Contribution ID: **216** Type: **Oral Presentation**

# The Impact of Re-homogenisation for Nodal Cross-section Corrections in OSCAR-4 as Applied to SAFARI-1 Research Reactor

*Wednesday, 1 July 2015 14:00 (20 minutes)*

## Abstract content <br>   (Max 300 words)<br><a href="http://events.saip.org.za/getFile.py/a target="_blank">Formatting &<br>Special chars</a>

Calculational support to the operation of the SAFARI-1 research reactor at Necsa is primarily performed with the in-house developed OSCAR-4 nodal diffusion code. Nodal diffusion methods implement a series of non-linear corrections to the nodal cross-sections. Such corrections are needed since nodal cross-sections are most-often generated in a typical infinite assembly environment, as opposed to the actual core environment. In this work, the impact of one such correction method, termed nodal re-homogenisation, is evaluated for the case of the SAFARI-1 reactor. Furthermore, this is done with respect to a newly proposed OSCAR-4 SAFARI-1 core model. The new model is based in part on nodal cross-sections generated from the Monte Carlo based Serpent code, which supplies a consistent reference transport solution against which the capability of the non-linear model may be measured. The capability of the homogenization model to correct for the environmental error is evaluated on a SAFARI-1 fresh core 2D model, considering both an All-Rods-In (ARI) and an All-Rods-Out (ARO) case. Such analysis has as yet not been applied to research reactors and in this work, we show that the environmental error for a SAFARI-1 core may be as large as 536 pcm and induce a maximum assembly power error of 9.2%. Both cases are then re-calculated, with the re-homogenisation model activated, to illustrate the capability of the re-homogenization correction method.

## Apply to be<br> considered for a student <br>   award (Yes / No)?

Yes

## Level for award<br> (Hons, MSc, <br>   PhD, N/A)?

MSc

## Main supervisor (name and email)<br>and his / her institution

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## Would you like to <br> submit a short paper <br> for the Conference <br> Proceedings (Yes / No)?

Yes

## Please indicate whether<br>this abstract may be<br>published online<br>(Yes / No)

Yes

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**Session Classification:** NPRP

**Track Classification:** Track B - Nuclear, Particle and Radiation Physics