

Self-assessment for the application of the IAEA Code of Conduct on the Safety of HANARO

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1. Introduction

The “Code of Conduct on the Safety of Research Reactors” [1] is one of the international protocols of the IAEA.

This code applies to the safety of research reactors at all stages of their lives from siting to decommissioning. The objective of this code is to achieve and maintain a high level of safety in research reactors. Even though this code is not a national safety regulation, it is important to meet the IAEA’s safety standards for the international market of research reactors. The scope of this paper is limited to the self-assessment of the role of the operation organization (Chapter VII of the code) of the HANARO, a 30 MW research reactor operated since 1995.

2. Methods and Results

In this section, the role of the operation organization, assessment levels, and the results of a self-assessment are described. The assessment levels refer to the guidelines of the 2014 IAEA meeting [2].

2.1 Role of the operation organization

Table I shows a paragraph description of the IAEA code for the role of the operation organization. Fifteen paragraphs show all stages of the RR’s lives.

Table I: Paragraph Description

Paragraph	Description Summary*
21	Management of safety
22	Assessment and verification of safety
23	Financial resources
24	Qualified human resources
25	QA programs
26	Human factors
27/28	Radiation protection
29	Emergency preparedness
30	Siting
31	Design, construction and commissioning
32	Operation, maintenance, modification and utilization
33	Extended shutdown
34/35	Decommissioning

*Details refer to the Code of Conduct on the Safety of Research Reactors

2.2 Assessment levels

Table II shows a level description for assessment. The assessment levels range from 0 (not applied) up to 3 (fully applied). The assessment levels refer to the guidelines of the 2014 IAEA meeting.

Table II: Level Description

Level	Description
Level 3	The recommendation is fully implemented.
Level 2	The recommendation is partially implemented with satisfactory progress.
Level 1	There is incomplete implementation, with significant gaps or limitations.
Level 0	The recommendation is not implemented.

2.3 Results of self-assessment

The levels are assessed by the reactor manager of HANARO. A parenthesis is the main consideration of each paragraph. The current status of HANARO for each paragraph is also described.

·*Management of safety* (The status of the management policies, the management structure, and the safety culture in the operating organization): Level 3

The reactor safety committee is in the HANARO Operation and Utilization Department. Safety culture is encouraged by the reactor manager.

·*Assessment and verification of safety* (The status of the safety analysis report (SAR), periodic safety reviews (PSR), and documentation thereof, conduct of operation and verification of the physical state of the reactor.): Level 3

SAR is periodically reviewed and updated. A PSR is being carried out. The verification of the physical state of HANARO is being carried out through a surveillance, testing and inspection in according to scheduled plan.

·*Financial resources* (The effective financing system for operation of the research reactor.): Level 3

HANARO is funded by the government (Ministry of Science and ICT).

·*Qualified human resources* (Available sufficient numbers of qualified staff and the status of training programs for operating personnel and users of the facility): Level 3

There are education and training programs for new employees. In addition, there are also refresh training

programs for reactor operators, and maintenance and other staffs.

·*QA programs* (The status of the establishment and implement of effective QA programs, including those for the experiments.): Level 3

The QA programs is well established. The regulatory body audits QA activities in operating organization every 2 years. The QA procedures are also periodically reviewed and updated.

·*Human factors* (The level of capabilities and limitations of the application of human factor consideration in operation and with respect to experiments.): Level 3

The operating procedure for testing and inspection describes difficulties of tasks and requirements of qualified persons.

·*Radiation protection* (The status of radiation protection system and measures for surveillance of exposure to the personnel and the environment.): Level 3

There is a program for radiation protection and a proper constraint of dose to workers, which is lower than a dose limit and practices for ALARA programs. Radiation monitoring consists of the monitoring of workers to determine the amount of radiation dose they receive, surveying both the radioactive contamination levels and the ambient dose rate at the workplace, and estimating the release of radioactive materials to the environment.

·*Emergency preparedness* (The availability of documented Emergency plans, performance of on-site and off-site drills, and arrangements for external assistance in response.): Level 3

The Emergency Plan (EP) and its implementing Procedures (EPIP) are prepared based on the radiation emergency preparedness act. In addition, emergency exercises for on-site and/or off-site emergency preparedness are held periodically.

·*Siting* (The status of programmers for continuing site-related evaluations and surveillance to ensure continued safety acceptability during the operational life time of the research reactor.): Level 3

SAR (chapter.2) and environment review report (ER) show the results of a site-related evaluation and surveillance.

·*Design, construction and commissioning* (The status of implementation of the recommendations in paragraph 31.): Level 3

Design, construction, and commissioning follow the IAEA standard and QA programs.

·*Operation, maintenance, modification and utilization* (The status of implementation of the recommendations in paragraph 32, with attention to the availability of safety-related documentation.): Level 3

Operating limits and condition manual (operational technical specification), operational procedures, maintenance procedures, experiments clearance and approval, fresh and spent fuel arrangement and surveillance procedures, waste management procedures, safety committee organization and functioning, and technical documentation management procedures are well prepared.

·*Extended shutdown*: N/A

HANARO will be operating more than 10 years. There is no plan to be an extended shutdown state.

·*Decommissioning* (The availability and scope of the plans for decommissioning of the research reactor.): Level 3

HANARO has plan for decommissioning. The report of “Initial Decommissioning Plan” was submitted to the regulatory body.

3. Conclusions

A self-assessment, limited to the role of the operation organization of HANARO, was conducted with reference to the “Code of Conduct on the Safety of Research Reactors”.

The results show that HANARO achieves and maintains a high level of safety.

REFERENCES

- [1] IAEA, Code of Conduct on the Safety of Research Reactors, IAEA-CODEOC-RR-2006, IAEA, 2006.
- [2] International Meeting on the Application of the Code of Conduct on the Safety of Research Reactors, IAEA Headquarters, Vienna, Austria, 16-20 June 2014.