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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 40444-2021

**General requirements for instrumentation and control systems
important to safety in nuclear power plants**

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Foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for Standardization Work Part 1. Structure and Drafting Rules of Standardization Documents"

Drafting.

This document uses the redrafting law to amend and adopt IEC 61513.2011 "General Requirements for Instrumentation and Control Systems Important to Safety in Nuclear Power Plants"

begging".

The technical differences between this document and IEC 61513.2011 and the reasons are as follows.

---Regarding normative reference documents, this document has made adjustments with technical differences, and the adjustments are concentratedly reflected in Chapter 2 "Regulations"

The specific adjustments in "Model Reference Documents" are as follows.

* Replace IEC 60964 (see 5.2.2, 5.2.4, 5.4.2.3) with GB/T 13630-2015 modified to adopt international standards;

* Replace IEC 61226 (see 5.2.3.1, 5.4.2.6, 6.2.1, 6.5.3.3, Appendix B);

* Replace IEC 60965 (see 5.4.2.3) with GB/T 13631 modified to adopt international standards;

* Replace IEC 60709 with NB/T.20060 modified to adopt international standards (see 5.4.2.4, 6.2.2.3.2, 6.2.3.3.3);

* Replace IEC 61500 with NB/T 20342 modified to adopt international standards (see

5.4.2.4);

* Replace IEC 60880 with NB/T.20054-2011 modified to adopt international standards (see 5.4.2.5, 5.4.4.2, 5.6.2, 6.1,

6.2.2.3.3, 6.2.2.3.4, 6.2.2.7, 6.2.3.2, 6.2.3.3.4, 6.2.3.4, 6.2.4.1, 6.2.6, 6.2.8, 6.3.2.1, 6.3.2.2, 6.3.5, 6.4.2.2, 6.4.4.1, 6.5.3.3, 8.2);

* Replace IEC 62138 with NB/T.20055-2011 modified to adopt international standards (see 5.4.2.5, 5.6.2, 6.1,

6.2.2.3.3, 6.2.2.7, 6.2.3.2, 6.2.3.4, 6.2.4.1, 6.2.8, 6.3.2.1, 6.4.4.1, 6.5.3.3, 8.2);

* Replace IEC 62340 with NB/T.20068 modified to adopt international standards (see 5.4.2.6, 6.2.2.3.2, 6.2.3.3);

* Replace IEC 61000-4-1 (see 5.5.4.2, 6.5.3.2) with GB/T 17626.1 equivalent to the international standard;

* Replace IEC 61000-4-2 with GB/T 17626.2 which is equivalent to the international standard (see 5.5.4.2, 6.5.3.2);

* Replace IEC 61000-4-3 with GB/T 17626.3 equivalent to the international standard (see 5.5.4.2, 6.5.3.2);

* Replace IEC 61000-4-4 with GB/T 17626.4 equivalent to the international standard (see 5.5.4.2, 6.5.3.2);

* Replace IEC 61000-4-5 (see 5.5.4.2, 6.5.3.2) with GB/T 17626.5 equivalent to the international standard;

* Replace IEC 61000-4-6 (see 5.5.4.2, 6.5.3.2) with GB/T 17626.6 which is equivalent to adopting international standards;

* Replace IEC 60987 with NB/T 20298-2014 modified to adopt international standards (see 6.1, 6.2.1, 6.2.2.3.4,

6.2.2.3.6, 6.2.3.2, 6.2.4.1, 6.2.8, 6.3.6, 6.4.4.1, 6.5.3.3, 8.2);

* Replace ISO 9001 with GB/T 19001 equivalent to the international standard (see 6.3.2.1);

* Added reference to GB/T 12727 (see 6.5.3.2) and GB/T 13625 (see 6.5.3.2);

* Removed IEC 60780 and IEC 60980.

---In order to adapt to my country's technical conditions, this document has made some adjustments to the "Terms and Definitions" in Chapter 3, and the specific adjustments are as follows.

* Modified the definitions of common cause failures, diversity, items important to safety,

hypothetical initiating events, safety systems, and single failures, and adopted

Definition in HAF102 (2016) (see 3.8, 3.15, 3.33, 3.35, 3.44, 3.46);

* Modified the definition of commissioning and quality assurance, adopting the definition in HAF003 (1991) (see 3.7, 3.39);

* Modified the definition of security group, adopting the definition in GB/T 13284.1-2008 (see 3.43);

* Modified the definition of components and configuration management, adopting the definition in GB/T 13629-2008 (see 3.10, 3.12);

* Modified the definitions of channel, redundancy, single failure criterion, and type test, adopting the definition in GB/T 4960.6-2008

(See 3.5, 3.40, 3.47, 3.56);

* Modified the definition of evaluation (of system characteristics), adopting the definition in GB/T 18272.1-2000 (see 3.19);

* Modified the definition of quality, adopting the definition in GB/T 19000-2016 (see 3.38);

* Modified the definition of reliability, adopting the definition in GB/T 7163-2008 (see 3.41);

* The definitions of errors, failures, and failures are revised, and the definitions in GB/T 11457-2006 (see 3.18, 3.20, 3.21) are adopted;

* Modified the definition of requirements, adopting the definition in GB/T 1.1-2020 (see 3.42).

--- Deleted abbreviations not used in part of the text in Chapter 4.

The following editorial changes have been made to this document.

---In accordance with the requirements of GB/T 1.1-2020, the preparation of Chapter 1 is standardized;

--- Deleted part of the notes in Chapter 3 "Terms and Definitions";

--- In the Note 2 of 5.2.3.1, "The normative reference documents for functional classification in different countries may be different, and may be different from the reference in this document.

"Documents (IEC 61226) are different" amended to "Different practices may have different functional classification methods";

--- Modify the description of defense in depth in A.4 to be consistent with HAF102 (2016);

---Delete "IAEANS-G-1.3" in Appendix B to extend this classification concept to instrumentation and control systems. I

Systems important to safety and systems not important to safety. Then, the system important to safety is subdivided into 'safety system' and 'safety related

System' and put forward design requirements. "And "The number of levels specified by IAEA is different from IEC 61226.2009 (safety system and safety

All related systems correspond to categories A, B and C). And the definitions and concepts used by IAEA and IEC are also different (IAEA's system

The classification corresponds to the IEC functional classification/system classification), and these differences may lead to different interpretations. "

---Appendix D and Appendix E have been deleted.

---According to the actual reference content of this document, the references have been adjusted.

Introduction

Instrumentation and control important to safety (I

The combination of two types of equipment is realized. This document is important to safety I

Technology I

This document emphasizes the importance of deriving safety according to the safety objectives of nuclear power plants.

This document proposes I

Power Plant Safety Goals and Important to Safety I

The life cycle described and followed in this document is not the only viable life cycle.

Other life cycles can be followed.

The main core technical elements of this document include the following 4 chapters (Figure 1 shows the overall framework structure).

---Chapter 5 describes important safety I

* Determine I according to nuclear power plant safety analysis

Class, plant layout and operating environment;

* Create I

Includes guidelines for providing defense in depth and minimizing the possibility of common cause failure (CCF);

* Design I