



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

NOV 14 1979

Mr. G. E. Liebler, Chairman  
Combustion Engineering Owners Group  
Florida Power & Light Company  
P. O. Box 013100  
Miami, Florida 33101

Dear Mr. Liebler:

SUBJECT: EVALUATION OF OPERATOR GUIDELINES FOR SMALL-BREAK  
LOSS-OF-COOLANT ACCIDENTS IN C-E DESIGNED OPERATING PLANTS .

Our letter of June 5, 1979 (Robert W. Reid to all operating Combustion Engineering plants) requested that operating plants with C-E designed reactors develop guidelines for the preparation of operating procedures to cope with small-break LOCA's. In response to this request, the C-E Owners Group submitted report CEN-114-P (Amendment 1P) which included said guidelines. In response to our requests for additional information and to issues raised during our meeting of October 30, 1979, the guidelines were subsequently modified. The modified guidelines were submitted by your letter to D. F. Ross dated November 8, 1979. We have completed our review of the modified guidelines, and are attaching hereto as Enclosure 1 a copy of our evaluation.

As stated in our evaluation, we have concluded that the guidelines submitted by your November 8, 1979 letter are acceptable for use in developing operating procedures to cope with small-break LOCA's in C-E operating plants having high-pressure safety injection pumps with shut-off heads less than 1600 psi. Although the guidelines were based on a reference plant having 200 psi safety injection tanks and 1300 psi high-pressure safety injection pumps, you have stated that they are applicable to all operating C-E plants, including those with 600 psi safety injection tanks and those with 2400 psi high-pressure safety injection pumps. However, we have not as yet determined that the guidelines are acceptable for a plant having high-pressure safety injection pumps with a 2400 psi shut-off head. Our concern is related to the potential events in which water could be discharged through the safety valves while the operator is attempting to reach a condition of at least 50° F below saturation. A copy of the approved guidelines, subject to acceptably incorporating those revisions required by Enclosure 1, is attached hereto as Enclosure 2.

Those licensees with C-E designed reactors for which these guidelines are approved may now proceed with the development of small-break LOCA emergency procedures and operator training. In developing these procedures, each licensee must account for the effects of specific design characteristics at its plant. As indicated on Page 5 of Enclosure 6 to the Darrell G. Eisenhower letter dated September 13, 1979 to all operating nuclear power plants, these procedures and related operator training are to be implemented by December 31, 1979.

1401 263

7911280 261

C

NOV 14 1979

Mr. G. E. Liebler

-2-


In implementing these procedures, each licensee shall provide:

- (1) The instrument uncertainties involved with HPI termination criteria to indicate that the criteria will assure subcooled conditions.
- (2) Adequate assurance that the HPSI pumps will not be run deadheaded in the recirculation mode and that minimum flow requirements will be met.
- (3) An indication of the typicality of the analyses documented in CEN-114-P (Amendment 1P) and in the modified guidelines shown in Enclosure 2 relative to its own plant.

Licensees will also be required to implement emergency procedures covering the extended loss of all feedwater, (including pressure vessel integrity considerations), and to revise emergency procedures for initiating and monitoring natural circulation, including provisions for plant cooldown. These procedures will be based on guidelines which the C-E Owners Group are developing under "inadequate core cooling."

As part of our audit program, we expect to examine the procedures at a lead C-E operating plant initially, and at other C-E operating plants at a later date to assure that the procedures were developed in accordance with the approved guidelines. We also plan to check out some of the procedures at a C-E simulator on a schedule to be developed later. It should be noted however, that our audit program need not impede progress toward implementing the procedures and associated training by December 31, 1979.

