# An Application of The LSWCR(lower shifted worth control rod) for The Power Maneuvering for Pressurized Water Reactor

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## Abstract

In this research, Two lower shifted worth control rods (LSWCR) are suggested to mitigate problems related to variation of axial power distribution during power maneuvering. Then, two experiments are performed. The one experiment is in condition that the LSWCR1 is fixed at bottom of the core and the LSWCR2 is moved, and the other experiment is in condition that LSWCR2 is fixed at half of the core, and the LSWCR1 is moved. From the application results, it is shown that the insertion of LSWCR at 100% power equilibrium state, can produce the required reactivity to return to full power, and a boron concentration change is minimized. It seems possible that a combinative use of LSWCR1 and LSWCR2 controls AO within the target AO band

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# MPC-Based Auto-tuned PID Controller for the Steam Generator Water Level

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## ABSTRACT

In this work, proportional-integral-derivative (PID) control gains are automatically tuned by using a model predictive control (MPC) method. The MPC has received much attention as a powerful tool for the control of industrial process systems. An MPC-based PID controller can be derived from the second order linear model of a process. The steam generator is usually described by the well-known $4^{th}$ order linear model which consists of the mass capacity, reverse dynamics and mechanical oscillations terms. But the important terms in this linear model are the mass capacity and reverse dynamics terms, both of which can be described by a $2^{nd}$ order linear system. The proposed auto-tuned PID controller was applied to a linear model of steam generators. The parameters of a linear model for steam generators are very different according to the power levels. The proposed controller showed good performance for the water level deviation and sudden steam flow disturbances that are typical in the existing power plants by changing only the input-weighting factor according to the power level