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December 3, 1998
PY-CEI/NRR-2342L

United States Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Perry Nuclear Power Plant
Docket No. 50-440
Supplemental Letter to the License Amendment Request
Regarding Extending The Emergency Diesel Generator
Completion Time to 14 Days

Ladies and Gentlemen:

This letter supplements the September 3, 1998 license amendment request (PY-CEI/NRR-2319L) submitted by the Perry Nuclear Power Plant (PNPP) staff, which request an extension of the Emergency Diesel Generator (EDG) Technical Specification (TS) Action Completion Time to 14 days for a Division 1 or 2 EDG and allowance to perform the EDG 24-hour TS Surveillance Requirement test in Modes 1 and 2. Approval of this license amendment request is expected to reduce the complexity of activities performed during refueling outages, therefore reducing human performance errors and the duration of refueling outages, while not adversely impacting the margin of safety.

Information regarding the May 1997 Peer Review Certification of the PNPP Probabilistic Safety Assessment (PSA) model has been requested to assist the NRC in reviewing the aforementioned EDG license amendment request. This information will aid in defining a "qualified" PSA model to be used to support risked based decision making. Attachment 1 provides the elements of the final PSA Peer Review Certification report that applies to the EDG license amendment request.

The PNPP staff is encouraged by the NRC Staff's efforts towards risk based decision making to enhance safety decisions and to improve regulatory efficiency. The PNPP staff looks forward to fully supporting this initiative. The PNPP PSA Peer Review Certification report is maintained onsite, and is available for NRC Staff review.

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If you have questions or require additional information, please contact Mr. Henry L. Hegrat, Manager - Regulatory Affairs, at (440) 280-5606.

Very truly yours,

Lea W Myers

Attachment

cc: NRC Project Manager
NRC Resident Inspector
NRC Region III
State of Ohio

Probabilistic Safety Anaysis Model Certification for the Perry Nuclear Power Plant

During May, 1997, the Perry Nuclear Power Plant (PNPP) participated in a "PSA Peer Review Certification" administered under the auspices of the Boiling Water Reactor Owner's Group (BWROG) Peer Certification Committee. The purpose of the Probabilistic Safety Analysis (PSA) certification process is to establish a method of assessing the technical quality of the PSA for the spectrum of its potential applications.

The Perry PSA Peer Review Certification team consisted of seven individuals with a combined 165 man-years of nuclear experience of which 111 man-years has been in the PSA area. These engineers and analysts provided both an objective review of the PSA technical elements and a subjective assessment based on their PSA experience. The review team had considerable expertise in both PSA development and PSA applications. The team was knowledgeable in the PSA methodology used for the PNPP PSA and BWR 6 plant design and operational practices.

The process used a tiered approach of checklists that allows for detailed review of the elements and the sub-elements of the PSA to identify PSA strengths and areas that need improvement. The checklists require implementation by an experienced team of PSA experts to be used effectively.

A grading system was used that allowed the certification team to focus on technical issues and to transmit that information in the form of a "grade" at a sub-element level. Four grades of certification were identified by the Nuclear Energy Institute (NEI) Risk Based Application Task Force (RBATF) as reasonable to span the spectrum of potential applications. These four grades are as follows:

GRADING SYSTEM

Grade 1 – Useful for Identifying Severe Accident Vulnerabilities, Accident Management Insights, and General Prioritization of Issues. This grade requires the minimum standard and has satisfied NRC expectations for responding to Generic Letter 88-20. Most PSAs are expected to be capable of meeting these requirements. This grade of certification would serve as an industry standard.

Grade 2 – Useful for Risk Ranking with Deterministic Input. This grade of certification requires a review of the PSA model, documentation, and maintenance program. Certification at this grade would provide assurance that, on a relative basis, the PSA methods and models yield meaningful rankings for the assessment of systems, structures, and components, when combined with deterministic insights (i.e., a blended approach).

Grade 3 – Useful for Risk Significance with Deterministic Input. This grade of certification extends the requirements to assure that risk significant determinations made by PSA using absolute risk insights are adequate to support a broader range of regulatory applications, when combined with deterministic insights.

Grade 4 - Useful as a Primary Basis for Decision Making. This grade of certification requires a comprehensive, intensively reviewed study, which has the scope, level of detail, and documentation to assure the highest quality of results. Routine reliance on the PSA as the basis for certain changes is expected as a result of this grade. It is expected that few plants would currently be eligible for this grade of certification.

It should be noted that while each of the four application oriented grades have different characteristics as previously delineated, the boundaries between the grades are not sharp. This leaves, in some cases, an element of judgement to be applied when assigning a specific application to a specific grade. This lack of sharp boundaries is due in part to the fact that varying degrees of supplementary deterministic considerations or focused PSA studies may be used with any of the four grades of PSA to effectively support an application.

PERRY PEER REVIEW

The following is a summary of the peer review performed at the Perry Plant during May 1997. The summaries are not inclusive; however, they address the areas germane to the applicable EDG Completion Time extension amendment request.

