

[7590-01-P]

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

[Docket No. PRM-50-76]

Robert H. Leyse; Petition for Rulemaking

AGENCY: Nuclear Regulatory Commission.

ACTION: Petition for rulemaking; notice of receipt.

SUMMARY: The Commission is publishing for comment a petition for rulemaking filed by Robert H. Leyse on May 1, 2002.

The NRC assigned the petition Docket No. PRM-50-76 on May 8, 2002. The petition requests amendment to NRC's regulations concerning evaluation models for Emergency Core Cooling Systems (ECCS) and associated guidance documents. The petitioner believes the amendments are necessary to correct technical deficiencies that do not consider the complex thermal hydraulic conditions during a Loss-of-Coolant-Accident (LOCA), including the potential for very high fluid temperatures.

DATE: Submit comments by (75 days after publication in the Federal Register). Comments received after this date will be

considered if it is practical to do so, but the Commission is able to assure consideration only for comments received on or before this date.

ADDRESSES: Mail comments to: Secretary, U.S. Nuclear Regulatory Commission, Washington, DC 20555-00001, Attention: Rulemaking and Adjudicatory Staff.

Deliver comments to: 11555 Rockville Pike, Rockville, Maryland, between 7:30 a.m. and 4:15 p.m. on Federal workdays.

For a copy of the petition, write to Michael T. Lesar, Chief, Rules and Directives Branch, Division of Administrative Services, Office of Administration, U.S. Nuclear Regulatory Commission, Washington, DC, 20555-0001.

You may also provide comments via the NRC's interactive Rulemaking website at <http://ruleforum.llnl.gov>. This site allows you to upload comments as files in any format, if your web browser supports the function. For information about the interactive Rulemaking website, contact Ms Carol Gallagher, (301) 415-5905 ([email:cag@nrc.gov](mailto:cag@nrc.gov)).

Documents related to this petition, including comments received, may be examined, and/or copied for a fee, at the NRC's Public Document Room, located at One White Flint North, 11555 Rockville Pike (first floor), Rockville, Maryland. Publicly available records will be accessible electronically from the ADAMS Public Library component on the NRC Web site (the Electronic Reading Room), www.nrc.gov. If you do not have access to ADAMS or if there are problems in accessing the documents located in ADAMS, contact the NRC PDR Reference staff at 1-800-397-4029, 301-415-4737 or by e-mail to pdr@nrc.gov.

FOR FURTHER INFORMATION CONTACT: Michael T. Lesar, Chief, Rules and Directives Branch, Division of Administrative Services, Office of Administration, U. S. Nuclear Regulatory Commission, Washington, DC 20555-0001 or e-mail: MTL@nrc.gov.

SUPPLEMENTARY INFORMATION:

Mr. Leyse's petition covers three distinct issues: (1) amendment of Appendix K to Part 50 of the Commission's regulations, (2) amendment of an NRC guidance document entitled Regulatory Guide 1.157, Best-Estimate Calculations of

Emergency Core Cooling System (ECCS) Performance, and (3) the need for further analysis of Part 50 backup data.

Issue (1) - Amendment of Appendix K to Part 50

The petitioner details at length technical deficiencies in Appendix K to Part 50, in Section I.A.5. The petitioner claims that Section I.A.5 does not accurately describe the extent of zirconium-water reactions that may occur during a loss-of-coolant accident (LOCA). The petitioner specifically describes how the Baker-Just equation used (Baker, L., Just, L.C., "Studies of Metal Water Reactions at High Temperatures, III. Experimental and Theoretical Studies of the Zirconium-Water Reaction," an Argonne National Labs document (ANL-6548) page 7, May 1962) does not include any allowance for the complex thermal-hydraulic conditions during a LOCA, including the potential for very high bulk fluid temperatures within the cooling channels of the zirconium-clad fuel elements.

The petitioner cites the abstract of ANL-6548, and disputes the use of the conclusions drawn using test apparatus that do not accurately reflect the conditions present during a LOCA, specifically:

- The bulk water temperature was no greater than 315 C (599F),

- The volume of water within the test apparatus was substantially greater than the volume of zirconium specimens, creating a vastly greater capacity to cool the heated zirconium particles of the Baker and Just experiment than would exist under LOCA conditions, and

- Zirconium specimens were exposed to water only, while LOCA conditions include steam and non-equilibrium water-steam mixtures that reached higher bulk fluid temperatures. The petitioner further questions the appropriateness of the dimensions of the apparatus used in the investigations, detailing volume ratio of water to zirconium for several specimens.

The petitioner concludes that a footnote to the Baker and Just analysis stating “This discussion is of a preliminary nature: work in this area is continuing,” obviates the application prescribed in Appendix K to Part 50 in Section I.A.5. of the Baker-Just equation to calculate the rate of energy release, hydrogen generation, and cladding oxidation from the metal/water reaction.

Issue (2) - Amendment of Regulatory Guide 1.157

The petitioner states Regulatory Guide 1.157, Best-Estimate Calculations of Emergency Core Cooling System (ECCS)

Performance, uses data from NUREG-17 (the particular reference is ORNL/NUREG-17, Zirconium Metal-Water Oxidation Kinetics IV, Reaction Rate Studies, by Cathcart, et. al., August 1977) for calculating the rates of energy release, hydrogen generation, and cladding oxidation for cladding temperatures greater than 1900 degrees F. The petitioner claims this data is based on very limited test conditions and consequently, the results obviate the use of NUREG-17 in LOCA conditions.

