NUCLEAR MANAGEMENT AND RESOURCES COUNCIL

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William H. Rasin
Vice President & Director
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Mr. William T. Russell
Associate Director
Inspection and Technical Assessments
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Russell:

During the September 17, 1993, NRC staff/industry discussions on the NRC Fatigue Action Plan, industry was asked to provide comments on NUREG/CR-5999, "Interim Fatigue Design Curves for Carbon, Low-Alloy, and Austenitic Stainless Steels in LWR Environments." Inasmuch as this report is under technical review by groups such as the Pressure Vessel Research Committee (PVRC) and the ASME Boiler and Pressure Vessel Committee, and the adequacy of the existing ASME Section III fatigue curves has not been discussed with industry or standards development organizations, our comments are limited to addressing the belief that any implementation (e.g., required use by industry) of the interim fatigue design curves would be premature.

The PVRC Working Group on S-N Data Analysis is in the process of evaluating the effects of reactor water environments on fatigue crack initiation and growth in carbon, low-alloy and austenitic stainless steels. A major concern we have is that without the complete technical review noted above, the interim fatigue design curves may not have optimized management of environmental effects. The PVRC Working Group is currently examining data, and has begun to formulate ranges for the environmental variables of interest -- strain range, strain rate, coolant oxygen concentration, temperature, metal sulfur content, and coolant fluid velocity -- within which the current ASME Code Section III fatigue design curves remain acceptable. The preliminary data suggests that only a combination of environmental variables, all violating these limits, represent conditions that might be grounds for supplemental fatigue evaluation. Such combinations of variables are expected to be rare for actual plant operating conditions and cyclic service.

The PVRC Working Group approach is in marked contrast with the one taken in the development of the interim fatigue curves in NUREG/CR-5999, where bounding

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effects for each of the environmental variables have been superimposed. The latter approach will penalize virtually all applications with excessive conservatism, and will fail to distinguish those combinations of environmental variables that are of real concern. We recommend that the NRC staff reevaluate the interim fatigue curves to assure that this universal penalty is justified.

Industry is concerned that other alternatives for addressing the potential significance of environmental factors on fatigue may have been overlooked in the NRC staff evaluations. One promising approach is based on the use of a strain range multiplier defined as K_{env}, which can be used under conditions where combinations of environmental effects compromise the existing ASME Code fatigue design curves. This environmental multiplier was suggested in a 1986 EPRI study, NP-4644M, "Application of Environmental Fatigue Stress Rules to Carbon Steel Iron Piping," which is enclosed for your consideration. A similar approach was recommended under certain conditions by the industry for license renewal of reactor coolant systems and primary pressure boundary piping components.

Additionally, the interim fatigue design curves have failed to reflect the total fatigue conservatism inherent in the ASME Code Section III fatigue design process. It is unclear if the interim fatigue curves are attempting to maintain the initial level of conservatism throughout the service life of plant components. If the intent is to maintain the initial level of conservatism, the interim fatigue curves approach may needlessly jeopardize continued operation of components with ample remaining service life.

In conclusion, we reemphasize that implementation of the NUREG/CR-5999 interim fatigue design curves is premature and needlessly conservative. Technically preferable is the more selective evaluation of environmental effects currently being considered by PVRC. Furthermore, NUMARC encourages the use of the ASME Code consensus approval process that will be capable of evaluating the total amount of conservatism contained in the design process. We believe that this broad consensus process will yield the most technically appropriate requirements.

A meeting between the industry and the staff appears warranted in the interest of furthering technical understandings during the development of a final resolution. Discussion of the interim fatigue design curves and alternative methods would be appropriate during this meeting.

Thank you for this opportunity to comment. Should you or your staff have questions concerning theses comments and recommendations, please contact Kurt Cozens of the NUMARC staff.

Sincerely,

William H. Rasin

KOC/rs
Enclosure

c: Terence Chan, NRC