

ALARA Design Concept of SMART Reactor for Standard Design Approval

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1. Introduction

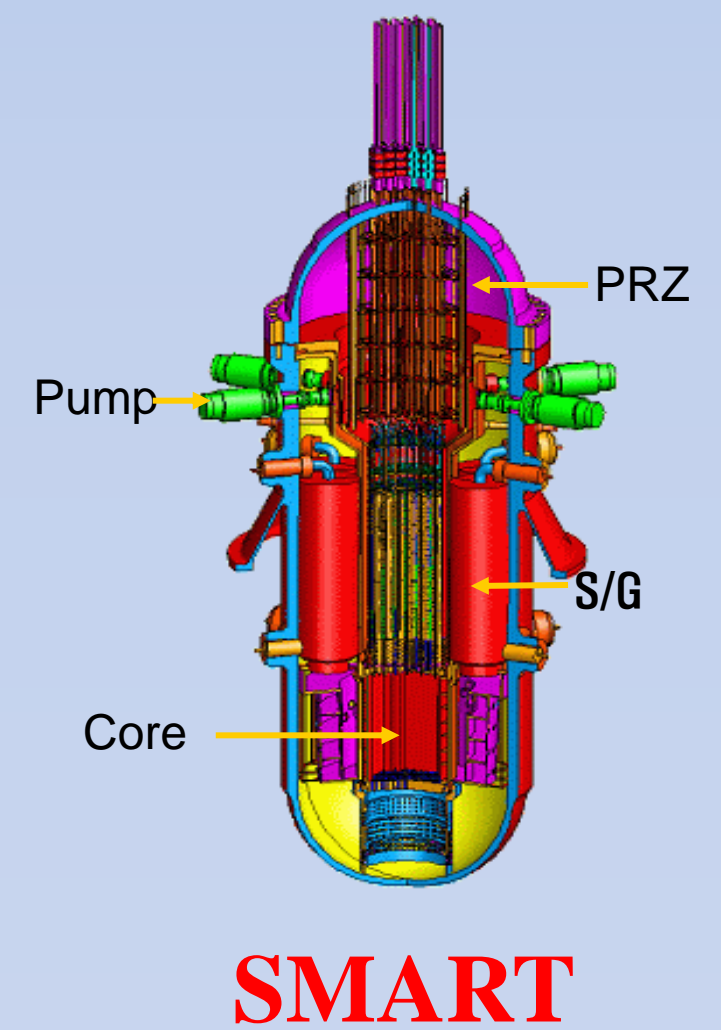
Small modular reactors (SMRs) are part of a new generation of nuclear reactor being developed worldwide. One of the beneficial advantages of SMR is the easy receptivity of advanced design concepts and technology. SMART (System integrated Modular Advanced Reactor), a small sized integral type PWR with a thermal power of 330 MW, is an advanced SMR.

Since several groups within a SMART design organization (e.g., mechanical engineering, main component design, system design, safety analysis, radiation protection groups) are interested in SMART reactor design and equipment selection, an ALARA evaluation team was installed in order to control and review all of design products within SMART organization.

2. Objective

The objective of this study is :

- a) to describe the organization and responsibilities in view of the need for upper-level management support and authority in order for the implementation of ALARA
- b) to provide the guidance and procedures for design, review and evaluation with a view to ALARA implementation,
- c) to provide the general design guidelines for SMART NSSS designers to implement ALARA principles in design stage, and
- d) to describe the training and instruction requirement of NSSS designers for the familiarization of ALARA principles to be implemented in NSSS designs.



3. Methods

To attain the integrated effort needed to keep exposures of the plant personnel ALARA, each applicant and licensee should develop an ALARA program that reflects the efforts to be taken by the SMART owner, nuclear steam supply system vendor, and architect-engineer to maintain radiation exposure ALARA in all phases of a plant's life. This program should be in written form and should contain sections that cover the generally applicable guidance presented in this guide, as a minimum. This program may be combined with the plant's radiation protection manual, safety analysis report, or other documents or submittals. It need not be an independent document.

A management policy for, and commitment to, ensuring that the exposure of station personnel to radiation will be ALARA, should be established.

In order to complete SMART design of ALARA concept, followings were checked and implemented:

- 1) ALARA Organization, Responsibilities, and Program
- 2) ALARA Design and Review
- 3) NSSS Design Guidelines for Occupational Radiation Exposures(ORE) ALARA including Source Term Reduction , Material Selection and Refueling Operation
- 4) Training and Instruction

4. Results and Discussion

This ALARA Design Concept for SMART provides

- 1) description of the organization and responsibilities needed for upper-level management support and authority in order for the implementation of ALARA,
- 2) guidance and procedures for design, review, and evaluation needed for SMART ALARA program implementation,
- 3) general design guidelines for SMART NSSS and BOP designers to implement ALARA principles in design stage, and 4) training and instruction requirement of SMART NSSS and BOP designers for the familiarization of ALARA principles to be implemented in NSSS designs.

5. Conclusions

Specifications for equipment should reflect the objectives of the ALARA program, including consideration of reliability, serviceability, limitations of internal accumulations of radioactive material, and other features addressed in ALARA design guide.

The SMART design based on ALARA concept for standard design was completed by the end of 2010.