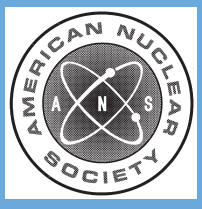
American Nuclear Society

external-events PRA methodology

an American National Standard



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Foreword

(This foreword is not part of American National Standard External-Events PRA Methodology, ANSI/ANS-58.21-2003.)

This standard, ANSI/ANS-58.21-2003, hereafter referred to as "this standard," sets forth requirements for external-event probabilistic risk assessments (PRAs) and related analysis methodologies that can be used to support risk-informed decisions for commercial nuclear power plants. This standard also prescribes a method for applying these requirements for specific applications.

This standard is intended to be used together with other PRA standards that cover different aspects of PRA scope. Specifically, this standard is intended to be used directly with the PRA standard developed by the American Society of Mechanical Engineers ("Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications," ASME-RA-S-2002), which covers an "internal-events PRA" for a commercial nuclear power plant operating at nominal full power. Similarly, this standard is intended to be used with two other standards when those, now under development, are available: the American Nuclear Society (ANS) PRA-methodology standard covering low-power/shutdown operations and the ANS PRA-methodology standard covering accidents initiated by internal fires.

External events covered within this standard's scope include both natural external events (e.g., earthquakes, high winds, and external flooding) and human-made external events (e.g., airplane crashes, explosions at nearby industrial facilities, and impacts from nearby transportation activities).

The scope of a PRA covered by this standard is limited to analyzing accident sequences initiated by external events that might occur while a nuclear power plant is at nominal full power. It is further limited to requirements for (a) a Level 1 analysis of the core damage frequency and (b) a limited Level 2 analysis sufficient to evaluate the large early release frequency. The scope of a seismic margin assessment (SMA) covered by this standard is limited to analyzing nuclear power plant seismic capacities according to either the so-called Electric Power Research Institute method or the so-called U.S. Nuclear Regulatory Commission (NRC) method, the guidance documents for both of which are referred to and heavily relied on in this standard itself.

In contrast, the scope of ASME-RA-S-2002 covers internal plant initiators (except internal fires) that might occur while the nuclear power plant is at nominal full power. Accidents initiated by internal flooding are explicitly included in ASME-RA-S-2002, as are accidents initiated by a loss of off-site power (LOSP), unless the LOSP is due to one of the external events covered herein that also causes other important damage to the plant, in which case the LOSP is within the scope here. Therefore, this standard and ASME-RA-S-2002, when used together, cover all potential accident initiators arising at nominal full power, except internal fires. The only initiators explicitly excluded are accidents resulting from purposeful human-induced security threats (e.g., sabotage).

The scope of this standard includes the widely used SMA methodology. SMA methods employ many of the same tools as a seismic PRA. SMA methods can be used, as appropriate, for selected risk-informed applications. The scope also includes not only traditional PRA analyses, which are intended to be realistic, but also screening analyses and demonstrably conservative or bounding ap-

proaches that use aspects of PRA methodology but are not full-scope PRAs themselves. Many risk-informed applications can and do use such analyses.

The types of risk-informed PRA applications contemplated under this standard are very broad and include applications related to design, procurement, construction, licensing, operation, and maintenance. Both regulatory risk-informed applications involving the NRC and applications not involving those regulations are contemplated. While the NRC does not require the use of this standard for any specific risk-informed applications, its use is expected to be common in such applications. In this regard, this standard's approach is intended to be identical to that used in the closely related ASME-RA-S-2002, so the approach and supporting logic of ASME-RA-S-2002 are relied upon heavily in this standard's guidance in this area.

Working Group ANS-58.21 of the Standards Committee of the American Nuclear Society had the following membership at the time it approved this standard, and indeed the membership was stable throughout the development of the standard:

R. J. Budnitz (Chair), *Lawrence Livermore National Laboratory*
N. C. Chokshi, *U.S. Nuclear Regulatory Commission*
W. Henries, *Maine Yankee Atomic Power Company*
M. K. Ravindra, *ABS Consulting, Inc.*
J. D. Stevenson, *J. D. Stevenson Consultants*
T. Yee, *Southern California Edison Company*

This standard was processed and approved for submittal to ANSI by the Risk Informed Standards Committee (RISC) on ANSI/ANS-58.21, "External-Events PRA Methodology." Committee approval of the standard does not necessarily imply that all committee members voted for its approval. At the time it approved this standard, the RISC Committee had the following members:

R. A. Bari (Chair), *Brookhaven National Laboratory*
P. J. Amico (Former Chair), *Science Applications International Corporation*
Suriya Ahmad (Secretary), *American Nuclear Society*

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