UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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AFFIRMATION/DISCUSSION AND VOTE

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PUBLIC MEETING

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Nuclear Regulatory Commission

One White Flint North

Rockville, Maryland

Thursday, April 6, 1989

The Commission met in open session, pursuant to notice, at 11:24 a.m., the Honorable LANDO W. ZECH, JR., Chairman of the Commission, presiding.

COMMISSIONERS PRESENT:

LANDO W. ZECH, JR., Chairman of the Commission

THOMAS M. ROBERTS, Member of the Commission

KENNETH M. CARR, Member of the Commission

KENNETH C. ROGERS, Member of the Commission

JAMES R. CURTISS, Member of the Commission

STAFF AND PRESENTERS SEATED AT THE COMMISSION TABLE:

SAMUEL J. CHILK, Secretary

WILLIAM C. PARLER, General Counsel

P R O C E E D I N G S

(11:24 a.m.)

CHAIRMAN ZECH: Good morning, ladies and gentlemen.

This is an affirmation session. We have one item to come before us this morning. Before I ask the Secretary to walk us through that item, do any of my fellow Commissioners have any comments to make?

(No response.)

If not, Mr. Secretary, you may proceed.

MR. CHILK: The item, Mr. Chairman, is SECY 88-325, entitled Policy Statement on Additional Applications of Leak-Before-Break Technology.

The Commission, in this paper, is being asked to act on a policy statement indicating the Commission's position on extending the leak-before-break concept to emergency core cooling systems and equipment qualifications.

All Commissioners have approved the policy statement, with modifications proposed by Commissioners Roberts and Curtiss. The statement indicates that the Commission is not undertaking any rulemaking to extend the applicability of the leak-before-break to emergency core cooling systems, or to environmental qualifications of safety-related electrical and mechanical equipment at this

time. However, the Commission does encourage the industry to provide the quantitative information necessary for NRC to justify devoting resources to rulemaking efforts in the future.

Would you please affirm your votes?

(Chorus of ayes.)

CHAIRMAN ZECH: Is there anything else to come before us this morning?

MR. CHILK: I have nothing further.

CHAIRMAN ZECH: All right. Thank you very much. We stand adjourned.

(Whereupon, at 11:26 a.m., the meeting was adjourned.)

CERTIFICATE OF TRANSCRIBER

This is to certify that the attached events of a meeting of the United States Nuclear Regulatory Commission entitled:

TITLE OF MEETING: AFFIRMATION/DISCUSSION AND VOTE

PLACE OF MEETING: ROCKVILLE, MARYLAND

DATE OF MEETING: APRIL 6, 1989

were transcribed by me. I further certify that said transcription is accurate and complete, to the best of my ability, and that the transcript is a true and accurate record of the foregoing events.

Phyllis Young

Reporter's name: PHYLLIS YOUNG

scheme involved. The illogic of this inconsistency is highlighted by the absence of a sound technical justification for applying leak-before-break only for certain applications, when the technology has been proven and accepted.

4. Qualification Capabilities

A number of potential benefits could be realized through improved qualification testing. Such improved testing would establish with greater precision the qualified characteristics of components and equipment.

LOCA Testing: With reduced environmental profiles, LOCA testing could be improved. In such tests rapid temperature and pressure rises associated with current design basis breaks are difficult to simulate in test chambers where "overshoot" invariably occurs, resulting in unnecessary test failures.

Further, present LOCA assumptions result in initial transients with peak conditions occurring in approximately 10 seconds. In order to simulate these rise times LOCA simulations typically involve purging of the air contained in the test chamber during the initial portion of the transient. Recent research has suggested that degradations for certain materials can be strongly influenced by the lack of oxygen (air) in the test chamber. Furthermore, the condensing heat transfer from the chamber environment to the test specimens is significantly increased when noncondensables are removed from the test chamber. Consequently, the effects of the unrealistic rapid temperature rise, such as increased stresses due to differential expansion of specimen parts, are multiplied by a larger condensing heat transfer coefficient.

As an example, some terminal block tests have resulted in cracking of the block material due to transient expansion differences between the block and the junction box metal wall. In both cases (the purging of air and the increased heat transfer to the test specimen) the effects on equipment are not reflective of postulated LOCA conditions. By employing leak before break assumptions the longer rise times could be adequately simulated without the air purging. Consequently, the simulation would more accurately represent the LOCA environmental conditions.

Standardization: In addition, to the extent profiles are reduced and licensees' bounding conditions become more consistent (presently, there are wide variations in profiles) it would be (1) feasible to establish generic profiles, permitting manufacturers to perform testing with more generic applicability than is possible now, and (2) for licensees to sponsor new testing to support implementation of some of the

benefits described here. More uniform testing will also facilitate regulatory reviews by the Staff.

In particular, due to a variety of considerations including plant vintage, primary system configuration, containment size, etc., accident environmental profiles can vary significantly from plant to plant. This is presently reflected by the lack of a specific qualification environmental profiles in regulatory requirement documents and applicable environmental standards for all reactor types. (Note that the French have established a standardized qualification profile.)

Further, if leak before break assumptions were utilized, existing plant specific variations would be minimized and more uniform profiles may result. There are a number of resulting implications. For instance, regulatory criteria and standards documents could reference an enveloping standard qualification profile. (Previous efforts to develop such an enveloping or standard profiles were hampered by the variety of different profiles. Consequently, the enveloping profile was overly conservative and did not adequately represent any one plant.)

In addition, the use of standardized profiles could result in fewer but more rigorous future qualification test programs. The broader use of new tests performed to standardized profiles would insure a detailed review of all test facets by both the NRC and the industry. By focusing on a few detailed tests, rather than a broad spectrum of tests customized to each plant's unique conditions, industry and staff resources would be conserved, yet a more thorough review of each qualification test would be performed.

Finally, beyond conserving technical resources, qualification to standardized profiles would encourage manufacturers and groups of utilities to cost effectively sponsor qualification testing of new equipment. In an era where the utility industry is experiencing a loss of support from equipment manufacturers, the standardization would encourage manufacturers to support qualifying state-of-the-art equipment for use in safety related applications. As a result increased equipment performance and reliability may result from the use of newer equipment designs.

5. Operational Capabilities Would Be Enhanced

In achieving reductions in environmental profiles, improvements in operational capabilities could also be realized. These improvements may increase the level of safety by providing additional equipment or time for responding to

accident conditions, or providing better indication of plant conditions to permit appropriate operator responses.9/

For instance, additional equipment might be designated as qualified for accident response, whether as a result of (1) reducing harsh profiles (thereby permitting previously unqualified equipment to be qualified or increasing the availability of already qualified equipment); or (2) eliminating harsh profiles (thereby permitting additional equipment to be designated as available for accident response). The net result of such changes would be to enhance emergency response capabilities (e.g., by permitting use of additional response capabilities in the accident context, including the use of familiar normal cooldown or operational transient approaches).

Further, operational enhancements may be achieved by permitting the use of more appropriate operating set points, thereby reducing reactor trips and the associated challenge to reactor systems. For instance, set point calculations use "worst-case" instrumentation inaccuracies, which typically occur at the peak temperature during LOCAs or Main Steam Line Breaks ("MSLB") and with peak postulated radiation doses. The test profiles themselves are based on a conservatively postulated accident profile, plus additional margins. Factoring in potential instrumentation inaccuracies narrows further the acceptable "window of operation", resulting in unnecessarily restrictive set points. As a consequence, unnecessary reactor trips and associated challenges to the systems result. Applying leak-before-break to lower environmental profiles would permit more realistic instrumentation setpoints, thereby expanding the window of operation and minimizing unnecessary reactor trips.

An example of this situation involves the Steam Generator Lo-Lo Level Reactor Trip Setpoint. Because of conservative post-accident temperature profiles, steam generator level set points are premised on these elevated conditions (e.g., inaccuracy effects due to reference leg heatup and sensor effects). This artificial raising of the level trip setpoint has produced unnecessary reactor trips. Reduction of the containment temperature profile, permitting relaxation of considerations, resulting in overly conservative inaccuracy assumptions (e.g., the reference leg heatup requirement) could enhance the ability of the unit to handle a transient without a reactor trip.

9/ In this regard, we note that with an increased availability of leak-before-break, licensees may well pursue improved leak detection methodologies which would provide additional benefits, e.g., in licensee's ability to detect and respond to adverse plant conditions.

6. Plant and Equipment Designs Could be Advanced

Reductions in environmental profiles as a result of applying leak-before-break technology may permit the use of alternative equipment with better overall performance characteristics, more advanced equipment or beneficial changes to plant design. The Group describes below some of the potential improvements in these areas.10/

Because of the paramount need for equipment and components to be qualified for parameters associated with harsh environments, certain materials or components which exhibit greater overall performance characteristics may be excluded from consideration. For instance, silicone cable insulation exhibits notably better performance characteristics, such as with respect to thermal capabilities, than other cables. However, other cable insulation exhibits more favorable performance characteristics in other areas, and is, on balance, selected for applications requiring qualification. As a further example, the use of materials with excellent performance characteristics for use in sealing applications or for valve seats has been limited because they could not withstand harsh environmental conditions associated with presently postulated pipe ruptures.

Further, with many plant locations potentially seeing less harsh environments, use of state-of-the-art equipment may become an option. Such equipment normally produces improved reliability and more accurate monitoring capability. For example, many new electronics have built-in functionality checkers. These functionality checkers verify proper operation and calibration (partial or complete) of the equipment. (This function can also lead to a reduction in maintenance requirements, thereby producing the benefits described above.)

With respect to potential plant design improvements, particularly for outside containment applications, rooms adjacent to a room with a pipe break/leak may not be as greatly impacted by leakage cracks as they are from large pipe ruptures because the pressure driving force for propagation of the accident environment will be substantially reduced.

For example, for BWRs, the existing design bases require the analysis of a variety of reactor building steam line breaks. These breaks typically include HPCI/RCIC steam lines

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10/ It should be noted that with the opportunity to utilize different materials or design concepts for applications previously limited to harsh environments may also provide incentives for further design enhancements of particular equipment or components.

and RWCU lines. Present analyses of DEG breaks in these lines require venting of the break areas to other building compartments to prevent unacceptable structural pressurization in the break compartment. Unfortunately, such venting significantly increases the building areas and safety-related equipment exposed to the temperature, pressure, and steam conditions. If more realistic assumptions regarding break size were permitted, the postulated area of influence for break sizes would be reduced. This, in turn, would reduce the amount of equipment postulated to experience the harsh conditions. Accordingly, some locations may be reclassified as mild environments, resulting not only in the potential benefits discussed above, but in improved response capability in other regulatory areas (e.g., fire protection, by the elimination of unnecessary doors or vents installed to distribute post-accident environmental conditions).

F. No Genuine Safety Detriments Would Be Created; Therefore A Net Safety Benefit Will Result

The application of leak-before-break technology to environmental qualification design bases would not create true safety detriments within the context of design basis requirements. Because the Commission would determine that adequate protection of the health and safety of the public would remain, licensees would still provide the necessary reasonable assurance. Further, the viability of leak-before-break technology has been proven, as demonstrated by the Commission's adoption of the technology in eliminating the dynamic effects of pipe rupture and in modifying arbitrary intermediate break criteria.

Consequently, when licensees employ this technology, they will follow detailed acceptance criteria and apply the resulting changes in environmental profiles by maintaining assurances that equipment and components remain qualified to the (now modified) predicted profiles. These profiles will simply reflect a more realistic assessment of appropriate design basis conditions, eliminating demonstrated overly conservative assumptions. Thus, equipment and components will remain qualified to perform their intended functions under accident (harsh) conditions, as predicted by the best available technology. Any perceived "reduction" in safety would simply be premised on continued consideration of design assumptions presently-recognized as unduly conservative and non-realistic.

Finally, it should be noted that unrealistic environmental assumptions do not necessarily result in qualification conservatism. Sandia Laboratories, in a preliminary draft of its EQ Risk Scoping Study for the NRC, noted the negative safety implications of overly conservative environmental

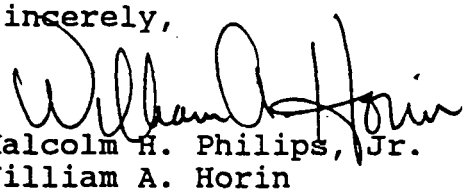
qualification assumptions. As discussed above, the impacts such conservatisms have on instrument accuracy and the resulting reduction in margin between safety system trip points and anticipated reactor operating regimes produces unnecessary challenges to reactor systems.

In sum, if one applies the Commission's "net safety benefit" test, it is apparent that the potential safety benefits described herein are substantial and far outweigh any perceived reduction. There is a reasonable expectation of realizing a net benefit (both safety and otherwise), and, accordingly, the Commission should proceed with the contemplated rulemaking.

III. CONCLUSION

For the foregoing reasons, the Nuclear Utility Group on Equipment Qualification supports the initiation of rulemaking regarding the application of leak-before-break technology to environmental qualification design bases.

Sincerely,



Malcolm H. Philips, Jr.
William A. Horin
Counsel to the Nuclear
Utility Group on
Equipment Qualification

(2)

New England Coalition
on Nuclear Pollution
Box 545, Brattleboro
Vt. 05301
802-257-0356

Secretary of the Commission -
Docketing and Service Branch.
Washington, DC.

8/9/88.

On August 8, 1988 the Coalition received a notice for proposed rule making on "Leak before Break Technology." The comment period ended on August 5.

Outdated requests for Public Comments make it very difficult for us to respond, particularly on technical matters. It can take up to a month to receive the necessary background information.

I request that the comment period be extended again - copy 53FR134 enclosed.

Sincerely, John Gilbert

comments received by the Commission may be examined at the NRC Public Docket Room, 1717 H Street NW., Washington, DC 20555.

FOR FURTHER INFORMATION CONTACT: John A. O'Brien, Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission, Washington, DC 20555, Telephone (301) 492-3928.

Dated at Rockville, Maryland, this 6th day of July 1988.

For the Nuclear Regulatory Commission.

Guy A. Arlotto,

Director, Office of Nuclear Regulatory Research.

[FR Doc. 88-15689 Filed 7-12-88; 8:45 am]

BILLING CODE 7590-01-M

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

Leak-Before-Break Technology; Public Comment Period Extended

AGENCY: Nuclear Regulatory Commission.

ACTION: Request for comments.

SUMMARY: The Nuclear Regulatory Commission is proposing to investigate the safety benefits associated with using leak-before-break technology to modify functional and performance requirements for emergency core cooling systems and environmental qualifications of safety related electrical and mechanical equipment.

DATE: On April 6, 1988, the Nuclear Regulatory Commission published a notice soliciting public comments on additional applications of leak-before-break technology (53 FR 11311). The original closing date for public comment of July 5, 1988, is now extended to August 5, 1988. Rcvd. 8/8/88 !

ADDRESSES: Send written comments to the Secretary of the Commission, Washington, DC 20555, Attention: Docketing and Service Branch. Copies of

(22)

ROCHESTER GAS AND ELECTRIC CORPORATION • 89 EAST AVENUE, ROCHESTER, N.Y. 14649-0001

ROBERT E. SMITH
Vice President
Production and Engineering

TELEPHONE
AREA CODE 716 546-2700

August 5, 1988

Secretary of the Commission
U.S. Nuclear Regulatory Commission
Washington, DC 20555
Attn: Docketing and Service Branch

Dear Mr. Chilk:

Rochester Gas and Electric wishes to provide comments concerning the benefits of applying "leak-before-break" technology to areas other than eliminating dynamic effects. We believe that there would be substantial benefits, both in terms of increased equipment operability/availability, and reduced analytical requirements. Resources thus saved could be placed on other tasks, such as increased technical support for maintenance initiatives, configuration management, and risk assessment.

1. Elimination of postulated large steam line breaks would eliminate the need for the boric acid storage tanks, and the problems associated with maintaining a hot solution of the high concentration boric acid. Problems with heat tracing, both under normal and accident conditions can, and have, caused boric acid crystallization in the safety injection lines. Also, the use of high concentration boric acid requires cautions to be added to the emergency procedures because of the need to flush these lines. These actions may delay performance of other safety-related operator actions.

   Elimination of postulated large steam line breaks would also eliminate superheated steam concerns, as described in IEIN 84-90, resulting in the savings of significant analysis resources (to define the superheated environment) as well as additional environmental qualification costs for the steam line break mitigation equipment.

2. Because of the anticipated reduction in the radiation source term, the spray additive for the containment spray system could potentially be eliminated, reducing the potential for operational problems associated with inadvertent NaOH addition. For long-term pH control, an additive such as hydrazine could still be added to the recirculated sump water.

3. Reduced pressure and temperature profiles could allow the use of better materials for equipment operability. This would also allow easier maintenance and calibration. In many cases superior materials have not been used in potential sealing applications because they could not meet the unrealistically harsh containment conditions associated with postulated full-diameter ruptures.

4. Reduced profiles would simplify LOCA testing, because the rapid initial temperature and pressure rise associated with the design basis breaks are difficult to simulate in test chambers. In order to meet these arbitrary profiles, the pressures and temperatures in the test chambers invariably exceed the required level by significant amounts, resulting in unjustified test failures.

5. Use of more reasonable profiles would result in better accuracy for LOCA-tested equipment, thus allowing this increased accuracy to be used in safety analyses and Emergency Procedures. This would both simplify and streamline the procedures.

   For example, our experience in transmitter testing has shown that worst-case inaccuracies result during this severe initial profile rise, due to the artificially severe temperature differential between the transmitter casing and the test chamber atmosphere.

6. With less severe environmental conditions, it is anticipated that more equipment could be environmentally qualified. This could result in more equipment being added to the Master (EQ) List, which would in turn further simplify EOPs. The operator could use equipment and methods in the EOPs which are similar or identical to the equipment and methods used in normal cooldown or for transients. This would result in fewer potential mistakes.

7. Equipment could be located and configured to simplify routine maintenance and calibration. A less harsh environment could result in less restrictive sealing procedures, which make equipment difficult to work on, and better locations (less flooding could allow lower location of equipment and make it more accessible for testing and maintenance).

8. Due to the anticipated lower peak energy removal requirements, containment heat removal systems, such as the fan coolers, could have less restrictive operability requirements, providing for more operational flexibility (for the fan cooler system and the support systems such as

service water). This would lessen the number of LCOs associated with the heat removal systems, and provide additional flexibility to use service water to other "nice-to-have" components, such as air compressors.

9. Reduction in mass and energy release during a LOCA could eliminate or reduce the need for the core flood tanks (safety injection accumulators). This could eliminate the need to perform the difficult and somewhat dangerous full flow accumulator discharge check valve test, or eliminate the personnel radiation exposure associated with periodic disassembly of these valves, as required by ASME Section XI.

10. For postulated pipe breaks outside containment, the use of LBB could have a major impact on requirements for flooding protection, since the fluid source term would be much smaller.

We hope that these comments will be given reasonable consideration and that the NRC will extend the leak-before-break principles beyond mitigation of dynamic effects.

Very truly yours,

Robert E. Smith

BALTIMORE
GAS AND
ELECTRIC

CHARLES CENTER • P.O. BOX 1475 • BALTIMORE, MARYLAND 21203

CHARLES H. CRUSE
MANAGER
NUCLEAR ENGINEERING SERVICES DEPARTMENT

August 19, 1988

U. S. Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: Document Control Desk

SUBJECT: Calvert Cliffs Nuclear Power Plant
Unit Nos. 1 & 2; Docket Nos. 50-317 & 50-318
Comments on Additional Application of Leak-Before-Break Technology

Gentlemen:

On April 6, 1988, the Commission requested comments concerning additional applications of leak-before-break technology. We are providing comments on the safety and operational benefits which could be gained by applying leak-before-break technology to modify Emergency Core Cooling System (ECCS) and Environmental Qualification (EQ) requirements.

