EVALUATION OF POSSIBLE REVISIONS TO REQUIRED FEATURES OF 10 CFR 50 APPENDIX K

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BACKGROUND

- 10 CFR 50.46 allows two options for calculating ECCS performance using either:

  1. A model in conformance with the required and acceptable features of Appendix K (1974 ECCS rule), or:

  2. A realistic model with evaluation of modeling and input uncertainties so that there is a high level of probability that the ECCS criteria would not be exceeded (1989 ECCS rule change).

- Research and analysis since 1974 has shown that two of the most significant conservatisms in Appendix K are:

  1. The requirement to use the 1971 ANS-5 standard for decay heat with a multiplier of 1.2, and

  2. The requirement to use the Baker-Just metal water reaction model.

- It should be noted that by electing to use the 50.46 realistic option, an applicant/ licensee/ vendor can choose any realistic models, evaluate and combine uncertainties and obtain the maximum benefit.

RES EVALUATION PROCESS

- RES is evaluating the effect of allowing more realistic models for decay heat and metal water reaction in Appendix K analyses. In particular:

  1. Would the model changes result in any significant risk changes?

  2. What is the reduction in conservatism associated with separate or combined model changes?

  3. What is the retained conservatism as a result of the changes?

- Any modification to Appendix K would select a simple decay heat and/or metal water reaction model with an appropriate uncertainty for each model.

- NRC has chosen to evaluate the 1979 ANS decay heat standard and the Cathcart-Pawel metal water reaction model, since they are referenced as acceptable models in Reg. Guide 1.157 (Best Estimate Calculations of ECCS Performance,1989).

- Other decay heat and metal water models would be possible candidates, but they are similar in magnitude to the selected models.

MARGIN REDUCTION AND RETAINED CONSERVATISM

- To evaluate the reduction in conservatism and the retained conservatism of using more realistic models, RES will utilize existing information or perform analyses. For a sufficient sampling of plant types the information will include:

  1. A current Appendix K calculation,

  2. One or more Appendix K calculations using the more realistic decay heat and/or metal water models. Those models should include appropriate uncertainties, and

  3. A best estimate calculation that meets the requirements for the realistic option of 50.46.

- The difference in results between 1 and 2 is a measure of reduction in conservatism achieved by using less conservative models.

- The difference in results between 2 and 3 is a measure of retained conservatism.

- Some additional analyses will also be performed to estimate the increase in thermal power available by utilizing more realistic decay heat and metal water reaction models.

MARGIN REDUCTION AND RETAINED CONSERVATISM (CONTINUED)

- RES is accumulating as many existing analyses of the three types mentioned above as possible. Where there are gaps we are supplementing the existing information with our own analyses.

- RES would greatly appreciate any information that industry could provide to facilitate this effort.

- Our schedule is to complete the assessment by August 31, 2000.