or shortly after the 1992 IPE submittal. These are listed below along with their current status.

- Relax restrictions in Drywell Spray Initiation Curve (Capability maintained in the drywell spray initiation limit curve in the site emergency operating procedures.)
- Create procedure to crosstie 4 kV electrical buses (Capability maintained in current site response procedures which allow for alignment of alternate power supply for any 4kV Safeguard Bus using any diesel generator.)
- Create procedure to power C & D ESW Pumps from Unit 1, Division 3 & 4 respectively. (Capability maintained in a current station procedure.)
- Create cross connection between diesel driven Fire Pump and Fire Water System and RHR. (Capability maintained in a current station procedure.)

Section 7 of the Limerick IPEEE [12] listed the following plant improvement items. All of the items were addressed shortly after the 1995 IPEEE submittal.

- Address housekeeping concerns identified from the seismic walkdowns. This included items such as unrestrained lifting devices, open S-hooks, and free standing equipment and maintenance concerns such as rusting support bolts and loose battery rack spacer pads. (A maintenance housekeeping procedure and a guidance procedure for storage and housekeeping are both active to ensure good housekeeping practices at the site.)
- Designate fire compartments 1, 7, 22, and 23 as transient combustible free zones. (Transient combustible free zones are currently controlled via an operations procedure.)
- Replace all wood scaffolding with metal scaffolding and revise procedures to prevent further use of wood scaffolding. (Scaffolding installation, inspection, and removal is controlled via a maintenance procedure. The original commitment was subsequently slightly altered to minimize use of wood scaffolding in the RCA. This change was reported to the NRC.)
- Revise the combustible control procedure to provide more conservative combustible control guidelines in safety related areas within the reactor enclosures. (Combustible controls are currently maintained via an operations procedure.)

- Administratively control additional doors as “fire” doors to limit the amount of air available for combustion. The existing doors are fire rated. (Fire barriers are currently controlled via a station procedure.)
- Increase the fire brigade drill activities and awareness of fixed combustible risk in fire compartments 2, 20, and 26. (Fire brigade activities are currently controlled via an operations procedure. The original commitment was subsequently slightly altered to indicate that fire drill scenarios should focus on realistic fire situations based on plant operating experience and that challenge plant operations in risk significant areas.)

As noted in NEI 91-04 [13], the CPI program issues applicable to Limerick were effectively subsumed into the IPE process in Supplement 1 and 3 to Generic Letter 88-20. Additionally the Emergency Procedure Guidelines (EPG) and Severe Accident Guidelines (SAG) developed by the BWROG and implemented at Limerick incorporate the accident management strategies identified in the CPI program and elsewhere [14]. Therefore, other than EPG/SAG implementation, there are no additional specific items to list related to the CPI program.

Note that in addition to the items noted above, other plant enhancements have been made over the years at Limerick since the 1989 SAMDA. Examples of changes that have been implemented at the site to substantially reduce CDF and LERF since the 1989 SAMDA include the following items.

- Isolation valves were installed in the ESW loop piping to limit the affected portions of ESW during maintenance to one unit at a time.
- Technical Support Guidelines were developed to refill the CST from the existing fire system.
- The 4 kV corridor fire header valve was locked throttled to reduce internal flooding risk in that area.

References

[1] U.S. Nuclear Regulatory Commission (NRC). May 2006. Generic Environmental Impact Statement for License Renewal of Nuclear Plants: Regarding Nine Mile Point Nuclear Station, Units 1 and 2 - Final Report (NUREG-1437, Supplement 24), Washington, D.C. (ADAMS Accession No. ML061290310).

[2] U.S. Nuclear Regulatory Commission (NRC). March 2009. Generic Environmental Impact Statement for License Renewal of Nuclear Plants: Regarding Susquehanna Steam Electric Station, Units 1 and 2 (NUREG-1437, Supplement 35), Washington, D.C. (ADAMS Accession No. ML090700454).

[3] U.S. Nuclear Regulatory Commission (NRC). 2012. Generic Environmental Impact Statement for License Renewal of Nuclear Plants: Regarding Columbia Generating Station — Final Report, Main Report, Volume 1 and Appendices, Volume 2 (NUREG-1437, Supplement 47, Vol. 1), Washington, D.C. (ADAMS Accession Nos. ML12096A334 and ML12097A271).

[4] Constellation Energy. May 2004. Nine Mile Point Nuclear Station. License Renewal Application, Environmental Information, Appendix F. Severe Accident Mitigation Alternatives (SAMAs) (ADAMS Accession No. ML041490222).

[5] PPL Susquehanna, LLC (PPL). September 2006. Susquehanna Steam Electric Station Units 1 and 2 Application for License Renewal, Appendix E: Applicant's Environmental Report – Operating License Renewal Stage. Allentown, Pennsylvania. (ADAMS Accession No. ML062630235).

[6] Energy Northwest. January 2010. Appendix E, Applicant's Environmental Report, Operating License Renewal Stage, Columbia Generating Station, Docket No. 50-397 License No. NPF-21. (ADAMS Accession No. ML100250666).

[7] Exelon Generation Company, LLC. June 2011. Applicant's Environmental Report - Operating License Renewal Stage, Limerick Generating Station, Units 1 and 2. (ADAMS Accession No. ML11179A104).

[8] ASME/ANS RA-Sa-2009, February 2009. Addenda to RA-S-2008, Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications.

[9] NUMARC 93-01. April 1996. Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants, Revision 2.

[10] NEI 00-04. July 2005. 10 CFR 50.69 SSC Categorization Guideline.

[11] Philadelphia Electric Company. July 1992. Individual Plant Examination Limerick Generating Station Units 1 & 2.

[12] PECO Energy. June 1995. Limerick Generating Station Units 1 & 2 Individual Plant Examination for External Events (IPEEE).

[13] NEI 91-04 (Formerly NUMARC 91-04). December 1994. Severe Accident Issue Closure Guidelines, Revision 1.

[14] BWR Owners' Group. March 2001. Emergency Procedure and Severe Accident Guidelines, Revision 2.