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The Determination of Thermal Energy Deposition Rates in Nuclear Reactors

An American National Standard

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American National Standard The Determination of Thermal Energy Deposition Rates in Nuclear Reactors

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American Nuclear Society

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Foreword

(This foreword does not contain any requirements of American National Standard "The Determination of Thermal Energy Deposition Rates in Nuclear Reactors," ANSI/ANS-19.3.4-2022, but is included for informational purposes.)

It is the intent of this American National Standard to provide guidance for performing and validating the sequence of calculations leading to prediction of thermal energy deposition rates in nuclear reactors and to provide guidelines by which the adequacy of design calculations may be demonstrated. This standard recognizes the diversity of the calculational procedures employed in reactor design. Consequently, the major thrust of this standard is in the areas of verification, validation, and documentation. The standard is intended to cover thermal energy deposition calculations for the entire nuclear industry—from fast to thermal reactors, research to power reactors. Since many different kinds of calculations are performed, each having its own requirement for accuracy and verification, it is necessary that this standard be of a general nature.

Compliance with the intent of this standard can be demonstrated for an intended area of applicability of the calculational system used by meeting the requirements included in this standard. It is the intent of this standard to require the individual to (1) give careful consideration to those physical and numerical effects that may contribute to the validity of the results, (2) document the reasons for the choice of calculational path, and (3) validate the calculational system used over the intended range of applicability by testing it against appropriate experiments, or verify it with more rigorous calculations.

The requirement for documentation is a crucial part of this standard and will provide an auditable path. In those instances where the foregoing documentation is proprietary in nature, documentation edited by excluding the proprietary information is to be prepared and publicly available or available on request. Areas omitted due to proprietary consideration are to be noted where possible. This standard would not require all documentation to be made public and thus by implication acknowledges the existence of proprietary documentation.

The ANS-19.3.4 standard was first approved in 1976. The initial release was reaffirmed in 1983 and again in 1989. It was revised in 2002, and the 2002 revision was reaffirmed in 2008 and again in 2017. The current revision contains editorial changes to the standard, and an appendix, which contains no requirements of the standard, has been added. A list of acceptable approximations by application was removed to maintain general applicability of the standard to a broad range of nuclear reactors. The appendix contains reference energy deposition calculations.

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 was prepared by the ANS-19.3.4 Working Group of the American Nuclear Society. The following members contributed to this standard:

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