



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

1979

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

FROM: S. H. Hanauer, Director
Unresolved Safety Issues Program

SUBJECT: ATWS REQUIREMENTS FOR STANDARD PLANTS

Ref: M. W. Golay Draft Report dated September 27, 1979

Summary

I believe Mr. Golay's conclusions are incorrect because I believe some of his premises to be incorrect. Here are the principles I propose NRC should follow, and my proposed resolution of requirements for standard plants.

1. Issue and Options

Issue: Which alternative ATWS requirement shall be imposed on standard plants approved after the alternative 4/alternative 3 cutoff date, but in accordance with a design approved before the cutoff date?

The alternative requirements are summarized in Appendix A. Implementation options are:

Option A. (Original DSS Proposal) Alternative 3 for all plants receiving CP before 1/1/78; Alternative 4 after. Standard plants treated like all others.

Option B. (Standardization Branch Proposal) Plants receiving a CP after 1/1/78, duplicate or replicate of a plant receiving a CP before that date, may follow alternative 3.

Option C. (Golay's recommendation) Plants receiving a CP after 1/1/78 duplicate a replicate or referencing a plant or design approved before 1/1/78 may follow alternative 3.

2. Principles

2.1 The ATWS component of risk should be decreased in all plants. This was accepted by RRRC. Golay agrees (page 28).

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2.2 Plants fixed per alternative 4 have lower risk than plants fixed per alternative 3. The reasons for this are summarized in Appendix A of this memo. Golay agrees (page 25). Thus to minimize ATWS risk, all plants should implement alternative 4.

2.3 The cost (dollars, downtime, personnel doses) of alternative 4 is much higher for an operating plant or one too far along in construction, so the cost/benefit ratio is very different. Although NRC has not clearly articulated a policy regarding cost/benefit considerations in safety licensing decisions, DSS proposed alternative 3 for old plants, with "old" defined as plants receiving a CP before 1/1/78. Golay (page 13) does not evaluate the cutoff date for custom plants, but accepts (page 10-12) the principle.

2.4 I believe it is not required that all plants have similar risk as Golay states (page 19). Newer plants can and should be safer than old plants because:

- (a) This is the way to minimize the increase in societal risk as the number of plants increases;
- (b) We know better how to make safe plants as a result of experience;
- (c) It is more cost-effective to improve new plants even when backfit is not justified.

2.5 Standardization seems to me to be a bargain, rather than a principle as Golay implies (page 18-19). The "integrity of the agency" (Golay, page 21, line 14) is, I believe, embodied principally in the degree to which the public health and safety is protected, rather than how the standardization bargain is carried out. Although we should keep our promises, all standard designs and standard plants were approved subject to implementing the "generic solution of ATWS". I believe that standardization, licensing stability, and "fairness" (Golay, page 19, line 22) must give way to NRC's primary safety mission. Golay evidently does not agree.

2.6 Making a pair of identical plants on the same site has a lot of safety advantages and weighs heavily in cost/benefit, also. Thus, I agree we should treat all such groups the same. For different sites of the same company, there is a weaker benefit in similarity, e.g. Phipps Bend/Hartsville or Cherokee/Perkins. Golay does not discuss this point.

2.7 Since alternative 4 is a lot more expensive than alternative 3 except for W plants, and since applicants and licensees think their plants are safe enough already, all industry effort will be to favor alternative 3. The only push for alternative 4 will come from NRC in view of its greater safety.

3. Discussion of the cutoff date

3.1 The 1/1/78 CP cutoff date in NUREG-0460, Vol. 3, was based on the perception over a year ago that (1) rulemaking would be completed by 1/1/80, and (2) a plant with a 1/1/78 CP would be ready to load fuel about 1/1/84, leaving four years to design and install alternative 4 plant changes. Today I perceive that (1) rulemaking will take at least until 1/1/81, and (2) only a small fraction of the pre-1/1/78 CP plants we were going to allow alternative 3 are likely in fact to be completed by 1/1/84. A re-evaluation of the cutoff date is therefore in order.

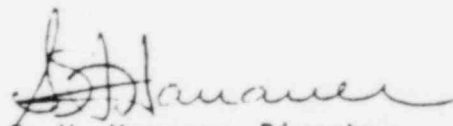
3.2 We should decide with the next year, so the rule can be definite, but we do not need to decide now. For the draft rule circulated for public comment, it should suffice to state the principles by which the cutoff date will be redetermined, for both custom and standard plants. By next summer, the licensing program should be sufficiently stabilized to permit being explicit.

4. My Recommendations

4.1 The final ATWS rule should be definite regarding which plants (custom and standard both) are required to implement which alternatives.

4.2 A general alternative 3/4 cutoff date should be established. The principles of Section 2 of this paper should apply. The time remaining before completing plant construction should be the determining factor. However, since completion dates are rubbery, the actual rule criteria should be tied to a definite date (that's why we used CP date in NUREG-0460, Vol. 3) or a definite list of plants.

