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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB 15146.8-2008

Replacing GB 15146.8-1994

Nuclear criticality safety for fissile materials outside reactors - Part 8: Criticality safety criteria for the handling, storage and transportation of LWR fuel outside reactors

反应堆外易裂变材料的核临界安全 第8部分：堆外操作、贮存、运输轻水堆燃料的核临界安全准则

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Standardization Administration of the PRC

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Foreword

All technical content in this section is mandatory. GB 15146 "Nuclear criticality safety for fissile materials outside reactor" has so far released the following 11 sections.

--- GB 15146.1 Part 1. Nuclear Criticality Safety Administration regulations (instead of GB 15146.1-1994)

--- GB 15146.2 - Part 2. Operation fissile material, processing and handling of basic technical rules and subcritical limits (instead of GB 15146.2-1994)

--- GB 15146.3 Part 3. storage of fissile material for nuclear criticality safety requirements (instead of GB 15146.3-1994)

--- Aqueous solutions of fissile material for nuclear criticality safety criteria for steel - pipe intersections containing GB 15146.4

--- GB 15146.5 plutonium - natural uranium nuclear criticality control criteria and subcritical limits for mixtures

--- GB/T 15146.6 borosilicate glass Raschig rings and its application criteria

--- GB 15146.7 subcritical neutron multiplication measurements in situ

--- GB 15146.8 Part 8. heap outside the handling, storage and transport of nuclear criticality safety criteria for LWR fuel (instead of GB 15146.8-1994)

--- GB 15146.9 performance and testing requirements for nuclear criticality detection and alarm systems

--- GB 15146.10 Safety requirements for fixed neutron absorber

--- GB/T 15146.11 based nuclear criticality safety limits and controls moderator GB 15146 fissile materials outside the reactor operation, processing, handling, storage and transport of nuclear criticality safety requirements and recommendations made. This section GB of

Section 815 146. This Part replaces GB 15146.8-1994 "for fissile materials outside reactor - Nuclear criticality safety-pile handling, storage and transportation of LWR Nuclear criticality safety guidelines "of the fuel cell. This section compared with GB 15146.8-1994 major changes.

--- Increased the preamble;

--- Increased LWR fuel rods in the range;

1 Scope

Part 8 narrows the series to the case that arises most often in practice: light water reactor fuel, in the form of pellets, rods and assemblies, being handled, stored and transported outside the reactor. It sets the criticality safety criteria for those operations - the enrichment and geometry conditions under which an assembly or an array may be treated as safe, the requirements on packaging and spacing, and the controls on moderation and flooding - which makes it the part a fuel fabricator and a transport operator use directly. Issued on 19 September 2008, in force since 1 August 2009, replacing GB 15146.8-1994. This page is published from the official record of the standard held by the Chinese standards administration: the identification, the dates, the classification and the edition it replaces are taken from there. The clause text, the tables and the numeric limits are not reproduced on this page - they are in the document itself, which is delivered in full in English translation.

This section provides guidelines for nuclear criticality safety-pile handling, storage and transportation of LWR fuel rods and the fuel element. This section applies to operations outside reactors LWR fuel rods and fuel cells, storage and transport.

2 Normative references

The following documents contain provisions which, through reference in this text, constitute provisions of this part. For dated references, subsequent Amendments (not including errata content) or revisions do not apply to this section, however, encourage the parties to this part of the research agreement Whether the latest versions of these documents. For undated reference documents, the latest versions apply to this section.

GB 15146.1 fissile materials outside reactor - Nuclear criticality safety - Part 1. Nuclear Criticality Safety Administration regulations

GB 15146.2 outside reactors Nuclear criticality safety for fissile materials - Part 2. The operation of fissile material, processing, handling basic Technical guidelines and subcritical limits

GB 15146.7 outside reactors Yi Nuclear criticality safety subcritical neutron multiplication of fissile material for measurements in situ Performance and testing

GB 15146.9 fissile materials outside reactor - Nuclear criticality safety for nuclear criticality

detection and alarm systems Claim

GB 15146.10 Safety requirements outside reactor nuclear criticality safety for fissile material fixed neutron absorber

3 Terms and Definitions

The following terms and definitions apply to this section.

