

Topical Peer Reviews, ARTEMIS and other Approaches to Peer Review

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1

Korean Experience of Topical Peer Review: IRRS 2014 Extended Follow-up Mission

Overview

- **Brief History of IRRS Mission to the Republic of Korea**
 - Initial mission in 10-22 July 2011
 - Preparatory meeting of Extended Follow-up Mission in July 2014
 - Extended Follow-up Mission in 8-19 December 2014
 - Final report submitted in March 2015

- **Major Achievements of 2014 Extended Follow-up Mission**
 - Closure of 9 out of 10 recommendations & all 12 suggestions of the 2011 IRRS mission
 - Systematic implementation of a comprehensive action plan made in 2011
 - Significant progress and improvements in many areas since the 2011 IRRS mission

- **Summary of Outcomes of 2014 Extended Follow-up Mission**
 - 3 Good practices
 - 9 Recommendations
 - 9 Suggestions



Overview (cont'd)

■ **Progress since 2011 IRRS mission**

- Establishment of independent and competent regulatory body (NSSC)
- Addressing the findings of the 2011 IRRS mission systematically and comprehensively
- Commendable performance in improving regulatory system for nuclear safety
- Numerous improvements to enhance public information and involvement in nuclear safety
- Considerable progress in the application of lessons learned from the Fukushima Daiichi accident and the counterfeit, fraudulent and suspect items (CFSI) event

■ **Purpose of 2014 Extended Follow-up Mission**

- To review the measures undertaken following the recommendations and suggestions of the 2011 IRRS mission

Overview (cont'd)

■ Review Team

(Led by Georg Schwarz, ENSI)

- 16 Senior Regulatory Experts from 15 IAEA Member States
- 1 Observer
- 3 IAEA Staff Members
- 1 IAEA Administrative Assistant

■ Korean Counterparts

- NSSC (Nuclear Safety and Security Commission)
- MOHW (Ministry of Health and Welfare)
- MOE (Ministry of Environment)
- KINS (Korea Institute of Nuclear Safety)
- KINAC (Korea Institute of Nuclear Nonproliferation and Control)



Overview (cont'd)

▪ **New Extended Scope of Mission**

• **New Areas**

- Fuel Cycle Facilities
- Radioactive Waste Management Facilities
- Decommissioning Activities
- Radiation Sources including Code of Conduct on the Safety and Security of Radioactive Sources
- Transport of Radioactive Material

• **New Additional Areas**

- Occupational Radiation Protection
- Control of Medical Exposure
- Radioactive Discharges
- Environmental Radiation Monitoring
- Control of Radioactive Discharges and Materials for Clearance
- Existing Exposure and Radon
- Interfaces with Nuclear Security

• **2 Policy Issues**

▪ **Review on 2011 IRRS Mission**

- Module 1~10 in the 2011 IRRS Mission
- Additional Review Scope
 - Counterfeit, fraudulent and suspect items (CFSI)
 - Post Fukushima Daiichi accident actions



Counterfeit, Fraudulent and Suspect Items (CFSI) Initiative



Revelation of Forgery
In 2012



Investigation & Confirmation
In Nov 2012



Full Investigation &
New Discovery



Legislative Changes since 2011 IRRS Mission

- Law was revised to provide NSSC with power, legislating to strengthen regulation of supply chain via inspection and enforcement.
- Further revisions of the law make it a legal requirement for the supply chain to report non compliances to the NSSC.
- The revised law requires NSSC to designate an expert organization to evaluate and inspect the equipment testing laboratories.
- The revised law also requires the Periodic Safety Review for NPP and research reactors to undertake an analysis and review of safety culture.

The new requirements of revision to Article 22 of NSA will increase the scope of inspection activities of NSSC and KINS to encompass suppliers and testing laboratories to strengthen the regulatory oversight of the supply chain.

Regulatory Actions after Fukushima Daiichi Accident



Changes since 2011 IRRS Mission

Safety Improvement Actions

- 50 action items identified by Special Safety Inspections (SSI) in NPPs
- 10 more action items determined by utilities from experience and self-evaluation

Implementation Status of Improvement Measures

- 53 of 60 action items have been implemented so far
- Important safety improvements still in progress

Stress Test of Selected NPPs

- Stress Test (ST) of nuclear power plants beyond its original design lifetime
- ST of Wolsong Unit 1 and Kori Unit 1 was completed
- ST covers 6 areas and consists of 3 steps: self-assessment; technical review of results; reporting

Future Actions

- 3 complementary safety improvement measures will be applied to all operating and new plants
- Regulations and guides are expected to be revised to cover BDBAs including aircraft crash
- Revision of safety objectives and goal to cover extreme natural hazards

Conclusion

NSSC and KINS made considerable progress in the application of lessons learned from TEPCO Fukushima Daiichi accident to the improvement of nuclear safety in Korea

Policy Issue 1 : Roles & Functions of the Regulatory Body in Building Nuclear Safety Regulation Policy