The attachment discusses the safety and operational benefits which Calvert Cliffs Units 1 and 2 might see if additional applications of leak-before-break are allowed. We urge the Commission to allow other applications of leak-before-break technology. Also, we support the comments on this issue provided by the Nuclear Utility Group on Equipment Qualification.

Should you have any further questions regarding this matter, we will be pleased to discuss them with you.

Very truly yours,

Charles H. Cruse

CHC/PSF/dlm

Attachment

cc: D. A. Brune, Esquire
J. E. Silberg, Esquire
R. A. Capra, NRC
S. A. McNeil, NRC
W. T. Russell, NRC
D. C. Trimble, NRC
T. Magette, DNR
J. A. O'Brien, NRC

ATTACHMENT

COMMENTS ON ADDITIONAL APPLICATION OF
LEAK-BEFORE-BREAK TECHNOLOGY

The following are a summary of some of the benefits we believe could be gained by applying leak-before-break technology to Emergency Core Cooling System (ECCS) and Equipment Qualification (EQ) requirements. The data provided is approximate; we have not performed extensive analyses to determine the exact benefits. Our determination of benefits is based on the assumption that the CEOG will provide an acceptable analysis which eliminates a double-ended large pipe rupture (Loss of Coolant Accident [LOCA] and Main Steam Line Break [MSLB]) from consideration in ECCS and EQ requirements.

ECCS DESIGN

ECCS operating conditions would be less severe. The requirements for starting and reaching rated flow could be relaxed, which reduces stress on the pump motors. Time between maintenance cycles could be reduced and the equipment lifetimes may be extended. The probability of component failure would be reduced.

Some of the equipment used during normal operations would also be available for use during a plant transient. The environmental conditions may be reduced to the point where this equipment would be considered operable for most severe transients. The operators could then use more familiar equipment and procedures to mitigate these transients. This would increase the reliability and diversity of the equipment used for transients and ensures an even higher level of safety than presently exists.

EMERGENCY DIESEL GENERATORS (EDG)

If ECCS is not required as soon, because the primary system doesn't experience a rapid loss of coolant, then the EDG is not required to start as soon either. Slower EDG starting and loading would have several benefits. These are:

- A decreased potential for bearing degradation
- A decreased potential for EDG power transmission and gear degradation
- An increased margin on instrumentation time delay responses
- Safety-related motor loads could be spaced out. This would reduce the chance that we would exceed the capabilities of the voltage regulator/generator.
- Fast starts exercise the governor to its maximum capability. We may be able to eliminate the air start booster for the governor. This eliminates a potential governor failure, which increases reliability.

Maintenance testing will also benefit from slower diesel generator starts. Currently, the automatic start relays and switches must be bypassed to do the slow diesel start required by post-maintenance testing. If the normal starting mode for the EDG were slower, the switches might not have to be changed during testing.

The above benefits would increase EDG reliability and reduce EDG failures to start by at least 25%.

EQUIPMENT QUALIFICATION

We assume that the equipment qualification temperature, pressure and radiation profiles will change significantly if LOCA and MSLB are eliminated as EQ design basis events. This would allow credit for the use of presently unqualified equipment during severe transients.

Under the present environmental conditions assumed, instrument uncertainties increase significantly during a LOCA or MSLB. Pressure transmitters provide an example of this.

	NORMAL CONDITIONS	ACCIDENT CONDITIONS
Temperature	-40°F to 200°F	318°F for 8 hours
Humidity	0 to 100%	Steam Environment
Radiation	Location Dependent	2.2×10^7 rads
* Accuracy	0.25%	4.5% (temperature) 8% (radiation) 5% (after accident)

* Accuracy is one component of instrument uncertainty. Other components are drift, normal environmental effects, power supply effects, accident environmental effects and safe shutdown earthquake effects.

The uncertainty associated with a primary system pressure transmitter doubles under accident conditions. The Reactor Coolant Pump trip setpoint has been changed to account for this additional uncertainty. Also, the steam generator secondary side pressure trip setpoint has been set much closer to the normal operating pressure to account for instrument uncertainty. We have been unable to find evidence that a specific plant trip has been caused by this change in trip setpoints. However, plant transients have challenged the reactor system because of the conservative trip point settings.

Instrument lifetimes could be extended if they didn't have to be designed to operate under severe environmental conditions. It may be possible to reduce the number of instrument replacements due to instrument age by two or three over the life of the plant. For a pressure transmitter this could save upwards of $10,000 for each replacement. With the large number of qualified transmitters in the two units, this is a significant savings.

Also, a number of presently unqualified components could be qualified under less severe environmental conditions. A reduction in peak temperature and source term would have the greatest impact. Our procedures could then be changed to allow the use of equipment normally used during operation.

REDUCTION IN RADIATION EXPOSURE

Maintenance is typically more frequent and more complicated on qualified equipment than on commercial grade equipment. Maintenance time and the resulting radiation exposure would be reduced if the equipment was not designed to withstand such extreme environments. We believe that EQ maintenance-related exposure could be reduced by at least five to ten percent overall, and up to twenty to fifty percent in some cases. This could result in a manrem savings of at least 14 manrem per unit for each outage. With approximately 27 outages remaining for both units, we could realize at least a 378 manrem savings. Due to the limited scope of the review, this number could be much higher.

A specific example of a potential dose reduction involves replacement of the primary system RTDs. We recently used about four manrem for RTD replacement. Prior to 10 CFR 50.49 requirements, we used approximately one manrem for the same task. Another example involves servicing transmitters which now require "Raychem" splices. By eliminating the use of "Raychem" splices in favor of terminal blocks, we could reduce the time spent on this job by 20%. Dose savings are dependent on the location of the transmitters.

OPERATIONS

The application of leak-before-break technology to large pipe break requirements will have a significant impact on the operations of the units. Operators will be affected in two major ways.

- Normal plant equipment could be used during severe plant transients.
- Trip setpoints may be relaxed because of a reduction in instrument uncertainty, therefore, the operating band would be widened.

These changes will ensure a higher level of safety than presently exists.

Changes would be made in the Emergency Operating Procedures to allow the use of plant equipment used for normal operation during an accident. Operators are much more familiar with the equipment they use daily. It is probable that transients would be less severe because operators could respond using everyday equipment and actions.

The reduction of instrument uncertainties would have a major impact on plant operations. If the instrument uncertainties stayed the same under accident conditions as under normal operations, operators would not have to know that the uncertainties would change or by how much. Operators would also have more confidence that the data from the instruments is as accurate as under normal conditions. Also, trip setpoints could be set less conservatively because they would no longer have to account for the larger instrument uncertainties during an accident. This would allow more flexibility because the plant would be capable of handling transients which would now cause a trip. An example of this is the steam generator pressure transmitters. The margin between the normal operating pressure and the trip pressure was cut in half because of instrument uncertainties associated with equipment qualification requirements. This will have a significant impact on the safe operation of the plant.

CONCLUSION

We urge the Commission to allow additional applications of the leak-before-break technology. We feel these would be a significant net benefit to Calvert Cliffs Units 1 and 2. A quick review has provided the above approximate data which shows significant net benefits. Further evaluations would uncover additional quantitative and qualitative benefits. Also, we endorse the comments made by the Nuclear Utility Group on Equipment Qualification.

ENCLOSURE 3

[7590-01]

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

Policy Statement on Additional Applications of Leak-Before-Break Technology

AGENCY: Nuclear Regulatory Commission.

ACTION: Policy Statement.

SUMMARY: The Nuclear Regulatory Commission (NRC) has at this time decided not to undertake rulemaking which would extend the scope of application of Leak-Before-Break (LBB) technology to emergency core cooling systems (ECCS) or environmental qualification (EQ) of safety-related electrical and mechanical equipment. Use of exemptions with respect to the application of LBB to EQ continues to be permitted in accordance with the modification of General Design Criterion 4.

FOR FURTHER INFORMATION CONTACT: John A. O'Brien, Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission, Washington, DC 20555. Telephone (301) 492-3894.

SUPPLEMENTARY INFORMATION:

EVALUATION OF PUBLIC COMMENT

On April 6, 1988 the NRC solicited public comment on the application of LBB to ECCS and EQ (53 FR 11311). Twenty-one effective comment letters were received. Twelve comment letters opposed the application of LBB to ECCS or EQ (from private citizens, citizens groups, regional coalitions and environmental groups) while eight comment letters supported such an application (from utilities, a nuclear steam supply system vendor, industry groups and a nuclear fuel vendor). One nuclear steam supply system vendor took a neutral position.

Among those opposing, repeated citation was made to the Surry pipe rupture in December 1986, the March 1988 General Accounting Office report, "Action Needed to Ensure that Utilities Monitor and Repair Pipe Damage," the unreliability of ultrasonic detection of piping flaws and public statements made in August 1983 by the then Director of the Office of Nuclear Reactor Regulation (NRR) pertaining to intergranular stress corrosion cracking in BWR piping. The NRC has determined that none of these citations discredit either the present or proposed expanded scope of LBB. This is explained as follows: LBB acceptance criteria cannot be satisfied in the feedwater suction line which ruptured at Surry. There is no reason to expect LBB behavior in this line. The cited GAO

report treated erosion/corrosion of piping. The factors which control erosion/corrosion are sufficiently understood so that the NRC can determine with confidence which piping systems are susceptible to erosion/corrosion. NRC acceptance criteria do not permit piping subject to erosion/corrosion to qualify for LBB. Difficulties with ultrasonic testing are irrelevant to LBB. Leakage detection with high margins is used instead to detect throughwall cracks in high energy piping during service. The statements made in August 1983 to the Commissioners by the then Director of NRR were made at a time when LBB had not advanced to its present state, and moreover were directed to BWR piping. Unless special materials or measures are employed, LBB cannot be applied to BWR piping because of intergranular stress corrosion cracking.

The nuclear steam supply system vendor that took a neutral position with respect to the application of LBB to EQ and ECCS recognized that limited safety and operational benefits could result. However, this comment letter concluded that comparable benefits could be obtained employing another recent rule change (as described below), and that " economic benefit....does not appear to be major, and net safety benefits may not outweigh the detriments."

Among those supporting the expanded use of LBB to EQ and ECCS, many economic, operating, testing, maintenance and design benefits were cited. The NRC remains firm in using safety benefits as the prime measure in deciding whether to divert resources to the research and rulemaking efforts needed to apply LBB to EQ and ECCS. A few safety benefits were identified in public comment. These are discussed as follows. The test and design requirement

for fast starting of emergency diesel generators is derived from the double-ended guillotine rupture of reactor coolant loop piping when analyzed in accordance with 10 CFR 50.46 and Appendix K. The test requirement degrades bearings, gears, the governor and power transmission such that the prospect of reliable service from the emergency diesel generators could be diminished if pipe ruptures actually occur. Using LBB to postulate smaller pipe ruptures would lengthen the starting time and assist in preserving the reliability of the emergency diesel generators for some (but not all) plants. A second safety benefit deals with radiation embrittlement of the reactor pressure vessel. The relatively low peaking limits for the fuel might be increased in some plants when smaller LOCAs replace the double-ended guillotine break requirement. With higher peaking limits the fuel configuration can be redesigned to yield less radial fluence leakage. This can mitigate concerns with vessel life extension and pressurized thermal shock of the vessel. An additional safety benefit can be achieved by equipment reliability improvements (other than for the emergency diesel generators) resulting from fewer plant scrams and challenges due to lower ECCS set points and less harsh equipment qualification environments. However, reliability improvement due to lower ECCS set points and less harsh equipment qualification environments can be offset by safety degradations associated with such actions, particularly with respect to severe accident performance. It is uncertain that overall safety would improve when less harsh EQ profiles are specified or ECCS set points are reduced.

The first two safety benefits cited above can be obtained more expeditiously and efficiently under the recent ECCS rule (53 FR 35996, September 16, 1988) which permits best estimate methodology with quantified uncertainty for

evaluating LOCAs. The models needed for implementing the ECCS rule have undergone substantial development; however, research must be initiated to develop replacement design basis pipe ruptures when LBB is invoked for ECCS. Moreover, whereas the ECCS rule already exists in final form, the rulemaking needed to expand LBB technology would consume at least two years and considerable NRC effort. Finally, while the ECCS rule can be applied directly to all light water reactors (except one with stainless steel fuel cladding), LBB can be applied only to qualifying reactors. The scope of qualifying reactors is unclear; especially in question are BWRs.

With respect to harsh environments inside the containment, unless LBB can be successfully applied to main steam lines, harsh environments will not substantially change. Significant requirements will remain unless most of the large diameter piping inside the containment satisfy LBB requirements. Additionally, other breaches in the fluid system boundary, such as failed manways or valve bonnets, must be examined to determine whether they control EQ profiles. Reductions in EQ profiles are more readily achieved outside the containment because temperature, pressure and humidity do not build-up due to venting and blow out panels in some cases. However, EQ profiles outside the containment attract lesser interest because the EQ profiles are usually less harsh and thus more easily satisfied. Moreover, there are no current activities to apply LBB to piping outside the containment.

A few commenters noted difficulties with cable insulation, seals and valve seats resulting from materials selected to resist harsh environments associated

with the postulated double-ended guillotine pipe rupture. The NRC acknowledges these difficulties, but is not certain that reducing harsh environments would, on balance, increase safety. The difficulties cited seem to be more related to operational, economic or maintenance factors than to safety considerations. Additionally, it was suggested that the threat of pressurized thermal shock would be reduced by lower pumping set points for low pressure safety injection. The NRC does not accept this position because pressurized thermal shock is controlled by injection of cold water at relatively high pressure during a small break LOCA.

POLICY STATEMENT

Having considered all public comments received, the Commission has at this time decided not to undertake any rulemaking to extend the applicability of LBB to ECCS or EQ. Any safety benefits associated with ECCS can be more readily obtained under the recent ECCS rule. The use of exemptions for applying LBB to environmental qualification was permitted in the revision to General Design Criterion 4 (52 FR 41288). This option continues to remain open.

Dated at Rockville, Maryland this _____ day of _____ 1988.

For the Nuclear Regulatory Commission.

_____

Samuel J. Chilk,

Secretary of the Commission.

(5) Elimination of Unnecessary Surveillance and Maintenance in Radiation Areas

Elimination of an unnecessarily high "reserve life" to accommodate an accident will allow a longer qualified life, thus reducing maintenance and replacement activity. This more realistic approach will reduce the overall radiation exposure to plant workers. Less frequent maintenance activity will also improve plant availability. INPO 87-022 "Operational Performance of Reactor Protection Systems In U.S. Pressurized Water Reactors: 1981-1985" identifies trips while one channel is out for maintenance or surveillance, as a major cause of unplanned automatic scrams.

(b) Application of LBB technology in determining the environmental requirements within containment will reduce the temperature and pressure parameters (as well as the radiation). This reduction would:

(1) Eliminate some additional qualification testing as in (a)(1) above.

(2) Enable more standard equipment to be applied as in (a)(2) above.

(3) Improve availability as in (a)(3) above.

(4) Extend qualified life and reduce surveillance and maintenance as in (a)(5) above.

(c) The nature of a large bore guillotine pipe break outside containment, e.g. main steam line break (MSLB), is to create harsh environmental conditions not only in the vicinity of the break, but in rooms far removed. The application of LBB technology would:

(1) Reduce EQ Requirements for Rooms Which Do Not Contain High Energy Piping

Correspondingly, leak detection provisions outside containment will need to be supplemented and improved. The designer would be required to show that the leak detection capabilities are consistent with the reduction in the propagation of the environmental effects. Provision of radiation monitors for leak detection outside containment may have limited application. However, area temperature and humidity monitors located in compartments where high energy piping failures are postulated should improve leak detection capability.

(2) Improved Knowledge of Plant Condition

An increased number of leak detection instruments distributed strategically throughout the plant would provide Control Room personnel with improved knowledge of pressure boundary performance. For the same expenditure, the capability of the defense-in-depth is improved by investment in leak detection rather than by investment in qualifying equipment located in compartments that are remote from the postulated break area.

Use of various and appropriate leak detection devices would represent a diversification of safeguards as compared to the environmental qualification of existing equipment.

Equipment as presently specified is over-designed for the environment that it is likely to see throughout its lifetime. The reduction of EQ requirements represents a more cost effective selection of equipment. An additional benefit of the extensive leak detection system will be better plant availability since operators will be able to respond earlier to a leak rather than to the break that might ensue. Among the benefits of early response would be a reduction of drainage and wastes to treat.

(d) Similarly to item (c), a postulated break in the letdown line creates an area of harsh chemical, temperature and dynamic effects. Under application of LBB technology:

If the harsh chemical environment has ruled out the use of some equipment, benefits to diversity as described in (a)(1) will be possible; and

If the harsh chemical environment has necessitated modifications to equipment, benefits to the quality of equipment as described in (a)(2) will be possible.

ECCS Related Comments

(a) The designer can use LBB methodology to define a new "Design Maximum Leak" as justified by the system components and piping employed. Defining a new "Design Maximum Leakage" may allow reduced capacity requirements for the ECCS pumps. With a reduced capacity requirement, the designer could improve pump reliability by lowering motor starting torque, reducing required Net Positive Suction Head (NPSH), and improving the NPSH available to the pumps. These factors would improve seal wear ring, and bearing wear and enhance equipment performance during testing and actual operation.

With reduced ECCS pump motor sizes, operational benefits will be accrued when loading the Emergency Diesel Generator (EDG). Assuming loss of offsite power, these pump motors will sequence onto the safeguards bus more reliably because the load step with transient instability will be lower. Mitigation of this transient may also be achieved by expanding the timing allowed for the EDG loading sequence.

(b) The designer can use the removal of the sudden large break case to revise the instrument setpoints for ECCS actuation. This would create a larger margin to the normal operating range. This application of LBB technology would reduce the occurrences of inadvertent actuations of the ECCS systems due to the widening of margins for normal instrumentation readings. The occurrence of spurious scrams amounted to 17% of the cases as reported in INPO 87-022.

Once again, TU Electric strongly endorses the initiation of a proposed rulemaking to bring practical realism to modify functional and performance requirements for ECCS and EQ.

Very truly yours,

W. G. Counsil

HAM/grr

c - Mr. R. D. Martin, Region IV
Resident Inspectors, CPSES (3)

(20)

NUCLEAR UTILITY GROUP
ON EQUIPMENT QUALIFICATION

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August 5, 1988

Secretary of the Commission
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555
Attn: Docketing and Service Branch

Subj: Comments Regarding Additional Applications of Leak-Before-Break Technology (53 Fed. Reg. 11311 (April 6, 1988))

I. INTRODUCTION AND SUMMARY

On April 6, 1988, the Commission requested comments concerning additional applications of leak-before-break technology. (53 Fed. Reg. 11311) The Commission's request indicated that it was investigating the safety benefits associated with using leak-before-break technology to modify functional and performance requirements for emergency core cooling systems ("ECCS") and environmental qualification ("EQ") of safety-related electrical and mechanical equipment. The following comments are submitted on behalf of the Nuclear Utility Group on Equipment Qualification.1/ The Group's comments address the potential applications of leak-before-break technology to environmental qualification design bases.

