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反应堆工程

基于先进程序+保守评价模型的300 MW压水堆核电站大破口失水事故分析

倪超[1];匡波[1,*];任志豪[1];路璐[2];梁国兴[1]

1.上海交通大学 核科学与工程学院，上海200240 2.上海核工程研究设计院，上海200233

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摘要 大破口失水事故(LBLOCA)是决定核电站运行功率的设计基准事故之一，本文利用最佳估算系统分析程序RELAP5/MOD3，通过修改其相关模型或关系式，结合有关分离效应与整体效应试验数据验证，形成满足10CFR50附录K中保守评价模型要求的LOCA分析工具——先进程序+保守评价模型程序及分析方法。在此工具与方法开发基础上，对300 MW压水堆核电站进行了一回路冷管段双端剪切断裂LBLOCA计算分析，计算的包壳峰值温度(PCT)与应急堆芯冷却系统(ECCS)验收准则及相应最终安全分析报告对比表明：应用该工具与分析方法，可望获得进一步的PCT裕量。

关键词 大破口失水事故 验证 先进程序+保守评价模型 10CFR50附录K PCT裕量

分类号

300 MW PWR NPP LBLOCA Analysis Based on Advanced Code Plus Conservative Evaluation Models

NI Chao[1];KUANG Bo[1,*];REN Zhi-hao[1];LU lu[2];LIANG Guo-xing[1]

1.School of Nuclear Science and Engineering, Shanghai Jiao Tong University, Shanghai 200240, China;2.Shanghai Nuclear Engineering Research & Design Institute, Shanghai 200233, China

Abstract Large break loss of coolant accident (LBLOCA) is among the limiting design basis accidents (DBAs) that determine operation power of nuclear power plants (NPPs). Based on the best estimate (BE) system code RELAP5/MOD3, the advanced code plus conservative evaluation models (EMs) LOCA analysis tool and method were developed, which modified related models/correlations within the code, and were verified through related separate and integral effect tests. This makes it meet the conservative EM requirements of 10CFR50 Appendix K. With the achieved tool and method, double ended guillotine break LOCA analysis of a 300 MW PWR NPP was carried out. The resulted peak cladding temperature (PCT), as compared with the emergency core cooling system (ECCS) acceptance criterion and corresponding PCT value in final safety analysis reports (FSAR), indicates that further PCT margin is expected to be potentially acquired with the methodology.

Key words large-break loss of coolant accident verification advanced code plus conservative evaluation models 10CFR50 Appendix K PCT margin

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