Design, Maintenance and Lifetime of Nuclear Components: The Contribution of Experience Feedback

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ABSTRACT

Division D of SMIRT deals with experience feedback relating to the in-service behaviour of nuclear components, the design and construction of this equipment, its maintenance and the evaluation and management of its lifetime. The nuclear industry now having reached maturity, with more than 300 units in service worldwide, these problems are now of predominant importance to the activity of the industry and in its development programmes. This applies particularly to the problems relating to the lifetime of nuclear plants, problems which are rightly of such concern both to the utilities, in view of the enormous investments involved, and also to the safety authorities.

All the main issues concerning the mechanical behaviour of nuclear components have been presented at SMIRT conferences since 1981. These issues concerned in particular reactor vessels, steam generators, piping, bolts, containments and diesel generators. The majority of the many and valuable papers presented related to LWRs, which are by far the most numerous.

These contributions have been reviewed for the purpose of analysing the essential points. This analysis highlights the considerable advances achieved during the recent decades in design and maintenance methods and practices.

It also identifies the areas in which progress still remains to be made.

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1. A RECENT HISTORY

Division D of SMIRT, which deals with experience feedback relating to the mechanical behaviour of nuclear structures, was created recently. The subject was first discussed in a seminar at the time of SMIRT 6 held in Paris in 1981 but Division D was not set up until SMIRT 7 in Chicago in 1983.

The relatively recent appearance on the scene of experience feedback is not surprising. It follows the natural development of the nuclear industry. First we had the pioneering period, from 1955 to 1965, with its almost infinite variety of reactors and prototypes. Then followed a phase of rapid expansion, geared to "conquering territory", and roughly covering the years from 1965 to 1980, which was dominated by design and construction problems. This growth has now come to a halt which we hope will not last too long. However, it also corresponds to a phase of maturity and industrial operation. More than 330 nuclear power plants are in