4.3 Standard plants should conform to the date of 4.2, except that identical units on the same site should implement the same ATWS alternative.



S. H. Hanauer, Director
Unresolved Safety Issues Program

cc: Dr. M. Golay A. Thadani
E. G. Case W. Russell
R. J. Mattson R. Baer
D. Vassallo

Appendix A
Summary of Alternatives

A.1 Alternative Means for Reducing ATWS Risk

In NUREG-0460, Volumes 1 and 2, NRC staff developed requirements for mitigation of ATWS events. The objective in Volumes 1 and 2 was to reduce the likelihood of severe consequences from ATWS events by ~ factor of 100 (from $\sim 10^{-4}$ /RY to $\sim 10^{-6}$ /RY). The proposed "fix" is the same as the Alternative #4 fix in NUREG-0460, Volume 3. In NUREG-0460, Volume 3, the staff selected a mix of prevention and mitigation measures for various classes of plants taking into consideration cost/benefit factors.

Note that for W plants, Alternatives 2, 3, and 4 are essentially the same.

A.1.1 Alternative #2 Fix

Incorporate diversity in electrical portions of the scram systems for GE, B&W, and CE. For W, incorporate diverse means to actuate turbine trip and auxiliary feedwater system.

The approximately 12 plants to which this alternative is applied in NUREG-0460, Volume 3, are unique and any additional changes are to be considered on plant-specific basis.

A.1.2 Alternative #3 Fix

Prevention as per Alternative #2, plus mitigation of some ATWS events--applicable to plants with CP before 1/1/78.

A.1.3 Alternative #4 Fix

Mitigation of essentially all ATWS events. Also provides for longer delays in operator action than 10 minutes.

A.2 Improvement Yielded by These Alternatives

Only Alternatives 3 and 4 are compared here:

Alternative 3

Includes some prevention capability
Mitigates some ATWS events
Some uncertainties regarding the capability of B&W, CE plants to mitigate ATWS events
Generally cannot withstand additional single failure
Early operator action required

Alternative 4

No prevention capability
Mitigates most ATWS events
Little uncertainty
Can withstand single failure
Operator action can be delayed

In order to assess the relative merits of Alternative 3 and Alternative 4 plants, we have estimated the frequency of severe consequences from ATWS events assuming Alternative 3 and Alternative 4 fixes are implemented. These estimates, to a large extent, are based on (a) judgment of ATWS frequency and thus may have large uncertainties, and (b) event trees.

<u>Plant Type</u>	<u>Frequency of Severe ATWS, per RY</u>	
	<u>Alt. #3</u>	<u>Alt. #4</u>
W - designed	$\sim 10^{-6}$	$\sim 10^{-6}$
CE-designed	$\sim 4 \times 10^{-5}$	$\sim 10^{-6}$
B&W-designed	$\sim 4 \times 10^{-5}$	$\sim 10^{-6}$
GE-designed	$\sim 10^{-5}$	$\sim 10^{-6}$

Thus, we judge that (except for W) the plants modified per Alternative #4 provide greater protection from ATWS events than those modified per Alternative #3.

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MEMORANDUM FOR:

William P. Gamhill, Assistant Director
for Standardization and Advanced Reactors
Division of Project Management

FROM:

C. J. Heltemes, Jr., Chief, Standardization
Branch, Division of Project Management

SUBJECT:

RECOMMENDED IMPLEMENTATION PROGRAM FOR ATWS
FIXES ON STANDARD PLANTS

As you know, the Standardization Branch has reviewed the implementation program for ATWS in both the draft and final versions of NUREG-0460, Volume 3. The draft version of the report, which we reviewed in November 1978, took special note of standard plants and permitted all plants utilizing the same standard design to have a common ATWS fix. This is consistent with the standardization program and therefore, we agreed with that implementation plan.

The final version of the report, issued in December 1978, had a radically different implementation plan which, in effect, ignores standard plants and in certain instances, requires plants utilizing the same standard design to implement different ATWS fixes. See Enclosure 1 for a summary of the effect of the NUREG-0460, Volume 3 implementation plan on standard plants. We were not consulted about this change and, if we had been, would have taken exception. Since the publication of NUREG-0460, Volume 3, the RRRC has met to consider, among other things, its implementation program. In R. Boyd's presentation to the RRRC, he recommended that the RRRC disapprove the NUREG-0460 implementation plan and permit standard plant designs to be common from plant-to-plant with respect to the required ATWS fix. As a result, the RRRC, while approving the implementation program for custom plants, was unable to make a recommendation to the MRR Office Director for implementation of ATWS for standard plants.

Subsequently, we have performed a study of various implementation plans for standard plants. This study is provided in the Enclosure 2 to this memorandum. We have considered six options ranging from Option 1, which closely approximates the implementation plan in the draft report, to Option 6, the one that we now recommend. These options differ mainly in

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