Grade 4 – Provides Primary Basis for Application

No elements associated with the qualitative summaries received a Grade 4

Grade 3 – Supports Risk Significant Evaluations with Deterministic Input

Thermal Hydraulic Analysis (TH) - The thermal-hydraulic analyses are plant specific and of sufficient detail to support most applications. The analysis uses plant specific Modular Accident Analysis Program (MAAP) runs as the basis for thermal-hydraulic treatment.

> TH Evaluation Performed: The thermal-hydraulic analyses are sufficient for the evaluation of the change in risk evaluated with the PSA model for the applicable EDG Completion Time extension amendment request.

Systems Analysis (Fault Trees) (SY) - The system modeling is considered a strength of the PNPP PSA process and is very thorough in its presentation of the important system insights and modeled attributes. The system fault trees are modeled to the major component level and very little modularization is used (strength).

The structure of the support system fault trees is constructed without their support modeled (i.e., to break logic loops). The use of common cause across divisions, even though the major equipment is different, should be investigated in more depth and incorporated if not justified otherwise. Spatial dependency evaluation needs strengthening. The clarity of the written support in the system notebooks is a strength. Success criteria used in the fault trees are based on the realistic MAAP analyses.

SY Evaluation Performed: In support of the applicable EDG Completion Time extension amendment request, the EDG and 4160 VAC circuit breaker common causes were incorporated into the revised model. The logic loop breaking associated with the EDGs, the Emergency Service Water (ESW) pumps and the electrical buses had no impact on the calculations performed in support of this EDG Completion Time extension amendment request.

Dependency Analysis (DE) - The Human Reliability Analysis (HRA) process is considered good and capable of supporting applications up to and including Grade 3. Common cause treatment was a strength of the DE element. The completeness of the walkdown for each system was a strength. The dependency matrices are controlled at too high a level to reveal train and loop dependencies; but the correct dependencies appear to be included in the systems analysis. There was adequate evidence of evaluation of high dependencies in the final cutsets although the modeling process is stated to have taken dependencies into account as part of the HRA.

DE Evaluation Performed: The dependency analyses are considered sufficient for the evaluation of the change in risk evaluated with the PSA model for the applicable EDG Completion Time extension amendment request.

Structural Response (ST) - The structural analysis performed supports assessments of containment, reactor pressure vessel, piping, and secondary containment for Level 1 and Level 2 PSA related issues. Acceptance criteria, e.g. Anticipated Transients Without Scram (ATWS), are consistent with current industry practices. PNPP uses generic pipe failure data normalized to the plant specific design, which is acceptable.

ST Evaluation Performed: The structural analysis is considered sufficient for the evaluation of the change in risk evaluated with the PSA model for the EDG Completion Time extension amendment request.

Quantification (QU) - All of the necessary sub-elements for performance of the quantification to achieve a Grade 3 are currently being performed. The inclusion of an uncertainty analysis, which is beyond what many Individual Plant Examination (IPE) submittals included, is considered a strength. The dominant sequences appear to be reflective of the physical configuration of the plant, account for multiple human recovery terms and have correctly broken logic loops. The method used to break logic loops may limit application of the model and needs to be reevaluated in light of expected applications. The truncation limit of 1E-10 is adequate for Grade 3 applications. The quantified results appear reasonable and traceable to plant unique features. All of the necessary sub-elements for performance of the quantification to achieve a Grade 3 are currently being performed.

QU Evaluation Performed: A review of the logic loop method and potential to impact this application was undertaken. The logic loop breaking associated with the EDGs, the ESW pumps, and the electrical buses had no impact on the calculations performed in support of the EDG Completion Time extension amendment request.

Grade 2 – Supports Risk Ranking Applications

Accident Sequence Evaluation (Event Trees) (AS) - The accident sequence analysis goes above and beyond the requirements in the IPE and is superior for addressing plant vulnerabilities. The event tree structure is complete and well documented. The Loss of Offsite Power (LOOP) event tree should be revisited to remove conservatism in the offsite AC power recovery, especially since the affected sequences dominate the computed Core Damage Frequency (CDF). Documentation of the accident sequence evaluation is excellent. One of the major strengths is the explicit cross-reference of values used in the evaluation to the source documents and calculations. Another significant strength is that the accident sequence calculations not only describe the systems that are credited in the model, but they also provide a good description of the front line systems that were not credited and the basis of the exclusion.

AS Evaluation Performed: The potential impact of the LOOP tree conservatism was investigated as it applies to the EDG Completion Time extension amendment. This conservatism is deemed to not affect the conclusion of the referenced amendment request. However, it is important to update the model as it applies generally to future applications at the next major revision. It is important to raise this element to Grade 3 quality. However, the current Grade 2 quality is adequate for the EDG Completion Time amendment.