For the reasons presented below, the Group urges the Commission to initiate rulemaking to consider the application of leak-before-break technology to environmental qualification design bases. The Group considers the initiation of such rulemaking to be consistent with, and indeed to further, the Commission's statutory mandate to protect the public health and safety. To this end, the comments below focus on two principal areas: (1) the factors the Commission should consider in deciding whether to proceed with rulemaking (Sections II.B. and II.C.); and (2) how rulemaking in this

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1/ The Group is comprised of over 40 utilities, each of which is a holder of a NRC construction permit or operating license for one or more power reactors. Since 1980, the Group has actively participated in the public process leading to the formulation, adoption, implementation, and enforcement of NRC regulations and guidance related to equipment qualification.

area, considering the potential benefits to be derived, satisfies those factors (Sections II.D.-II.F).

To summarize, the Group urges the Commission to consider, consistent with its rulemaking discretion, all potential benefits that may be derived from this rulemaking in deciding whether to proceed with rulemaking. At a minimum, even if the Commission focuses only on safety benefits, it should proceed with rulemaking if there is a reasonable expectation that net benefits will be derived from rulemaking. The Group maintains that significant safety benefit will be realized in numerous areas including reduction in man-rem exposure, reduction in challenges to safety systems, reduction in equipment changeouts (a recognized accident precursor), increased standardization of accident profiles and the resultant safety benefits, and increased allocation of industry and staff resources to areas with greater safety impact. Finally, the Group perceives no significant detriments that could outweigh those benefits. Accordingly, we urge the Commission to proceed with rulemaking.

II. DISCUSSION

A. Background

For some time now, the Commission has closely scrutinized applications of leak-before-break technology. In 1986, the Commission modified General Design Criterion 4 ("GDC-4") of 10 C.F.R. Part 50, Appendix A, to permit the application of leak-before-break technology to exclude from design bases the dynamic effects of postulated ruptures in primary coolant loop piping in pressurized water reactors ("PWRs"). At that time, the Commission indicated its intent to pursue future rulemaking to extend the application of leak-before-break technology as experience was gained in this area. (51 Fed. Reg. 12502 (April 11, 1986).) Thereafter, on October 27, 1987, the Commission further expanded the application of leak-before-break technology so as to eliminate from plant design bases the dynamic effects of postulated ruptures in all piping in all reactor types that satisfy stringent acceptance criteria. At that time, the Commission noted that the exclusion of ECCS, EQ and containment designs from the scope of the rule change introduced an inconsistency into the regulations. (52 Fed. Reg. 41288.)2/

Recognizing the inconsistency in the regulations created by the limitation of leak-before-break applications to the

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2/ The Commission did provide for consideration of leak-before-break technology in the environmental qualification area on a case-by-case basis (i.e., by exemption) (52 Fed. Reg. 41288).

consideration of dynamic effects of pipe ruptures, the Commission directed that the Staff pursue application of leak-before-break in other areas (52 Fed. Reg. 41288). By memorandum dated October 9, 1987, from the Secretary of the Commission to Victor Stello (Executive Director for Operations), the Commission noted that the above rule change was "an excellent example of how the NRC can enhance safety by eliminating overly conservative and unrealistic requirements." The Commission indicated that other areas may benefit from expanding the leak-before-break concept and simplification of requirements, noting specifically environmental qualification and ECCS. Accordingly, the Commission directed the Staff to review other areas for possible modifications and solicit public input. The Commission requested suggestions as to rulemaking changes to regulations to enhance safety by application of this concept. The present solicitation of comments is in response to the Commission's directive.

B. The Commission May Consider Benefits in Addition to Safety Benefits When Determining Whether to Proceed With Rulemaking

The Commission states in the solicitation of comments that:

> [t]he priority which the NRC assigns to modifying functional and performance requirements for EQ and ECCS will be determined in large measure from the balance between accrued safety benefits and detriments believed to result (including impacts on severe accident performance).
> [53 Fed. Reg. at 11312.]

The Commission concludes that "[i]f it can be shown that net safety benefits outweigh the detriments, then modification to the existing design bases may be permitted" (Id.). For the reasons set forth below, the Group submits that the Commission may properly consider safety and other benefits in deciding whether to proceed with this rulemaking.3/

3/ With respect to the inquiry concerning the potential impact on severe accident considerations of applying leak-before-break to environmental qualification, the Group supports assessment of such considerations in the appropriate context. The present inquiry, however, is not the proper forum for addressing that question. The proper focus of the present effort concerns the appropriateness of amending current design bases (e.g., GDC-4 requirements). The Commission has underway a separate process to assess severe accidents (see "Severe Accident Policy Statement," 50 Fed. Reg. 32138

(Footnote 3 continued on next page)

The Commission's rulemaking authority is derived from Section 161 of the Atomic Energy Act ("Act"), which provides, inter alia, that the Commission may "establish by rule, regulation or order, such standards and instructions to govern the possession and use of special nuclear material, source material and byproduct material as the Commission may deem necessary or desirable . . . to protect health or to minimize danger to life or property" (42 U.S.C. § 2201(b)). In addition, Section 182(a) of the Act, 42 U.S.C. § 2232(a), dictates that the NRC assure that the use of radioactive material "provide[s] adequate protection to the health or safety of the public."

In accordance with this statutory scheme, the Commission may take such rulemaking actions as it deems desirable so long as it assures "adequate protection" of the health and safety of the public. Thus, where adequate protection ultimately results from the contemplated rulemaking action, the Commission is empowered to consider "economic costs or any other factor" in deciding initially whether to pursue the rulemaking at all. (See Union of Concerned Scientists v. NRC, 824 F.2d 108, 118 (D.C.Cir. 1987)).

The Group maintains that so long as the Commission ultimately finds that application of leak-before-break technology to environmental qualification design bases provides "adequate protection of the health and safety of the public", any factor may be considered in deciding whether to proceed with the rulemaking. Indeed, the ultimate determination as to whether the adequate protection standard would be satisfied (the Group believes it would be satisfied) is best determined in a full rulemaking proceeding. Consequently, at this pre-rulemaking stage the Commission clearly may consider any factor in deciding whether to proceed with rulemaking.

(Footnote 3 continued from previous page)
(August 8, 1985)). Progress is being made in this area, and the Commission is presently considering various Staff proposals (see "Integration Plan for Closure of Severe Accidents," SECY 88-147 (May 25, 1988)). In addition, research has been undertaken in the form of a probabilistic risk evaluation of environmental qualification requirements (a draft "EQ Risk Scoping Study" is presently being reviewed by ACRS). In sum, the issue of severe accident considerations is being examined independently of the present inquiry. To assure regulatory consistency, the impacts of applying leak-before-break technology in the severe accident context should be assessed with other severe accident issues, not in the context of this inquiry.

C. Rulemaking Should Be Undertaken if There is a Reasonable Expectation That a Net Benefit Will Be Realized

In considering whether to undertake this rulemaking, the Group believes that the appropriate basis for proceeding is if there is a reasonable expectation that a net benefit will ultimately result. In other words, at this point the Commission need not establish with absolute certainty that specific benefits will be derived. The Commission's statements regarding an examination of safety benefits should be implemented accordingly.

To be specific, the posture of the present solicitation of comments, i.e., a pre-rulemaking evaluation, affords the Commission particular leeway in exercising its discretion in the rulemaking context. Indeed, where, as here, the issue before the Commission is merely deciding whether to undertake rulemaking in the first instance, such discretion is particularly broad. (See Natural Resources Defense Council v. Harrington, 768 F.2d 1355, 1416-17 (D.C.Cir. 1985).) In this context, therefore, the Commission is well within the bounds of its discretion to initiate rulemaking where a reasonable expectation exists that there will be a net benefit from a potential rule change.

In addition, there are practical considerations which dictate that the Commission should not require (as appears to be contemplated) a final, definitive, demonstration of net safety benefits before proceeding with rulemaking. In particular, the decision here simply involves a further extension of a technology already accepted by the Commission. Thus, the appropriateness and feasibility of applying this technology in the Commission's regulatory arena has already been proven and is not in question here. Further, a complete demonstration of benefits to be derived is closely intertwined with the implementing criteria that would be established to apply leak-before-break technology in this area. Consequently, full consideration of the parameters for implementing this technology with respect to environmental qualification must necessarily occur in conjunction with the development of criteria and parameters to be developed in the context of the rulemaking itself. In view of these considerations, the Commission should proceed with the rulemaking so long as there is a reasonable expectation of a net safety benefit.

D. Environmental Qualification Profiles Will Be Favorably Altered by Application of Leak-Before-Break Technology

Implicit in any discussion of applying leak-before-break technology to environmental qualification is the assumption that significant changes in environmental conditions will result. Because licensees have already established their environmental qualification profiles based on presently required "worst case" pipe ruptures, individual licensees possess little comprehensive data with respect to the impact of eliminating those breaks. However, available data does provide valuable insights and supports reasoned conclusions regarding the impact on environmental effects of applying leak-before-break technology. In addition, data already submitted in the context of this inquiry (see W. J. Johnson (Westinghouse) Letter to NRC providing comments on the present request, dated July 13, 1988) provides further indication of the potential for favorable impacts on environmental qualification profiles. Further, to the extent pending reviews of applying leak-before-break to postulated steam line breaks result in relief in that arena, yet additional reductions in the severity of profiles could be realized.4/

1. Temperature, Pressure, and Steam Considerations

Pipe breaks can be categorized as either non-isolatable (i.e., LOCAs and inside containment MSLBs) or isolatable (i.e., certain outside containment MSLBs and other piping system breaks). For all breaks, the mass and energy release rates will be significantly lower when leak-before-break rather than Double Ended Guillotine (DEG) assumptions are used. Consequently, the ramp time of any initial environmental temperature and pressure transients will be less severe.

Further, although the post-transient conditions for non-isolatable breaks utilizing GDC-4 assumptions may be similar to the DEG values if one assumes the total mass and energy releases are similar, the peak temperature and pressure conditions may be significantly lower. For in-containment breaks the peak values may be significantly lower when the decreased temperature transient rise time permits suppression of the peak due to containment spray system operation or the effects of other heat removal systems. These effects are most

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4/ Although the Group firmly believes, as demonstrated herein, that significant safety benefits will accrue, should the NRC Staff nonetheless perceive a need to resolve uncertainties prior to initiating a rulemaking, we submit that appropriate research should be undertaken to address those uncertainties.

significant for steam line breaks creating super-heated vapor space conditions. The assumptions regarding automatic or manual initiation of the containment spray or other heat removal systems may be critical in determining the environmental changes when leak-before-break assumptions are used.

For the isolatable breaks typical of outside containment accidents, peak temperature and pressure values will vary based on assumptions regarding detection and isolation of the break. For many breaks, existing analyses indicate that compartment temperatures continue to increase, with the peak temperatures occurring at break isolation. If one assumes that initiation of isolation is independent of break size, then smaller size breaks will directly result in lower peak temperatures.

Finally, virtually all outside containment breaks are not contained within defined volumes. Pressurizations are generally dependent on mass flows from compartment to compartment. Consequently, reductions in break size should directly result in reduced peak compartment pressures. (This may not be true for compartments with "blow-out panels" or other structural considerations which limit peak compartment pressure.)

2. Radiation Considerations

Present equipment qualification dose requirements assume an instantaneous release to containment of part of the core at the start of the accident. Per the guidance of NUREG-0588 and Reg. Guide 1.89, instantaneous releases of 100% noble gases, 50% halogens, and 1% of the remaining fission products are assumed for the design basis LOCA (i.e., double ended guillotine break of the largest line). For other accidents, the source terms are based on an instantaneous release of the inventory of the breached fuel elements to the primary system.

Existing qualification source term criteria assume not only core damage significantly more severe than predicted by ECCS performance models, but the instantaneous release of these radionuclides into containment. If more realistic break criteria were assumed, the extreme conservatism in the existing qualification source terms and release assumptions could be reexamined. Indeed, models of design basis (and beyond design basis) events do not calculate substantial core damage until core melt has occurred. This rarely occurs within the first half hour and may not occur until several hours after the accident initiation. The utilization of leak-before-break criteria would support revisions to the existing source term and release assumptions. Consequently, recognition could be given to the fact that equipment required

to operate during the initial phase of the accident would not experience significant radiation levels during that time frame.

E. Modified Environmental Qualification Profiles Will Provide Licensees the Opportunity to Realize Benefits, Including Safety Benefits, From the Application of Leak-Before-Break Technology

Where environmental qualification profiles may be modified to reduce or eliminate "harsh" environments with respect to one or more profile parameters, licensees will have an opportunity to realize important benefits, including safety benefits. These benefits cover a broad spectrum of general operating and equipment-specific considerations. Benefits from a regulatory standpoint would also be realized. Of course, the availability of particular benefits to particular licensees will vary depending on several factors. Nonetheless, all licensees will have the opportunity to pursue such benefits as may apply to their facility.

1. Equipment Reliability

A significant potential benefit would follow from the increased service life of qualified equipment resulting from reduced or eliminated harsh environments.5/ Equipment and component service life is determined by two principal factors: (1) normal ambient temperatures; and (2) severity of the accident environment in which the component must operate. To the extent predicted accident temperatures may be reduced by applying leak-before-break, the service life of the equipment or component could be increased.6/

A longer service life would have the beneficial impact of reducing the frequency of equipment and component change-outs. In that one of the recognized precursors to accidents is "change," this will have a significant and positive impact on safety. In addition, a longer service life would increase plant maintenance intervals and reduce material and personnel

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5/ The normal service life of equipment and components, as addressed here, is the length of time the equipment or component can be installed and still perform its intended function in a harsh environment.

6/ In some instances, it may be necessary or appropriate to perform additional qualification testing. This will be a factor for licensees to consider when determining whether to proceed with a particular change. However, it is not a question which impacts the determination of whether to proceed with rulemaking.

costs. Less harsh environments could permit less restrictive sealing processes (e.g., eliminate environmental seals, Raychem), thereby simplifying maintenance. Similarly, more convenient locations may become available (e.g., reduced flood levels could permit relocation or the equipment to lower, more accessible, locations).7/

2. Reductions in Radiation Exposures

To the extent either maintenance/replacement frequency is decreased, or those activities are made less complicated (whether by simplification of accessibility) and, therefore, less time and personnel-consuming, benefits will also be realized in reducing maintenance worker exposures. For instance, based on data obtained from Group members a licensee may realize up to a 75% reduction in radiological exposure (from 4R to 1R) associated with replacement/maintenance of each primary RTD were EQ-required replacement/maintenance eliminated. Similarly, for at least one Group member, ease of maintenance, as well as frequency of maintenance, for hydrogen analyzer valves could also be beneficially impacted, producing a 50% reduction each outage in exposures (from 300 to 150 mrem) associated with work on each valve.

3. Regulatory Consistency Will Be Promoted

The Commission indicated in promulgating prior revisions to GDC-4 that the application of leak-before-break to eliminate the dynamic effects of pipe rupture was one phase in possible applications of that technology (52 Fed. Reg. at 41288). Indeed, as noted, the Commission has acknowledged that an inconsistency has been created in its regulations by this phased approach (see e.g., 53 Fed. Reg. at 11312). This inconsistency embraces not only GDC-4 and dynamic effects associated with pipe rupture, but Staff guidance concerning arbitrary intermediate breaks.8/

The above inconsistency presents an unfortunate dilemma for licensees. Licensees must treat pipe breaks in a different manner depending on the context and regulatory

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7/ In addition, to the extent licensees may reallocate resources that would otherwise be dedicated to maintenance or other activities under the present design bases, enhanced attention in other areas would be possible.

8/ See "Relaxation in Arbitrary Intermediate Pipe Rupture Requirements," Generic Letter 87-11 (June 19, 1987), Transmitting a revision to Branch Technical Position MEB/3-1 of Standard Review Plan Section 3.6.2 (NUREG-0800).

POLICY ISSUE
(Affirmation)

November 22, 1988 SECY-88-325

For: The Commissioners

From: Victor Stello, Jr.
Executive Director for Operations

Subject: POLICY STATEMENT ON ADDITIONAL APPLICATIONS OF LEAK-BEFORE-BREAK TECHNOLOGY

Purpose: To obtain Commission approval for a recommended policy on the scope of application of Leak-Before-Break Technology and for the publication of a Federal Register notice announcing this policy.

Category: This paper covers a major policy issue.

Background: Under the broad scope revision to General Design Criterion 4 (52 FR 41288, October 27, 1987), the NRC allowed the use of leak-before-break technology to exclude from structural design consideration the dynamic effects of postulated pipe ruptures when certain acceptance criteria are satisfied. The Staff Requirements Memorandum, which gave Commission approval for this revision, (Chilk to Stello, October 9, 1987) stated, "There are possibly other areas which could benefit from expanding the leak-before-break concept and simplification of requirements such as environmental qualification and ECCS. The staff should review other areas for possible modifications and solicit public input through a Federal Register notice requesting detailed suggestions on changes which could be made to the Commission regulations to enhance safety by application of this concept." SECY-88-31 dated January 28, 1988 transmitted to the Commissioners the staff response to the above cited Staff Requirements Memorandum. The Federal Register notice enclosed with SECY-88-31 soliciting public input appeared on April 6, 1988 (53 FR 11311) and is attached as Enclosure 1. The comment period, originally scheduled to end on July 5, 1988, was extended to August 5, 1988 in response to public requests.

Contact: J. A. O'Brien, RES
492-3894

Discussion: Twenty-three comment letters were received (See Enclosure 2). One private citizen wrote two brief notes which are hereafter treated as a single correspondence. Also, a regional coalition sent a written request to extend the comment period a second time, but offered no views or relevant information. This letter is not included, thereby reducing the tally to twenty-one letters. Four letters were received from utilities, four from private citizens, eight from groups which can be described as citizens groups, regional coalitions or environmental groups, two from NSSS vendors, two from industry groups and one from a nuclear fuel vendor. Twelve letters opposed an extension of LBB technology to environmental qualification and ECCS, many requesting that the present use of LBB for eliminating dynamic effects be retracted. These twelve letters were prepared by the four private citizens and the eight groups which can be characterized as either citizens groups, regional coalitions or environmental groups. The four utilities, two industry groups, the nuclear fuel vendor and one of the NSSS vendors supported the extension of LBB. The remaining NSSS vendor was neutral with regard to whether LBB technology should be expanded to environmental qualification and ECCS.

Among those opposing the additional application of LBB, repeated citations were made to the Surry pipe rupture in December 1986, the March 1988 GAO report "Action Needed to Ensure that Utilities Monitor and Repair Pipe Damage," the unreliability of ultrasonic detection of piping flaws, and statements made by Harold Denton to the Commissioners in August 1983 relating to intergranular stress corrosion cracking and pipe ruptures in BWR piping. The staff has determined that none of these citations discredit the validity of the present or proposed expanded scope of LBB. This is explained as follows:

The Surry double-ended pipe rupture occurred in non-safety related piping. Non-safety related piping would not satisfy NRC's rigorous acceptance criteria for LBB and, therefore, such piping would be excluded from consideration within the LBB policy.

The cited GAO report treated erosion/corrosion in piping. The factors which control erosion/corrosion are sufficiently understood so that the staff can determine with confidence which piping systems are susceptible to erosion/corrosion. The NRC acceptance criteria do not permit piping subject to erosion/corrosion to use LBB.

Difficulties with ultrasonic testing for detecting cracks in piping are not relevant since LBB does not depend on ultrasonic testing. Instead, leakage detection in service is used to identify cracks in high energy piping. Leakage detection must be sensitive, redundant and reliable, and large margins on performance are required.

The cited comments by Harold Denton were made at a time when LBB technology had not advanced to its present state, and moreover, were directed to BWR piping. In any case, BWR piping would only be considered for LBB provided that materials are used that are not susceptible to intergranular stress corrosion, along with other special measures.

