

From: James Downs > *NR*
To: Eva Brown
Date: Tue, Mar 23, 2004 7:00 AM
Subject: Re: Comparision between Fire Protection Regulations between Germany and USA

Eva,

It's a very high level overview... I'd even call it a fly-by. =)

-JD

>>> Eva Brown 03/23/2004 6:49:39 AM >>>

James,

I missed the original e-mail with your summary. Would you please forward this to me?

Thanks.

- Eva

✓>>> James Downs Monday, March 22, 2004 3:25:19 PM >>>

I already sent these to Alex and Sunil, but if you want to read the actual code for yourself, its attached.

✓>>> Ray Gallucci 03/22/2004 3:21:22 PM >>>

"Few equivalencies are given in the German code to permit deviation from the mandated structural separation requirements and no references of any manual actions are cited as alternative means of fire protection."

How interesting.

✓>>> James Downs 03/22/04 01:33PM >>>

Attached is the paper, it compares the German KTA 2101 series to the NRC fire protection regulation.

-JD

✓>>> Sunil Weerakkody 03/22/2004 1:12:34 PM >>>

This is an outstanding product because it is written at the right level of detail with no editorial errors. I was able to read the document and understand the high-level differences between us and German regulations within about 10 minutes. Please share this with the rest of the section. Please send me an e-copy because I want to share this with Suzie, Mike and John.

Sunil

22-7

MEMORANDUM TO: Michael Cullingford
Director's Office
Office of Nuclear Reactor Regulation

FROM: Sunil D. Weerakkody, Chief
Fire Protection Engineering and Special Projects Section
Plant Systems Branch
Division of Systems Safety and Analysis
Office of Nuclear Reactor Regulation

SUBJECT: Comparison of German and United States Fire Protection Regulations

The Fire Protection Engineering and Special Projects Section has completed the requested review and comparison of the German Safety Standards:

KTA 2101.1 Fire Protection in Nuclear Power Plants - Part 1: Basic Requirements
KTA 2101.2 Fire Protection in Nuclear Power Plants - Part 2: Fire Protection of Structural Plant Components
KTA 2101.3 Fire Protection in Nuclear Power Plants - Part 3: Fire Protection of Mechanical and Electrical Plant Components

Attached is our summary. If you require any additional information please contact James Downs of my staff. Mr. Downs can be reached at 301-415-3194.

Attachment: As stated

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DISTRIBUTION: JDowns MSalley JHannon MJohnson SBlack

DOCUMENT NAME:G:\SPLB\Section B - Weerakkody\Downs\german codes.wpd

OFFICE	SPLB:DSSA:NRR	SPLB:DSSA:NRR	SC:SPLB:DSSA		
NAME	JDowns	MSalley	SWeerakkody		
DATE	03/ /04	03/ /04	03/ /04		

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Comparison of Fire Protection Regulations for Nuclear Power Plants In Germany and the United States

Objective: Provide a high-level overview of fire protection regulations in nuclear power plants of Germany and the United States. Illustrate similarities and differences within the goals, regulatory design, and general requirements of these standards.

Introduction

Germany's nuclear power plant (NPP) fire protection regulations, written and enforced by the German Reactor Safety Commission (GRS), provide for meaningful comparison to those of the United States Nuclear Regulatory Commission (NRC). The safety standard series KTA 2101 provides the source of fire protection regulation in Germany, while the core of NPP fire protection regulation in the United States comes from 10 CFR Part 50, specifically Section 50.48, Appendix A, and Appendix R. While the objectives of these documents are very similar, the regulatory design and specifications contain some differences.

Regulatory Goals

The International Atomic Energy Agency (IAEA) outlines distinct fire protection objectives through their Safety Standards Series - Protection Against Internal Fire and Explosions in the Design of Nuclear Power Plants. These goals are identical to those found in the KTA 2101 series and in 10 CFR Part 50. The requirements of these objectives are:

- (1) to prevent fires from starting;
- (2) to rapidly detect, control, and extinguish fires;
- (3) to protect structures, systems, and components important to safety.

Both the GRS and NRC regulations state a fourth objective, which is implied by IAEA:

- (4) to protect the public, environment, and plant personnel.

Although the methods used to achieve these goals vary between Germany and the United States, it is important to realize that the basis of NPP fire protection is identical throughout most of the world. Relevant assessments can be derived from comparing different regulatory approaches with concurrent objectives.

Regulatory Design

The regulatory structure for fire protection of NPP instituted by GRS and NRC are both relatively complex. The KTA 2101 series and portions of 10 CFR Part 50 form the basis of fire protection requirements, but many other types of documents are referenced within each standard. (Attachment 1). Overall, Germany appears to have two levels of fire protection regulation; specific (KTA series) and detailed (DIN series). The United States can classify its guidance into three levels; general (sections of 10 CFR Part 50), specific (Regulatory Guides and NUREGS), and detailed (Generic Letters and Information Notices).

