Indian Point Nuclear Generating Units 2 and 3
Docket Nos. 50-247/ 50-286-LR

NRC Staff's Response in Opposition to State of New York's Motion for Partial Summary Disposition of NYS Contention 16/16A

Exhibit F

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REGULATORY GUIDE

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AN APPROACH FOR USING PROBABILISTIC RISK ASSESSMENT IN RISK-INFORMED DECISIONS ON PLANT-SPECIFIC CHANGES TO THE LICENSING BASIS

1. PURPOSE AND SCOPE

1.1 INTRODUCTION

The NRC's policy statement on probabilistic risk assessment (PRA) (Ref. 1) encourages greater use of this analysis technique to improve safety decisionmaking and improve regulatory efficiency. The NRC staff's Risk-Informed Regulation Implementation Plan (Ref. 2) describes activities now under way or planned to expand this use. These activities include, for example, providing guidance for NRC inspectors on focusing inspection resources on risk-important equipment.

Another activity under way in response to the policy statement is using PRA to support decisions to modify an individual plant's licensing basis (LB).[1] This regulatory guide provides guidance on the use of PRA findings and risk insights in support of licensee requests for changes to a plant's LB, as in requests for license amendments and technical specification changes under Sections 50.90-92 of 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities." It does not address licensee-initiated changes to the LB that do NOT require NRC review and approval (e.g., changes to the facility as described in the final safety analysis report (FSAR), the subject of 10 CFR 50.59).

Licensee-initiated LB changes that are consistent with currently approved staff positions (e.g., regulatory guides, standard review plans, branch technical positions, or the Standard

[1] These are modifications to a plant's design, operation, or other activities that require NRC approval. These modifications could include items such as exemption requests under 10 CFR 50.11 and license amendments under 10 CFR 50.90.

reviewers, the summarized review findings, and resolutions to these findings where applicable. Industry PRA certification programs and PRA cross-comparison studies could also be used to help assess appropriate scope, level of detail, and technical acceptability of the PRA. If such programs or studies are to be used, a description of the program, including the approach and standard or guidelines to which the PRA is compared, the depth of the review, and the make-up and qualifications of the personnel involved should be provided for NRC review. Based on the peer review or certification process and on the findings from this process, the licensee should justify why the PRA is adequate for the present application in terms of scope, level of detail, and technical acceptability. A staff review cannot be replaced in its entirety by a peer review, a certification, or cross-comparison; although the more confidence the staff has in the review that has been performed for the licensee, the less rigor should be expected in the staff review.

The NRC staff is currently developing a regulatory guide to endorse the American Society of Mechanical Engineers (ASME) PRA standard.[4] This new guide will provide guidance on how the PRA standard may be used to better understand the level of confidence in the PRA results and their role in decisionmaking. The guide will also endorse PRA standards or industry programs, including exceptions or additional staff requirements.

The NRC continues to support ongoing initiatives to develop industry PRA standards and expects to endorse PRA standards that are suitable for regulatory decisionmaking as described in this regulatory guide. Other standards for external events (e.g., seismic events) and low power and shutdown conditions are under development.[5] In the interim, the NRC staff is continuing to evaluate PRAs submitted in support of specific applications using the guidelines given in Section 2.2.3 and Section 2.5 of this regulatory guide, Chapter 19 of the Standard Review Plan (Ref. 3), and the information in SECY-00-0162 (Ref. 10), which defines minimum technical attributes for a technically acceptable PRA. In addition, the references and bibliography provide information that licensees may find useful in deciding on the acceptability of their PRA.

2.2.4 Acceptance Guidelines

The risk-acceptance guidelines presented in this regulatory guide are based on the principles and expectations for risk-informed regulation discussed in Section 2, and they are structured as follows. Regions are established in the two planes generated by a measure of the baseline risk metric (CDF or LERF) along the x-axis, and the change in those metrics (ΔCDF or ΔLERF) along the y-axis (Figures 3 and 4) and acceptance guidelines are established for each region as discussed below. These guidelines are intended for comparison with a full-scope (including internal events, external events, full power, low power, and shutdown) assessment of the change in risk metric, and when necessary, as discussed below, the baseline value of the risk metric

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[4] The American Society of Mechanical Engineers (ASME) recently issued "Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications," ASME RA-S-2002, which covers Level 1 and Level 2 (LERF only) PRAs for internal events (excluding fire) that occur during full-power operations.

[5] The American Nuclear Society (ANS) is developing a draft standard for external events (e.g., seismic events, including seismic margins, wind, flood), "Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications: External Events." The ANS is also developing a draft standard for low-power and shutdown conditions, "Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications: Low Power and Shutdown." In addition, the various engineering professional societies are considering developing a fire PRA.

Examples are the analysis of some external events and the low-power and shutdown modes of operation. There are issues, however, for which methods of analysis have not been developed, and they have to be accepted as potential limitations of the technology. Thus, for example, the impact on actual plant risk from unanalyzed issues such as the influences of organizational performance cannot now be explicitly assessed.