The nuclear steam supply system vendor that took a neutral position with respect to the application of LBB to environmental qualification and ECCS recognized that limited safety and operational benefits could result. However, this comment letter concluded that comparable benefits could be obtained employing another recent rule change (as described below), and that "economic benefit....does not appear to be major, and net safety benefits may not outweigh the detriments."

Among those promoting the expanded application of LBB to environmental qualification and ECCS, a few genuine safety benefits were indicated. Additionally, economic, operating, testing, maintenance and design benefits were cited. One letter developed the thesis that even if safety benefits could not be demonstrated, pursuing other benefits would be sufficient reason to undertake rulemaking actions so long as an adequate level of safety is achieved. Another letter suggested that containment design should be included in the scope of additional applications of LBB. The principal safety improvements described in public comments are summarized as follows:

1. Fast Start of Emergency Diesel Generators

   This test and design requirement is derived from the postulated double-ended pipe rupture of the reactor coolant loop when analyzed according to 10 CFR 50.46 and Appendix K. A major negative consequence of fast start testing is potential degradation of bearings, gears, the governor and power transmission in addition to decreased reliability of instrumentation. If a smaller rupture were postulated for the reactor coolant system, it can be expected that the emergency diesel generators would provide more reliable service when

called upon during accident situations for some (but not all) plants.

2. Fuel Design (or Redesign) and its Effects on Radiation Embrittlement of the Reactor Pressure Vessel

   The postulated double-ended rupture in reactor coolant loop piping when analyzed in accordance with 10 CFR 50.46 and Appendix K leads to relatively low peaking limits for the fuel. With smaller postulated accidents, higher peaking limits might be allowed for some plants. As a result of the higher peaking limits, the fuel assemblies can be redesigned to yield less radial fluence leakage. This will mitigate concerns with vessel life extension and pressurized thermal shock of the vessel.

3. Equipment Reliability Improvements Due to Less Harsh EQ Environments and Fewer Plant Scrams and Challenges

   The service life of electrical and mechanical equipment which is based on qualification for stressful EQ environments and ECCS set points, can be expected to increase when the equipment is operated in less harsh environments and with reduced set points, leading to fewer scrams and challenges. Also, reliable equipment performance can result because equipment wear is reduced. Additionally, longer service life implies less replacement or changeout and, therefore, less radiation exposure for workers. Moreover, frequent equipment changeout can reduce safety due to potential errors while installing new equipment.

The first two safety benefits can be obtained under the ECCS rule (recently approved by the Commissioners, 53 FR 35996, September 16, 1988) as well as by use of LBB technology. However, it should be more expeditious and efficient to obtain these benefits under the ECCS rule, which permits best estimate methodology with quantified uncertainty for evaluating LOCAs. The models needed for implementing the ECCS rule have undergone substantial development, while research must be initiated to develop replacement design bases when LBB is invoked for ECCS. Moreover, while the ECCS rule already exists in final form, the rulemaking needed to expand LBB technology to ECCS will consume at least two years in addition to considerable staff and industry effort, and in the end would be redundant. Finally, while the ECCS rule can be

directly applied to all light water reactors (except one with stainless steel fuel cladding), LBB can be applied only to qualifying reactors. The scope of qualifying reactors is unclear; especially in question are BWRs.

The third safety benefit can diminish severe accident performance, and would also require long term rulemaking and research to develop replacement criteria for the double-ended pipe rupture. It is uncertain whether overall safety would improve when less harsh EQ profiles are specified or ECCS set points are reduced.

With respect to harsh environments inside the containment, unless LBB can be successfully applied to main steam lines, harsh environments will not substantially change. At the present time LBB has not been applied to main steamlines, although a utility group is developing an application. Most commenters supporting the application of LBB to EQ emphasized benefits inside the containment. These benefits, in general, can be obtained only in the unlikely event that most of the large diameter high energy piping inside the containment satisfy LBB requirements. Additionally, other breaches in the fluid system boundary, such as failures of manways or valve bonnets, must be shown not to control the EQ profiles. EQ benefits are more readily achieved outside the containment because pressure, temperature and humidity do not build-up due to venting and the use of blow out panels in some cases; however, these benefits are of lesser interest because the EQ profiles are usually less harsh (thus more easily satisfied) and because there are no current activities to apply LBB to piping outside the containment.

A few commenters noted difficulties with cable insulation, seals and valve seats resulting from materials selected to resist harsh environments associated with the postulated double-ended guillotine pipe rupture. The staff acknowledges these difficulties, but is not certain that reducing the harsh environments using LBB would, on balance, increase safety. The difficulties cited seem to be more related to operational, economic or maintenance factors than to safety considerations. Likewise, one commenter suggested that lower pumping set points for low pressure safety injection could preclude inadvertent injection during plant depressurization, thereby reducing the threat of pressurized thermal shock. However, the pressurized thermal shock problem occurs at high pressure injection, not low pressure injection. LBB likely will not offer any benefit for this situation.

Having considered all public comments received, the staff recommends no rulemaking be undertaken to apply LBB to either environmental qualification or ECCS. Any safety benefits associated with ECCS can be more readily obtained under the ECCS rule. The use of exemptions for applying LBB to environmental qualification was permitted in the broad scope revision to General Design Criterion 4. This option remains open, but the staff foresees no immediate utilization of this option because so many large diameter lines inside the containment must qualify for LBB before EQ profiles are reduced significantly inside the containment, and because there are no present activities to apply LBB outside the containment.

Recommendation: That the Commission approve for publication in the Federal Register a notice (Enclosure 3) announcing the policy recommended above, the bases thereof and the evaluation of public comments received related to this matter.

Victor Stello, Jr.
Executive Director for Operations

Enclosures:
1. Federal Register Soliciting Additional Applications of LBB (53 FR 11311)
2. Comment Letters received in response to Enclosure 1
3. Proposed Federal Register notice announcing Commission Policy on Additional Applications of LBB

Commissioners' comments or consent should be provided directly to the Office of the Secretary by c.o.b. Friday, December 9, 1988.

Commission Staff Office comments, if any, should be submitted to the Commissioners NLT Friday, December 2, 1988, with an information copy to the Office of the Secretary. If the paper is of such a nature that it requires additional time for analytical review and comment, the Commissioners and the Secretariat should be apprised of when comments may be expected.

This paper is tentatively scheduled for affirmation at an Open Meeting during the Week of December 12, 1988. Please refer to the appropriate Weekly Commission Schedule, when published, for a specific date and time.

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ENCLOSURE 1

ADDRESSES: The location of the April 18–19, 1988, meeting of the HLW Licensing Support System Advisory Committee is the Conservation Foundation, 1250 Twenty-Fourth St., NW., Washington, DC 20037.

FOR FURTHER INFORMATION CONTACT: Donnie H. Grimsley, Director, Division of Rules and Records, Office of Administration and Resources Management, U.S. Nuclear Regulatory Commission, Washington, DC 20555, Telephone: 301–492–7211.

SUPPLEMENTARY INFORMATION: The sixth meeting of the HLW Licensing Support System Advisory Committee ("negotiating committee") is scheduled to include continued discussion of substantive issues related to a high-level waste licensing support system.

The following are the remaining meetings of the negotiating committee that are scheduled as of the date of this notice:

May 18–19, 1988—The Conservation Foundation, Washington, DC.

Dated at Bethesda, Maryland, this 1st day of April, 1988.

For the Nuclear Regulatory Commission.

David L. Meyer,

Chief, Rules and Procedures Branch, Division of Rules and Records, Office of Administration and Resources Management.

[FR Doc. 88–7521 Filed 4–5–88; 8:45 am]

BILLING CODE 7590–01–M

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10 CFR Part 50

Leak-Before-Break Technology; Solicitation of Public Comment on Additional Applications

AGENCY: Nuclear Regulatory Commission.

ACTION: Request for comments.

SUMMARY: The Nuclear Regulatory Commission (NRC) is proposing to investigate the safety benefits associated with using leak-before-break technology to modify functional and performance requirements for emergency core cooling systems (ECCS) and environmental qualifications (EQ) of safety related electrical and mechanical equipment.

DATE: The comment period expires on July 5, 1988. Comments received after this date will be considered if it is practical to do so, but assurance of consideration can only be given to comments received on or before this date.

ADDRESSES: Send written comments to the Secretary of the Commission, Washington, DC 20555, Attention: Docketing and Service Branch. Copies of comments received by the Commission may be examined at the NRC Public Document Room, 1717 H Street NW., Washington, DC 20555.

FOR FURTHER INFORMATION CONTACT: John A. O'Brien, Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission, Washington, DC 20555. Telephone (301) 492–3928.

SUPPLEMENTARY INFORMATION:

Existing Applications of Leak-Before-Break Technology

On October 27, 1987 (52 FR 41288), the NRC published a final rule which modified General Design Criterion 4 (GDC–4) in 10 CFR Part 50, Appendix A, by allowing the use of leak-before-break technology to eliminate from design consideration the dynamic effects of postulated ruptures in all piping in all reactor types that satisfy rigorous acceptance criteria. The supplementary information to this rule states, however, that containments, ECCS, and EQ of safety related electrical and mechanical equipment are not affected by leak-before-break technology. This introduced an inconsistency into the regulations which is addressed by this request for comment. While not emphasized in the final GDC–4 modification, when leak-before-break technology was disallowed for ECCS, EQ, and containment design, functional and performance requirements cited in different portions of 10 CFR Part 50 were maintained. However, limited case-by-case modifications of EQ functional and performance requirements were allowed in the GDC–4 amendment using the exemption process.

The specific functional and performance requirements retained when leak-before-break is accepted under the recent modification to GDC–4 are as follows:

1. *For Containments.* Global loads and environments associated with postulated pipe ruptures, including pressurization, internal flooding, and elevated temperature.

2. *For ECCS.* Heat removal and mass replacement capacity needed because of postulated pipe ruptures.

3. *For EQ.* Pressure, temperature, flooding level, humidity, chemical environment, and radiation resulting from postulated pipe ruptures.

However, under the recent modification of GDC–4 local dynamic effects uniquely associated with pipe rupture may be deleted from the design basis of containment systems, structures and boundaries, from the design basis of ECCS hardware (such as pumps, valves, accumulators, and instrumentation), and from the design bases of safety related electrical and mechanical equipment when leak-before-break is accepted. "Local dynamic effects uniquely associated with pipe rupture" means dynamic effects due to pipe whipping, jet impingement, missiles, local pressurizations, pipe break reaction forces, and decompression waves in the intact portions of piping postulated to rupture. Glocal pressurizations, temperature transients, and flooding transients on containment systems and structures are not local dynamic effects and may not be uniquely related to pipe rupture, and therefore are retained for containment design. Thus, while functional and performance requirements for containments, ECCS, and EQ remain unchanged under the now effective modification of GDC–4, the design bases for these aspects of facility design have been modified in that local dynamic effects uniquely associated with ruptures in piping which qualified for leak-before-break may be excluded from consideration.

This present notice examines the potential additional application of leak-before-break technology to modifying functional and performance requirements for emergency core cooling systems and for environmental qualification of safety related electrical and mechanical equipment. Modification of functional and performance requirements for containments is explicitly excluded from consideration at this time.

Invitation To Comment

To meet its statutory obligation to assure an adequate level of safety, the NRC uses the "defense-in-depth" concept which is codified in the General Design Criteria in 10 CFR Part 50, Appendix A. Stated in simple terms, and with some notable exceptions, defense-in-depth is implemented by utilizing high standards of design, fabrication, and inspection, and then postulating severe failure in structures, systems, and components. It must be demonstrated that these severe failures will not lead to undue risk to public health and safety. Risk is generally kept low by employing redundancy and diversity in design. When severe failures are unacceptable (as for example, in reactor pressure vessels), extraordinarily high standards are required. In the case of piping, different standards of design, fabrication, and inspection are imposed depending on the safety significance of the piping. Until recently, severe failure for piping has been defined as the instantaneous double-ended guillotine break regardless of the standards applied to piping. Under leak-before-

break technology, it has become possible to exclude the double-ended guillotine break from the dynamic structural design basis because it is unrealistic and overly conservative in certain situations. Piping which meets NRC's acceptance criteria now need only postulate stipulated "leakage cracks" as severe failure. This relaxation in requirements under the final GDC–4 amendment actually improves safety because it allows the removal of counter-productive hardware which impedes inservice inspection, could restrain thermal growth of piping (leading to unforeseen stresses and cracking), and could degrade seismic performance of piping due to impacting between piping and pipe whip restraints during earthquakes. Worker occupational radiation dosages are reduced substantially.

When the Commission published the proposed broad scope amendment to GDC–4, comment was invited on the decision to limit impacts of this modification to only dynamic effects associated with pipe rupture. In response to this request, a number of commentators stated that the use of the leak-before-break technology should be extended to modify the requirements for EQ and ECCS. Safety benefits for EQ and ECCS were suggested wherein protection against the effects and consequences of postulated pipe ruptures causes less reliable overall performance. Because the NRC is primarily concerned with fulfilling its safety mission, documented evidence describing safety degradations and safety enhancements due to postulated pipe rupture requirements on EQ and ECCS is requested. Specifically, actual citations from operating experience are requested; however, conclusions based on testing and deterministic or probabilistic evaluations would also be useful.

The priority which the NRC assigns to modifying functional and performance requirements for EQ and ECCS will be determined in large measure from the balance between accrued safety benefits and detriments believed to result (including impacts on severe accident performance). If it can be shown that net safety benefits outweigh the detriments, then modification to the existing design bases may be permitted.

Dated at Washington, DC, this 1st day of April 1988.

For the Nuclear Regulatory Commission.

Samuel J. Chilk,

Secretary of the Commission.

[FR Doc. 88–7538 Filed 4–5–88; 8:45 am]

BILLING CODE 7590–01–M

DEPARTMENT OF HEALTH AND HUMAN SERVICES

Food and Drug Administration

21 CFR PART 133

[Docket No. 84P–0133]

Pasteurized Process Cheese Spread; Proposal To Amend Standards of Identity

AGENCY: Food and Drug Administration.

ACTION: Proposed rule.

SUMMARY: The Food and Drug Administration (FDA) is proposing to amend the standards of identity for pasteurized process cheese spread and, by cross-reference, three other cheese spread standards to permit the use of nisin. Nisin is an antimicrobial agent which prevents the outgrowth of *Clostridium botulinum* spores and toxin formation in the packaged cheese. This action is taken to promote honesty and fair dealing in the interest of consumers.

DATES: Comments by June 6, 1988. The agency proposes that any final rule that may issue based upon this proposal shall become effective 60 days after date of publication of the final rule in the Federal Register.

ADDRESS: Written comments to the Dockets Management Branch (HFA–305), Food and Drug Administration, Rm. 4–62, 5600 Fishers Lane, Rockville, MD 20857.

FOR FURTHER INFORMATION CONTACT: Karen L. Carson, Center for Food Safety and Applied Nutrition (HFF–414), Food and Drug Administration, 200 C Street, SW., Washington, DC 20204, 202–485–0110.

SUPPLEMENTARY INFORMATION: Arthur A. Checchi, Inc., representing Aplin and Barrett, Ltd. of Trowbridge, Wiltshire, England, submitted a citizen petition, dated March 30, 1984, requesting that FDA amend the standards of identity for pasteurized process cheese spread (21 CFR 133.179) and, cross-reference, pasteurized cheese spread (21 CFR 133.175), pasteurized cheese spread with fruits, vegetables, or meats (21 CFR 133.176), and pasteurized process cheese spread with fruits, vegetables, or meats (21 CFR 133.180), to require the mandatory addition of 250 parts per million (ppm) nisin to the food. The petition identifies nisin as a microbiological inhibitory substance which is produced by *Streptococcus lactis*, Lancefield group N.

The petitioner asserts that this action is necessary to prevent the outgrowth of *C. botulinum* spores and subsequent botulinal toxin production in these foods. The petitioner believes that under certain conditions this outgrowth is possible because these cheese spreads are: (1) Packaged in hermetically sealed containers, (2) not refrigerated during retail marketing, (3) not sterile, and (4) cannot be rendered sterile by heat processing without adversely affecting the texture and flavor of the food.

Pasteurized process cheese formulations commonly used in the United States are relatively low in moisture and contain emulsifiers and salt at the high end of the range of concentration permitted by the standard. The petitioner believes these factors may have been effective in preventing the outgrowth of *C. botulinum* in the past. However, with the emphasis today on reducing the sodium content of the diet, it is the petitioner's position that manufacturers may reduce the sodium content of cheese spreads and manufcture products in the high moisture range thereby increasing the potential for *C. botulinum* spore outgrowth. To combat with the petitioner perceives as a potential problem with these cheese products, the petitioner has requested that the standards be amended to require the addition of 250 ppm nisin to the finished food. In support of this request, the petitioner has included data from studies, using pasteurized process American cheese spread, demonstrating the effectiveness of nisin in preventing the outgrowth of *C. botulinum* spores and subsequent toxin formation in formulations with varying amounts of emulsifier, with and without added salt.

In a separate action, the petitioner has requested GRAS affirmation of nisin as an ingredient in pasteurized cheese spreads and pasteurized process cheese spreads. Because nisin is a component of a preparation derived from a fermentation culture, the GRAS affirmation documents deals with nisin preparation rather than pure nisin. A final rule responding to this request is published elsewhere in this issue of the Federal Register.

FDA has reviewed Arthur A. Checchi, Inc.'s, petition with its supporting data and has concluded that making the use of nisin in the aforementioned cheese spread products mandatory is not necessary to protect the public health. As the petitioner recognizes, typical cheese spread formulations used in the United States result in products which do not support the outgrowth of *C. botulinum* spores. Under these circumstances, a requirement that nisin be used cannot be supported.

The agency, however, recognizes that the potential for *C. botulinum* spore

DOCKET NUMBER
PROPOSED RULE PR 50
(53 FR 11311)

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L30-88(06-07)-LP

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USNRC

ILLINOIS POWER COMPANY

CLINTON POWER STATION, P.O. BOX 678, CLINTON, ILLINOIS 61727

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DPH-0518-88
June 7

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ENCLOSURE 2

Mr. Samuel J. Chilk
Secretary of the Commission
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Attention: Docketing and Service Branch

Subject: Comments on Federal Register Notice
Regarding Leak-Before-Break Technology

Dear Sir:

Illinois Power Company concurs with the NRC proposed regulatory changes described on pages 11,311-12 of the Federal Register, dated April 6, 1988, regarding leak-before-break (LBB) technology. It is believed that the extension of LBB technology to the performance requirements for emergency core cooling systems and the environmental qualification of safety related equipment is appropriate. Due to limited operating experience at our Clinton Power Station, we have not identified any specific examples where the use of the existing double ended-guillotine pipe break criteria leads to less reliable overall performance. It is believed, however, that such changes may generally improve safety as described and should be further investigated. Such a requirement change should also make it possible to simplify operating plants and encourage important design improvements.

Sincerely yours,

D. P. Hall
Vice President

DLH/krm

(2)

DOCKET NUMBER
PROPOSED RULE PR 50
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21 June 88

OFFICE OF SECRETARY
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JEAN S. EWING
3300 JOURDAN ROAD
DARLINGTON, MARYLAND
21034

Gentlemen

In the case of "Leak before Break" technology, it seems that the Commission denies the best advice available to it.

Safety must be your first and essential concern. Unreliable technology such as this must be re-evaluated.

