

The Power Maneuvering of PWRs with Axially Variable Strength Control Rods

Ung-Soo Kim and Poong-Hyun Seong
Department of Nuclear and Quantum Engineering
Korea Advanced Institute of Science and Technology
373-1, Guseong-Dong, Yuseong-Gu
Daejeon, Korea, 305-701

Abstract

In this research, axially variable strength control rods (AVSCRs) are suggested and developed to solve the problems related to the axial power distribution of reactor during the power maneuvering of PWRs. The control rods are classified into two types. The first type is 'multi-purpose control rod', and the other type is 'regulating control rod'. Two multi-purpose control rod banks (AVSCR1, AVSCR2) are newly developed and conventional-axially uniform strength-control rods are adopted as regulating control rod banks to minimize design change of PWRs. The newly developed AVSCRs are three sectioned control rods. And the worth shapes of these AVSCRs are optimized to obtain appropriate moving characteristics which are related to the variation of axial offset according to the motion of AVSCRs. Then the operation strategy for the power maneuvering is developed considering the moving characteristics of AVSCRs. This strategy consists of simple logics and no use of reactivity compensation by boron is considered. Finally, the AVSCRs are applied to the power maneuvering with a typical 100-50-100%, 2-6-2-14h pattern of daily load-follow for all burn-up state of core. From the application results, it is shown that the use of AVSCRs make it possible to regulate AO within the target band during the power maneuvering with only control rods and consequently the power maneuvering without reactivity compensation by boron concentration change is accomplished, and also the AVSCRs can cover the whole burn-up states of reactor core.