



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

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February 7, 1986

MEMORANDUM FOR: Harold R. Denton, Director
Office of Nuclear Reactor Regulation

THRU: Frank J. Miraglia, Director *FJM*
Division of PWR Licensing-B

FROM: Dennis M. Crutchfield, Assistant Director
for Technical Support
Division of PWR Licensing-B

SUBJECT: PROGRAM PLAN FOR B&W DESIGN REEXAMINATION

In his letter to Mr. Tucker of the B&W Owners Group, Mr. Stello indicated that the staff was developing a program plan for this reassessment. The schedule for the program plan was mid-February. As a part of this effort, NRR was to provide overall direction of the program with support from the Regions and appropriate NRC offices. Each of the Regions and Offices identified a contact to work with NRR in this effort. Those contacts are provided in the enclosure.

On February 3, 1986, a draft plan was circulated to the contacts for review. This draft plan outlined a scope that the staff believes would be needed to accomplish this reassessment. On February 5, 1986, the staff, including a large number of the identified Regional and Headquarter contacts, met with the B&W Owners Group. Part of this meeting dealt with the Owners Group's response to the January 24, 1986 letter. The Owners Group Chairman, Mr. Tucker, indicated that it is logical for them to serve in a leadership role in resolving the NRC's concern. He also indicated that the Owners Group is willing to work with the NRC on this program. In light of this meeting, there was a discussion among the contacts on February 6, 1986 of the draft program plan. It was agreed that it would be changed to reflect the major comments of the staff and would reflect the Owners Group intent to play a leadership role.

Enclosed is a revised plan. This plan is being provided to each of the Regional and Headquarters contacts for review and approval by them and their respective Regional Administrators or Office Director. It includes those items that the staff believes are necessary to carry out the reexamination. Identified in the plan are those items that we expect the Owners Group would take the lead in or play a major role in completing. Those items that the Owners Group are not doing, such as a comparison with other PWRs, will be handled by the staff. We intend to meet with the Owners Group after they have submitted their response to Mr. Stello describing what they will do. As a result, there could be changes in the plan.

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Harold R. Denton

- 2 -

By copy of this memo, each Regional and Headquarters contact is being asked to obtain their Regions' or office's concurrence by February 11, 1986, so that final preparation of this plan for Mr. Stello can occur by February 14, 1986.

(51)
Dennis M. Crutchfield, Assistant Director
for Technical Support
Division of PWR Licensing-B

Enclosures:

1. List of Contacts
2. Revised Program Plan

cc: D. Eisenhut
R. Starostecki, R-I
A. Gibson, R-II
L. Reyes, R-III
J. Gagliardo, R-IV
J. Crews, R-V
E. Jordan
F. Gillespie
J. Heltemes

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ENCLOSURE 1

IDENTIFIED CONTACTS

Region I - R. Starostecki
Region II - A. Gibson
Region III - L. Reyes
Region IV - J. Gagliardo
Region V - J. Crews
IE - E. Jordan
RES - F. Gillespie
AEOD - J. Heltemes

ENCLOSURE 2
REVISED PROGRAM PLAN

1. INTRODUCTION

Since the TMI-2 accident, there has been a growing realization of the sensitivity of Babcock and Wilcox (B&W) plants to operational transients. By letter dated January 24, 1986, the Acting EDO informed the Chairman of the Babcock and Wilcox Owners Group (B&WOG) that a number of recent events at B&W designed reactors lead us to conclude that there is a need to re-examine the basic design requirements for B&W reactors. The letter stated that the staff will reassess the overall safety of the B&W plants and determine whether the present set of requirements for these plants are appropriate for the long term and lead to a level of safety that is comparable to other pressurized water reactors. NRR has been assigned the responsibility to provide overall direction of this effort with support from the Regions and all appropriate NRC offices. The B&WOG has been asked to take a leadership role in developing with the NRC the plans for the reassessment effort.

This Task Action Plan outlines the scope that the staff believes is needed to accomplish the reassessment. It is likely that the B&WOG will play a major role in carrying out a large part of this reassessment but that there will be areas that the staff feels need to be evaluated, that the Owners Group will not be doing.