Sincerely

Jean S Ewing

Marvin I. Lewis
7801 Roosevelt Blvd.#62
Phila., PA 19152

Secretary of the Commission
USNRC
Washington, D. C. 20555

Dear Mr. Secretary:

Please accept the following letter as my comments on 10CFR Part 50 Leak Before Break Technology; Solicitation of Public Comment on Additional Applications. (Federal Register Vol. 53 #66 4-6-88 Pages 11311 & 11312.)

Introduction: Leak before break technology has allowed a reduction in the restraints used on piping in nuclear power plants. These restraints or snubbers had failed and continued to fail many design and quality control criteria. The snubbers were often in inappropriate places. They often failed testing to simulate earthquake conditions. Getting rid of the snubbers may have actually improved the design and operation of some nuclear power plants, but not for the reason stated in the final rule dated October 27,1987.

Getting rid of the snubbers allows designers and operators to design powerplants more realistically. Operators and designers cannot depend on snubbers to provide earthquake protection. The result is that the design may actually wind up safer because the snubbers are not depended upon to do a job to which they are incapable. Since snubbers could not perform their safety function adequately , the NRC used the ruse to eliminate the need for snubbers. The ruse which was used to eliminate snubbers was a non-technology called leak before break. I have been commenting upon this non-technology for many years, but I shall review some of my comments to familiarize those who have not had prior experience with this non-technology.

The idea behind leak before break seems logical. Leak before break technology assumes that a detectable, and detected, leakage will precede a double ended , guillotine pipe break during reactor operation. Since the assumption is that leakage will occur and be detected before a double ended pipe break, the design need only require detection of leakage. The design does not need to withstand a double ended pipe break while the reactor is operating. Leak before break sounds logical, but it fails every test that LBB should logically meet.

What tests should LBB meet to be useful?

LBB assumes that a detectable and detected leak will precede a double ended, guillotine pipe break.

1. LBB is an assumption. There have been no full scale, in reactor, operating test to prove this assumption. Even after LBB has been adopted as part of the rules in GDC 4, full scales tests are not funded or contemplated. This sort of full scale testing should have proceeded the adoption of LBB into the rules.

2. LBB technology assumes that a detectable leak will precede a double ended, guillotine pipe break. Throughout reactor history, leakage measurement of coolant has been a subject of disagreement in method and results. There are a thousand ways to fudge or cheat on these numbers.

Two excellent examples of incredibly poor measurement of coolant level inventory have just come out this month. Measurement of coolant level inventory over time provides the leakage rate. Poor measurement of coolant level inventory results in meaningless and wrong leakage rates.

The first example is reported in NRC Information Notice No. 88-36: Sudden Loss of RCS Inventory During Low Coolant Level Operation. Entrapped air and other problems lead to incredibly inaccurate RCS inventory errors and subsequent pressurizations. This is exactly the scenario needed for a double ended, guillotine pipe break. LBB would not be predictive in this situation, and a double ended pipe break would ensue. At the same time, the rules do not require protection in the design from the consequences of a double ended, guillotine pipe break. NRC Information Notice 88-36 refers to Generic Letter 87-12 which lists 37 events attributed to low coolant levels many related to poor measurement. This first example shows that measurement is historically poor and unreliable. Depending upon measurement to detect leakages contradicts historical experience and logic.

The second example of why detecting a leak is unlikely relates to the recent decision on TMI#2. The Memorandum and Order, CLI-88-02 , Inquiry into the TMI2 Leak Rate Falsification, states , "The Board found that 50% or more of the tests were discarded." Page 3.(Docket LRP dated 28 April 1988.) No matter what the technology, if half the test are discarded, leaks will not be detected in a timely manner to stop a double ended pipe break. Leaks have been ignored in the past. Leaks are still being ignored. Leaks which are ignored cannot warn of an impending double ended guillotine pipe break. Leak before break technology cannot warn of double ended pipe breaks.

3. Leak before break technology assumes that a pipe remains as it was designed. The pipe does not remain as it was designed. Some of these changes are minimized during operation. The loss of pipe thickness to corrosion is minimized by addition of corrosion inhibitors such as hydrogen and all volatile acidity control. Pipe walls do thin out for other reasons than corrosion. Some of these other reasons have just become evident. (Summary of Responses to NRC Bulletin 87-01, "Thinning of Pipe Walls in Nuclear Power Plants.") The thinning is a newly observed phenomenon, and was not included in the design basis. The result of the thinning was a pipe break at the Vepco Surrey plant which killed four workers. The pipe did not leak before it broke.

4. The Advisory committee for Reactor Safeguards has branded this leak before break technology as a "delusion." ACRS has stated, "We know of no way to demonstrate its validity."(Groundswell, Nuclear Information and Resource Services Winter 88 Page 5.)

5. Other situations have caused piping to rupture without leaking. (NRC Information Notice No. 88-13: Water Hammer and Possible Piping Damage caused by Misapplication of Kerotest Packless metal Diaphragm Globe Valves.) Great amounts of information have recently surfaced concerning improper materials, improper markings, improper valves, and improper testing for severe accidents. For brevity, I shall not put down all the references. NRC Information Notices and Generic Letters contain most of these references going back to 1984 to the present.

Deviation from the design basis is a long and hallowed tradition in the nuclear industry. Leak before break technology depends upon the design and the actuality being fairly close. The design and the as-built plant have many differences . These differences are significant and far reaching and invalidate any assumption required by leak before break technology. Leak before break technology has lost any validity to which it ever aspired due to these many differences.

Reason to retract , and not to extend, the use of leak before break technology.

The proceeding discussion provides substantive reasons to retract the use of leak before break technology. Leak before break technology is a delusion. Leak before break technology has failed to predict pipe ruptures. The failure has cost lives. Leak before break technology depends upon materials and tests which have failed to meet any criteria of honesty. Inferior materials have been substituted and tests have been discarded. Leak before break technology is a dangerous delusion.

Specifics as to why Leak Before Break should not be extended.

1. Containment: The containment operates at pressures lower than those it will see during an accident. The containment is usually at very low pressure. During the TMI#2 accident, the containment saw over 27 psi due to a detonation. Calculations in support of NUREG 1150 have shown that even higher pressures are possible from hydrogen detonations in an accident. Leakages, which would be unobservable at normal test pressures, would lead to containment failure at these higher accident pressures.
2. Emergency Core Cooling System: During an accident, this system would be challenged repeatedly. If a leak developed , the ECCS could not be turned off for repairs during an accident. This would be a situation wherein even if leak before break technology worked perfectly, the result would be academic. The opportunity would have past wherein the pipe which was leaking could be repaired before catastrophe struck. The ECCS could not be turned off during an accident because the ECCS is needed to mitigate the accident. Catastrophe cold strike before the ECCS could be turned off to allow access to fix the leaking pipe.
3. Environmental Qualification: The discussion of what changes in EQ due to LBB does not appear in the RFQ. Please put in enough discussion in plain English to lead to comments.

Please do not extend the use of leak before break technology. Please retract the present use of LBB.

Respectfully submitted,

Marvin I. Lewis
7801 Roosevelt Blvd.#62
Phila., PA 19152
(215) 624 1574

DOCKET NUMBER PR 50
PROPOSED RULE
53FR11311

Nuclear Research Group
Wells Eddleman, pro se
c/o 811 Yancey Street
Durham, North Carolina 27701-315

Joint Comments on alleged safety "benefits" of assuming leak-before-break always occurs

Wells Eddleman for self & NCC 6-28-88

The NRC proposal assumes that the leak-before-break theory will always hold. This flies in the face of accumulating experience, good reasoning about failure modes, and common sense, for reasons that will be explained below. There is also no valid reason to assume that people will successfully apply the leak-before-break theory in practice, and good reasons why they often have not and will not. Also, even were the leak-before-break theory true, it would not justify the sorts of actions and inactions that the NRC proposes.

The real leak-before-break theory that the NRC evidently assumes has three or more key parts, i.e. (1) all pipes (or welds, pressurized systems, etc) that break will always leak noticeably before breaking (2) there will always be enough time between the leak and the break for (a) the leak to be detected and properly interpreted (hard to do in some forests of pipes than can exist in nuclear plants, and something that can involve radiation exposure increases in tracing the sources of leaks in radioactive water systems, e.g. one pipe leaking onto another such that the water flows along the other pipe and becomes obvious some distance away -- a pheonomenon familiar to many who have dealt with leaking roofs); (b) there will always be detection of every leak that can identify a potential break; (3) corrective action will always be taken, for every leak , before any break can occur.

All these assumptions are false in some cases. But even were they true, there are risks (negative benefits, you might say) in assuming them. For example, if pipe whip or other restraints or shielding around high energy or leak-vulnerable piping are removed, then a break which occurs after corrective action has been tried will not have those restraints or shielding, and thus be a more serious problem. Also, the removal of shielding etc from operating plants will involve radiation exposure and the parts removed will usually have to be disposed of as radioactive wastes or held on-site for later use or disposal. It is not clear that the doses of radiation assumed to be avoided by inspectors AFTER REMOVAL of the restraints or other material will be more than the cumulative dose involved in removing and storingtransporting/disposing of the shielding, restraints, etc. Since more frequent inspections may be required (almost surely, to be sure to detect leaks promptly, before breaks), there may be no dose savings, and there will be monetary costs of removing the material from the piping areas and costs of additional inspections. In addition, removal of material should reduce the value of plant in service and increase waste disposal expense and repair/modification expense in the short term, which are not economic benefits to the utility, but losses.

If even one of the assumptions is not always true, among those listed above, problems mount. For example, if some event can break a pipe without it leaking first (sabotage, sudden water or steam hammer, overpressure, earthquakes, or even terrorist activity are possible causes, among others) then the absence of the pipe restraints and/or sheilding can make an accident much worse. If a leak goes undetected, or proper corrective action is not taken, or there is not time to take corrective action, again the lack of restraints and/or shielding complicates and worsens the accidents that can occur, at least in most cases. At minimum, the added adverse consequences need to be fully taken into account. To do this, worst-case estimates should be used for known causes of accidents, to compensate for unknown or overlooked causes. The effects of difficult to quantify factors, such as easier accessibility to saboteurs or terrorists, as well as the effects of sabotage and/or terrorism, need to be accounted for also.

Taking such factors into account, it is extremely unlikely that the assumption of leak-before-break will produce any net benefits, for safety or otherwise. And it is clear that all the components of the leak-before-break concept set out above are not correct. Every one is false, some to a greater degree than others. Since avoiding serious accidents is necessaryin order for there to be a nuclear industry

more serious accidents, the best course at this time is to drop this proposal and instead pursue more research on pipe breaks and means to prevent them and/or to mitigate the consequences of such failures or similar failures.

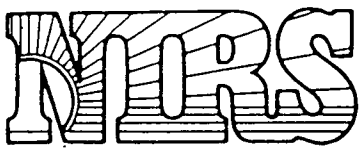
Among the reasons that the leak before break concept is false (and thus the previously stated course of action is better than NRC's proposal) are: (1) pipes do break without leaking first. This is a particular problem where erosion is the source of failure, but it can also occur with rapidly-propagating cracks, thermal shock-induced failure, failures due to extreme force, flexion, impact (another reason to keep shielding), and probably other causes. As nuclear plants age, the cumulative stress and erosion, corrosion and other effects on piping and other systems make all sorts of failures, including sudden failure, more likely. It would be far more oproductive to deal with means to reliably detect or prevent sudden failure than to rely on leak-before-break assumptions which are not supported by any valid theory, nor by operating experience. The suddent feedwater pipe failure at Surry in 1986 is only one example of a break without a leak, but given the problems of erosion, thinning and corrosion in piping at nuclear plants it is a key warning (which NRC proposes to ignore and fly in the face of).

Radiographing piping contaminated with radioactivity and/or activation products is clearly impractical for detecting cracks, and dubious for detecting thinning unless the complete pipe is very carefully surveyed using sources inside the pipe and detectors outside, correcting for contamination. This is extremely difficult. Practically speaking, NRC won't order it and there arent enough competent people who would be doing it. Ultrasonic testing's reliability is a "delusion" according to NRC's own Advisory Committee on Reactor Safeguards, so far as measuring cracks goes. As shown at the Trojan plant, among others,corrosion and erosion, even far from bends in pipes, can be very widespread without any obvious leaks at the vast majority of vulnerable spots. For erosion, bursting or other forms of sudden failure are more readily expected than leaks before breaks. Erosion can be a chaotic process in the mathematical as well as the practical sense, occuring where it has not been expected or predicted. Turbulent flow, flaws in metal, erosion by particles etc. in flows, and other causes can create patterns of thinning in safety-related pipe that are difficult to detect easily, that do not cause leaks, and that can and do cause breaks. Wear is not unfirom in pipes, due to both random and chaotic effects. A flaw at one point can change flow or other conditions and help to create or exacerbate other flaws downstream in a pipe. Reflected pressure patterns around flaws or intrusions, especially at bends, can create flaws upstream. And, of course, corrosion is non-uniform in many cases, and corroded parts can fail under mechanical stress before they leak or before they leak noticeably. How do you tell a leak from minor condensation of moisture, for example, on a "cold" pipe in a 120°F containment, which pipe has safety functions?

In sum, as Harold Denton (then Director of NRR) warned the NRC in 1983, "Leak Before Break is not an established law" (indeed, current evidence is mostly going against the LBB theory). Denton also accurately warned that if there is a pipe "cracked half-way through or 55 percent of the way through before it begins to leak, then there is very little time to detect that leakage and take proper corrective action." This is even more true for pipe thinning, and one should note that peipes don't really leak unless some part of the wall is 100% failed.

Thus, NRC assumption (2) is false: there won't always be correction done before a break, due to both breaks without leaks, and undetected leaks, and leaks detected too late. The ideas that every leak will be promptly detected is also false. Some leaks may be detected soon, but only with frequent inspections (which can involve more radiaation exposure to inspectors). Some leaks can be hidden; some will be overlooked. Finally, re assumption (3), even if there is time for corrective action, it may not be taken soon enough (due to costs of closing plants, etc.) or the wrong action may be taken, or the leak ignored (e.g. the chronic pressurizer PORV leaks at Three Mile Island).

NRC's "leak before break" assumptions are false; even if true they would not have significant net benefits offsetting the risks resulting from NRC's propossed changes to operating plants, which involve more radioactive waste and radiation exposure to remove equipment that could prevent or mitigate accidents); NRC is [illegible] and breaks without leaks. Foolish



Nuclear Information and Resource Service
1424 16th Street, N.W., Suite 601, Washington, D.C. 20036 (202) 328-0002

June 30, 1988

Secretary
US Nuclear Regulatory Commission
Washington, D.C. 20555
Attn: Docketing and Service Branch

Dear Mr. Chilk,

Enclosed please find the comments of the Nuclear Information and Resource Service concerning the NRC's request for comments on proposing to investigate the safety benefits associated with using leak-before-break technology for emergency core cooling systems (ECCS) and environmental qualification (EQ) of safety related electrical and mechanical equipment.

We thank you for taking the time to consider these comments on the additional application of leak-before-break technology.

Sincerely,

Robert Beaudoin
Information Services

On April 6, 1988, the Nuclear Regulatory Commission published in the Federal Register a "Request for Comments" on the additional application of leak-before-break technology (53 FR 11311). The NRC contends that it has become possible to exclude the double-ended guillotine break from the dynamic structural design basis because it is "unrealistic and overly conservative in certain situations."

The leak-before-break theory claims that pipes will leak before they break, giving operators ample warning and time to shut down a plant before any large-pipe break could cause a major loss-of-coolant accident (LOCA). But what if a crack in a pipe doesn't leak enough to be detected before it breaks? Harold Denton, former Director of Nuclear Reactor Regulation, told the Commissioners in August 1983, "Leak-Before-Break is not an established law." He warned that "... if there is really a pipe out there somewhere that is cracked half-way through or 55 percent of the way through before it begins to leak, then there is very little time to detect that leakage and take proper corrective action."

Any basis for the continued and increased application of leak-before-break to detect severe failure in piping must be related to the various problems associated with pipe thinning, quality, stress, and the technological ability to detect pipe cracking before a pipe break could cause an accident. For the NRC to promote leak-before-break as a means to improve safety is questionable at best, because it presumes that the proceedures and equipment in place aren't functioning properly.
The present safety requirements in place for containments, emergency core cooling systems (ECCS), and environmental qualification (EQ) are not necessarily under scrutiny, rather the costs associated with maintaining these safety standards are considered by industry as a severe cost penalty.

This appears to be another case where the NRC has buckeled under industry pressure involving the inspection of piping systems. An example of this is the release of an NRC IE Bulletin 83-02 (March 1983), which required augmented inspections of welds in the recirculation piping systems and called for more stringent requirements for inspectors. Subsequent inspections at three plants revealed widespread cracking of recirculation and residual-heat-removal piping. With the accumulation of this evidence, NRC's Director of Nuclear Reactor Regulation, Harold Denton, decided to accelerate the inspection program. On July 15, 1983 Denton requested that the Commission vote to shut down five units within 30 days. The Commission heeded Denton's advice and voted to shut down the plants for inspection; however, on the very next day the Commission revoked its decision in order to give the industry more time to submit its arguments and to arrange a more suitable shutdown schedule.

The nuclear industry used the leak-before-break theory to influence the Commissioners, even though some NRC staff members expressed doubts about the trustworthiness of this theory. This reversal by the NRC was followed up with a request by the Commission that it be informed by the Executive Director for Operations on what actions should be taken regarding intergranular stress corrosion cracking (IGSCC) in stainless steel piping at uninspected boiling water reactors (BWR). The staff met with Electric Power Research Institute (EPRI), General Electric, and the affected utilities and came up with these conclusions: " ... measurable pipe leakage should occur before pipe structural failure. However, the leak-before-break concept cannot be the sole basis for continued safe operation." The staff also noted that: "There is considerable uncertainty in the ability to determine the depth of cracks and this uncertainty must be accounted for when establishing the extent of the required pipe crack repairs." (SECY-83-350)

Ultra-Sonic Testing (UT) is used in detecting and sizing cracks in pipes, and there is a great deal of disagreement among the NRC, industry, and the scientific community on the reliability of UT. Additional unresolved issues include: the trade-off between radiation exposure incurred by inspection workers and the problems stemming from any attempts to decontaminate portions of the plant; the validity of the industry's "leak-before-break theory; and the relative values of a wide range of temporary fixes now in use or under consideration by industry. In fact, the NRC's Advisory Committee on Reactor Safegards (ACRS) called reliance on UT a "delusion" to be taken "on the basis of faith." Further arguments put forth by industry claim that cracked pipes will leak for a long time before they break. ACRS called this an "unproven hope;" and when utilities suggested that pipes could leak for as long as a year before they break, NRC's Denton countered that " ... commission experts believe the time between leak and break could be very brief indeed."

Comments on UT would not be complete without mention of the industry's own evaluation of the ultarsonic technique and of the inspectors involved in the pipe crack analyses. In 1983, EPRI conducted a testing exercise seeking to evaluate the industry's capability for detecting cracks and for making valid depth measurements. Only three of fourteen teams correctly characterized 80 percent of the cracks and six teams racked up an "inadequate" score. Industry continued to argue in favor of UT and EPRI announced that a more advanced UT system would be developed. ACRS mitigated its criticism of UT and called the development of new techniques "promising." However, ACRS also warned that "Equipment and procedures that will allow the reliable determination of the depth of the cracks...are not yet available."

