PDR

Advance Copy

[redacted]

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November 10, 1988

U.S. Nuclear Regulatory Commission
Mr. Eric S. Beckjord, Director
Office of Nuclear Regulatory Research
1717 H Street, NW
Washington, D.C. 20555

Dear Mr. Beckjord:

In response to your November 7, 1988 letter I have to direct your attention on the controversy between the content of the letter and the attached August 9, memo: "the most serious criticism" is a new idea of hydrogen boundary layer, what questions the entire "extensive existing data base", including the attached report. One should understand this fact without being an "expert who has a great deal of experience in this area". In fact, if the results of isothermal experiments are correct, as I believe, it means that the gas diffusion effect is included in the measured rate, and because at these experiments the temperature is constant, the generated prior a selected moment hydrogen is a great deal more, than in a heatup process. It means that only the opposite conclusion would be supported by this new idea, because in a heatup process in any selected moment the prior generated hydrogen is always less, then it would be in an isothermal process.

Also points #1 - #4 should be considered as questions to be answered in an investigation of the zirconium fire, but I limited my investigation to the solid-state oxidation with correct selection of control volumes and correct transient calculation. This resulted in that a likely combination of parameters in a real core causes accelerated heatup and burning of the cladding. Also, I collected evidences from related experiments and accidents, and I did not find a single evidence, contradicting to my conclusions. I had an opportunity to consult my investigation with professor Edward Teller, who agrees with my method and conclusions.

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Sincerely

Aladar Stolmar

RD-25 Nuclear Safety

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August 3, 1988

U.S. Nuclear Regulatory Comission
Director of Reactor Safety
1717 H Street, NW
Washington, D.C. 20555

Dear Director of Reactor Safety:

Attached please find a short description of proposed solutions, recently offered to the Department of Energy for reduction to practice.

Please, review the described inventions and inform me about the Commission's view on the implementation of these.

Sincerely

Aladar Stolmar

Please, pass this over to Dr. Sheron!

SAFE NUCLEAR POWER PLANTS

by Aladar Stolmar

Concern #1: The trapped inside the ceramic fuel fission products endangaring the public, while there is a possibility of release into the environment. The existance of such a possibility is proven by TMI-2 and Chernobyl-4 accidents.

Solution #1: An emergency cold shutdown state is being designed for every nuclear power plant unit, and on every nuclear steam supply unit the appropreate equipment is being installed, allowing the natural, unavoidable processes to bring the unit into this emergency cold shutdown state from any initial accidental state, from any initially damaged state.

The appropreate equipment for a pressurized or a boiling water reactor (PWR or BWR) is a set of steam relief/depressurization valves and borated water tanks; the actuation of every element of the equipment is performed directly by the change in the state of the nuclear steam supply system itself, such as the liquid level decrease initiates and performes the actuation of intence steam relief and depressurization, and the pressure decrease initiates and performes actuation of borated water injection into the reactor.

The emergency cold shutdown state is organized as a natural circulation through a depressurized core of a reactor, which is being submerged under borated water, so the last stage of borated water tanks is a gravity tank, which - in the event of a pipe or vessel rupture - includes the reactor cavity.

Basis for solution #1: is the finding that in an accident, causing the possibility the ceramic fuel to damage in a PWR or BWR the liquid level has to decrease and steam has to replace water below the normal liquid level and above the top of the core a considerable time before the fuel could be damaged. The intense steam relief/depressurization would cause the cooling of the core to intensify, the chain reaction to terminate due to the boiling in the core, and the flooding of reactor cavity and the submerging the vessel in the event of pipe or even vessel rupture would assure reliable cooling without limitation in the duration.

Concern #2: The required steam relief/depressurization valve does not exist.

Solution #2: An equipment, consisting of an auxilliary hydraulic cylinder operated main valve and spring and floating body operated pilot valves had been concieved, and the design methodology has been determined.

Basis for solution #2: is the finding that there is a possibility to design a small pilot valve, operated in the entire range of pressure and temperature of a BWR or a PWR, using combined sizing of the floating body, spring and valve cross section.

Concern #3: Even if the proposed equipment installed, in some cases core overheat is possible due to the organization of local steam bubble.

Solution #3: In a PWR such situation is possible at a cold leg break, and it can be eliminated, directing the reverce flow through the closed in normal operation check valves, installed in the reflector. Also, intense cooling can be organized, installing in the reflector heat exchangers, cooled by gas expansion, injected at low pressures and exhausted on the core inlet, in order to intensify coolant flow through the core.

Basis for solution #3: is the finding that the decrease of the duration of the depressurization can be achieved if the resistance of the reverce flow path is decreased, and there is a possibility to organize local circulation, using cooling effect in the reflector.

Concern #4: The water, designed to cool the core in emergency cold shutdown state can be lost through the penetrations, pipe connections through the containment walls.

Solution #4: The containment below the designed emergency cold shutdown water level has to be sealed and in every connecting pipe line the penetration through the wall has to be installed in an elevated section, incorporating a vacuumbreaker/degasser valve above the designed water level, allowing the liquid flow to be discontinued, after

depressurization.

Basis for solution #4: is the finding that if allow to enter the gases from the atmosphere inside the containment into the connecting pipe lines, the elevated pressure, expected in the containment would not drain the water pool, while the siphon effect is being eliminated.

Concern #5: It is a very high cost modification.

Answer on the concern #5: The above solutions are eliminating the necessity of active elements for emergency core cooling systems and eliminating the necessity for emergency evacuation planning, considerably decreasing the cost of a new unit. For a modification of an existing unit the extent of modifications can be limited, considering the already existing measures, and if any modification is required, it can be limited to the installation of reliable level measurements, using the pilot valves by solution #2.