Transactions of the Korean Nuclear Society Autumn Meeting
Gyeongju, Korea, November 2-3, 2006

IAEA Code of Conduct on the Safety of Research Reactors and Suggestions for Effective Application

W. S. Kim, Y. S. Choi, K. S. Choi, D. S. Shin
Korea Institute of Nuclear Safety
wskim@kins.re.kr

1. Introduction

In 1998, the International Nuclear Safety Advisory Group (INSAG) raised concerns about research reactors, especially those neither operating nor decommissioned (extended shutdown) in developing countries and recommended that the IAEA develop an international protocol or similar legal instrument to address these concerns. The board of IAEA requested the agency to develop and implement an international research reactor enhancement plan including preparation of a Code of Conduct on the Safety of Research Reactors. After holding two open-ended meetings to develop a draft code and circulating it to all Member States, the Code was adopted by the Board of IAEA in March 2004. This paper presents what the Code of Conduct [1] is and what the Member States have to do. In addition, several suggestions are identified for effectively applying the Code of Conducts to domestic research reactors.

2. Major Contents of the Code of Conduct

In general, the Code of Conduct is the non-binding international instruments that provide guidance for development and harmonization of national policies, laws, and regulations and set forth desirable attributes. Therefore, the Code of Conduct on the safety of research reactors offers "best practice" guidance for management of research reactor safety. It includes technical provisions based on consensus documents, primarily IAEA Safety Fundamentals and Requirements [2-4].

The Code applies to the safety of research reactors at all stages from siting to decommissioning, but does not apply to physical protection of research reactors. Military-purposed research reactors are beyond the scope. The Code aims to achieve and maintain a high level of safety through enhancement of national measures and international co-operation.

The Code states that the Member State should apply it through national safety regulation; make appropriate use of IAEA safety Standards; apply a graded approach commensurate with the hazard potential, while maintaining a strong safety culture; and communicate any difficulties faced and assistance required in application of the Code to the IAEA. The Code covers 14 topics listed in Table 1.

Table 1 Topics addressed in the Code

• Legal and Governmental Infrastructure
• Regulatory Process
• Management of Safety
• Assessment and Verification of Safety
• Financial and Human Resources
• Quality Assurance
• Human Factors
• Radiation Protection
• Emergency Preparedness
• Siting
• Design, Construction, Commissioning
• Operation, Maintenance, Modification, Utilization
• Extended Shutdown
• Decommissioning

Among the articles of the Code, the followings seem to be more important because of their impacts on nuclear environment in Korea.

- The regulatory body should be **effectively independent from organizations or bodies charged with promotion** of nuclear technologies or with operation of research reactors;
- The State should, if it deems necessary, define how **the public and other bodies are involved** in the regulatory process;
- The State should take appropriate steps to ensure that **arrangements are put in place to inform neighboring States** in the vicinity of a planned research reactors;
- The operating organization should **carry out safety reviews at appropriate intervals** through its life.

3. Significance and Limitations of the Code

Issuing the Code is highly desirable because it provides an international guidance to establish the roles of government, regulatory bodies and operating organizations to enhance and maintain a high level of research reactors' safety. But, there are some limitations. It is a non-mandatory instrument. Original articles suggested by INSAG were reduced from 42 to 36 articles. Other issues contain (1) no articles related

to aging management and life extension; (2) no explicit guidance on the application of a graded approach; (3) ambiguity on the international co-operation; (4) immaturity on the consensus of public involvement in the regulatory process; (5) exclusion of the existing research reactors from the application of informing neighboring States in the vicinity of a planned research reactors, etc.

4. Considerations for implementing the Code

Research and training reactors subject to application of the Code are shown in Table 2. HANARO operated by KAERI is expected to comply with most articles of the Code. The conclusion of compliance is based on the IAEA peer review performed in 2004. The review report was prepared according to the safety requirements specified in the Convention on Nuclear Safety [5] and the Code of Conduct. The review team suggested some recommendations to enhance the safety of HANARO. Considering conformity with the Code, current regulations and technical standards for research reactors should be improved in the following aspects;

- **Regulatory independence** from organization charged with operation of research reactors
- Regulation for **periodic safety review** of research reactors
- Regulation for provision of **sufficient human resources and budget**

If a new research reactor is planned to build in the near future, the article of the Code related to informing neighboring countries of a planned research reactor could affect the construction and licensing of a new research reactor. It is necessary to make preparation against the request from surrounding countries to inform a planned research reactor.

As shown in Table 1, training reactor operated by Kyung Hee University (KHU) has quite less thermal power than HANARO has. The Code states that the States should adopt a graded approach to application of the guidance in the Code commensurate with the hazard potential. The thermal power may be one factor to estimate the radiological hazard. Therefore, regulatory body should establish the guidance for the application of a graded approach to the training reactor in KHU.

5. Suggestion for Effective Application of the Code

Although the Code of Conduct is non-binding instrument, it is expected to require for the States to implement it because another Code of Conduct on “the safety and security of radioactive sources [6] became mandatory after three years discussion among the States. Therefore, it is necessary to prepare for the mandate of the Code, including the regulatory independence and periodic safety review. The application of a graded approach should be considered in revising regulatory framework for research reactors. It is recommended to verify the compliance with the Code by performing regulatory inspection or self assessment.

REFERENCES

[1] Code of Conduct on the Safety of Research Reactors, March 2004, IAEA
[2] IAEA SS No. 110 : Safety of Nuclear Installations, 1993, IAEA
[3] IAEA NS-R-4, Safety of Research Reactor, 2005, IAEA
[4] IAEA INSAG-10 : Defence-in Depth in Nuclear Safety, 1996, IAEA
[5] Convention on the Nuclear Safety, Oct. 1996, IAEA
[6] Code of Conduct on the Safety of Research Reactors, Sept. 2003, IAEA

Table 2 Status of Research and Training Reactors in Korea

Reactor Types	Researcher Reactors			Training Reactor
	TRIGA MARK-II	TRIGA MARK-III	HANARO	AGN-201
Operating Organization	KAERI	KAERI	KAERI	Kyung Hee University
Thermal Power	250 KW	2 MW	30MW	0.1W
Operation	1962	1972	1995	1982
Fuel	20% Enriched Uranium	70% Enriched Uranium	20% Enriched Uranium	20% Enriched Uranium
Remarks	- Under Decommissioning - Suspension Report (1996) - Discontinuation Report (1996) - Decommissioning Approval (2000)	- Under Decommissioning - Suspension Report (1996) - Discontinuation Report (1998) - Decommissioning Approval (2000)	- Full Power Operation since Feb. 2005	- Application of Power Uprate (0.1W→10W)