The method of inservice inspections (ISI) to detect cracked piping is used by utilities to justify the continued operation of plants with cracked piping. However, a number of problems with this inspection process have surfaced: the lack of qualified inspectors, EPRI's inability to upgrade the qualifications of existing inspectors, and the rapid "burnout" of inspectors due to the high radiation exposure involved in the job. The NRC confidently relys on leak-before-break and ultrasonic testing to deal with pipe crack problems regardless of internal and scientific criticism of these methods. The NRC is reluctant to treat pipe cracks as a safety issue; in fact, the NRC's position can be likened to that of a Commonwealth Edison official, who called pipe cracks a "sound maintenance management issue," "not a safety issue."

An article published by the Energy Laboratory at the Massachusetts Institute of Technology ("Predicting Wear in Steam Pipes.") explains how the cycle of corrosion and erosion reduces pipe thickness. Steam-extraction pipes fail after ten years even though they were designed to last for forty. The use of ultrasonic equipment was considered to be limited and inaccurate because "... a single measurement may not be representative of conditions nearby." The most important claim made in this paper is that "Wear is nonuniform and randomly located, with worn spots occuring besides unworn ones. A single measurement may give an inaccurate picture of a pipe's remaining lifetime." What this means is that even though a pipe might pass inspection, it could have a severe crack in an uninspected section resulting in the pipe breaking before it leaked.

Leak-before-break technology is based on the specious assumption that pipes remain as they were designed. NRC BULLETIN NO. 87-01: Thinning of Pipe Walls in Nuclear Power Plants, addresses the problem of erosion/corrosion in carbon steel piping. This bulletin was written because of the catastrophic failure of a main feedwater pipe at Virginia Power's Surry plant in 1986. Some of the piping in the secondary loop thinned from one-half inch in thickness down to the size of a credit card. A feedwater pipe ruptured, releasing superheated steam which injured eight workers. The severity of this accident was not limited to one area of the plant; in fact, steam released from the pipe activated several fire protection systems, which then adversely affected the air in the control room and the plant's security and communications systems.

The eighteen inch diameter pipe that failed was located in the secondary or "non-safety-related" portion and was not subject to inspection. This might suggest that the leak-before-break theory did not fail because it was not applied. However, this line of reasoning is flawed because the pipe, regardless of inspection,

never leaked even though its thickness was greatly reduced. Thus, it is clear that the pipe did not leak before it broke but it did tragically kill four workers.

As a result of the Surry accident the GAO published a report: "Action Needed to Ensure That Utilities Monitor and Repair Pipe Damage." This report addressed the Surry accident and the 1987 discovery of widespread pipe deterioration at the Trojan plant. Although the Surry incident involved non safety-related piping, a follow-up inspection found a significant amount of pipe thinning in the Trojan plant. Portland General Electric reported excessive erosion/corrosion in both safety and non-safety piping. This marked the first time that a utility discovered extensive damage in both portions; damage was also found in straight sections of pipe far away from where erosion/corrosion would have been expected. In light of this evidence, it is difficult to understand why the NRC permits and wishes to expand the use of leak-before-break, especially when this epidemic of pipe thinning problems was never included in the NRC's design basis.

The GAO report raises questions about the long-term safety of pipe systems at nuclear power plants. Erosion/corriosion in single phase pipe was not anticipated by the NRC or the nuclear industry. Furthermore, the GAO attributes the Surry accident to a continued condition of erosion/corrosion which was neither regulated nor monitored by the NRC or industry standards. Because of the significance of the Surry accident, the NRC required utilities to report on the extent of erosion/corrosion damage at their plants. In February 1987, a survey of 91 plants by the NRC discovered a significant amount of secondary plant pipe thinning and noted "... that utilities do not adequately monitor for pipe thinning or ensure that appropriate corrective action is taken when they find it." The NRC also found that Virginia Power did not have an inspection program to examine the thickness of feedwater pipe systems at Surry. The scenario for inspections which are not carried out and leaks which are ignored will only leed to more accidents because leaks will not be detected in a timely manner.

Although the Commission sought more information from utilities on the pipe thinning problem, any regulatory action seemed uncertain at best. In fact, the GAO concluded " ... that NRC needs a mechanism to ensure that utilities periodically assess the integrity of pipe systems in their plants to reduce the risk of future injury to plant personnel or damage to equipment caused by erosion/corrosion." It is foolish for the NRC to call for the increased application of leak-before-break at a time when the GAO is recommending that the NRC adopt the mandatory inspection of all nuclear power plants for pipe deterioration.

The NRC uses the "defense-in-depth" concept to assure an adequate level of safety. This concept is implemented by using high standards of design, fabrication, inspection and by providing enough back-up systems to protect against accidents. Robert Pollard, senior nuclear safety engineer with the Union of Concerned Scientists, contends that "... the NRC's lax policy on pipe cracks further erodes the defense-in-depth philosophy." Pollard also noted that "The traditional safety analysis assumes one break but that multiple breaks could result from weakened piping. In the event of an earthquake. even if the emergency core cooling system responds as it is supposed to, it could be a serious accident."

In August 1983 a top NRC official made a similar analogy in regards to a plant's overall risk profile. He said, " If you have a plant with a large number of weakened pipes you are going to get an elevated level of risk from all kinds of things: for instance, earthquakes. Plants are designed so that an earthquake won't hurt normal pipes, but weakened pipes could break, resulting in a large-break loss-of-coolant accident." This official also went on to say that the NRC would eventually have to face this problem sooner or later.

WHY LEAK-BEFORE-BREAK SHOULD NOT BE EXPANDED:

A safety advisory committee to the NRC called the "leak-before-break" theory a "delusion" stating that "we know of no way to demonstrate its validity." The NRC's reliance on leak-before-break is an irrational response to a very real safety problem. Moreover, for the NRC to even suggest the increased application of leak-before-break points to the continued lip service which the NRC pays to its primary concern, that of fullfilling its safety mission.

In December of 1987 a weld failed in Farley-2's emergency core cooling system resulting in thermal cycling. According to the NRC and some industry sources, thermal cycling may indicate a generic problem that could lead to a double-ended pipe failure within LWRs. Charles Rossi, director of the Office of Nuclear Reactor Regulation's (NRR) division of operational events assessment admitted that a double-ended failure of flawed piping could occur and that an ECCS pipe crack could cause a medium-sized LOCA. However, Pat McDonald, a senior vice president at Farley claimed "The plant was never in any danger," because " ... pipe materials verified the existence of leak-before-break." This reaction by Mr. McDonald only typifies the "out-of-sight-out-of-mind" mentality used to convince themselves and the NRC that there is no immediade safety problem.

Recently, the NRC identified 34 plants with significant erosion/corrosion pipe damage; and raised concerns about the quality of widely used pipes and flanges, yet the NRC proposes to expand leak-before-break. Rather than investigate this delusionary theory, the NRC should implement mandatory piping inspections of all nuclear power plants and re-evaluate leak-before-break because of its unreliability and tragic failure.

We thank you for considering our comments regarding the additional application of leak-before-break.

June 30, 1988

Robert Beaudoin
Nuclear Information and Resource Service
1424 16th Street, N.W. Suite 601
Washington, D.C. 20036

June 30, 1988

Secretary
US Nuclear Regulatory Commission
Washington, D.C. 20555
Attn: Docketing and Service Branch

Dear Mr. Chilk,

Enclosed please find the comments of the Nuclear Information and Resource Service concerning the NRC's request for comments on proposing to investigate the safety benefits associated with using leak-before-break technology for emergency core cooling systems (ECCS) and environmental qualification (EQ) of safety related electrical and mechanical equipment.

We thank you for taking the time to consider these comments on the additional application of leak-before-break technology.

Sincerely,

Robert Beaudoin
Information Services

50
(53FR11311)

27 June 88

JEAN S. EWING
3300 JOURDAN ROAD
DARLINGTON, MARYLAND
21034

Dear Mr Secretary

Leak Before Break technology appears unreliable and should be discarded.

It is upsetting to the public to find the Commission indifferent to the findings and recommendations of the General Accounting Office and of the Advisory Committee on Reactor Safeguards.

Take no chances, cut no corners.

Flukey reactors will get you all out of business in a hurry.

Sincerely,

Jean Ewing

COMBUSTION ENGINEERING

July 5, 1988
LD-88-051

Mr. Samuel J. Chilk
Secretary of the Commission
Attn: Docketing and Service Branch
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Leak-Before-Break Technology; Solicitation of Public Comment on Additional Applications

Dear Sir:

Combustion Engineering has reviewed the subject Federal Register notice (53FR11311) and is pleased to provide comments. Combustion Engineering supports expanding the applicability of Leak-Before-Break technology to the functional and performance requirements for Emergency Core Cooling Systems and Environmental Qualification.

Combustion Engineering is already utilizing Leak-Before-Break technology in support of its operating plant customers and in its current efforts to design an Advanced Light Water Reactor. Such use is, however, limited to those applications allowed by the current General Design Criterion 4, specifically, the dynamic effects associated with pipe ruptures. Further broadening of regulations covering design criteria would allow additional benefits as outlined in our detailed comments provided in the Attachment.

In addition, Combustion Engineering encourages the Commission to consider a further extension of Leak-Before-Break applicability to containment design criteria. Such an extension could have a positive impact an overall plant safety for the Advanced Light Water Reactors currently in the design process.

Combustion Engineering believes that containment design criteria can be established to ensure adequate safety margins against all credible scenarios while still allowing improvements in safety margins in other areas, such as

Power Systems
Combustion Engineering, Inc.

1000 Prospect Hill Road
Post Office Box 500
Windsor, Connecticut 06095-0500

(203) 688-1911
Telex: 99297

plant transient response. We would encourage the Commission to move expeditiously to remove the "Double Ended Guillotine Break" from containment design consideration so that ongoing design development work may be modified accordingly.

If the staff has any questions concerning our comments, please do not hesitate to contact me or Mr. C. M. Molnar of my staff at (203)285-5205.

Very truly yours,

COMBUSTION ENGINEERING, INC.

A. E. Scherer
Director
Nuclear Licensing

AES:ss

Attachment

Comments on Extension of
Applicability of Leak-Before-Break Technology

Summary

Extension of Leak-Before-Break technology to the functional and performance requirements for Emergency Core Cooling Systems (ECCS) and Environmental Qualification (EQ) of safety related electrical and mechanical equipment will accrue safety and reliability benefits for both operating plants and future plant designs. In particular, one positive impact on operating reactors will be a reduction in unnecessarily conservative and restrictive system and component plant Technical Specifications for the Emergency Core Cooling Systems. For future plant designs, the proposed extension of Leak-Before-Break, if implemented now, will allow more realistic and balanced design criteria to be established for the Advanced Light Water Reactor. More detailed discussion on the impacts of the proposed extensions is provided below.

Application to Operating Plants

Operating plants are currently designed to rigorous performance criteria based on the assumption of surviving a highly conservative, hypothetical, Doubled Ended Guillotine pipe break. While it is not expected that operating plants will remove existing equipment on a wholesale basis as a result of this possible extension of Leak-Before-Break, an extension could allow operating units to accrue certain near term benefits. Specifically, benefits can be expected in areas that minimize the challenges to existing equipment, minimize or simplify surveillance testing and improve plant operating flexibility and reliability by removing unnecessary testing requirements and revising overly restrictive equipment setpoints.

In the area of simplified performance testing for ECCS equipment, operating plants would benefit from more realistic test criteria in demonstrating functional acceptability. For example, eliminating consideration of the Double Ended Guillotine Break rupture would allow a reduction of the conservative low pressure safety injection pumping capacity currently required by safety analyses. Once justified by new analysis, a lower pumping capacity could be used to reduce overly restrictive Technical Specifications. Similarly, setpoints for safety injection tanks and/or pumps could be lowered to levels that preclude inadvertent injection on minor plant depressurizations. Potential actuation setpoint relaxation or reactor protection system setpoint relaxation are also possible, Resulting in reductions in the number of unnecessary plant scrams and challenges to ECCS.

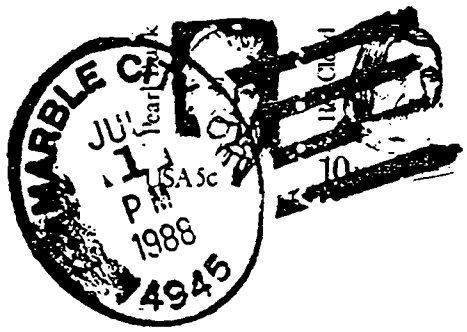
As with ECCS equipment, operating plants have installed electrical and mechanical equipment that is environmentally qualified to highly conservative design standards. Application of Leak-Before-Break to the area of environmental qualification offers operating plants a number of potential benefits. These include more realistic maintenance and surveillance testing requirements. Reductions in the amount of time spent maintaining equipment improve its availability, reduce the potential for maintenance errors, reduce the potential for initiating spurious plant transients and reduce occupational exposure. In addition, more realistic environmental design criteria could allow reduced surveillance testing and reduce unnecessary cycles of equipment, thereby enhancing equipment lifetime. Equipment life may also be extended in those areas where restrictive environmental qualification requirements force periodic replacement to assure continued acceptable performance at unnecessarily conservative conditions. Further, when replacement of equipment becomes necessary, use of realistic environmental conditions should allow selection from a much broader base of suppliers. This offers a significant potential benefit in that the designers and plant operators will have the flexibility to use equipment based on its reliability, operability and maintainability rather than based on how well it is "armored." The impact of this aspect of extending Leak-Before-Break offers the potential for improved plant reliability and safety.

Application to New Plant Designs

For new plant designs, application of Leak-Before-Break technology will allow the design of plant structures and equipment to be based on more reasonably conservative performance requirements. Overall, this will result in a less complex and more readily maintainable system. For example, reduced sizing requirements for safety injection system components and/or relaxation of actuation setpoints will likely result from Leak-Before-Break considerations. Reduced sizing could result in lower ECCS pump capacities and in possible elimination of one or more safety injection tanks and associated valves and piping. Smaller ECCS pumps can be expected to result in increased diesel generator reliability due to elimination of the need to sequence large electrical loads. The ability to eliminate one or more safety injection tanks yields a benefit from the reduced radiation exposure doses associated with current component testing and maintenance. The same benefits noted for operating plants regarding lower safety injection system and reactor protection system setpoints also apply to new plants.

The application of Leak-Before-Break technology to the functional and performance requirements for the environmental qualifications of safety related electrical and mechanical equipment in new plants could also result in an increase in plant safety. As previously stated, application would lead to lower and more realistic assessments of pressure and temperature design requirements for safety related equipment, thereby permitting the selection of equipment from a broader base of suppliers to perform a given function. The benefits to be derived are similar to those of operating plants with the additional benefit of being able to better integrate the equipment interfaces at the design stage.

Native Americans for a Clean Environment
P. O. Box 40
Marble City, OK 74945



Secretary of the Commission
U.S. N.R.C.
Washington, DC
20555

July 1, 1988

Dear Mr. Chilk,

NATIVE Americans for a Clean Environment wishes to join with Marvin Lewis of Philadelphia, PA in his comments on 10 CFR Part 50 Leak Before Break Technology; Solicitation of Public Comment on Additional Applications (in response to Federal Register Vol. 53 #66, 4/6/88, Pages 11311 & 11312.

We do wish the entension of the use of leak before break technology. Please retract the present use of LBB.

Sincerely,

Jessie DeerInWater

Jessie DeerInWater
chairperson

June 30, 1988

COMMENTS OF OHIO CITIZENS FOR RESPONSIBLE ENERGY, INC. ("OCRE") ON SOLICITATION OF PUBLIC COMMENTS ON ADDITIONAL APPLICATIONS OF LEAK BEFORE BREAK TECHNOLOGY, 53 FED. REG. 11311, April 6, 1988.

The NRC is seeking public comment on additional applications of leak before break technology with regard to modifying the functional and performance requirements of emergency core cooling systems and for environmental qualification of safety related electrical and mechanical equipment. OCRE opposes any additional applications of leak before break technology.

First, it must be emphasized that the NRC is not empowered to consider cost savings and economic benefits to licensees in either setting or enforcing standards for adequate protection of the public health and safety. Union of Concerned Scientists v. NRC, 824 F.2d 108 (D.C. Cir. 1987). The NRC can only change its current ECCS and EQ regulations due to leak before break technology if it determines that there is a net safety benefit. It is hard to envision any safety benefits in these regulatory areas resulting from the assumption of leak before break. The NRC should carefully investigate any such claimed safety benefits which the industry may advance; it is likely that the industry will try to create safety benefits to reap the economic rewards of deregulation.

Second, the phenomenon of erosion-corrosion and the resultant sudden catastrophic (i.e., break before leak) failure at Surry in December 1986 makes it imperative that no further extensions of leak before break technology be considered. The General Accounting Office has investigated the Surry incident and other incidences of erosion-corrosion. GAO/RCED-88-73, "Action Needed to Ensure that Utilities Monitor and Repair Pipe Damage", March 1988. This report states that 34 nuclear plants have some evidence of erosion-corrosion damage. The extensive erosion-corrosion found at the Trojan plant is especially troubling in that pipe thinning was found in safety-related portions of the plant and in straight sections of pipe thought to be least susceptible to erosion-corrosion. The Surry incident also involved systems interactions causing degraded control room habitability, due to actuation of fire suppression systems, and malfunctions in security and communications systems. The Surry event demonstrates that the NRC must pay more attention to the consequences of pipe rupture on other systems, not less. This event has special significance for any planned changes to EQ regulations.

The NRC should take aggressive action to reduce the danger and probability of pipe ruptures, rather than assuming that pipes will not break.

Respectfully submitted,

Susan L. Hiatt

Susan L. Hiatt
OCRE Representative
8275 Munson Road
Mentor, OH 44060
(216) 255-3158

(10

DOCKET NUMBER
PROPOSED RULE PR 50
(53 FR 11311)

Conservation Council Of North Carolina

'88 JUL -7 A11:42

OFFICE OF SECRETARY
DOCKETING & SERVICE
BRANCH

307 Granville Road
Chapel Hill
North Carolina 27514
(919) 942-7935

June 23, 1988

Secretary
US Nuclear Regulatory Commission
Washington, D.C. 20555
Attention: Docketing and Service Branch

Re: Leak-before-break technology

Dear Sir:

The Conservation Council is a statewide environmental group with 45 member groups and over 650 individual members. We have intervened in various nuclear licensing procedures in North Carolina and have frequently commented on changes to the NRC regulations.

We take object to the apparent NRC staff position that there is validity to leak-before-break technology for pipes used for cooling water. It appears that reliance on this theory will be used solely to justify weakening the regulations, reducing the amount of safety equipment in the emergency core cooling systems.

Ultra-sonic testing has never been a reliable technique for determining the presence and depth of cracks. The Advisory Committee on Reactor Safeguards recently found that ultra-sonic testing could not be relied on because there is no correlation between the measured depth and actual depth of the cracks. In several instances in this country, pipes have cracked and workers have been injured. We have been lucky that there has not been a major loss-of-coolant accident.

The present safety standard of "defense-in-depth" needs to be retained rather than allow leak-before-break to replace it.

Thank you for the opportunity to comment.

Sincerely,

John Runkle

John Runkle
General Counsel

Dedicated to a healthy and beautiful North Carolina

RD 4 Doylestown Pa. 18901
7/1/88

(11)

MARY BYE
3105 CHURCH SCL RD
DOYLESTOWN PA 18901

DOCKET NUMBER
PROPOSED RULE PR 50
(53 FR 11311)

'88 JUL -7 A11:50

OFFICE OF SECRETARY
DOCKETING & SERVICE
BRANCH

Secretary of the Commission
Washington DC 20555
Attn: Docketing & Service Branch

Dear Mr. Secretary,

The NRC is living in a dream world. There is no absolute law regarding leak-before-break. Consider Lenny when a pipe suddenly burst under pressure. Francis Bacon understood 3 centuries ago that scientists may find 99 cases out a hundred that corroborate their theory, but if the hundredth, does not fall in line, then they have not discovered a law.