- Various governmental bodies perform nuclear and radiation safety functions



Mechanisms for Policy Coordination among Governmental Bodies



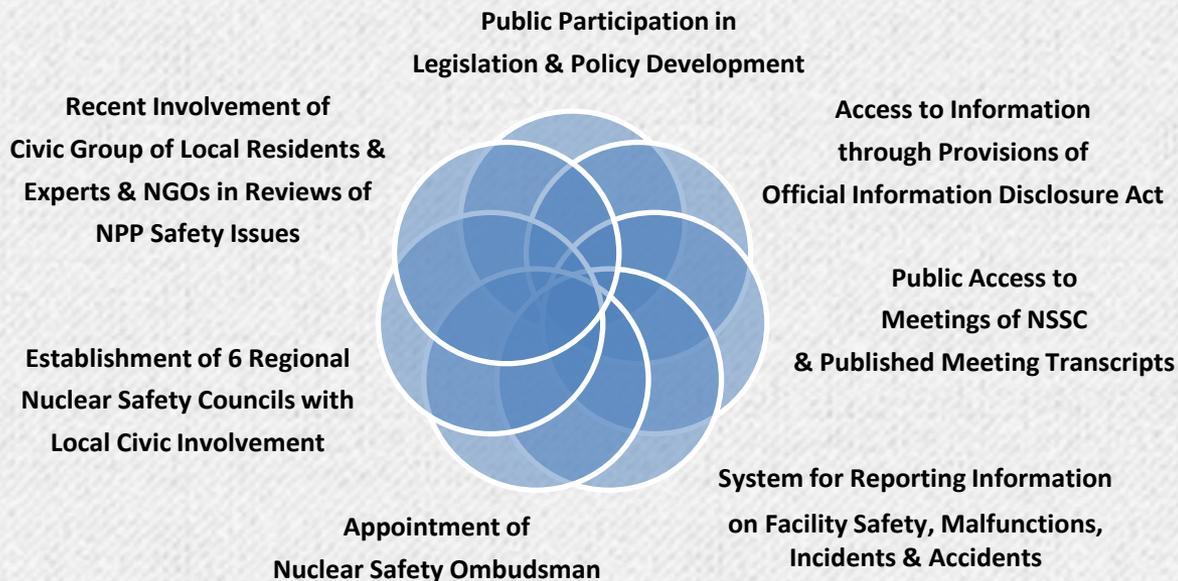
Areas for Improvement

- Need for experience exchange on licensing of import & export of sealed source between NSSC, Korean Radiation Safety Foundation & Korean Customs Service
- Need to control radiation hazards and non-radiation hazards that coexist in nuclear facilities
- Potential overlaps in regulation of medical exposures between NSSC & MOHW
- Need for efficient coordination on transport of radioactive material between NSSC & Ministry of Land, Infrastructure and Transport
- Need for coordination on national dose registers between NSSC & MOHW

Policy Issue 2 : Stakeholder Involvement

“Stakeholder involvement” was selected as a policy issue to review the initiatives taken since 2011 to **rebuild public trust** that have eroded due to Fukushima Daiichi accident, CFSI events, and cover-up of the station blackout at Kori 1, etc.

NSSC and KINS have taken actions and initiatives to engage more actively the stakeholders involvement including the media in the regulation of nuclear and radiation safety.



Initiatives for Openness, Transparency & Stakeholder Involvement

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ARTEMIS and other Approaches to Peer Review

IAEA ARTEMIS and others

- **An integrated review service for radioactive waste and spent fuel management, decommissioning and remediation programmes**
- **Objective: to provide independent expert opinion and advice on**
 - ✓ radioactive waste and spent fuel management,
 - ✓ control of nuclear discharges to the environment,
 - ✓ decommissioning, and
 - ✓ environmental remediation issues
- **Based on IAEA safety standards, technical guidance, international good practice**
- **Others: OSART (Operational Safety Review Teams)
IPPAS (International Physical Protection Advisory Service)**

Learn more at
www.iaea.org/artemis

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Conclusion

Lessons learned

- **Peer Review on Non-Nuclear facilities, which have been under lesser attention, resulted in a quantum leap of infrastructure:**
 - **Further strengthening the coordination of and liaison between the various authorities involved in radiation safety such as Ministry of Environment & Ministry of Health & Welfare**
 - **Establishing the legal basis for periodic safety reviews for fuel cycle facilities and radioactive waste management facilities**
 - **Requiring integrated safety assessment for fuel cycle facilities, including chemical and industrial hazards**
 - **Improving the radiation safety framework for workers in non-nuclear facilities, patients and the public by better applying the principles of justification and optimization**
 - **Developing and implementing an action plan to address existing exposure situations in nearby living environment, in particular in relation to radon**
 - **Establishing a unique national dose record register to facilitate dose records keeping and for allowing easier access to the data**

