Industry Proposals for IAEA Safety Guide on „Safety Classification of SSCs in NPPs“
(Draft DS 367)

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Content

- History of IAEA Draft DS 367 until February 2011
- Requirements on Safety Classification of SSC in NPPs
- Approach of IAEA Draft DS 367
- Major Issues
- Industry Proposal for Changes in DS 367
- Conclusions

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History of IAEA Draft DS 367 until February 2011

- **Approval of DPP by the NUSSC/CSS:** 2007 June
- **CSs and TM to prepare the draft** 2008-2009

  Strong support: Finland, France, Japan, Russia, South Africa, UK, USA
- **Approval of the draft by NUSSC for submission to Member States for comments:** 2009 Q-4
- **Resolution of Member States' comments:** 2009-2010

  Strong support: Finland, France, Japan, Russia, South Africa, USA, ENISS, WNA
- **Resolution of NUSSC comments :** 2010 Q-4
- **Position of NUSSC for submission to CSS :** 2011 Q-1
  - **MS Comments on DS367 rev. 6.1a should be sent to TO by the 31 December 2010**
  - **DS367 rev.6.2 were commented by NUSSC Members again by February 2011 without achieving appropriate consensus for submission to CSS**

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Requirements on Safety Classification of SSC in NPPs

- **Framework of Safety Classification** is described in DRAFT SAFETY REQUIREMENTS No. SSR 2/1: "Safety of Nuclear Power Plants: Design", 1 June 2011, endorsed by CSS in May 2011

Requirement 4: Fulfilment of fundamental safety functions

- identifying items important to safety that are necessary and
- identifying the inherent features that are contributing to fulfilling or that are affecting the fundamental safety functions in all plant states.

Requirement 16: Postulated initiating events (PIE),

- identifying a comprehensive set of postulated initiating events.
- establish the preventive measures and protective measures that are necessary to ensure that the required safety functions will be performed.

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Requirements on of Safety Classification of SSC in NPPs

Requirement 16: (continue)

- expected behaviour of the plant shall be such that the following conditions can be achieved…:

…

(2) following a PIE, the plant would be rendered safe by means of passive safety features or by the action of systems that are operating continuously in the state necessary to control the postulated initiating event;

(3) following a PIE, the plant would be rendered safe by the actuation of safety systems that need to be brought into operation in response to the PIE; or

…

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Requirements on of Safety Classification of SSC in NPPs

Requirement 22: Safety Classification

All items important to safety shall be identified and shall be classified on the basis of their function and their safety significance.

5.34. The method for classifying the safety significance of items important to safety shall be based primarily on deterministic methods complemented where appropriate by probabilistic methods, with due account taken of factors…

1. **the safety function(s) to be performed by the item;**
2. **the consequences of failure to perform a safety function;**
3. **the frequency with which the item will be called upon to perform a safety function;**
4. **the time following a postulated initiating event at which, or the period for which, the item will be called upon to perform a safety function.**

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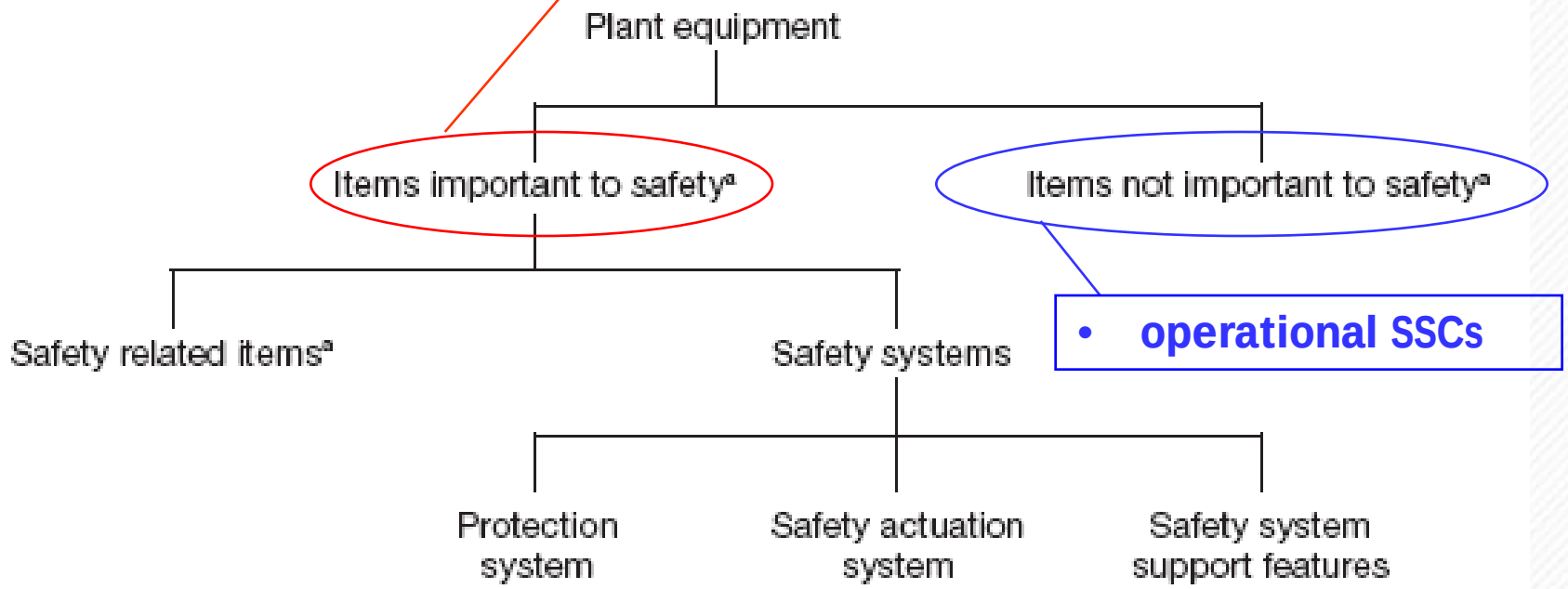
IAEA Glossary (2007):

