

LOCA Methodology of Calculating Energy Deposition for LOCA Analysis

150

LOCA Energy Redistribution Factor(ERF)
 가 ,
 ERF
 5x5 가 가 , 가
 가 가
 LOCA
 가 3
 1 ERF 가 가

Abstract

Under the current method to calculate Energy Redistribution Factor (ERF), the geometric model is not large enough to cover the gamma ray's mean free path, and the rod power distribution has the vagueness of selecting the representative one. The new method uses the response, that is independent of the burn-up and rod power distribution, and makes the calculation of ERF easy. The new method also includes the burn-up effect of a rod to the ERF and uses the 5x5 assembly array and the real rod power distribution. The new method applied to UCN3 cycle 1, where it is found that the current ERF has the too excessive margin compared with the ERF calculated by the new method

1.

가 가
 가 가 Loss of Coolant
 Accident (LOCA) 가

가 가 .

Peak Clad Temperature (PCT)

PCT Energy Redistribution Factor (ERF)

PCT ERF ERF 가 1% 가 PCT
 30°F 가 ERF 가 2.5% 가 PCT 100°F 가 .
 LOCA 가 ,

ERF 가 ,

2.

LOCA ERF LOCA 가
 가 ERF 가
 ABB-CE LOCA ERF 1%
 가 ERF ABB-CE ERF [1] 3.4
 가 가
 ERF
 ERF 2.5% penalty
 가 ERF PCT
 (Peak Linear Heat Generation Rate: PLHGR) (13.9 kW/ft → 13.6 kW/ft),
 ERF

3. ERF

3.1

가 가
 hot rod 가 hot assembly 24
 (1).

3.2

ERF

LOCA

가

hot rod (R) hot rod hot rod

$$R_{hi} = \frac{g_{hi}^p * M_i^p + g_{hi}^c * M_i^c}{\Gamma_h * M_h^p}$$

$$\Gamma_h * M_h^p = \sum_i [g_{hi}^p * M_i^p + g_{hi}^c * M_i^c]$$

g_{hi}^p hot rod i
 (Mev/g), g_{hi}^c hot rod i
 (Mev/g), Γ_h hot rod (Mev/g), M_p (g), M_c
 (g).

ERF

$$ERF_i = \frac{f_b + f_g \sum_{j \neq i} R_{j \rightarrow i} P_j}{P_i}$$

P, f_b , f_g

3.3

3 가

MCNP code[2]

