# ON THE RELATION BETWEEN CORE DESIGN AND REACTOR EXCURSIONS

by

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## SUMMARY

The broad objective of this work is to obtain approximate correlations between characteristics of core design and characteristics of reactor excursions, for different classes of reactors. For example, reactor design characteristics are the prompt neutron lifetime, fuel heat capacity, heat transfer area, etc. Reactor excursion characteristics are the initial asymptotic period, maximum power, total energy release, etc.

This objective is presently approached in three steps. In the first step, the experimental data from a class of eight reactors, used in the SPERT program, is considered. Empirical correlations have been obtained by means of dimensional analysis. Each correlation can be expressed in the form of a plot of a dimensionless combination of core and excursion characteristics versus a dimensionless parameter which is a measure of the initial asymptotic period. The correlations include all the significant core characteristics. The scatter in each plot is of the same order as the uncertainty in the experimental data from each reactor. This high degree of correlation is achieved even though each plot contains the data from all the reactors of the class.

For the second step, work is currently in progress to justify the above correlations on the basis of both physical and analytical arguments. The successful completion of this effort will provide not only additional

confidence in the results of step one but, more importantly, a methodology for the analysis of a variety of reactor classes.

In the third step, dimensional analysis and the methodology of the second step will be combined to study excursions in other classes of reactors.