ATTACHMENT

A key difference between the fire protection regulations of Germany and of the United States involves the scope to which the regulations can be applied. The KTA 2101 series has an inclusive scope, all German NPP must abide by the rules specified by the standard. This uniform application has been facilitated by comprehensive backfitting, resulting in significant fire safety improvements particularly in nuclear power plants built to earlier standards (Berg, 2001). This indicates that the fire protection basis is the same throughout all German NPP, although individual plants may have unique exemptions and procedures. Extensive regulatory uniformity is not present throughout NPP in the United States, the NRC regulations are organized to reflect the different eras of plant licensing basis.

Performance based characteristics of regulation are currently a hot topic within the fire protection and nuclear communities. Efforts to evolve into a risk informed environment are being made and the established framework of both the KTA 2101 series and 10 CFR Part 50 facilitate the probabilistic approach at different levels. Current German NPP fire protection regulation is generally more deterministic than that of the United States. This is exemplified by mandating specifics such as structural configuration, suppression system suitability, and inspection frequency directly through the KTA 2101 series. Section 50.48 along with Appendix A and Appendix R of 10 CFR Part 50, establish a framework for fire protection requirements but leave many specifying details to other documents. Attempts are being made by both the GRS and the NRC to create and utilize more risk insight to improve NPP safety. The differences in framework between the two countries' NPP fire protection regulations, may impact the efficiency at which risk informed guidance is developed.

General Requirements

Since the overall fire protection objectives of Germany and the United States are very similar, many requirements of the regulations are alike as well. The overall focus of both regulations is to assure safe shutdown by utilizing a defense-in-depth approach. Both standards discuss features such as structural fire protection, fire suppression, and routine inspections. There is some uniqueness, however, in what is emphasized for many of those features.

Containment of a potential fire can be performed many ways, often a critical element of defense is a structural barrier. Substantial portions of the KTA 2101 series address structural specifications. The entire KTA 2101.2 standard is devoted to a wide array of structural fire protection for plant components. Few equivalencies are given in the German code to permit deviation from the mandated structural separation requirements and no references of any manual actions are cited as alternative means of fire protection. Structural fire protection of NPP in the United States is focused on protecting the redundant trains, as well as providing fire area separation. Alternatives to structural protection of redundant trains are listed in Section III.G of Appendix R, giving NPP in the United States more options on this topic than those of Germany.

Effective fire suppression is a primary objective of NPP safety. Both regulations use a more deterministic approach to suppression requirements, especially pertaining to fire brigade functions and training. The regulatory uses of suppression, however, differ slightly between NPP of Germany and those of the United States. The KTA 2101 series specifies distinct areas where suppression is required and it even details the suitability of the type of suppression to be

utilized in each area. The portions of 10 CFR Part 50 detailing suppression focus more on the protection of the redundant trains rather than solely on requirements within specific locations.

Inspections play a vital role in any regulatory process, and the fire protection programs of these two countries both emphasize that significance. The GRS describes in detail the types of inspections to be performed, the testing interval, and who is required to be present. A chart is present in KTA 2101.1 that appears to be the basis of NPP fire protection inspection in Germany. The United States establishes the foundation of their fire protection program in Section 50.48 of 10 CFR Part 50, but defines criteria for inspections in other sections.

A final requirement which is noticeably different between the two countries' fire protection regulation is the amount of mandatory documentation. Germany describes the fire protection documentation called for in about a paragraph. The record keeping requirements of the United States on the other hand, amasses multiple pages of description. It can be assumed that neither code is written to be inclusive of all required fire protection documentation, however it is clear that the NRC places more of an emphasis on documentation in this case than the GRS does.

Further investigation of other GRS regulation would be needed to gain a more in-depth understanding of German NPP requirements. For example, the KTA 2101 series does not mention the third train concept which is utilized in most German NPP. Although this third train is not only a fire protection feature, it is a vital component in the GRS defense-in-depth concept. While other German fire protection related requirements may exist elsewhere, the KTA 2101 series does provide relevant assessment to specific portions of 10 CFR Part 50.

Conclusion

The NPP fire protection regulations of Germany and the United States mirror each other's mission of minimizing fire risk. Many of the required procedures to achieve this objective are very similar as well, but there are noticeable differences. Some of these are subtleties within the fire protection design requirements, but the majority of the variations are due to diversification between the structure of each country's regulatory documents.

References

Berg, H.P. "Reassessing the Fire Safety of Nuclear Power Plants Using Deterministic and Probabilistic Methods", European Safety & Reliability International Conference - Web Papers, Torino, Italy, September 2001, Italian Association of Chemical Engineering, Milano, Italy, 2001.