2. DISCUSSION

To achieve the objectives discussed above, a Task Action Plan has been developed that includes both deterministic and probabilistic assessments, an integrated evaluation to identify potential improvements to reduce the frequency and complexity of anticipated operational transients, and thereby improve the overall safety of the B&W reactor, and identification of potential revised licensing criteria. D. Crutchfield, Assistant Director for Technical Support, Division of PWR Licensing-B, NRR has been designated as the senior staff manager responsible for this program. Enclosure 1 lists the Regional and appropriate Office contacts. Figure 1 shows the major tasks and the interfaces between tasks.

An overview of the tasks shown in Figure 1 is discussed in the following paragraphs.

3. SCOPE AND CONTENT OF TASKS

The study and required information will be based on the following B&W designed plants for which utilities hold operating licenses:

- ° Arkansas Nuclear One, Unit 1 (ANO-1) - (Arkansas Power & Light Company)
- ° Crystal River, Unit 3 - (Florida Power Corporation)
- ° Davis-Besse, Unit 1 - (Toledo Edison Company)
- ° Oconee, Units 1, 2 and 3 - (Duke Power Company)
- ° Rancho Seco, Unit 1 - (Sacramento Municipal Utility District)
- ° Three Mile Island, Units 1 and 2 (Metropolitan Edison Company)

The main focus of the study will be the generic assessment of B&W designed reactors and the identification of potential improvements as related to reducing the frequency and severity of anticipated operational occurrences, and thereby improve the overall safety of the B&W reactors. In addition, representative Combustion Engineering (CE) and Westinghouse (W) PWR designs will be selected and compared with the B&W PWR design to assess the relative plant dynamic behavior that would result when confronted with similar anticipated operational occurrences, as well as their overall safety.

In general, Tasks 3.1 through 3.11 involve a spectrum of assessments, each of which should identify potential system, human factors, operations or analysis improvements aimed at increasing the perceived level of safety of the B&W reactors. Task 3.12 performs an integrated evaluation of all these improvements, without regard to cost/benefit judgements. Tasks identified with an asterisk are those where the Owner's Group is likely to take a lead or play a major role in completing.

3.1 Review Operating Events (*)

This activity will consist of the re-review of past B&W operational occurrences. The intent of this effort is to look at these events as a set of operational experiences that may indicate common problems, deficiencies, or system weaknesses. The review should include, but should not be limited to, the applicable Licensee Event Reports (LERs), Inspection and Enforcement (IE) Bulletins, Circulars and Notices and other information involving anticipated operational occurrences and related failures at each of the operating B&W plants, and for other PWR vendor plants. Existing compilations of data will be used where possible. This information will be input to Item 3.3, below.

3.2 Identify Problems, Root Causes, and Sensitive Systems (*)

The results of the review of B&W operating reactor events will be used to identify problem areas, complications during the events, root causes and sensitive systems. This review should also identify any human factors problems, including operator errors, procedural deficiencies or control room inadequacies. The reviews should rely, to the maximum extent possible, on existing reviews (i.e., industry, BWOG, NRC).

During this review, special attention should be given to the individual items to determine if the particular problem is within the plant's licensing basis. This determination will be used in later assessments.

Once the set of problems, root causes and sensitive systems is determined, the degree that these items would be the same for Westinghouse or CE reactors should be determined. Similarly, this determination should rely to the maximum extent possible, on existing reviews. Where reviews do not exist, the assessment should rely on engineering judgements as opposed to a detailed review of other NSSS reactor's experience.

*Tasks identified with an asterisk are those where the Owner's Group is likely to take a lead or play a major role in completing.

3.3 Obtain B&W Plant-Specific Design Information (*)

The objectives of this task are to: (1) assemble B&W plant system information (e.g., EFIC, SFRCS, AFW, valve positions on loss of ICS power, etc.), and (2) compile and compare operating B&W plant features. The information obtained from Item 3.2 above should be used as guidance in defining system information to be gathered.

3.4 Compile and Assess Previous Staff Reviews of Anticipated Operational Occurrences and the Status of Implementation (*)

The objectives of this task are to: (1) compile the results of previous reviews of B&W operational occurrences, and (2) summarize the status of the implementation of modifications at each B&W plant resulting from the requirements/recommendations developed during the previous reviews. Reviews of events beginning with the March 20, 1978 Rancho Seco "light bulb" event should be considered.

A detailed list of those events to be reviewed should be developed at the beginning of this task by the lead organization.

3.5 Review Existing Plant Probabilistic Risk Assessment (*)

The objective of this task is to assemble and review existing PRA's that have been performed for B&W plants and other PWR facilities. An assessment of the input data should be performed to verify that it is consistent with actual B&W data.

