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Time Response Criteria for Manual Actions at Nuclear Power Plants

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An American National Standard

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American National Standard Time Response Criteria for Manual Actions at Nuclear Power Plants

Secretariat
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Foreword

(This foreword is not a part of American National Standard "Time Response Criteria for Manual Actions at Nuclear Power Plants," ANSI/ANS-58.8-2019, but is included for informational purposes only.)

In 2015, members of the Institute of Electrical and Electronics Engineers' Power and Energy Society, Nuclear Power Engineering Committee, Subcommittee 5 (SC5), Human Factors, Control Facilities, and Human Reliability, reviewed the previous issue of this standard [ANS-58.8-1994 (R2017)]. There was consensus among SC5 members that the standard did not fully address the change in estimation of time required for manual actions due to the changes in technology and operations since the last revision of the standard. For example, there was a commonly shared concern that the empirical basis for the previous issue of this standard was drawn from simulator studies conducted in analog control rooms, and therefore, the standard lacked an empirical basis for application to highly integrated digital control rooms. Additionally, members were concerned that the data upon which the standard was developed were not publicly available, and therefore, the validity of the time constants derived from those studies was not scrutable.

Simply updating the empirical basis and related time constants of the standard was not adopted in this revision of the standard, ANSI/ANS-58.8-2019, because, given the design flexibility of digital technology as well as its rapidly evolving nature, such an approach would result in questions about whether the simulated control rooms and plant models used to develop the basis for the revised standard were representative of the designs to which the standard would be applied and whether the standard could quickly become outdated.

This revision of the standard attempts to address the concerns mentioned above. Technology- and operation-neutral criteria and methods were adopted to determine time requirements for manual actions. This revision differs in the following aspects:

(1) The previous version of this standard provided a calculational approach for determining acceptable manual action times. The industry has shifted to a performance-based approach using the plant and simulators to demonstrate achievable manual action times. The revised approach used in this standard allows preliminary time determinations by calculation; however, actual plant or simulator performance verification is required when feasible.

(2) The scope of the previous revision of this standard was limited to safety-related operator actions to be used in the design of light water reactor nuclear power plants. This revision is applicable to all nuclear power plants. Additionally, as mentioned above, it provides guidance not only for calculating manual action times during design, but also for validation of the calculated manual action times as well as for continued verification and configuration control of the times for operating plants. Owners and designers for other types of nuclear facilities might find portions of this standard helpful in determining the acceptability of manual actions for their facilities.

(3) The term "safety-related operator action" is not used in this revision. The term "time-critical action" (TCA) is used instead and refers to a manual action or series of actions, the performance of which within specified time constraints has been credited in the plant's design analysis (e.g., safety analysis) or licensing basis.

The criteria contained in this standard establish timing requirements for manual actions with specific time constraints associated with design-basis events (DBEs) and for manual actions to meet the plant licensing or authorization basis for nuclear power plants. These

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criteria are used to determine whether an activity can be initiated by operator action or requires automatic initiation. The time response criteria given in this standard adopt time intervals and other restrictions to ensure that adequate safety margins are applied to system and plant design and safety evaluations. Requirements and guidance for design of associated instrumentation, controls, indicators, and annunciators necessary for TCAs are provided. In addition, requirements and guidance for validation of the manual action times are also provided.

The scope of this standard is limited to manual actions associated with those DBEs that are required to be analyzed in the licensing-basis documentation of nuclear power plants. Should the scope of the licensing-basis documentation be expanded, this standard should be applied to new DBEs that require operator actions with specific time constraints.

Other actions that have a time limit that are not part of the licensing-basis documentation are not included in this standard. This standard is not intended to supersede time criteria included in preexisting licensee regulatory commitments but may be used to help justify changes to such commitments.

The recommendations in the Pressurized Water Reactor Owner's Group document PWROG-16030-NP, "Time Critical Action/Time Sensitive Action Program Standard," Revision 1, were considered in this standard, and; therefore, is relatively consistent with these recommendations.

NUREG/BR-0303, "Guidance for Performance-Based Regulation," was reviewed by the ANS-58.8 Working Group, and this standard was revised to clarify that performance-based approaches consistent with NUREG/BR-0303 are allowed.

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.

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Time Response Criteria for Manual Actions at Nuclear Power Plants

1 Introduction

1.1 Scope

This standard[1)] establishes criteria and methods for identifying, calculating, validating, tracking, and documenting time requirements for the performance of nuclear power plant time-limited manual actions that are associated with either design-basis events (DBEs) or licensing basis.

1.2 Purpose

The purpose of this standard is to provide

- an objective approach to ensure plant and system designs allow time intervals for site personnel to perform manual actions with assurance they can be performed without causing excessive personnel burden;
- adequate safety margin for system design and safety analyses (i.e., the margin criteria specified in this standard will yield time values sufficient to support plant design and safety analysis).

1.3 Applications

Specifically, this standard provides

- a method for determining whether an activity may be accomplished by manual action instead of an automatic action;
- general guidance for hardware, such as instrumentation, controls, indicators, and annunciators, necessary to support required manual actions;
- a method to confirm that manual action times remain valid during the life of the plant.

1.4 Assumptions

The criteria in this standard are based on the following assumptions:

- Facility-specific applicable procedures are clear, complete, available, and used by the operators. The operating staff is familiar with the procedures from use in operator licensing qualification and requalification programs.
- An adequate number of shift personnel are available and on station, based upon plant staffing requirements, to perform any required manual actions.

[1)] The current standard, ANSI/ANS-58.8-2019, is hereinafter referred to as “this standard.”