The petitioner describes the following test conditions:

- Zircaloy-4 specimens exposed only to steam, rather than fluid conditions as present in a LOCA;
- No documented heat transfer from the zircaloy surface to the slow-flowing steam;
- Small scale laboratory testing without conditions typical of the complex thermal-hydraulic conditions that prevail during a LOCA; and
- An unexplained shift from the MaxiZWOK (testing apparatus for investigations in the temperature range from 1652 to 1832 degrees F) to the MiniZWOK (different testing apparatus for investigations in the temperature range 1832 to 2734 degrees F).

The petitioner believes that the investigators have drawn misleading conclusions that

“overlook very substantially greater mass transfer coefficients that accompany the so-called appropriate heat transfer coefficients.” The petitioner concludes that “it is those very substantially greater mass transfer coefficients that led to the temperature overshoot of the MaxiZWOK test at 1832 F, and that would have led to very substantially greater temperature overshoots and likely destruction of the Zircaloy tubing if MaxiZWOK had been operated over the temperature range of the MiniZWOK runs.”

The petitioner cites NUREG-17 and the following warning on its introductory page:

This report was prepared as an account of work sponsored by the United States Government. Neither the United States nor the Energy Research and Development Administration/United States Nuclear Regulatory Commission, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness or usefulness of any information, apparatus, product or process disclosed, or represents that its use would not infringe privately owned rights.

The petitioner believes that inasmuch as the investigators do not warrant their work, and specifically assume no responsibility for the accuracy of their work, that the NUREG-17 is inapplicable to the regulation of nuclear power reactors in the U.S.A.

Issue (3) -- Need for further Analysis of Appendix K Backup Data

The petitioner challenges certain technical statements and conclusions in the data report referenced in Appendix K.I.D.3. and D.5; the petitioner notes that the full title of the report is “PWR FLECHT (Full Length Emergency Cooling Heat Transfer) Final Report,” Westinghouse Report WCAP-7665, April 1971. The petitioner explains that the data in WCAP-7665, which includes the certified Run 9573, includes the complex thermal-hydraulic conditions and zircaloy-water reactions that characterize reflood. The petitioner states that these conditions are not found in the narrow test procedures of ANL-6548 or NUREG-17.

The petitioner explains that a pertinent description of the complexities of thermal-hydraulic conditions during reflood, including negative heat transfer coefficients, is included in Part 3.2.3 of WCAP-7665, and further states that this description applies to data collected with FLECHT bundles with stainless steel cladding. The petitioner feels that another FLECHT zircaloy bundle test, Run 8874 is also pertinent to issues raised in this petition.

The petitioner cites WCAP-7665, Part 5.6, and finds statements regarding zircaloy-Stainless Steel Comparison to be

misleading, because they imply that stainless steel heat transfer coefficients may be used as a conservative representation of zircaloy behavior. The petitioner believes that the differences in behavior for various test runs are explained by the differences in the thermal hydraulic conditions that led to a different combination of heat transfer and mass transfer factors, and are not due to inconsistency of the data, as implied by the report.

The petitioner also finds Part 5.11 Materials Evaluation section of the report to be misleading in view of the total experience with FLECHT Run 9573. Finally, the petitioner notes that the same warning language as in NUREG-17 is on the cover page to WCAP-7665.

The petitioner further identifies a number of aspects of the data supporting the document entitled "Acceptance Criteria for Emergency Core Cooling Systems for Light-Water Cooled Nuclear Reactors-Opinion of the Commission," Docket No. RM50-1, December 28, 1973, and notes the Commission concluded, "It is apparent, however, that more experiments with zircaloy cladding are needed to overcome the impression left from run 9573." The petitioner finds that there has been a lack of appropriate response to the Commission's expressed need for more experiments, and believes that at the very least, Run 9573 should have been repeated. The petitioner emphasizes that although at least one billion dollars had been expended on other

analytical efforts, there has been no reported analysis of FLECHT Run 9573.

The petitioner states that the test programs of the subject petition were funded by government agencies, and believes that most of those programs were firmly controlled by those “who were indoctrinated in the methods of the tightly regimented Naval Reactors Program.” The petitioner finds that the “biased reporting of WCAP-7665 may be traced to these controls,” and believes that “the lack of application of the MaxiZWOK apparatus beyond 1832 F in NUREG-17 may likely be traced to rigid restrictions by management at the NRC.” The petitioner further contends that while the Argonne work of ANL-6548 was likely less impacted by these controls, the controls likely did inhibit further analysis or reporting of FLECHT Run 9573.

The petitioner notes that he has made several requests to the Knolls Atomic Power Laboratory for Report KAPL-1534 which have been ignored.

Request For Comments

The Commission requests public comment on the issues raised by the petitioner. In particular, the Commission requests

public comment on the following questions:

(1) Are the petitioner's three concerns with respect to ECCS cooling valid? If so, do these concerns constitute a significant safety concern?

(2) Are there actions available to the Commission other than rulemaking that would effectively address the concerns raised by the petitioner?

Dated at Rockville, Maryland, this date of , 2002.

For the Nuclear Regulatory Commission.

/RA/ 8/5/2002

Annette Vietti-Cook,
Secretary of the Commission.