Sincerely,

  
D. F. Ross, Jr., Director  
Bulletins & Orders Task Force

Enclosures:  
As stated  
cc: See attached lists

1401 264

ENCLOSURE 1

1401 265

## Evaluation of Combustion Engineering Post-LOCA Operating Guidelines

### Introduction

By letter dated June 5, 1979, the staff requested that all operating CE plants provide guidelines for the preparation of operational procedures for the recovery of plants following small LOCA's. The guidelines were to cover both short-term and long-term situations and follow through to a stable condition. Recognition of the event, precautions, actions, and prohibited actions were to be included also. CE submitted CEN-114-P-(NP), "Review of Small Break Transients in Combustion Engineering Nuclear Steam Supply Systems" in July, 1979 and CEN-115-P(NP), "Response to NRC IF Bulletin /9-06C Items 2 and 3 for Combustion Engineering Nuclear Steam Supply Systems" in August, 1979. CEN-114-P(NP) was submitted in response to our request for information while CEN-115-P(NP) revised this response to account for the impact of RCP operating requirements.

### Summary Description: CE Post-LOCA Operating Guidelines

The guideline submitted by CE is preceded by a bases section which supplies background material for the information presented in the guideline. The guideline itself is split into four sections: Symptoms, Immediate Actions, Follow-Up Actions, and Precautions.

The Symptoms are a list of indications which an operator is expected to utilize in confirming that a small break loss-of-coolant accident has occurred. Low pressurizer pressure, high containment sump level, high containment pressure or temperature, safety injection actuation, and high or low pressurizer level are among the symptoms provided to the operator to assist in the identification of this accident. A diagnostics chart has been appended to the LOCA guidelines to clarify symptoms and to channel the operator's actions into the correct procedure.

1401 266

Immediate Actions are those actions which are required to place the plant in a safe condition. These steps are distinguished from subsequent procedural steps by a requirement for memorization. An operator must know these steps without reference to a procedure, thereby ensuring that there is no delay in achieving a safe condition. The guidelines require that the reactor be tripped; standard post-trip actions be carried out (plant specific); safety injection be initiated (if not automatically actuated); reactor coolant pumps be tripped after SIAS actuation on low RCS pressure; auxiliary feedwater flow be established if main feedwater is not available; verification that the CIAS and SIAS signals have properly actuated; the SIS be operated to maintain a 50°F subcooling margin and indicated pressurizer level; and the break be located and isolated if possible.

**POOR ORIGINAL**

Follow-Up Actions are actions required to place the plant in a stable condition. The previous procedural steps (Immediate Actions) ensured that the reactor was in a safe condition, that the core remains covered by ECCS operation, and that escaping radioactivity is isolated by CIAS. The next steps are aimed at bringing the plant to a lower mode of operation, cold shutdown. The Follow-Up Actions require a plant cooldown within one-hour using the steam dumps or turbine bypass system. The cooldown is continued via a number of alternative paths such as long-term recirculation, initiation of shutdown cooling, continued use of the steam dumps and emergency feed, or, as a last resort, opening of the power operated relief valves.

The Precautions section lists warnings which the operator must observe to ensure plant safety. For example, the operator is warned that pressurizer level may not always be a true indicator of fluid inventory and that primary system temperature must be monitored when establishing auxiliary feedwater to prevent excessive cooldown rates. A total of eleven Precautions have been included for implementation by the licensees in the appropriate procedural locations.

1401 267

### Evaluation

The NRC staff reviewed the post-LOCA operating guidelines with respect to the following critical operator actions:

1. Reactor coolant pump trip
2. Safety injection termination criteria
3. Verification of safety systems actuation
4. Verification of a heat sink.

During our review, the staff identified modifications to be made to the guidelines to enhance the directions to the operator. These modifications were subsequently incorporated in the guidelines via revisions issued on November 8, 1979.

The criteria for tripping the reactor coolant pumps are consistent with the requirements of IE Bulletin 79-06C. All operating reactor coolant pumps are stopped after an SIAS caused by low reactor coolant system pressure and after it has been verified that the reactor has been shutdown for at least five seconds. We conclude that this criterion is acceptable subject revising "Immediate Action" item 3 of the guidelines to be consistent with the above wording.

The criterion for terminating safety injection flow is based on the establishment and maintenance of a 50<sup>0</sup>F subcooling margin along with an indication of pressurizer level. The staff concurs that these criteria are sufficient for ensuring that safety injection can be terminated without concern for detrimental voiding in the primary system. We conclude that this criterion is acceptable for those plants with low-head HPSI pumps (< 1600 psi).

