November 6, 1978

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Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

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Washington, D. C. 20555

In the Matter of
TENNESSEE VALLEY AUTHORITY
(Yellow Creek Nuclear Plant,
Units 1 and 2)
Docket Nos. 50-566 & 50-567

Gentlemen:

The results of recent analyses indicate that the post-LOCA hydrogen production due to corrosion of materials inside the primary containment (such as aluminun and zinc) and the thermal, chemical, and radiolytic decomposition of organic components in protective coating systems may not have been adequately considered in the evaluation of combustible gas control systems.

Following a LOCA in a light-water reactor nuclear power plant, hydrogen may accumulate inside the primary containment as a result of (1) metal-water reaction involving the fuel rod cladding; (2) radiolytic decomposition of the water in the reactor core and containment sump; (3) corrosion of materials inside the primary containment, such as aluminum and zinc (in the form of galvanized steel and metal-rich paints); and (4) thermal, chemical and radiolytic decomposition of organic components of protective coating systems. Although hydrogen sources are considered routinely by applicants in their determination of the required capacities of post-LOCA hydrogen control systems, such as hydrogen recombiners, and by the NRC Staff in our evaluation of the adequacy of such systems, there is reason to believe that certain hydrogen sources may not have been adequately considered. Although this may prove to be insignificant in that considerable margin is already provided in the capacities of post-LOCA hydrogen control systems, it may prove to be significant if it turns out that the capacities of the post-LOCA hydrogen control systems are such that the post-LOCA hydrogen concentrations cannot be maintained below their combustible limits.

As indicated in Dr. Mattson's memorandum, (attached) because of the uncertainty in the hydrogen generation rates with respect to corrosion of zinc in dry containments, calculations were performed to determine the impact of the uncertainty on the recombiner systems for several PWR plants. The hydrogen generation rate increase for galvanized steel was increased by a factor of 2.0 to bound the available experimental data for galvanized steel. This increase in the corrosion rate would only result in a very slight increase in the hydrogen concentration but would yield a H_2 concentration slightly in excess of 4% for Yellow Creek. In most cases, the recombiner systems had the capability of maintaining the hydrogen concentration below the 4% flammable limit by actuating earlier in the post-LOCA period.

In the analysis performed for the Yellow Creek plant, the hydrogen concentration would reach a peak value of about 4.13%; however, giving credit to the diluting effect of the steam in the containment atmosphere following a LOCA shows that the hydrogen concentration would not exceed the 4% flammable limit.

Although it is our view that no safety concern is involved as a result of our using the updated hydrogen generation rates for zinc-rich coatings, there is sufficient justification to warrant further Staff effort toward examining the generation of hydrogen from zinc-rich paints and organic materials. A more refined knowledge of the behavior of these materials would increase our confidence in this area of review.

We find, however, the effects evaluated regarding post-LOCA generation of hydrogen in both BWR and PWR pressure suppression type containments do not lead to new significant safety concerns not already being considered in our current safety reviews, although this matter was not explicitly considered in reviews until recently. Accordingly, the Staff's conclusion that the design of the Yellow Creek facility is acceptable has not been altered.

Sincerely,

Edward G. Ketchen
Counsel for NRC Staff

Enclosure

cc (w/encl.):
Memorandum for Roger S. Boyd from
Roger J. Mattson dated October 17, 1978
w/enclosures

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Atomic Safety & Licensing Board Panel
Atomic Safety & Licensing Appeal Panel
Docketing and Service Section