Risk Informed Grading of Quality Assurance Requirements set for Organisational Activities

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General

Regulatory Guide YVL 1.4 "Quality assurance for nuclear power plants"

(the guide has been published in 1991 and is not valid today)

The old version contained a requirement on grading of QA activities:

“A graded approach based on the relative importance to nuclear safety of each item, service or process shall be used.”
General

The grading of QA requirements concerning the equipment has been clear.

In most cases the grading has been based on the safety classification of the equipment.

Grading of activities:
- review and approval of the construction documentation
  - approval of the manufacturer
    - manufacturing control
  - extent of inspections and test
    - commissioning
  - maintenance during operation
    - etc.
General

According to the experiences the grading of organizational activities and processes has been more complicated.

The management systems of the licensees’ in Finland include the requirement of grading principle.

In Finland licensees have graded the QA requirements of processes on the basis of various factors such as:
- safety significance
- operating experience
- operating requirements.

Grading of QA requirements has led to some activities being allowed to be performed using reduced effort and for some activities, more stringent requirements have been imposed.
General

Interviews in STUK’s and licensees’ organizations have revealed some main questions:

- what is graded QA?
- what is risk-informed graded QA?
- tools for grading?
STUK’s pilot study on graded QA

Trying to give the answer to those questions a pilot study was initiated by STUK in 2002 to explore and develop risk informed methodology for graded QA:

The aim was to assess existing management systems and identify practices of grading of quality requirements.

One of the targets of the study was to wake up the licensees to notify that grading is a real regulatory requirement.
STUK’s pilot study on graded QA

The pilot Study showed that the grading of requirements included in the management system can be carried out in a risk-informed manner.

Poor knowledge of the methods and tools offered by PRA was considered a problem.
STUK’s pilot study on graded QA

STUK’s new regulatory requirements:

The procedure for grading of QA requirements of organisational activities shall be prepared by licensee:

- overall guidance of QA grading
- a systematic and consistent method for grading

PRA shall be used to develop and improve the management system.
Licensees’ quality management system

In Finland, licensees quality management systems include principles for grading of QA requirements. Several examples of grading exist, although few procedures have been made to systematise activities.

The classification has, however, been performed case-by-case with no systematic utilization of PRA in the assessment of safety significance.
Licensees’ quality management system

Olkiluoto NPP

- **Work Order System, less stringent procedures (PUT):** Simplified procedures for certain activities, which e.g. do not require special design efforts, radiation protection measures or fire protection. Applied for ”small” works, which do not cause disturbances in any process systems.

- **Procedural changes:** Small changes or clarification to operational procedures copies, located in main control room, can be made provided that the change is not significant. Review and acceptance procedures for the change is similar to any procedural change i.e. equally stringent.
Licensees’ quality management system

Olkiluoto NPP

- Classification of component maintenance activities based on functional requirements: Grading is based on e.g. Tech Specs, maintenance experiences, impact on operation, average repair time and expenses, PRA
Licensees’ quality management system

Loviisa NPP

- Secondary circuit maintenance log-book: small defects (e.g. leaks in flanges or casings) may be fixed without work order

- Review and acceptance of EOPs: For some EOPs, the review process is enhanced with an additional review by the TSO and/or electrical and I&C experts

- Less stringent process for drawing up pre-inspection documentation: Applied to small and insignificant repairs or modifications in safety class 3 - 4 and non-classified systems provided that work has no impact on safety and does not require QC reporting.
Olkiluoto 3 – construction project
Olkiluoto 3 – construction project

According to the STUK’s requirements the graded approach shall be implemented in Olkiluoto 3 project by:

- the licensee
- the plant vendor
- contractors (SC 1-3) of the licensee and the plant vendor.
The plant vendor has published a procedure for its contractors for preparing a Olkiluoto 3 specific quality plan.

The procedure contains requirements on issues as follows:
- safety culture
- documentation requirements
- product identification an traceability
- grading the types and extent of the control
- etc.

In practice the grading requirement is implemented through the supply chains in Olkiluoto 3 project.
Olkiluoto 3 – construction project

However, the implementation of the grading requirement has been challenging.

The meaning of grading has not been understood even if the grading has been a requirement of the contractor’s quality manual.

Finally, the plant vendor published a guide for contractors concerning the grading of QA requirements.
Olkiluoto 3 – construction project

The Graded Approach based on nuclear safety shall be used while establishing and implementing the Olkiluoto 3 commissioning activities and processes.

Examples of the grading process:

- qualification and training requirements for personnel participating in the Nuclear Island commissioning
- additional participation of PRA experts in the review process of test programs for nuclear commissioning
- evaluation of the potential risks of nuclear commissioning tests
- additional safety assessment for FOAK-tests
- etc.
Conclusions

Grading of Management System QA requirements:

- overall guidance is needed
- updating of the IAEA manual (TRS No. 328) is most welcome
- practicable tools and methods for grading should be developed
- risk-informed grading should be considered as one of potential tools.