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NRC Plans to Revise the LOCA Regulation, 10 CFR 50.46

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ABSTRACT

In March, 2003, the U.S. Nuclear Regulatory Commission approved a staff recommendation to modify 10 CFR 50.46 to provide for a more performance-based approach to meeting the acceptance criteria. These criteria are the well-known limits on peak cladding temperature of 2200°F (1204°C) and on maximum cladding oxidation of 17%, which are specified for Zircaloy and ZIRLO cladding materials. These limits were derived from ring-compression ductility screening tests on oxidized Zircaloy tubing, and the NRC has recently affirmed that retaining ductility is still the basis for the criteria. Ring-compression tests on Zircaloy (high burnup and unirradiated), ZIRLO (unirradiated), and M5 (unirradiated) cladding are currently being performed at ANL to provide an updated data base that will cover burnup and alloy effects. Other tests, such as bend-to-failure and measurement of hydrogen distribution, are being performed to understand ductility non-uniformities that are not predicted with typical oxidation analyses. Two options are being sought for the modified regulation. One would be a revised method of applying the current 2200°F and 17% limits to Zircaloy, ZIRLO, and M5 cladding for burnups at least to 62 GWd/t (rod average). The other would be a performance-based test, with specified acceptable results, that could be used for any zirconium cladding alloy and any burnup. Details of both options are unknown at this time and will depend on the results of ongoing tests at ANL. Confirmation for high-burnup fuel with ZIRLO and M5 cladding will be started as soon as irradiated specimens are available, but those tests will not be required before the regulation is modified. Qualification of a burnup surrogate, such as pre-hydriding, will be attempted during the confirmation phase so that future testing of actual high-burnup rod specimens can be avoided. A schedule has been established to develop the technical basis for the performance-based criteria by September, 2005, and this schedule is being tracked at a high level within the NRC. Rulemaking should begin shortly thereafter.