IAEA Glossary (2007):

- ***part of a safety group*** *and/or*
- ***failure could lead to radiation exposure***

plant equipment



- **operational SSCs**

[a] In this context, an 'item' is a *structure*, *system* or *component*.

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Conclusions for establishing a general approach of safety classification of SSC´s:

- "items important to safety" have to be safety classified and "inherent features" that are contributing to fulfilling or affecting the FSF have to be considered
- reference scale of safety classification are safety functions and the consequences in case of failure (safety significance)
- based on defence-in-depth concept and graded approach → adequate and well-balanced safety design of SSC´s in terms of reliability and effectiveness regarding all plant states
  - to prevent deviations from normal operation and failure of items important to safety
  - to control PIE´s in order to bring the plant in a "controlled" and "safe" state as well as
  - to prevent and/or mitigate consequences (harmful effects of radiation)
- compatible to well-established terminology

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General Approach of IAEA Draft DS 367
(4 Feb. 2011)

Main steps in classifying SSCs (Fig. 1)

1. **Review and Definition of PIE**
2. **Identification of reactor type specific, then plant specific preventive and mitigatory safety functions**
3. **Categorization of safety functions**
4. **Identification of SSCs or groups of SSCs to perform safety functions**
5. **Assignment of SSCs that perform safety functions to a safety class**
6. **Identification of engineering design rules for the design, manufacturing, qualification…**

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Major Issues

to step 2: “Identification of Safety Functions”

- **differentiation into reactor type specific and then plant specific SF doesn´t provide added value for classification methodology**
- **“preventive safety functions” are also assigned to operational SSCs (defined PIE spectrum)**

-> operational SSCs have no “safety function” according to IAEA requirements on design (s.a. glossary)

-> prevention against failure of SSCs is typically realised by specific properties and characteristics

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Major Issues

after step 5: "Assignment of SSCs that perform safety functions to a safety class"

- **the verification does not include the verification of chosen technical specifications (engineering design rules)**

-> only by consideration of the resulting specific properties and characteristics of SSCs in the verification the correct classification can be confirmed

- **some terminology used could lead to misinter-pretations**

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Industry Proposal for Changes in DS 367

- agreement in principle with the recommended general approach and methods of safety classification

  → **large parts of DS 367 are unchanged**

- abandonment of "reactor type specific" SF and introduction of proposals and definitions for "safety function", "provisions" etc.

  → **improvement of the approach and the terminology**

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Industry Proposal for Changes in DS 367

- expansion of the verification step in order to cover whole classification process

  → **assuring of a holistic check of SSC classification and design beginning with an adequate PIE selection right up to appropriate engineering design rules**

- use of the term "to control" (a PIE) instead of "to mitigate" (a PIE)

  → **description of PIE handling and the accomplishment of SF´s in a consistent and stringent way with SSR 2/1**

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Industry Proposal for Changes in DS 367

- determination of provisions for SSC at the end of the classification process instead of assigning “preventive safety functions” in step 2

  → identification and assignment of properties and characteristics (provisions) for the robustness to withstand potential impacts in order to improve the reliability of SSCs and to prevent failure

  → operational SSCs that can cause a PIE are considered in the classification process, e.g. by assigning provisions against failure, without being safety classified

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Conclusions 1/2

1. The approach of safety classification of SSCs in the drafted Safety Guide (DS367, February 2011) regarding to the structure and steps of classification as well as recommended methods are seen in principle as applicable to new reactor designs.
2. But this complex approach is relatively new and currently not broad used in the design practice so that the evidence to be effective and adequate as well as to be a basis for a recommendable standard method for safety classification have to be still demonstrated.