Lessons learned

- **After Fukushima, in spite of the special inspections to all NPPs and the performance of stress tests,**
 - extremely high level of public anxiety on nuclear safety due to CFSI etc.
 - growing voice of 'escape nuclear' by politicians, social leaders such as lawyers, professors and medical doctors, and by NGOs
 - spending a lot of extra resources by Government for the reverse of the atmosphere of public distrust on nuclear safety, provoked by Fukushima
 - nuclear engineering is no more attractive and promising job for the young and difficult to recruit new well qualified human resources in nuclear industries
- **Played the role of objective verification process and contributed significantly to the recovery of public confidence on nuclear and radiation safety**
 - without the public trust on and the assurance of nuclear and radiation safety, no more sustainable use of nuclear energy as major source of energy for further and consistent development of a nation

Lessons learned

- **Self-assessment has served as very effective opportunity and means for accelerating the implementation process of IAEA safety standards**
 - **Self-assessment: Important & beneficial process, but huge workload**
- **Linkage with the three-year-round self-assessments by the Convention on Nuclear Safety and/or Joint Convention could be one way of solution for the efficient use of limited regulatory resources**

" Safety is Our Priority "

Thank you 감사합니다

**Appendix: IRRS 2014 Extended Follow-up Mission
Recommendations, Suggestions
& Good Practices**

Recommendations

No.	Contents
RF1	The Government and NSSC should develop the legal basis for the requirement of an integrated safety assessment for fuel cycle facilities, that includes chemical and industrial hazards and require a safety analysis report (SAR) as part of a licence application.
RF2	The Government should establish the legal basis for periodic safety review for fuel cycle facilities and all radioactive waste management facilities.
RF3	The NSSC should ensure that arrangements are put in place for the justification of any type of practice involving radiation sources to be included in the review and assessment programme to ensure that only justified practices are authorized.
RF4	The Government should amend the legal framework to enable NSSC to regulate integrated management systems of organisations directly responsible for operating nuclear facilities and activities and providing services, consistent with the relevant IAEA safety requirements.
RF5	The Government should establish the legal basis that enables oversight of safety culture of organizations directly responsible for operating facilities and activities and providing services.
RF6	NSSC should review and more promptly amend the national regulations for the transport of radioactive material when the provisions for transport of radioactive material in the international regulations are revised, including incorporating the transitional arrangements of the IAEA Regulations for the Safe Transport of Radioactive Material into the Korean regulatory framework.
RF7	NSSC should introduce in the regulatory framework the concept of the supervised areas in addition to the controlled areas and ensure they are implemented consistent with GSR Part 3.
RF8	NSSC should ensure that measures are taken to ensure appropriate monitoring of internal exposure in nuclear medicine.
RF9	The regulatory body should develop and implement an action plan to address existing exposure situations in particular in relation to radon to ensure adequate protection of the public and the workers consistent with GSR Part 3.

Suggestions

No.	Contents
SF1	The Government and NSSC should consider further strengthening the coordination of and liaison between the various authorities involved in nuclear and radiation safety.
SF2	The Government should consider future allocation of human resources to the regulatory body commensurate with the nature and number of facilities and activities to enable the fulfilment of necessary regulatory functions and responsibilities.
SF3	NSSC should consider the development of Notices specific for fuel cycle facilities and guidance to implement a graded approach to regulation.
SF4	The NSSC should consider the establishment and enforcement of requirements for optimization of radiation protection in non-nuclear facilities.
SF5	NSSC and MOHW should consider the need for establishing a unique national dose record register to facilitate dose records keeping and for allowing easier access to the data for radiation protection purposes.
SF6	NSSC should consider establishing regulations to protect workers who are engaged in work that involves a source that is not under the control of their employer in non-nuclear facilities and activities consistent with GSR Part 3.
SF7	The NSSC in cooperation with the MOHW should consider developing an oversight method for clinical level justification of medical imaging and radiation therapy.
SF8	NSSC should consider defining diagnostic reference levels consistent with the principle of optimization.
SF9	The regulatory body should consider establishing specific reference levels in compliance with IAEA Standards for commodities containing radionuclides, including those of natural origin, in terms of activity concentrations.

Good Practices

GPF1:

Operation of real-time Radiation Source Location Tracking System for High Activity Sealed Source

- Korea is the only country to have a real-time online tracking system
- Radiation Source Location Tracking System (RADLOT) tracks the precise location of Cat I and Cat II sealed sources
- GPS network registers 850 devices and will be expanded to 1400 devices from 2016

GPF2 :

Implementation of well-balanced graded approach for inspection and completing full scope inspections of fuel cycle facility

- NSA Enforcement Regulation prescribes the timing for inspection of radiation sources practices into 1, 3, and 5 year cycle
- KINS fuel cycle facility inspection program is efficient since it covers all elements of the facilities structures, systems and components

GPF3 :

Establishment of comprehensive approach for managing interface between safety & security

- Korea has established effective system to address safety & security interface
- It also has identified specific provisions important for integration of safety and security
- It has provided sufficient background for strengthening regulatory oversight in licensed organizations