3.6 Assess B&W PRA's

The objectives of this task are to: (1) assess the probability of core melt at B&W plants considering observed operating events, and (2) compare core melt probability among the B&W plants. B&W plant-specific probabilities should be used in the evaluations. Existing plant PRA's (e.g., Midland, Oconee) should be used as tools in developing the task objectives.

3.7 Compare B&W and Other PWR PRA's

The objective of this task is to make a limited comparison of the core melt probability at B&W plants with other PWRs using the results of the PRAs.

3.8 Perform System Analyses and Sensitivity Checks Against Current Criteria (*)

This task will analyze the plant behavior when it is confronted with postulated failures and perturbations. Sensitivity checks will be included in the analysis to establish the plant response boundaries and margins. Current licensing criteria will be used in the analyses. For example, in addition to the assumed initiating event, single failures of active components and the effect of loss-of-offsite power would be considered. Some of the events and their postulated consequences that should be included are as follows:

*Tasks identified with an asterisk are those where the Owner's Group is likely to take a lead or play a major role in completing.

- ° Loss of normal feedwater
- ° Overcooling followed by repressurization
- ° Undercooling
- ° Steam generator overfill
- ° Turbine trip
- ° Loss of offsite power
- ° PORV or code safety relief valve open
- ° Steam generator tube failure
- ° Small break LOCA
- ° Steam line break spurious signal initiation
- ° Pressure temperature limit correlations

A B&W plant which includes design features, configurations, and capacities that resemble the majority of the B&W plants will be selected as the model for the systems analysis and sensitivity checks. Results of this effort will be applied to the other B&W plants recognizing the plant differences.

The same approach for analyzing behavior in B&W plants will be followed during the performance of this task for other vendor plants, except that the plant-specific information data base is limited to selected designs and features.

3.9 Evaluate Margins and Sensitivities Beyond Regulatory Objectives

This element of the study will determine, based on the identified problems, root causes and sensitive systems, the margins available beyond the classical limits when scenarios beyond the Standard Review Plan type events are encountered. This assessment will only consider scenarios that are pertinent to the items identified in Task 3.6. For example, this task may involve questions regarding how adequately the B&W plants can manage a total loss of feedwater event.

Questions regarding multiple failures, consequential equipment malfunctions, operator errors of commission, as well as omission, will be considered. The evaluations should determine:

1. The proximity to a regulatory limit,
2. The availability of systems and components to provide mitigation,
3. The information (i.e., procedures, training, and control room instrumentation) available to the operators, and
4. The time frames within which the operator must act to keep the event under control.

3.10 Identify Additional Safety Concerns

The main thrust of this element of the study effort is to address concerns that do not readily fall into a particular regulatory area. This element is aimed at describing operational, human factors, system or other concerns that arise in the course of the review of the operational events. For example, in the course of the review of events at B&W reactors, it is apparent that for a given relatively benign loss of feedwater transient, a number of safety systems are challenged. A review of a similar initiating event on a CE or W plant reveals a lesser challenge to safety systems. Although there are no regulatory limits that restrict reliance on safety systems to particular scenarios, the response of the B&W plant systems has become a concern in the engineering judgment of a number of analysts.

3.11 Regional Operations Experience Feedback

This task is aimed at utilizing the experience, judgements and concerns coming from the NRC's Regional staff, particularly the Resident Inspectors. These individuals have extensive first-hand knowledge of B&W reactor operations, procedures and design-related deficiencies that must weigh in the NRC's overall evaluation of the adequacy of the B&W plants.

The views of present and former Senior Resident Inspectors having experience at B&W reactors should be especially sought. Also, I&E training staff should be involved in this effort since their hands-on experience is invaluable.

A series of Region-based meetings may be the most efficient manner to obtain this information.

