



UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D. C. 20555

August 14, 1979

Honorable Joseph M. Hendrie
Chairman
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: STUDIES TO IMPROVE REACTOR SAFETY

Dear Dr. Hendrie:

The Advisory Committee on Reactor Safeguards has several recommendations to make concerning studies to improve reactor safety.

1. Accident Analysis

The ACRS recommends that an analysis be undertaken of postulated accidents involving a steam line rupture followed by a small break in the primary system, arising from an open relief valve, a steam generator tube break or some other opening. The analysis should not only review the capability of engineered safety features to cope with such an event but also examine the symptoms available to the operator and determine the adequacy of existing operating procedures.

2. Studies to Reduce the Probability of an Accident

The ACRS recommends a systematic reevaluation of the common-mode failure potential of compressed air systems used for control or service in both safety and non-safety applications. Among the matters to be considered in such a review should be the effect of moisture and corrosion products, and a total loss of air supply. Also of concern is any interconnection of compressed air supplies to both safety and non-safety devices and to other fluid systems. Consideration should be given to the adequacy of separation rules for air systems.

3. Studies to Reduce the Probability of an Accident

The ACRS recommends that studies be made of the interrelationship between the operation and interconnection of the auxiliary feedwater system, the main feedwater system, the atmospheric dump and the control system, in-board of the isolation valves on the main feedwater and main steam lines in order to ascertain whether there are significant undesirable interactions under various postulated accident scenarios.

The ACRS also recommends examination of feedwater flow during postulated ruptures of the main steam line in order to assure that adequate, but not excessive, heat removal capability is retained.

4. Studies to Reduce the Probability of an Accident

The ACRS recommends that studies be made of possible significant effects adverse to safety arising from shared systems or locations in existing multiple-reactor stations, of the probability of such adverse effects, and of possible mitigating features. Examples of potentially adverse effects to be considered include the possible loss of access to systems needed for one unit due to unexpected releases of radioactivity from a neighbor, and the potential overloading of emergency diesel capability arising from concurrent LOCA signals (real or spurious) for a system using a shared diesel.

5. Operating Procedures

The ACRS recommends that a study be made on how operating procedures should best be written. For example, should procedures be characterized in terms of events or in terms of symptoms, or both? Should the operator actions be keyed to changes in symptoms? Is the priority of operator action fixed so as to optimize public safety? How does one determine whether a given procedure is understood by the operator, and that the operator will carry it out properly?

The ACRS also recommends that a systematic examination be made of steps that the operator should be advised not to take, when and why. One example of such a step could arise in connection with the operator's capability to isolate certain LOCAs in BWRs and some PWRs. It is possible that such isolation following a relatively large loss of original primary system inventory could lead to reactor repressurization and an inability of the available high pressure capacity to keep the core adequately covered for a period long enough to cause significant core damage before the situation was recognized and remedied.

6. Environmental Qualification of Systems in Containment

The ACRS recommends a review and reevaluation of the current basis for judging environmental qualification requirements for equipment in containment and in other buildings where a hostile environment might result. The same review should be made of the locations of vital sensors and other measurement devices. The pros and cons of modified environmental qualification and equipment location should be examined with due consideration given to the difficulties of modifying existing equipment.

7. Design, Construction, and Operation Review

The ACRS recommends that consideration be given to the need for joint review by the nuclear steam system supplier, the architect-engineer, and the operating utility, prior to operation of a reactor, to consider, among other things, the adequacy of interfaces and other features developed under the aegis of multiple suppliers, the acceptability of technical specifications and other safety-related operational limits, and the adequacy of operational and accident procedures.

8. Decay Heat Removal Systems in ECCS

The ACRS recommends a reevaluation of the design basis of the low pressure recirculation heat removal system of the ECCS, including system capability and long-term reliability when circulating highly radioactive fluid containing particulates which might jeopardize certain components.

9. Direct Rather than Derived Safety Signals

The ACRS recommends that a review be made of the possible improvement in actuation reliability that could be achieved by employing a safety signal directly related to the matter of concern; e.g., radiation level for containment isolation. Derived signals have merit but they may be tied to specific scenarios for a transient or accident and hence subject to failure if some unanticipated course of events were to transpire.

10. Systems Interactions Involving Air, Instrument, or Hydraulic Lines

The ACRS recommends that each licensee be requested to review and evaluate his as-built plant for possible significant systems interactions wherein rupture in a medium or high pressure line could cause loss of vitally important air, instrument, and hydraulic lines and electrical circuits and equipment. For boiling water reactors, attention should be given particularly to the lines related to actuation of the scram system.

11. Accident and Transient Analyses

The ACRS recommends that further analyses be made of the course, consequence, and probability of transients which would lead to gross overfilling of the secondary side of the steam generator in PWRs and the equivalent event in BWRs in order to ascertain whether any additional measures are appropriate to provide additional protection of the public health and safety.

12. Studies to Improve Safety

The ACRS has previously recommended on several occasions that the NRC Staff utilize the methodology of probabilistic analysis to examine the reliability

August 14, 1979

of the design of systems important to safety, both for existing reactors and as it might apply to reactors to be constructed. For example, on July 11, 1978 the ACRS, in a letter from R. F. Fraley to L. V. Gossick, recommended that the NRC Staff provide an evaluation of the reliability of the auxiliary feedwater systems of current PWRs and BWRs in terms of various transients and incidents.

Recently, following the Three Mile Island Accident, the NRC Staff performed a short-term, intensive review of the auxiliary feedwater system for Combustion Engineering and Westinghouse operating PWRs and found many items of interest, including some which suggested a need for early regulatory action to remedy deficiencies. The ACRS recommends that this same procedure be applied, as expeditiously as practical, to each of the other systems of importance to safety in order to ascertain whether there are other features on operating reactors warranting early or near-term improvements.

Sincerely,

A handwritten signature in black ink, appearing to read "Max W. Carbon". The signature is fluid and cursive, with the first name "Max" being the most prominent part.

Max W. Carbon
Chairman