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U.S. DEPARTMENT OF ENERGY
NOTICE OF ENERGY RD&D PROJECT

OMB Control No. 1910-1400
Burden Disclosure
Statement on Back

1. DOE CONTRACT OR GRANT NUMBER DE-FG07-04ID14607

X New contract Continuation/Revision

2. BUDGET & REPORTING (B&R) CODE AF40

3. PRINCIPAL INVESTIGATOR

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4. DOE SPONSORING OFFICE (e.g., ER-34) NEER

5. TITLE OF PROJECT Global Monte Carlo Simulation with High Order Polynomial Expansions

6. PROJECT DESCRIPTION:

This is a research project involving the development of a computational methodology to predict the global neutron scalar flux and thermal power profiles throughout a nuclear reactor. This methodology is based on the utilization of high order polynomials within a Monte Carlo algorithm to accelerate Monte Carlo fission source iterations for loosely coupled reactor systems. Preliminary work has demonstrated the feasibility of using high order polynomials to estimate spatially and angularly varying quantities such as the scalar flux distribution within a lattice or the interface current distribution on a boundary. This work has also led to a second approach based on imbedding this methodology into a response matrix formalism, allowing one in principle to estimate high order response matrices that could be used to estimate global flux and power distributions with improved accuracy and efficiency compared with conventional Monte Carlo methods. These methods should improve the convergence of Monte Carlo fission source iterations for loosely coupled systems.

7. ASSOCIATED REFERENCE NUMBER

8. OUT YEAR COST ESTIMATE (in whole dollars) FY2005-100,000 FY2006-102,000

9. NON-DOE CONTRIBUTION (percentage whole number) 28%

10. PUBLICATION

1. Griesheimer, D.P. and W.R. Martin, “Estimating the Global Scalar Flux Distribution with Orthogonal Function Expansion,” Transactions of the American Nuclear Society, 2003.
2. Brown, F.B., D.P. Griesheimer, and W.R. Martin. “Continuously Varying Material Properties and Tallies for Monte Carlo Calculations,” presented at PHYSOR 2004.
3. F. B. Brown and W. R. Martin, "Stochastic Geometry in MCNP5," to be presented at the Winter Meeting of the American Nuclear Society (November 2004).

11. DATE October 2, 2004