Dear FOIA Requester:

The FOIA Improvement Act of 2016, which was enacted on June 30, 2016, made several changes to the Freedom of Information Act (FOIA). Federal agencies must revise their FOIA regulations to reflect those changes by December 27, 2016. In addition to revising our regulations, we intend to update the Form 464, which we use to respond to FOIA requests.

In the interim, please see the comment box in Part I.C of the attached Form 464. The comment box includes information related to the recent changes to FOIA that is applicable to your FOIA request, including an updated time period for filing an administrative appeal with the NRC.

Sincerely yours,

Stephanie Blaney /S/

Stephanie Blaney
FOIA Officer (Acting)

NRC FORM 464 Part I (12-2015)

U.S. NUCLEAR REGULATORY COMMISSION

RESPONSE TO FREEDOM OF INFORMATION ACT (FOIA) REQUEST

FOIA	RESPONSE NUMBER
2016-0732	1

RESPONSE TYPE ☐ INTERIM ☑ FINAL

REQUESTER:	DATE:
Tara Noble	SEP 2 2 2016

DESCRIPTION OF REQUESTED RECORDS:

Memorandum from R.L. Baer (NRC) to V. Stello, Jr. (NRC), Recommended Interim Revisions to Limiting Conditions for Operations (LCOs) for Emergency Core Cooling System (ECCS) Components, December 1, 1975

PART I. -- INFORMATION RELEASED

- ☐ Agency records subject to the request are already available in public ADAMS or on microfiche in the NRC Public Document Room.
- ☑ Agency records subject to the request are enclosed.
- ☐ Records subject to the request that contain information originated by or of interest to another Federal agency have been referred to that agency (see comments section) for a disclosure determination and direct response to you.
- ☐ We are continuing to process your request.
- ☑ See Comments.

PART I.A -- FEES

AMOUNT*

$ [ ]

*See Comments for details

- ☐ You will be billed by NRC for the amount listed.
- ☐ You will receive a refund for the amount listed.
- ☑ None. Minimum fee threshold not met.
- ☐ Fees waived.

PART I.B -- INFORMATION NOT LOCATED OR WITHHELD FROM DISCLOSURE

- ☐ We did not locate any agency records responsive to your request. *Note*: Agencies may treat three discrete categories of law enforcement and national security records as not subject to the FOIA ("exclusions"). 5 U.S.C. 552(c). This is a standard notification given to all requesters; it should not be taken to mean that any excluded records do, or do not, exist.
- ☐ We have withheld certain information pursuant to the FOIA exemptions described, and for the reasons stated, in Part II.
- ☐ Because this is an interim response to your request, you may not appeal at this time. We will notify you of your right to appeal any of the responses we have issued in response to your request when we issue our final determination.
- ☐ You may appeal this final determination within 30 calendar days of the date of this response by sending a letter or email to the FOIA Officer, at U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001, or FOIA.Resource@nrc.gov. Please be sure to include on your letter or email that it is a "FOIA Appeal."

PART I.C COMMENTS (Use attached Comments continuation page if required)

In conformance with the FOIA Improvement Act of 2016, the NRC is informing you that: (1) you have the right to seek assistance from the NRC's FOIA Public Liaison.

SIGNATURE - FREEDOM OF INFORMATION ACT OFFICER

Stephanie Blaney, Acting FOIA Officer Stephanie Blaney

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

DEC 0 1 1975

Victor Stello, Jr., Assistant Director for Reactor Safety, TR
THRU: Thomas M. Novak, Chief, Reactor Systems Branch, TR

RECOMMENDED INTERIM REVISIONS TO LCO's FOR ECCS COMPONENTS

A. Introduction

Science Applications, Inc. (SAI) has recently completed a study entitled, "The Impact of Component Outages on ECCS Unavailability", SAI-75-550-WA, which was funded by NRC. The study was based on the fault trees that were developed by the Reactor Safety Study and are therefore based specifically on the Peach Bottom 2/3 and Surry 1/2 nuclear power plants.