3.1 Limiting parameters within a predetermined range.

3.2 Containing fissile material nuclides elongated cylinder, usually enclosed in a metal sleeve.

3.3 Handling, storage and transport of the basic unit of time. For example, the fuel assembly, packed in together or spent fuel rods tank.

3.4 By a qualified examiner other than the original author of the nuclear criticality safety evaluation performed by the former carried out in order to ensure that the assessment The price is right. Author and reviewers can belong to the same unit.

4 General safety guidelines

4.1 Nuclear criticality safety for the general administrative requirements and technical requirements see GB 15146.1, GB 15146.2.

4.2 The method used to calculate the effective multiplication factor shall be confirmed in accordance with the GB 15146.2.

4.3 shall determine the necessity of setting threshold alarm systems and their use in accordance with the rules specified in GB 15146.9.

4.4 For any operation involving fuel or fuel cells, storage, operating systems, or transportation, or the first time in the job system early Prior-use, or they implement the change should be in accordance with the guidelines specified in chapter 5 for all normal operating conditions, credible abnormal working conditions Evaluated in order to determine such jobs or subcritical system (see Appendix A).

4.5 Nuclear criticality safety evaluation shall be determined and made clear that the controlled parameter criticality safety depends, and its design operating limits. These controlled Effect of changes in parameters or conditions arising shall be documented.

4.6 Nuclear criticality safety assessment should form files that you want detailed, well organized, can not be vague, in order to facilitate independent review and Ensure the accuracy of the results.

4.7 Prior to the implementation of the job, it should be an independent review to ensure that the evaluation requirements of

4.4 is appropriate.

4.8 Prior to the implementation of the job, you should verify the configuration and working condition in time to meet the

4.5 operating limits specified in the design and requirements.

4.9 can be used in a solution consisting of one of the fuel itself, structures, equipment or structures, devices, such as added gadolinium, boron neutron Absorbent methods to ensure nuclear criticality safety. However, when dependent neutron absorber ensure criticality safety, you should use control measures to ensure their protection Holding a predetermined arrangement, distribution and concentration. When using absorbent solution should be careful and should comply with the relevant safety standards. Fuel element You should be careful when containing burnable poison, looking for the most reactive state. Fixation should be used in accordance with the provisions of GB 15146.10 Sub-absorbent.

4.10 during the nuclear criticality safety evaluation, should select those characteristics of the fuel reactivity (such as material composition within the range of values credible, Geometry or temperature), the evaluation system in order to obtain the maximum neutron multiplication factor. You can identify one of the largest fuel cell reaction Sex, and to ensure that any fuel element reactivity values greater than the reactive strategies to consider since the burnup reactivity caused by drop low. Through the following measures to ensure that any fuel element reactivity does not exceed the maximum value of the reaction.

a) associated with the measurement of the reaction;

b) analyzing and verifying each irradiation history of the fuel element. Also, consider the fuel element in the axial burnup distribution.

5 Criteria to determine subcritical

5.1 When using the method of analysis to predict neutron added factor, according to equation (1) to calculate the neutron factor k p value should be equal to or less than the determined License neutron multiplication factors, namely. P<= c-Delta k k k k p-Delta c-Delta k m (1) Where. K p

--- under all normal operating conditions or credible abnormal conditions or circumstances of the incident, the proliferation of neutron evaluation system factor calculated value k eff. K c

--- k eff to calculate the average number of critical benchmark experiments with a specific calculation method. K c reference for calculating the critical experiment Physical components, configurations and nuclear properties (including a reflective layer), etc. should be similar to the system being evaluated. If you are parameters evaluation system Beyond the scope of the applicable benchmark critical experimentally determined, you can scope based k c with the trend of the parameter extrapolation Too. When larger extrapolation