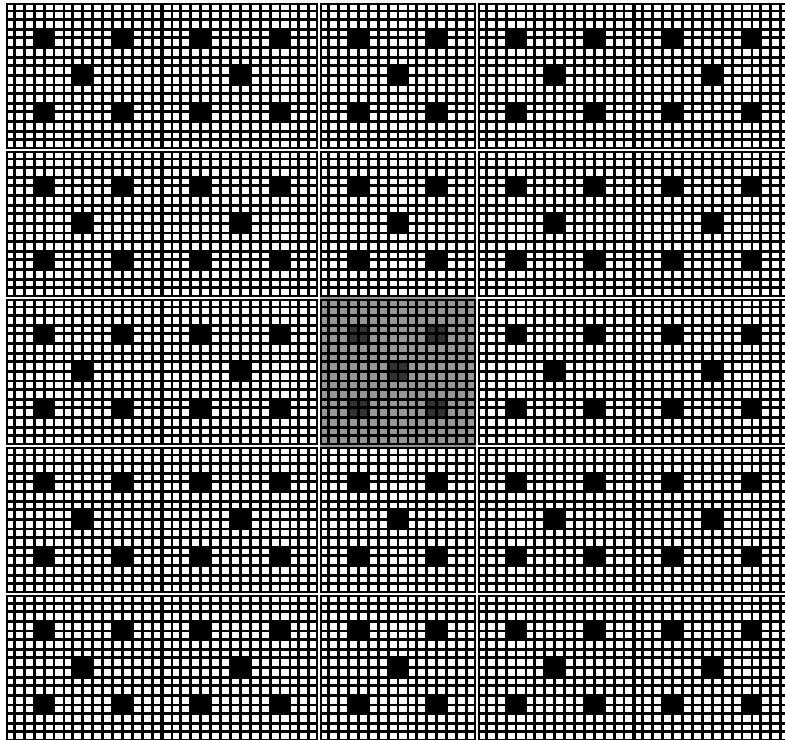
1 hot assembly 24 가

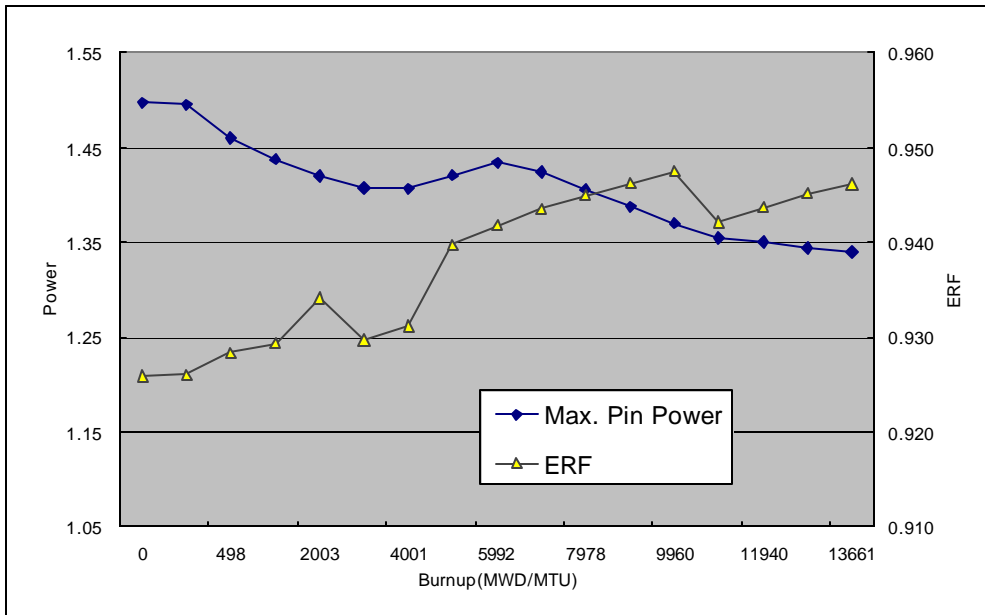
zero flux

UO2

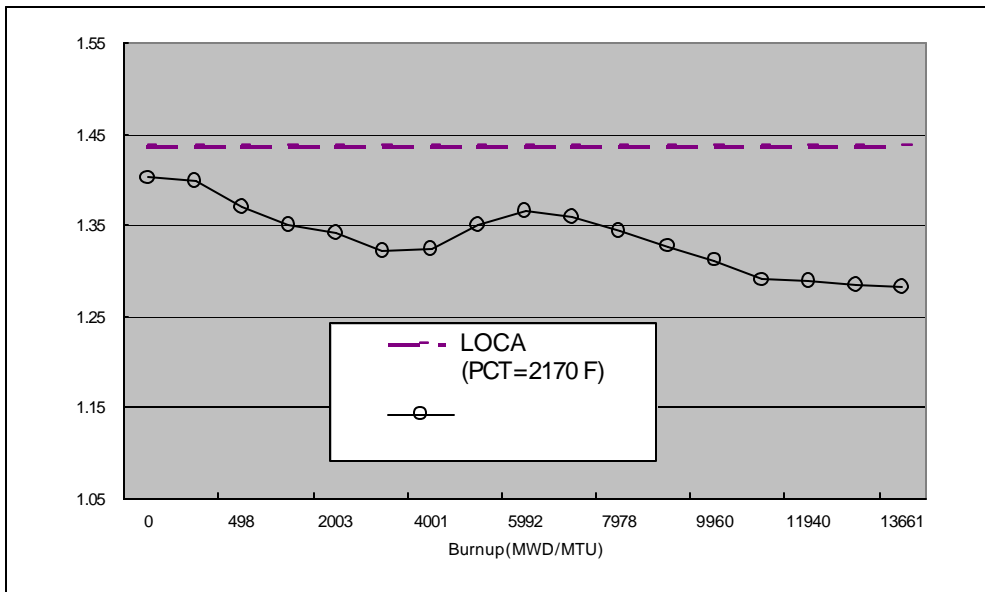
hot assembly hot rod 가
hot rod 가
hot rod 가 1/8
hot rod 가 hot rod
hot rod 가 1/8
hot rod
ERF 3 1
ERF hot rod 2 ERF 가 가 ERF 가
hot rod
ERF LOCA
2
LOCA ERF LOCA
ERF
4.
ERF
3 LOCA ERF (PLHGR)
가 13.9 kW/ft LOCA ERF
LOCA PCT , 가 ERF
가

5.
[1] J. A. Brown, P. F. O'Donnell, "Energy Redistribution Factors for LOCA Voided Conditions (14x14,16x16)", A-GM-FE-0080, Rev.00, September 1997.
[2] Judith F. Briesmeister, "MCNP – A General Monte Carlo N-Particle Transport Code ", LA-12625-M, Version 4B, March 1997.
[3] , "LOCA ", KNF-TR-ND1-99001/P Rev. 1 June, 2000.





2 ERF



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