The author of this memorandum has attempted to develop LCO's for ECCS components that are consistent and less arbitrary than the values currently included in the plant Technical Specifications. The initial effort reported in this memorandum is based on the results of the SAI study and also a computerized listing of Abnormal Operational Occurrences related to the ECCS system that was prepared for the author by the Processing & Programming Branch of the Office of Management Information & Program Control.

B. Discussion

If the Technical Specifications for allowable outage times for ECCS components were based only on reliability considerations, an average unreliability that cannot be exceeded for some time period such as a calendar quarter or year would be defined. Since the impact on system reliability varies with the particular component Technical Specifications based on purely reliability approach would be complex. Most likely, the Technical Specifications for LCO's would be in equation form with different factors or terms in the equation for various components.

To be at all precise such an approach would require a reliability study for each ECCS design. Further, the administration of such Technical Specifications would be complex for both the plant operator and for NRC.

The author and Joseph McGough, with whom the author consulted, agreed that the system reliability information currently available did not warrant this degree of complexity. Therefore, it was decided, for the present, to attempt to continue the use of the current Technical

Specification format for LCO's, but to adjust the specific values of LCO's based on some reasonable rationale.

The discussion below is presented in two parts, namely:

(1) The use of the SAI results; and,

(2) Actual information on the relative frequency of Abnormal Operational Occurrences associated with the ECCS.

1. The Use of the SAI Results

The numerical results presented below are based on the results of the SAI study. The following limitations of that study, and hence the results, should be kept in mind:

(a) the fault trees were based on the Peach Bottom 2/3 and Surry 1/2 plants;

(b) the Surry plant ECCS is rather atypical of most PWRs;

(c) recent changes to the Surry plant, particularly power lockout of some valves, are not reflected in the SAI results*; and,

(d) as noted in both WASH-1400 and the SAI report, there is a relatively large uncertainty associated with all the probability values stated.

A major portion of the SAI study was devoted to calculating the impact on ECCS unavailability (or unreliability) assuming that various components and/or trains were taken out of service. These results were then utilized by the author to investigate the effect of possible changes in the outage times currently permitted by plant Technical Specifications.

Basically the author calculated the average unavailability of the ECCS equipment needed to mitigate the consequences of a large LOCA as a function of outage time per month. The results for a PWR assuming one ECCS train is out of service for various time periods is presented in Table 1. One can see that the average unreliability increases only moderately as outage time increases.

The results for a BWR are shown in Table 2, based on the entire low pressure injection system being out of service for variable

* SAI has proposed a small additional effort to study the impact of these changes on their results. The author of this memorandum has recommended that we accept their proposal.

time periods. (The results would have been only slightly different if a train of the core spray system was assumed out of service instead). A comparison of Tables 1 and 2 show that: (1) with very low outage times the BWR ECCS is calculated to have a higher reliability than the PWR ECCS; and (2) the effect on reliability of longer outage times is more pronounced for the BWR than the PWR.

The mathematical expressions used to obtain Tables 1 and 2 were equated. This yields a series of outage times that result in identical average values of average unreliability for the BWR and PWR ECCS. These are presented in Table 3.

It should be noted that if a different time period; e.g., a calendar quarter instead of one month, were selected, the comparison in Table 3 would be different and more favorable to the BWR. Thus, it can be seen that the frequency of equipment outage should be a consideration in establishing LCO's.

2. Frequency of ECCS Equipment Outages

The Processing & Programming Branch provided a computer listing of Abnormal Operational Occurrences associated with the ECCS during 1974 and 1975 (through about September 30th). The author reviewed these and eliminated those occurrences that merely reported moderate instrumentation drift and those that occurred before the plant achieved commercial operational status. The remaining occurrences were categorized as to: (1) PWR and BWR; and, (2) whether the equipment involved was needed to mitigate the consequences of small or large LOCA. The number of outages was normalized by dividing the number of years of commercial operation for PWRs and BWRs during the reporting period. The results were as follows:

(a) PWRs - The equipment that is required to mitigate the consequences of large and small LOCAs has experienced an outage rate of about 0.36 and 0.37 outages/yr., respectively.