Therefore I deem it too risky to rely upon pipes holding up under constant stress chemically & physically without regular checkups, as the GAO recommended.

Sincerely,
Mary Bye

PUBLIC CITIZEN

Buyers Up □ Congress Watch □ Critical Mass □ Health Research Group □ Litigation Group

July 1, 1988

Samuel Chilk
Secretary of the Commission
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Chilk:

The U.S. Nuclear Regulatory Commission (NRC) has recently asked for comments on a proposal to extend the applications of the "leak-before-break" approach to nuclear power plant safety.

Simply described, "leak-before-break" (LBB) holds that certain pipes always leak before they break; that these leaks are always detected; and that when a leaky pipe is discovered, there will be sufficient time to correct the problem before the pipe breaks and causes severe damage.

The appeal of LBB is that it allows utilities to save money in the maintenance and repair of their nuclear power plants. However, the savings come at the expense of public health and safety.

All three of the NRC's assumptions above are incorrect, as Public Citizen's enclosed comments on the proposal explain. However, the NRC has accepted these faulty assumptions as facts, reaching the conclusion that LBB eliminates the need to inspect pipes for cracks and potential breaks.

The NRC has already implemented this technology for most of the pipes in nuclear power plants, and now it is proposing to apply it to pipes in the Emergency Core Cooling System and Environmental Qualifications System. The NRC claims LBB will yield safety benefits in the forms of lowered worker exposure to radiation and greater plant integrity against earthquakes. However, these potential benefits do not change the fact that reliance on LBB is questionable as an adequate means of predicting and preventing pipe breaks and the severe consequences that could result.

Based on the many valid criticisms of LBB (see attached comments), it appears that NRC's proposal to extend the application of LBB is designed primarily to ease the financial pressures on the nuclear industry at the expense of plant safety. As such, it is merely the latest in a series of actions in which the NRC has abandoned its responsibility to serve as an objective regulator of nuclear safety in favor of the economic interests of the nuclear industry.

These actions include the issuance of a "backfit" (safety-related

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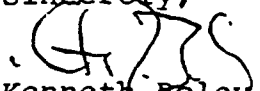
repair) rule which allows a utility's economic arguments to be considered and balanced against the relative safety benefit of a repair at a nuclear power plant. The agency is presently considering a proposal to allow certain "low-level" nuclear waste to be disposed of like regular garbage by declaring the waste's radioactivity "below regulatory concern." Of great public interest in the past few months has been the NRC's easing of the rules for emergency planning, geared largely toward the licensing of the Seabrook plant in New Hampshire and the financial redemption of its owners. The NRC has also deferred to the industry in numerous other cases, including the training of reactor operators, by endorsing the programs of the Institute of Nuclear Power Operations which is funded and run by the industry.

In conclusion, LBB represents another effort to place the economic interests of the nuclear industry ahead of public health and safety. Not only should LBB applications not be extended, but its present implementation should be discontinued except on non-safety related piping.

Sincerely,



Kenneth Bóley
Nuclear Safety Analyst
Critical Mass Energy Project
of Public Citizen

PUBLIC CITIZEN

Buyers Up ☐ Congress Watch ☐ Critical Mass ☐ Health Research Group ☐ Litigation Group

July 1, 1988

Secretary of the Commission
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Attention: Docketing and Service Branch

Subject: Comments on Additional Applications of Leak-Before-Break Technology (53FR11311)

Underlying the implementation of leak-before-break (LBB) technology is an immense, though faulty, leap in logic. That basic assumption is that if certain pipes have been observed to always leak before they break, then they will continue to do so. The Nuclear Regulatory Commission (NRC), in fulfilling its mandate to protect the health and safety of the public, should understand that a probablistic view based on past experience is not sufficient justification for the relaxation of a standard, rule, or procedure if the public safety could be jeopardized.

The Nuclear Management and Resource Council wrote in reference to the NRC's Proposed Standard Review Plan on Leak-Before-Break Procedures (52FR32626) that it "applauds the NRC's continued efforts . . . to reduce excess conservatism . . . which could detract from safe operation" of a nuclear power plant. ©On this point, Public Citizen and NUMARC in principle, but it cannot be demonstrated that LBB technology represents a safer technique for predicting and preventing pipe breaks than the presently used "excess conservatism."

Although the NRC currently gives credence to LBB technology for many applications, this fact should not be used to argue that LBB is a safe method of pipe break prevention. To extend its application to emergency core cooling systems (ECCS) and environmental qualifications (EQ) of safety related electrical and mechanical equipment is to treat LBB's safety as a foregone conclusion.

The NRC has made the assumption that if a pipe is going to break, it will leak first, and when it leaks, there will be sufficient time to fix it before there is a severe pipe break. However, five years ago, Harold Denton, then Director of Nuclear Reactor Regulation, stated that LBB "is not an established law" and warned that "if there is really a pipe out there somewhere that is cracked half-way through or is 55 percent of the way through before it begins to leak, then there is very little time to detect that leakage and take proper corrective action."

In December 1986 at the Surry plant in Virginia, a pipe burst and caused the deaths of four workers. The pipe had not leaked before it

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broke. Although the pipe was in a non-safety related part of the plant and was therefore not previously inspected for cracks, and was of a different variety from the pipes that are in the ECCS and the EQ systems, the incident does prove one very important point: pipes can lose their integrity, and pipe breaks can occur without previously leaking, even if historically they have not.

Further, even if one accepts that the pipes in question will leak before they break, one supposes a flawless system in assuming that these leaks will always be detected.

As stated in the Federal Register notice, the NRC has been using the "defense in depth" concept of reactor safety. However, contrary to the agency's contention, application of LBB to the ECCS and EQ systems would degrade "defense in depth." If actual inspection of certain pipes is to be replaced by a policy based on faulty assumptions, then the next line of defense should be that much more reliable and stringent. However, ultra-sonic testing (UT), which would likely be the next method for preventing pipe breaks, has been questioned extensively. The NRC's Advisory Committee on Reactor Safeguards (ACRS) has called UT's reliability a "delusion ... we can find no consistent experimental evidence or body of expert opinion indicating that [UT-] measured crack depths bear any direct relationship to actual crack depths." Implementation of a flawed policy such as LBB will lead to increased reliance of UT, which itself has been disavowed by the NRC's ACRS.

Public Citizen appreciates this opportunity to comment on the NRC's extension of leak-before-break to the ECCS and EQ systems. Our recommendation is that not only should these further applications be rejected, but implementation of leak-before-break in all of its other applications should be discontinued as well.

Sincerely,

Kenneth Boley
Nuclear Safety Analyst
Critical Mass Energy Project
of Public Citizen

MARYLAND NUCLEAR
SAFETY COALITION
safe energy alternatives

July 4, 1988

Secretary of the Commission
United States Nuclear Regulatory Commission
1717 H Street, N.W.
Washington, D.C. 20555

SUBJECT: COMMENT ON LEAK-BEFORE-BREAK TECHNOLOGY

Dear Sirs:

We believe that further use of the Leak-Before-Break technology for emergency core cooling systems would in fact REDUCE safety assurances and safety benefits.

Previous experience has shown that pipe-thinning and deterioration has progressed faster than expected, and in reactor systems where thinning was not expected, as the Surry and Trojan plants demonstrated.

We believe that there are no short cuts to safety, that its present use of leak-before-break technology is obviously unreliable, and that mandatory, periodic piping inspections of all piping should be required at all operating nuclear power plants.

We urge the NRC to use the most conscientious care in helping insure public safety and health.

Thank you.

Sincerely,

Patricia Birnie

Patricia Birnie
Co-Director

P.O. BOX 902/COLUMBIA, MD/21044
(301) 381-2714/433-4674

TMIA: THREE MILE ISLAND ALERT, INC.
315 Peffer St., Harrisburg, Penna. 17102 (717) 233-7897

DOCKET NUMBER
PROPOSED RULE PR 50 (53FR11311)

July 28 1988 -5 P2:37

OFFICE OF SECRETARY
DOCKETING & SERVICE
BRANCH

Secretary of the Commission
Washington, D.C. 20555
Attention: Docketing and Servicing Branch

Dear Secretary,

Three Mile Island Alert (TMIA) is a non-profit citizens group formed in 1977 after the construction of Three Mile Island (TMI) Unit 1 and Unit 2, and the licensing of Unit 1. In the last nine years we have been an active intervenor in hearings before the Nuclear Regulatory Commission (NRC) on safety, managerial and technical issues. Our organization is concerned with a proposal currently under consideration by the NRC.

The NRC is soliciting comments on leak-before-break technology for emergency core cooling systems (ECCS) and environmental qualification (EQ) of safety related electrical and mechanical equipment. Apparently the Commission feels that there are several benefits associated with this technology such as dose reductions, improved inspections and an improved performance during earthquakes.

The technology for detecting and sizing cracks, Ultra-Sonic Testing (UT), is imperfect and questionable at best. And in fact the Advisory Committee on Reactor Safeguards (ACRS) indicated that dependence on Ultra-Sonic Testing is a "delusion...we can find no consistent experimental evidence or body of expert opinion indicating that measured crack depths bear any direct relationship to the actual crack depths." For this reason alone, "defense-in-depth" should not be discarded for an experimental and unproven technology such as Ultra-Sonic Testing.

Our own experience with experimental tube technologies at Three Mile Island accentuates our anxiety. In 1981, the steam generators at TMI-1 were severely damaged by the inadvertent introduction of a sulfur compound into the reactor's primary system, which corroded the inside of all 31,000 of the plant's steam generator tubes.

No steam generator in the country has suffered the amount of damage as has TMI-1's steam generators. GPU chose to repair the steam generators with a highly experimental process by which most of the cracks were sealed by exploding each of the 31,000 tubes against the surrounding two foot long tubesheet. In addition, those tubes most seriously cracked - those with cracks greater than 40 % through the wall of the tubes - were plugged and removed from service, as required by TMI-1's license.

In 1984, GPU discovered that a number of tubes were showing new cracks, many of which were greater than 40 % throughwall. Under standard NRC license requirements, these tubes were required to be plugged. But NRC requirements also prohibit a plant from operating at full capacity with more than a certain number of plugged tubes. TMI-1 is now approaching the plugging limit.

Recognizing that tube degradation was likely to get worse, in November, 1985, the company submitted an unprecedented request to the NRC to amend its license to change the plugging criteria, so that tubes with up to 70 % throughwall cracks could remain in service.

There were a number of safety questions which concerned the NRC Staff: a lack of definitive information concerning the cause and form of the new degradation; inaccuracies in the testing process; and the failure of the new criteria to comply with the NRC requirements. The NRC's greatest concern was the failure of the company to verify its technical analysis, by removing an actual steam generator tube from the reactor and conducting a metallurgical examination. The Staff told the company that such destructive testing would be required before its approving this unprecedented request.

Despite much internal disagreement, the Staff decided to reverse its position. It advised GPU that if it submitted a modified, less extensive, "temporary" request to change the plugging criteria, the Staff would approve such a request without requiring any destructive testing and without resolution of the many concerns about the condition of TMI 1's steam generators.

The staff advised the company how to formulate the request in order to keep it outside the scope of the hearing process which was already underway, and to permit the Commission to approve the amendment immediately, without a prior hearing.

The fiasco at TMI 1 points to the danger of utilizing an experimental technology on steam generator tubes. If the NRC were to condone the use of leak-before-break technology, it would surely repeat some the mistakes made at TMI 1. Ultimately, utilities would be encouraged to relax their standards in order to accommodate unforeseen complications, thereby decreasing the margin of safety. TMIA believes that the NRC should thoroughly re-evaluate leak-before-break technology before considering the safety benefits incurred when employing its use.

Eric Epstein, Spokesperson, TMI-Alert

CEOG COMBUSTION ENGINEERING OWNERS GROUP

Arizona Public Service Co. Palo Verde 1, 2, 3
Baltimore Gas & Electric Co. Calvert Cliffs 1, 2
Florida Power & Light Co. St. Lucie 1, 2
Maine Yankee Atomic Power Co. Maine Yankee
Omaha Public Power District Ft. Calhoun
Arkansas Power & Light Co. ANO 2
Consumers Power Co. Palisades
Louisiana Power & Light Co. Waterford 3
Northeast Utilities Service Co. Millstone 2
Southern California Edison Co. SONGS 2, 3

Dr. Joseph K. Gasper, Chairman/c/o Omaha Public Power District/1623 Harney/Omaha, NE 68102

88 JUL -7 P3:24

July 5, 1988
CEOG-88-338

OFFICE OF SECRETARY
DOCKETING & SERVICE
BRANCH

DOCKET NUMBER
PROPOSED RULE PR 50
(53FR11311)

Mr. Samuel J. Chilk
Secretary of the Commission
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Attn: Docketing and Service Branch

Subject: Leak-Before-Break Technology; Solicitation of Public Comment on Additional Applications

Dear Mr. Chilk:

The Combustion Engineering Owners Group (CEOG) has reviewed the subject request published in the Federal Register (53FR11311) and is pleased to provide the following comments.

The CEOG supports the consideration of expanding the applicability of Leak-Before-Break Technology to modify functional and performance requirements for emergency core cooling systems (ECCS) and environmental qualifications (EQ) of safety related electrical and mechanical equipment. This additional application of Leak-Before-Break Technology will provide beneficial safety enhancements in both areas under consideration.

Expansion of Leak-Before-Break technology will have different benefits whether applied to operating plants or future plant designs. Specifically, operating plants have, in general, installed equipment designed to meet rigorous performance criteria based on the assumption of surviving a doubled-ended guillotine pipe break. When compared against criteria which would result from an assumption of realistic leaks or pipe breaks as justified by Leak-Before-Break technology this equipment is significantly over designed. In most situations this equipment would not be removed from an operating plant to be replaced by equipment designed to more realistic assumptions. As such, there will not be a significant increase in safety above that already designed into operating plants. The benefit to be gained will come in those areas which minimize the challenges to existing equipment, minimize or simplify surveillance testing and improve plant operating flexibility by reducing testing requirements or equipment setpoints. As regards ECCS equipment, reducing the size of leaks or eliminating pipe breaks through application of Leak-Before-Break technology which must now be accommodated, will allow relaxation of performance testing requirements. This will

provide a benefit by not requiring equipment to be periodically tested close to its performance limits to demonstrate acceptability at unrealistic performance levels. For example, without a double-ended guillotine rupture, low pressure safety injection pumping capacity could be lower than that now required by safety analyses. These pumps, although they would continue to deliver their design flows, could be demonstrated to deliver much lower flows based on realistic inventory replacement requirements thereby not taxing the pumps significantly. The setpoints for safety injection tanks and/or pumps could be lowered to levels which would preclude inadvertent injection on plant depressurizations. This has the potential to reduce system overpressurization events which in turn reduces the threat of pressurized thermal shock. There are other examples of this type which can be described, however, the point to be made is that operating plants already have a significant amount of safety margin built in which will not be removed by extension of Leak-Before-Break technology to ECCS and EQ. Rather, the safety benefit will be derived from improvements in plant operating flexibility through reduced performance requirements, testing and challenges to existing equipment. Potential actuation setpoint relaxation or reactor protection system setpoint relaxation also have associated safety benefits. The potential benefits here result from reductions in the number of plant scrams and challenges to ECCS which in turn result in less complicated plant transients. A further benefit is derived from higher system reliability due to reduced component wear and tear.

As with ECCS equipment, operating plants have already installed environmentally qualified electrical and mechanical equipment, where necessary. It is unlikely that this equipment will be replaced immediately if environmental criteria are reduced as a result of the application of Leak-Before-Break technology. Therefore, little additional direct safety benefit will be gained. The benefit will be derived from reduced maintenance activities necessary to keep up qualification to unrealistically high functional performance levels. Reductions in the amount of time spent working on equipment improve its availability, reduce the potential for maintenance errors, reduce the potential for initiating spurious plant transients and reduce occupational exposure. Equipment life may be extended in those areas where environmental qualifications required periodic replacement in order to assure continued acceptable performance at the conservatively high conditions. Further, where replacement equipment is necessary, use of realistic environmental conditions should allow selection from a broader base of suppliers as well as of types of equipment to perform a given function. Installing equipment based on satisfying a broader spectrum of performance requirements rather than compromising on one that can survive unrealistic conditions should result in an overall improvement in the performance of the component as well as the plant.

For new plant designs, application of Leak-Before-Break technology will allow the design of plant structures and equipment more in line with the realistic performance requirements it will have to satisfy. Overall this will make for a less complex more readily maintainable system. For example, applied to ECCS performance, reduced sizing requirements for the safety injection system

components and/or relaxation of actuation setpoints would likely result. Reduced sizing could result in lower ECCS pump capacities and in possible elimination of one or more safety injection tanks along with their associated valves and piping. With regard to the down sizing of ECCS pumps, a safety benefit would be derived from increased diesel generator reliability due to elimination of the need to sequence the large electrical loads required by present day pumps. The elimination of one or more safety injection tanks would have a safety benefit in that the radiation dosages associated with component testing and maintenance would be significantly reduced. The same benefits noted for operating plants regarding lower safety injection system and reactor protection system setpoints also applies to new plants. Mr. The application of Leak-Before-Break Technology for modifying the functional and performance requirements for the environmental qualifications of safety related electrical and mechanical equipment in new plants will also result in an increase in plant safety. As previously stated, application would lead to lower and more realistic assessments of pressure and temperature design requirements for safety related equipment, thereby permitting the selection of equipment from a broader base of suppliers as well as equipment types to perform a given function. The benefits to be derived are similar to those of operating plants with the additional benefit of being able to better integrate the equipment interfaces at the design stage.

For reasons discussed above, the CEOG supports the further expansion of the applicability of Leak-Before-Break technology to modify the functional and performance requirements for both ECCS and EQ.

Very truly yours,

J. K. Gasper

Dr. J. K. Gasper
Chairman, C-E Owners Group

PWR/rn

cc: Mr. B. Boger, NRC
Dr. R. Evans, NUMARC
Mr. J. Pfeifer, C-E

(66)

GERALD A. DRAKE, M.D.

DOCKET NUMBER
PROPOSED RULE PR 50
(53FR11311)

WINTER ADDRESS:
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'88 JUL 11 A8:26

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DOCKETING & SERVICE
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SUMMER ADDRESS:
7921 INDIAN GARDEN ROAD
PETOSKEY, MI 49770
616-347-9530

July 2, 1988

U. S. Nuclear Regulatory Commission
Washington, DC 20555

Att: Docketing and Service Branch

Gentlemen:

Rather than investigating the safety benefits of the "leak before break" technology, the whole "leak before break" theory should be further investigated.

We all know of the Surry accident where a pipe burst without warning, killing 4 people. The Trojan plant has found thinning pipes. I doubt that the "leak before break" theory is valid.

Yours truly,

Gerald Drake, MD

(17)

Westinghouse Electric Corporation
Power Systems
Nuclear Technology Systems Division
Box 355
Pittsburgh Pennsylvania 15230-0355

NS-NRC-88-3358
July 13, 1988

Docketing and Service Branch
Leak-Before-Break Technology
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Westinghouse Comments on Use of Leak-Before-Break Technology to Modify Functional and Performance Requirements for ECCS and EQ of Safety Related Electrical and Mechanical Equipment

Gentlemen:

Westinghouse is pleased to comment on the safety benefits associated with using leak-before-break technology to modify functional and performance requirements for emergency core cooling systems (ECCS) and environmental qualifications (EQ) of safety related electrical and mechanical equipment.