1401 268

As part of his immediate actions, the operator is directed to verify the reactor trip, safety injection actuation, adequate auxiliary feedwater flow (if main feedwater is not available), and containment isolation actuation. We concur that these actions are sufficient to ensure minimum safeguards and heat sink availability needed to mitigate small break LOCAs.

The staff noted that the guidelines are based on obtaining at least minimum safeguards operation to mitigate small break LOCAs. We require each licensee to extend the emergency procedures to cover the loss of all feedwater. Procedures for this degraded condition should also take into account pressure vessel integrity considerations. The Owners Group has committed to prepare guidelines for operational procedures regarding the loss of all feedwater as part of its effort on the issue of inadequate core cooling.

The staff also requires that the emergency procedures include instructions for monitoring and initiating (if lost) natural circulation for small break LOCAs where heat removal by the steam generators is required. A separate guideline has been received on natural circulation operation. The staff, upon completion of its evaluation, will require that the natural circulation guideline be appended to or referenced by the appropriate emergency procedures.

The staff requires that each licensee provide procedures for cooling down the plant under natural circulation conditions. These procedures should address boration control and monitoring, cooldown of the pressurizer, and adequate criteria for monitoring coolant system temperatures to ensure that voids do not form in the primary system which could inhibit adequate heat removal. As in

the case of loss of all feedwater, the Combustion Engineering Owners Group has committed to prepare guidelines for operational procedures regarding cooldown under natural circulation conditions as part of its effort on inadequate core cooling.

### Conclusions

Based on our review, we conclude that the small-break loss-of-coolant accident operating guidelines submitted by the Combustion Engineering Owners Group on November 8, 1979 are acceptable for C-E plants having high-pressure safety injection pumps with shut-off heads 1600 psi or less. Accordingly, said guidelines can be used for developing operating procedures for coping with small-break loss-of-coolant accidents for such plants, provided that the licensees implement the requirements noted above when developing their procedures. Our acceptance of these generic guidelines notwithstanding, each licensee must account for the effects of specific plant design parameters (e.g., differences in the shut-off pressures of high-pressure safety injection pumps, differences in the design pressure of the safety injection tanks), when translating these guidelines into plant specific operating procedures.



ENCLOSURE 2

1401 271

P.O. Box 529100  
Miami, FL 33152  
November 8, 1979

Dr. Denwood F. Ross, Jr.  
Director  
Bulletins and Orders Task Force  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission  
Washington, D. C. 20555

Subject: Transmittal of Revised Post-LOCA Guidelines

Reference: (A) NRC letter from Dr. D. F. Ross, Jr. to Mr. G. E. Liebler,  
dated October 19, 1979

(B) IE Bulletin 79-06C, dated July 26, 1979

(C) NUREG-0578, July 1979

Dear Dr. Ross:

Reference A requested additional information regarding the guidelines presented in CEN-114 Revision A and CEN-115 for loss of coolant accidents (LOCA). Questions regarding those guidelines were further discussed in a meeting with the NRC staff on October 30, 1979, and a number of revisions were agreed upon. This letter transmits those revised Post-LOCA guidelines. These guidelines are being submitted for your approval on behalf of the Combustion Engineering Owners Group so that they may be incorporated into utility procedures in accordance with Reference B and the schedule presented in Reference C.

It should be noted that these guidelines do not necessarily reflect the preferred actions of our vendor, Combustion Engineering. Combustion Engineering's preferred actions remain as stated in CEN-115. The NRC staff has specifically requested that the guidelines for RCP operation be revised to incorporate the RCP operating requirements stated in IE Bulletin 79-06C (Reference A, Item I.6.E). Combustion Engineering has been unable to identify a transient analyzed in Chapter 6 or 15 of the FSAR that will result in violation of acceptance criteria, provided the RCP's are not tripped until the rods have been fully inserted for 5 seconds. The enclosed guidelines have therefore been revised to reflect the staff's request.

If you should have any questions regarding these guidelines, please feel free to contact me at (305) 552-3811.

Ver

C-E

Geo  
Cha

DUPLICATE DOCUMENT

1401 272  
Entire document previously  
entered into system under:

ANO 7911090463

No. of pages: 11

Enclosure