(b) BWRs - Equipment outages that would render one core spray system or a major portion of the LPCI system inoperable have occurred at a rate of about 2.0 outages/yr. The outage rate for a single LPCI pump was about 0.27 outages/yr. The outage rate for HPCI was about 1.2 outages/yr. while that for ADS is very small, 0.04 outages/yr.

These results indicate that the ECCS equipment outages occur much more frequently in BWRs than PWRs.

C. Interim Recommendations

The following interim recommendations are made:

(1) That the PWR Standard Technical Specifications be revised to permit a single ECCS train to be out of service for 72 hours instead of 48 hours.

(2) That the BWR Standard Technical Specifications permit a core spray system or the LPCI system to be out of service for seven days, permit a single LPCI pump to be out of service for 30 days, and permit the HPCI system to be out of service for 14 days.

(3) That we approve the SAI proposed contract extension to study a RESAR-3 plant, and to update the results on the Surry 1/2.

The rationale for these recommendations is discussed in the following paragraphs. Item 1, above, provides some relief to PWRs regarding LCO's. However, as Table 1 shows the increase of allowable outage time from 48 to 72 hours has only a slight impact on the system average unreliability, even if such an outage were to occur each month. Based on actual data, however, such an outage would be expected to occur less than once a year so the impact on average unreliability is negligible.

The recommendations of item 2 above would leave the allowable outage times for the low head ECCS unchanged from the values generally used in current BWR Technical Specifications. Based on actual operating experience, this would result in a better average annual unreliability for BWRs than PWRs when one considers the systems required to mitigate the consequences of a large LOCA. However, when one considers a one-month period with the allowable outage times, the reliability of the PWR and BWR ECCS are about the same. The same rationale was employed regarding the recommendation of an allowable outage time of 14 days for the HPCI system. That is, a comparison of the ECCS needed to mitigate the consequences of a small LOCA in PWRs and BWRs would show a better reliability for the BWRs on an annual basis, based on actual experience. However, if the maximum outage time were to occur in a single month, the reliability of the two systems are about the same.

Regarding item 3 above, the RESAR-3 effort of item 3 is recommended because the RESAR-3 plant is more typical of PWRs currently being

oonstructed than Surry 1/2. Such information would permit refinement of the interim recommendations made in this memorandum. The other effort recommended in item 3 requires only a minimal expenditure of funds and would increase the assurance of the validity of the SAI results reported in SAI-75-550-WA.

Robert L. Baer

Robert L. Baer, Section Leader
Reactor Systems Branch
Division of Technical Review

cc: J. McGough
J. McMillen

Table 1 - AVERAGE PWR UNRELIABILITY

One train outage time (days/month)	Average Unreliability
1	3.9×10^{-3}
2	4.1×10^{-3}
3	4.3×10^{-3}
4	4.5×10^{-3}
5	4.8×10^{-3}
7	5.2×10^{-3}
10	5.8×10^{-3}

Table 2 - AVERAGE BWR UNRELIABILITY

Low Pressure Injection System Outage Time (days/month)	Average Unreliability
1	5.7×10^{-4}
5	2.4×10^{-3}
7	3.4×10^{-3}
10	4.7×10^{-3}
15	7.1×10^{-3}

Table 3 - PWR/BWR Outage Times for Equal Average Unreliability

Outage Times (days/month)		Average Unreliability
PWR	BWR	
1	8.2	3.9×10^{-3}
2	8.7	4.1×10^{-3}
3	9.1	4.3×10^{-3}
4	9.6	4.5×10^{-3}
5	10.0	4.8×10^{-3}
6	10.5	5.0×10^{-3}
7	10.9	5.2×10^{-3}