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Conclusions 2/2

3. Some major critical issues were identified and concrete proposals were elaborated (industry proposals from August 2011) to bring the description of the approach closer to the current best practice and in particular to the requirements on safety design of NPPs as determined in the "Safety Requirements on Design of NPP", SSR 2/1, (rev. NS-R-1).
4. The industry further proposes to elaborate representative test cases to verify the applicability and robustness of the approach.
5. These test cases should be a substantial input for the IAEA Consultancy Meeting planned for 14-18 November 2011.

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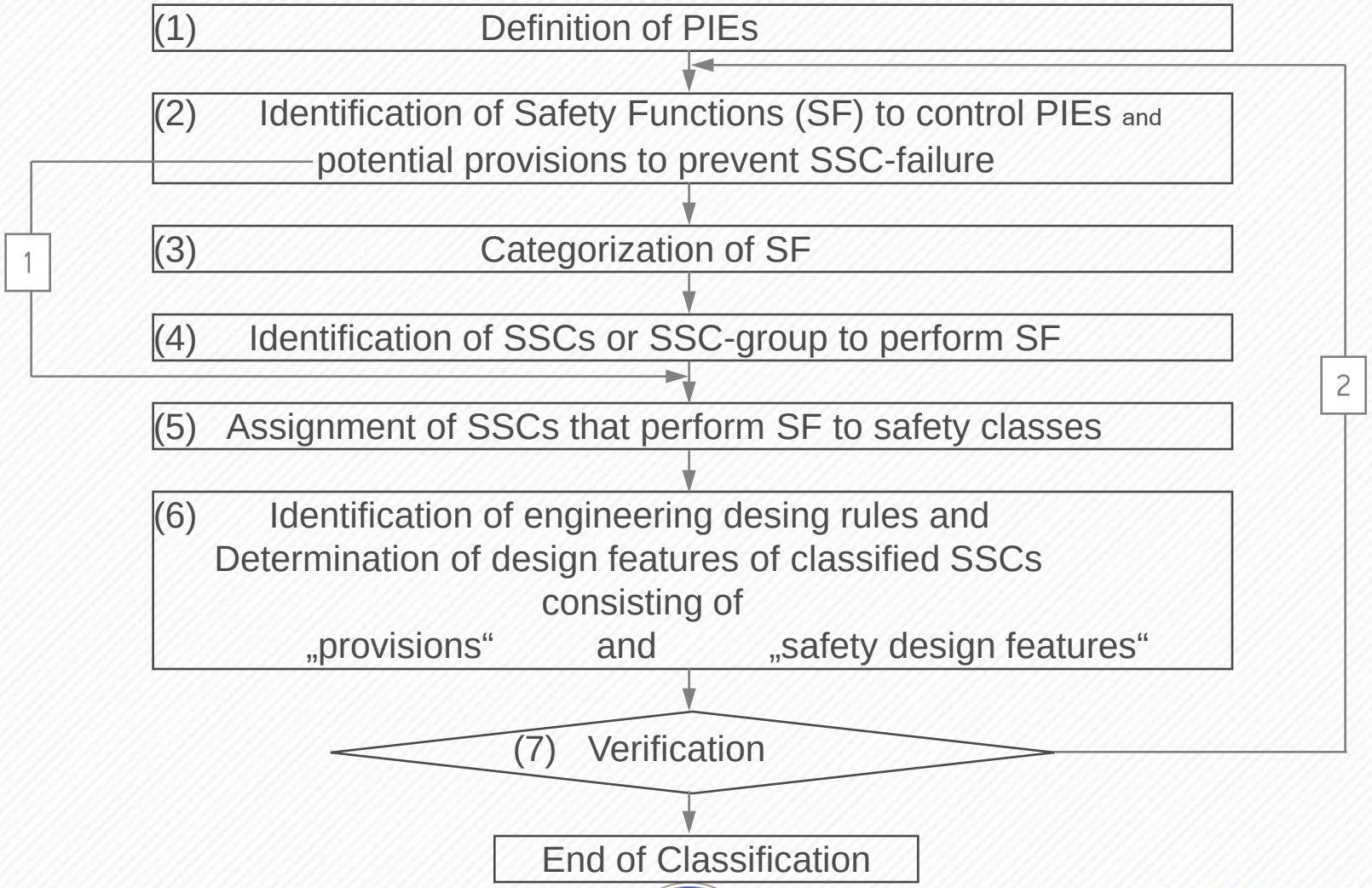
Backup

New Approach for Safety Classification Process – Industry Proposal (August 2011)



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