Maintenance and Update Process (MU) - To date, the maintenance and update program for PNPP is only conceptual. Updates (e.g., Bayesian update of the PNPP specific EDG failure data), and changes affecting the PSA program, which are germane to the EDG Completion Time extension amendment request, have been incorporated. The review team provided a review based on intentions communicated by the lead of the PSA group. It is important, therefore, to carry through with completion the intentions to develop the program and dedicate additional personnel to assure a quality maintenance program and application of the PNPP PSA.

MU Evaluation Performed: Three additional personnel were assigned to the PSA element; however, the Lead Engineer of the element left employment of the PNPP. To augment the PSA staff, a consultant with more than ten years of PSA expertise was utilized. Additional consultant resources were used to provide expertise, where needed, in support of the calculations generated in support of the EDG Completion Time extension amendment request. Although a formal update process has not yet been developed in the form of a guideline, the program was reviewed to determine areas that were in need of update to support the applicable EDG Completion Time extension amendment request.

This effort included the development of fault trees to model the electrical distribution system. Furthermore, the PSA element reviews and assesses any design and other changes in accordance with plant procedures. Therefore, the model is expected to remain accurate.

Human Reliability Analysis (HRA) - The process for performing HRA is documented and thorough, and should enable PNPP to appropriately consider Human Error Probabilities (HEPs) in the PNPP PSA. The PSA update program should provide for additional input from operations personnel when updating HEPs. The pre-initiator HEPs were found to be an area for potential improvement. The approach seemed to somewhat arbitrarily screen out many pre-initiator HEPs relating to restoration errors and did not include several mis-calibration HEPs found to be important in previous BWR PSAs. Post-initiators were found to be good in detail and in their adherence to the actual procedures. The PSA used an HRA evaluation approach to address dependencies during the modeling process and to avoid unexpected dependency issues at the later stage of model quantification. All analyses appear to be performed and documented.

HRA Evaluation Performed: The mis-calibration HEPs important in other BWRs are not associated with the EDG or electric power systems and were not included in the revised model.

Containment Performance Analysis (L2) - The overall process for Level 2 is judged to be comprehensive and capable of providing the necessary information for application evaluation for risk ranking. The Level 2 Analysis is in need of improvement for most Grade 3 applications; however, the current quality is acceptable for use for the EDG Completion Time extension amendment request.

L2 Evaluation Performed: The Level 2 analysis is considered sufficient for the evaluation of the change in risk evaluated with the PSA model for the applicable EDG Completion Time extension amendment request. Large Early Release Frequency (LERF) was evaluated in support of the EDG Completion Time extension amendment request.

Data Analysis (DA) - The data analysis task is judged to support PSA applications up to Grade 2, i.e. risk ranking. Screening values were used for most common cause failure events. The Common Cause Failures (CCF) events documented using NUREG/CR-4780 were well developed. Common cause events for batteries and ESW pumps did not include the Division III equipment. Common cause was not included for the Division III batteries because of the dissimilarities compared with the Division I and II batteries. The system train unavailabilities are based on plant-specific data from 1991.

DA Evaluation Performed: For the EDG Completion Time extension amendment request, common cause was updated for the ESW pumps. High Pressure Core Spray (HPCS) and Reactor Core Isolation Cooling (RCIC) maintenance unavailabilities were updated based on more recent data (early 1997). At the time of the peer review process the maintenance unavailabilities for HPCS and RCIC were updated through Cycle 3.

The more current data for risk significant systems have been updated through Cycle 6; essentially doubling the time frame considered previously.

Initiating Events (IE) - The overall process for evaluating initiating events was acceptable. The Failure Modes Effects Analysis (FMEA) for determining initiating event data was thorough in determining the support systems needed. The IE grouping excludes only two specific initiating events. Loss of DC Power and Partial Loss of AC Power are possible initiating events which were not considered, but could be contributors to CDF and are important to risk ranking applications and On-Line Maintenance (OLM) applications. The initiating event frequencies for the general initiators are based solely on generic data. The plant specific initiator data were estimated rather than calculated. The interfacing LOCA analysis was thorough and plant specific. The frequencies do not generally reflect the PNPP SCRAM data or special initiator evaluation. The primary exception was the loss of Service Water initiator frequency, which was originally estimated and subsequently changed per the Perry IPE Request for Additional Information (RAI) but not documented.

IE Evaluation Performed: The Loss of DC Power and Partial Loss of AC Power frequencies are inherent to the existing initiating event tree structures along with the explicit modeling of the AC distribution structure, including individual buses. Additional basic events are included that cover the loss of AC and DC power. The calculations performed for the EDG Completion Time extension amendment request considered these events.

Grade 1 – Supports Assessment of Plant Vulnerabilities

No elements received a Grade 1

CONCLUSION

The PNPP PSA model used for evaluating the risk change in the EDG Completion Time extension amendment request is considered appropriate in light of the comments provided during the peer review process. The peer review process enhanced the PSA evaluation of the applicable EDG Completion Time extension amendment request in that it provided a focus on issues that had potential to impact the calculation of risk. With the changes incorporated above we believe the calculation of risk in this Technical Specification amendment is accurate.