The proposal to investigate the safety benefits associated with applying the leak-before-break technology (LBB) to emergency core cooling (ECCS) and environmental qualification (EQ) performance requirements has been reviewed with respect to application to Westinghouse designed plants. Consideration has been given to the potential impact on operating plants in the areas of safety injection systems, containment systems, and environmental qualification requirements and on the potential impact on new plant designs. The review was also conducted with consideration of the currently approved Appendix K ECCS models and to the pending rule change (August 88) which will allow the use of Best Estimate Methodology to large break analysis.

For Westinghouse commercial PWRs, the use of leak-before-break technology does present potential benefits to utilities since it should provide additional operating margin such as relaxation in Tech. Spec. peaking factors (Fq) and potentially increased plant reliability in areas such as increased emergency diesel start times. Leak-before-break technology should also produce benefits from a somewhat reduced EQ envelope. However, constraints on ECCS system performance remain for the smaller LOCA breaks which will prevent large-scale Tech. Spec. relaxation for existing plants. No existing safety system will be made obsolete in W operating PWRs by eliminating the large break LOCA as a design basis event. Additionally, new LOCA model development and plant analysis effort may be needed to identify and license models if the "intermediate" break sizes become the new limiting case.

By retaining the Appendix K rule on break sizes and taking advantage of rule changes which permit best-estimate LOCA methodology, utilities can reap comparable operating margin benefits. Therefore, the overall economic benefit to utilities of applying LBB technology to EQ and ECCS performance requirements does not appear to be major, and net safety benefits may not outweigh the detriments.

A more detailed discussion of our review of this matter is attached. If there are any questions, please contact me or Dr. F.F. Cadek (412-374-4720) of my staff.

Very truly yours,

W.J. Johnson, Manager
Nuclear Safety Department
Power Systems Division
Westinghouse Electric Corporation

Attachment

Attachment to NS-NRC-88-3358

WESTINGHOUSE COMMENTS ON APPLICATION OF LEAK-BEFORE-BREAK TECHNOLOGY TO ECCS AND EQ (Ref: Federal Register/Vol. 53, No. 66/April 1988)

INTRODUCTION

The proposal to investigate the safety benefits associated with applying the Leak-Before-Break Technology (LBB) to Emergency Core Cooling (ECCS) and Environmental Qualification (EQ) performance requirements has been reviewed with respect to application to Westinghouse designed plants. Consideration has been given to the potential impact on operating plants in the areas of safety injection systems, containment systems, and environmental qualification requirements and on the potential impact on new plant designs. The review was also conducted with consideration of the currently approved Appendix K ECCS models and to the pending rule change (August 88) which will allow the use of Best Estimate Methodology to large break analysis.

INTERPRETATION OF THE RULE CHANGE

The modification of General Design Criterion 4 permitted the use of leak- before-break (LBB) technology to exclude from the design basis the dynamic effects of postulated ruptures of the primary coolant piping of qualified PWRs. This rule has been utilized by Westinghouse to limit the postulated reactor coolant system (RCS) pipe break sizes which must be considered in plant structural analysis. In a few plants, pressurizer surge lines, accumulator lines, and other large branch line breaks have also successfully been eliminated from consideration. The loss-of-coolant accident (LOCA) analyses performed to demonstrate ECCS performance under the proposed rule would consider any possible RCS break size up to and including the maximum size which has not been dispositioned by LBB technology. Also, containment analyses performed to define the EQ transients for PWRs would continue to consider ruptures of the carbon steel main steamlines.

CURRENT LOCA ANALYSIS CONSIDERATIONS

An analysis which demonstrates the ECCS performance of "instantaneous double-ended breaks ranging in cross-sectional area up to and including that of the largest pipe in the primary coolant system" is presently prepared to license any LWR facility in the United States per 10CFR50 Appendix K. In practice, a spectrum of break sizes are analyzed using an approved evaluation model. Separate evaluation models are employed by Westinghouse for large and small break LOCA events. In large break LOCAs, which exhibit a very rapid depressurization of the reactor coolant system (RCS), the fluid behavior is dominated by inertial effects. A break cross-sectional area of one square foot has historically defined the boundary between large and intermediate break LOCAs for analysis purposes.

LOCA breaks in the size range of less than one sq. ft. area but greater than eight inches in diameter are the so-called "intermediate" breaks, which are strongly influenced by both inertia and gravity. Traditionally, the intermediate breaks have received limited attention in ECCS performance analyses because the double-ended ruptures have been limiting. Breaks of the surge line and accumulator discharge line are in the intermediate break range. If the LBB methodology is applied to the RCS loop piping but not branch lines, these breaks may become limiting. Additional LOCA model development and plant analysis effort may be needed to identify and license models if the surge line break becomes the new maximum break size.

Small break events exhibit low flow rates, slow depressurization of the RCS, and distinct mixture levels which develop in various locations in the RCS. For analysis purposes small break cases are typically eight inches or less in equivalent diameter. The Westinghouse small break LOCA evaluation model for 10CFR50 Appendix K analyses (using NOTRUMP) has been qualified for small break sizes.

LOCA SAFETY INJECTION SYSTEM

Plant safety injection systems possess the capability to mitigate core thermal transients for the spectrum of postulated LOCA break sizes. While the double-ended RCS pipe rupture has emphasized the perceived relative importance of the certain components in the plant SI systems, all major safety injection components perform significant functions throughout the LOCA break size spectrum. ECCS safety system requirements for existing plants are, therefore, not expected to be substantially reduced by implementation of the leak-before-break approach to Westinghouse designed PWRs.

The high head safety injection (HHSI) system primarily functions to mitigate small break LOCA events. Westinghouse plants have from two to four HHSI pumps to deliver flow to the RCS at elevated pressures of 1400 psia or greater. Often a centrifugal charging pump doubles as an HHSI pump. Since the proposed leak-before-break methodology will not affect the postulated small break LOCA rupture scenarios, no relaxation in HHSI system performance is anticipated. Note that the limiting thermal shock condition for LOCA is the injection of cold water at high pressure during small break LOCA events. The proposed leak-before-break rule on ECCS offers no benefit for this class of breaks.

The cold leg accumulators provide a necessary and diverse source of safety injection water at an elevated pressure during the small break LOCA Appendix K analyses. Many of the small break transients are controlled and/or terminated via accumulator injection, and this important functional capability must be retained for current plants independent of large break LOCA considerations. Also, accumulators are needed to refill the reactor vessel for intermediate break LOCAs. Since the accumulators are passive in nature, they are valuable in probabilistic assessments of ECCS behavior and in ameliorating the risks which arise from postulated LOCA events.

No relaxation of accumulator requirements in existing plants is anticipated thru application of LBB technology. However, with appropriate analysis of small and intermediate break LOCAs, it should be possible to relax setpoint requirements somewhat. In the limit, one of the four accumulators in 4-loop plants could, conceivably, be permitted to be out of service if large LOCAs are eliminated from consideration.

The low head safety injection (LHSI) system performance requirements and/or availability could be impacted by the adoption of leak-before-break for ECCS. However, significant requirements would remain since this system must maintain adequate capability to mitigate the consequences of a surge line rupture (an area of 0.68 sq. ft. for many plants), or the largest LOCA break when LBB is applied. Furthermore, LHSI flow is also needed for many plants for certain small break cases to augment HHSI flow in maintaining adequate core cooling once the accumulators are empty. Above all, for current Westinghouse plants the LHSI pumps must be operable indefinitely following a postulated LOCA event to provide flow in sump recirculation mode; the LHSI pumps draw liquid from the sump to supply the HHSI pumps. The LHSI pumps are essential to meet core flow and cooling requirements in the post-LOCA long-term cooling mode for any and all break sizes.

It is interesting and pertinent to note that the low head pumps used as part of the ECCS for the large majority of Westinghouse plants also serve as the normal plant cooldown system. The pumps were specified to obtain the necessary residual heat removal (RHR) from the RCS for plant cooldown to a shutdown condition. The post-LOCA RHR injection flowrates have been derived from pump and system parameters established to accomplish normal plant cooldowns. Since the RHR system must maintain a flow capability comparable to its functional design value in order to accomplish normal plant cooldowns, no significant permanent reductions in the actual RHR pump performance are acceptable in the plants currently operating.

The net conclusion, from the above review, is that plant safety following a LOCA will mandate that existing plants maintain HHSI, accumulator and LHSI capability similar to that currently in their Technical Specifications (TS). However, the capability does exist with leak-before-break to obtain benefits in plant reliability, not only by modifying Tech. Spec. flow rates for the SI pumps but also by justifying less severe diesel generator start times. Alternatively, comparable benefits can be obtained by applying advanced large break LOCA modeling technology in plant analyses. However, no elimination of any SI systems from the plant Technical Specifications should be anticipated by application LBB. Existing SI system equipment will remain necessary for safety purposes in existing plants.

CONTAINMENT SYSTEMS AND ENVIRONMENTAL QUALIFICATION REVIEW

The large break LOCA has been the traditional design basis accident for containment design purposes, including EQ curves. Deletion of large break will decrease the severity of the post-LOCA containment temperature and pressure response. However, even with LBB technology main steamline break cases up to and including the double-ended rupture would still need to be analyzed. For most plants pressure/temperature transients in containment following a steamline break are comparable to the large LOCA transient in the short term, and in many cases steam breaks are limiting. Furthermore, in the long term the mass and energy releases for the newly limiting LOCA line break (and any other LOCA break size for that matter) must continue until equilibration of the RCS primary and secondary sides to the prevailing containment condition is achieved. The same amount of stored energy must ultimately be expelled to containment for a given RCS initial condition and decay heat level with a limited LOCA break size, albeit at a reduced rate. Overall, the benefit of the leak-before-break technology for EQ curves (if any) will be limited to the intermediate portion of the transient envelope curves, between 300 and 10000 seconds. The short-term temperature through 300 seconds is established by steam break and will be unaltered, while the long-term values for LOCA in the post-10000 seconds range may also be expected to remain the same. If large break LOCA were ignored, a temperature benefit of as much as $40^{\circ}F$ could result at about 1000 seconds. Between 300 and 10000 seconds the time-average temperature benefit in the EQ envelope due to elimination of large break LOCA is estimated to be about $18^{\circ}F$.

Since the "modification of functional and performance requirements for containments is explicitly excluded from consideration at this time," the proposed leak-before-break methodology will have no effect on containment spray system and fan cooler capacity requirements as derived from containment integrity analysis.

NEW PLANT DESIGNS

The preceeding discussion addressed the impact of adopting leak-before-break technology on existing Westinghouse plants. Future plants, currently under design, were also reviewed for potential impact:

1. The AP600 advanced light water reactor incorporates passive safety injection from a core makeup tank which is maintained at RCS pressure, an in-containment refueling water storage tank (IRWST) and accumulators. The key consideration in the AP600 design is depressurization of the RCS to containment atmospheric pressure so that the IRWST can provide long-term injection and cooling by gravity drain. In short, small break LOCA is the true design basis transient for the AP600 safety systems, which turn all LOCA breaks into a large hot leg break. Via judicious selection of core makeup tank design parameters it is probable that the AP600 accumulators can be rendered unnecessary for the small LOCA spectrum. Thus, if large break LOCA were legislated away the need for accumulators as derived from deterministic analyses could be eliminated. Elimination of accumulators would not affect any small or medium break LOCA probabilistic risk values obtained to date in support of the AP600 plant design.

   The AP600 will need to consider main steamline break events and to provide extended heat removal following LOCAs to the ultimate heat sink. The passive containment safeguards design and derived EQ curves are not expected to be greatly altered by leak-before-break technology.

2. The APWR SI system design is much more similar to the existing plant configuration. High and low head safety injection pumps and accumulators are provided to mitigate any size LOCA break; the source of SI water is an in-containment tank rather than an external tank. Small break LOCA SI requirements will mandate that the HHSI capability be maintained as is even if leak-before-break methodology is adopted. With the current APWR design, the accumulators are probably necessary for intermediate break LOCA mitigation. HHSI redesign could, conceivably, justify their elimination, or perhaps the system would be reoptimized if leak-before-break technology were accepted for ECCS.

   With regard to the containment safeguards, spray will remain in order for steamline break control, and fan coolers will still be needed for long-term heat removal to the ultimate heat sink.

CONCLUSIONS

For Westinghouse commercial PWRs, the use of leak-before-break technology does present potential benefits to utilities since it should provide additional operating margin such as relaxation in Tech. Spec. peaking factors (Fq) and potentially increased plant reliability in areas such as increased emergency diesel start times. Leak-before-break technology should also produce benefits from a somewhat reduced EQ envelope. However, constraints on ECCS system performance remain for the smaller LOCA breaks which will prevent large-scale Tech. Spec. relaxation for existing plants. No existing safety system will be made obsolete in W operating PWRs by eliminating the large break LOCA as a design basis event. Additionally, new LOCA model development and plant analysis effort may be needed to identify and license models if the "intermediate" break sizes become the new limiting case.

By retaining the Appendix K rule on break sizes and taking advantage of rule changes which permit best-estimate LOCA methodology, utilities can reap comparable operating margin benefits. Therefore, the overall economic benefit to utilities of applying LBB technology to EQ and ECCS performance requirements does not appear to be major, and net safety benefits may not outweigh the detriments.

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July 21, 1988
RAC:041:88

Secretary of the Commission
U. S. Nuclear Regulatory Commission
Washington, DC 20555
Attention: Docketing and Service Branch

Dear Sirs:

Subject: Solicitation of Public Comment on Leak Before Break Applications

Ref.: Federal Register, Vol. 53, No. 66, "10 CFR Part 50, Leak-Before-Break Technology: Solicitation of Public Comment on Additional Applications," pp. 11311-11312, April 6, 1988

In the referenced Federal Register notice, comments were invited to describe potential safety enhancements from the extension of Leak Before Break technology to environmental qualifications and emergency core cooling systems. The potential safety enhancements that could result from the extension of the technology are the same as the safety enhancements realizable from the proposed 10 CFR 50.46 rule change. These safety enhancements include the potential of mitigating the effect of the irradiation embrittlement of the pressure vessel, thus reducing the likelihood of pressurized thermal shock, and to increase component reliability by reducing the severity of the equipment duty requirements (e.g., diesel generator life).

The large break loss of coolant accident (LOCA) is a very unlikely design base event. For certain PWRs, the large break LOCA, when analyzed in accordance with the requirements of 10 CFR 50.46 and 10 CFR 50 Appendix K, determines the allowable peaking limits and sets related equipment performance requirements. Because of the model and assumptions requirements, the plant system and cycle designs necessary to comply with the criteria may exacerbate more probable events, or may dictate artificially stringent component performance requirements. If the Leak Before Break technology can support a reduced maximum allowable break size such that flow stagnation and reversal do not occur for the worst break, the currently approved models would predict a significant amount of energy removal early in the transient, and therefore would provide margin which could be used to address other safety issues. Increased peaking limits would provide the flexibility to develop very low radial leakage cycle designs which would reduce the fast fluence reaching the pressure vessel, and therefore mitigate the irradiation embrittlement of the vessel and vessel welds. Increased allowed peaking obtained from refinements of the current evaluation models has been used as part of vessel fluence reduction programs in some domestic PWRs. This fluence reduction could also benefit pressure vessel life extension.

Margin in the large break LOCA could also be used to reduce the severity of the equipment duty, thus increasing reliability. For example, because of Appendix K requirements used in a large break LOCA analysis, the diesel generators are required to cold start within a few seconds. The surveillance testing required to verify these short start times reduce the life of the generator. If the Leak Before Break technology provides margin for the worst break LOCA, the margin could be used to lengthen diesel generator start times. The increased start times would allow the surveillance tests to be conducted with less risk of damage to the diesel generator.

The large break LOCA is a very unlikely event, and the calculations with the current evaluation models are very conservative. This conservatism, and the resulting safety benefits of more realistic calculations, is being addressed in the proposed change to 10 CFR 50.46 which would allow the use of more realistic models and quantified uncertainties. However, the development of these more realistic models requires substantial resources. The use of the Leak Before Break technology to support a reduced maximum break size criterion may provide an alternative that allows the safety benefits from a more realistic LOCA analysis while using current evaluation models.

Sincerely yours,

R. A. Copeland
Manager, Reload Licensing

gf

cc: Mr. J. A. O'Brien (USNRC)

TU ELECTRIC

Log # TXX-88557
File # 903.1
903.11
Ref. # 10CFR50.4(a)

August 5, 1988

William G. Counsil
Executive Vice President

Mr. Samuel J. Chilk,
Secretary of the Commission
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555
Attn: Docketing and Service Branch

SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION (CPSES)
COMMENTS ON ADDITIONAL APPLICATIONS OF
LEAK-BEFORE-BREAK TECHNOLOGY
(53 FED. REG. 11311, APRIL 6, 1988)

Dear Mr. Chilk:

In the subject Federal Register publication, the NRC stated that it is proposing to investigate the safety benefits associated with using leak-before-break technology to modify functional and performance requirements for emergency core cooling systems (ECCS) and environmental qualification (EQ) of safety-related electrical and mechanical equipment. The publication requested comments on this proposal, with particular emphasis on "documented evidence describing safety degradations and safety enhancements due to postulated pipe rupture requirements on EQ and ECCS...". It indicated that the priority which it "assigns to modifying functional and performance requirements for EQ and ECCS will be determined in large measure from the balance between accrued safety benefits and detriments believed to result (including impacts on severe accident performance)."

In response to this NRC request for comments, TU Electric strongly endorses the proposal to investigate the safety benefits associated with using leak-before-break (LBB) technology to modify functional and performance requirements for ECCS and EQ and urges the NRC to initiate a proposed rulemaking to implement such benefits.

The following comments describe the substantial safety benefits that would be derived from such additional applications of LBB technology. Although TU Electric cannot at this time provide documented data in support of such benefits it believes that the arguments are sufficiently convincing that the NRC should assign high priority to a proposed rulemaking in this area.

EQ Related Comments

(a) The current interpretation of accident criteria develops calculated radiation exposures of 10^8 to 10^9 rads gamma plus beta for areas inside containment. Instruments and electrical penetrations in common usage meet the requirements of 10^7 to 10^8 rads gamma. The application of leak-before-break (LBB) technology would reduce the level of calculated radiation exposures inside containment under accident criteria and thus provide the following significant safety benefits:

(1) Elimination of Additional Qualification Testing

Reduction in the qualification testing will make more types of instrumentation available to the designer at reasonable cost. The system safety will be improved by the introduction of diverse safety equipment. For example, the AMSAC equipment utilized by CPSES has taken advantage of the availability of an alternative manufacturer (FSAR Section 7.8.1.9).

(2) Utilization of Proven Equipment

Standard equipment models represent the bulk of manufacturer operational experience and, in general, perform the best. If special adaptations are made to meet excessive radiation requirements, then the new material selection or design feature may not perform equivalently. This has many actual examples. A common one is the substitution of a more radiation resistant but harder gasket material resulting in more repeated maintenance than a resilient material would require.

(3) Improved Quality, Availability and Cost of Replacement Parts

The discussion with respect to instrumentation availability as given in (1) is equally applicable to replacement parts. The discussion with respect to the use of proven equipment as given in (2) is equally applicable to the quality and capability of replacement parts.

(4) Elimination of Unnecessary Shielding

If the equipment radiation resistance cannot be improved, the designer may elect to shield the equipment from the hypothetical radiation. This case is analogous to the additional supports eliminated by the original LBB interpretation. Elimination of the unnecessary shielding improves access for maintenance and testing of the ECCS instruments.