

## Estimation of the Power Peaking Factor in a Nuclear Reactor Using Fuzzy Neural Networks

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### Abstract

The local power density should be estimated accurately to prevent the fuel rod from being melted. The local power density at the hottest part of a hot fuel rod is more important information than the local power density at any other position in a reactor core, which is described by the power peaking factor. Therefore, in this work, the power peaking factor ( $F_q$ ) that indicates the highest local power density in a reactor core is estimated by fuzzy neural networks using lots of measured signals of the reactor coolant system. The fuzzy neural network are trained using a training data set and are verified with another verification data set. The fuzzy neural networks are applied to the first cycle of the Yonggwang 3 nuclear power plant. The estimation accuracy of the power peaking factor is 1.02 % based on the relative  $2\sigma$  error by using the fuzzy neural networks without in-core neutron flux sensors signal input and 0.38% with in-core neutron flux sensors signals, which is accurate enough to be used in LPD protection and monitoring.