The issue of completeness of scope of a PRA can be addressed for those scope items for which methods are in principle available, and therefore some understanding of the contribution to risk exists, by supplementing the analysis with additional analysis to enlarge the scope, using more restrictive acceptance guidelines, or by providing arguments that, for the application of concern, the out-of-scope contributors are not significant. Approaches acceptable to the NRC staff for dealing with incompleteness are discussed in the next section.

2.2.5.5 Comparisons with Acceptance Guidelines

The different regions of the acceptance guidelines require different depths of analysis. Changes resulting in a net decrease in the CDF and LERF estimates do not require an assessment of the calculated baseline CDF and LERF. Generally, it should be possible to argue on the basis of an understanding of the contributors and the changes that are being made that the overall impact is indeed a decrease, without the need for a detailed quantitative analysis.

If the calculated values of CDF and LERF are very small, as defined by Region III in Figures 3 and 4, a detailed quantitative assessment of the baseline value of CDF and LERF will not be necessary. However, if there is an indication that the CDF or LERF could considerably exceed 10^{-4} and 10^{-5} respectively, in order for the change to be considered the licensee may be required to present arguments as to why steps should not be taken to reduce CDF or LERF. Such an indication would result, for example, if (1) the contribution to CDF or LERF calculated from a limited scope analysis, such as the IPE or the IPEEE, significantly exceeds 10^{-4} and 10^{-5} respectively, (2) there has been an identification of a potential vulnerability from a margins-type analysis, or (3) historical experience at the plant in question has indicated a potential safety concern.

For larger values of ΔCDF and ΔLERF, which lie in the range used to define Region II, an assessment of the baseline CDF and LERF is required.

To demonstrate compliance with the numerical guidelines, the level of detail required in the assessment of the values and the analysis of uncertainty related to model and incompleteness issues will depend on both (1) the LB change being considered and (2) the importance of the demonstration that Principle 4 has been met. In Region III of Figures 3 and 4, the closer the estimates of ΔCDF or ΔLERF are to their corresponding acceptance guidelines, the more detail will be required. Similarly, in Region II of Figures 3 and 4, the closer the estimates of ΔCDF or ΔLERF and CDF and LERF are to their corresponding acceptance guidelines, the more detail will be required. In a contrasting example, if the estimated value of a particular metric is very small compared to the acceptance goal, a simple bounding analysis may suffice with no need for a detailed uncertainty analysis.

Because of the way the acceptance guidelines were developed, the appropriate numerical measures to use in the initial comparison of the PRA results to the acceptance guidelines are mean values. The mean values referred to are the means of the probability distributions that result from the propagation of the uncertainties on the input parameters and those model uncertainties explicitly represented in the model. While a formal propagation of the uncertainty is the best way to correctly account for state-of-knowledge uncertainties that arise from the use of the same parameter values for several basic event probability models, under certain circumstances, a formal propagation of uncertainty may not be required if it can be demonstrated that the state-of-knowledge correlation is unimportant. This will involve, for example, a demonstration that the bulk of the contributing scenarios (cutsets or accident sequences) do not involve multiple events that rely on the same parameter for their quantification.

Consistent with the viewpoint that the guidelines are not to be used prescriptively, even if the calculated ΔCDF and ΔLERF values are such that they place the change in Region I or II, it may be possible to make a case that the application should be treated as if it were in Region II or III if, for example, it is shown that there are unquantified benefits that are not reflected in the quantitative risk results. However, care should be taken that there are no unquantified detrimental impacts of the change, such as an increase in operator burden. In addition, if compensatory measures are proposed to counter the impact of the major risk contributors, even though the impact of these measures may not be estimated numerically, such arguments will be considered in the decision process.

While the analysis of parametric uncertainty is fairly mature, and is addressed adequately through the use of mean values, the analysis of the model and completeness uncertainties cannot be handled in such a formal manner. Whether the PRA is full scope or only partial scope, and whether it is only the change in metrics or both the change and baseline values that need to be estimated, it will be incumbent on the licensee to demonstrate that the choice of reasonable alternative hypotheses, adjustment factors, or modeling approximations or methods to those adopted in the PRA model would not significantly change the assessment. This demonstration can take the form of well formulated sensitivity studies or qualitative arguments. In this context, "reasonable" is interpreted as implying some precedent for the alternative, such as use by other analysts, and also that there is a physically reasonable basis for the alternative. It is not the intent that the search for alternatives should be exhaustive and arbitrary. For the decisions that involve only assessing the change in metrics, the number of model uncertainty issues to be addressed will be smaller than for the case of the baseline values, when only a portion of the model is affected. The alternatives that would drive the result toward unacceptableness should be identified and sensitivity studies performed or reasons given as to why they are not appropriate for the current application or for the particular plant. In general, the results of the sensitivity studies should confirm that the guidelines are still met even under the alternative assumptions (i.e., change generally remains in the appropriate region). Alternatively, this analysis can be used to identify candidates for compensatory actions or increased monitoring. The licensee should pay particular attention to those assumptions that impact the parts of the model being exercised by the change.

When the PRA is not full scope, it is necessary for the licensee to address the significance of the out-of-scope items. The importance of assessing the contribution of the out-of-scope portions of the PRA to the base case estimates of CDF and LERF is related to the margin between the as-calculated values and the acceptance guidelines. When the contributions from the modeled contributors are close to the guidelines, the argument that the contribution from the missing items