ANSI/ANS-19.3-2022

Steady-State Neutronics Methods for Power Reactor Analysis

An American National Standard

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American National Standard
Steady-State Neutronics Methods for Power Reactor Analysis

Secretariat
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American National Standard

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Foreword

(This foreword does not contain any requirements of American National Standard ANSI/ANS-19.3-2022, *Steady-State Neutronics Methods for Power Reactor Analysis*, but is included for informational purposes.)

The intent of this American National Standard is to provide guidance for developing, validating, and utilizing steady-state neutronics methods to calculate neutron reaction rate spatial distributions, power distributions, and effective neutron multiplication constants of nuclear power reactors and to provide guidelines by which the adequacy of design calculations may be demonstrated. This standard recognizes the diversity of the calculation procedures employed in reactor design. Consequently, the major thrusts of this standard are in the areas of methodology, verification, validation, and documentation. This standard is intended to cover reactor physics calculations for the entire nuclear industry, from fast to thermal power reactors. Since many different kinds of neutronics methods have been utilized for analyzing power reactors and each has its own validation requirements for accuracy, it is necessary that this standard be of a general nature. Furthermore, this standard does not endorse or exclude the application of any methodology that has been adequately verified, validated, tested, and demonstrated to yield reliable reactor physics parameters.

For illustrative purposes, a list of computer codes currently being used throughout the nuclear industry is presented in Appendix A. This appendix, however, does not contain any requirements for this standard.

Compliance with the intent of this standard can be demonstrated for an intended area of applicability of the calculation system used by meeting the requirements in this standard. The intent of this standard is to require the individual to (1) give careful consideration to those physical and numerical effects that may contribute to the validity of results; (2) document the reasons for selecting a specific calculation path; and (3) validate the calculation system used over the intended range of applicability by testing it against appropriate experiments, numerical benchmarks, and/or previously validated methods.

The requirement for documentation is a crucial part of this standard and will provide an auditable path. Areas omitted due to proprietary consideration are to be noted where possible.

The most important ways in which this revision differs from its earlier version, ANS-19.3-2011 (R2017) (withdrawn), are as follows:

(a) Sec. 4.9 has been revised for clarity and consistency between sections;

(b) A new section, 5.3.3, devoted to code-to-code comparisons has been added;

(c) The definitions have been expanded;

(d) The appendix, consisting of a list of commonly used computer codes, has been updated.

This standard might reference documents and other standards that have been superseded or withdrawn at the time the standard is applied. A statement has been included in the references section that provides guidance on the use of references.

This standard does not incorporate the concepts of generating risk-informed insights, performance-based requirements, or a graded approach to quality assurance. The user is advised that one or more of these techniques could enhance the application of this standard.

This standard for reactor physics calculations will undergo review and consideration for revision within 5 years. Suggestions for the improvement of this standard will be welcome. They should be sent to standards@ans.org.

This standard was developed and later revised by the ANS-19.3 Working Group of the American Nuclear Society, which at the time of this revision had the participation of the following members:

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