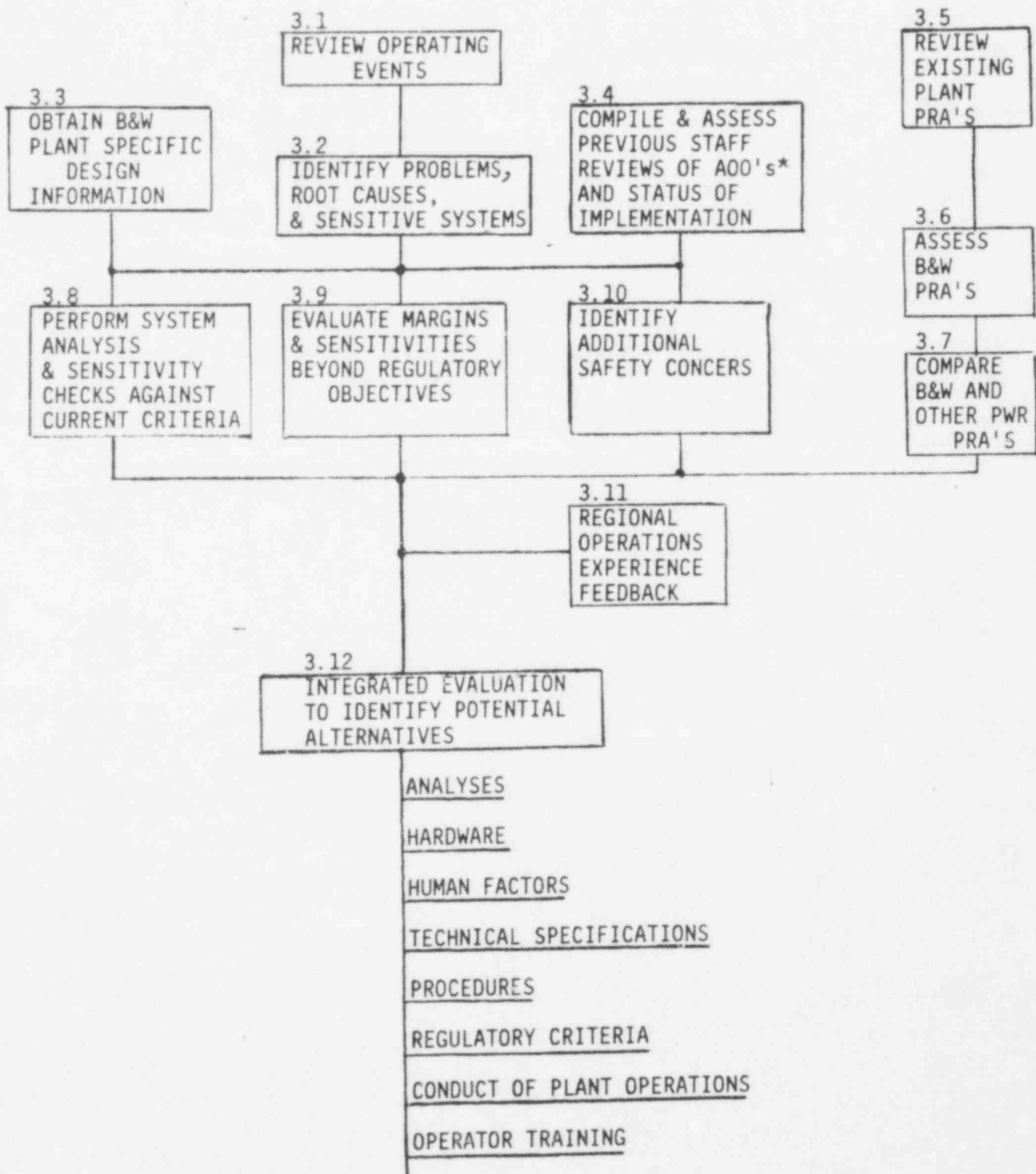
3.12 Integrated Assessment to Identify Plant Alternative Improvements

This phase of the effort involves a unified assessment of all the recommendations, conclusions and suggestions coming from the above described tasks. Since this could obviously involve a great deal of quantitative and qualitative information, the team should attempt to first organize the various items into sets or groups. Then, once into groups, the various items should be given a relative priority based on their perceived safety importance. Some possible groups are:

1. Items that are needed in the plant to meet current regulatory requirements.
2. Items that are not necessarily needed for regulatory conformance, but are needed for reducing the plant's susceptibility or severe response to transients,
3. Items that improve the operator's ability to manage transients, and
4. Items that result in B&W plant transient response being comparable to other NSSS transient response.

This phase of the overall effort should not consider the relative costs/benefits of the various recommendations. The items should be considered only in accordance with their perceived safety importance.

FIGURE 1
Action Plan for Reassessment of B&W Plants



*AOO=ANTICIPATED OPERATIONAL OCCURRENCE