Review on Advice from IAEA on Fukushima Remediation

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The IAEA International Mission and the its Follow-up Mission

The IAEA International Mission

◆ Date : 7-15 October 2011

♦ Objective

- To Provide assistance related to Japan's plans to remediate large areas contaminated by the accident at the TEPCO Fukushima Daiichi NPP

- To review Japan's ongoing remediation related strategies, plans and activities, including contamination mapping

- To share its findings with the international community

◆ Participants (IAEA) : 12 specialists

Destination : Tokyo (opinion exchange with relevant ministries), Fukushima (Date City, litate Village, TEPCO Fukushima Daiichi NPP etc.)

The Follow-up IAEA International Mission

• Date : 14-21 October 2013

◆ Objective

- To provide assistance to Japan in assessing the progress made with the remediation of the Special Decontamination Area and the Intensive Contamination Survey Areas

- To review remediation strategies, plans and works, in view of the advice provided by the previous mission on remediation of large contaminated off-site areas

- To share its findings with the international community as lessons learned

◆ Participants (IAEA) : 13 specialists

Destination : Tokyo (opinion exchange with relevant ministries), Fukushima (Fukushima City, Date City, Tamura City, Okuma Town etc.)

IAEA-MOE Experts' Meeting

- Objective
- To discuss the current status (progress, achievements, challenges and future endeavors) of environmental remediation activities taking place in off-site areas affected by the accident at the TEPCO Fukushima Daiichi NPP
- To provide assistance to Japan, as appropriate, in considering approaches that can foster further progress with the environmental remediation works currently being undertaken or planned
- To collect the extensive experience accumulated so far by the MOE in the implementation of the remediation activities with the aim of sharing relevant findings with the international community

Date

1st meeting : 4-5 February 2016

2nd meeting : 14-18 November 2016

3rd meeting : 17-21 April 2017

4th meeting : 6-10 November 2017

Destination

1st meeting : Tokyo

2nd meeting : Tokyo and Fukushima (Fukushima prefectural government, litate Village, Date City, Miharu Town, Okuma Town etc.)

3rd meeting : Tokyo and Fukushima (Minamisoma City, Date City)

4th meeting : Tokyo and Fukushima (Minamisoma City, Date City)

◆ Future plan

To prepare a consolidated report on the results and achievements of the four Experts' Meetings

Main Highlights Pointed out at the First Mission (Oct. 2011)

- Japan allocated quickly the necessary legal, economic and technological resources and the Fukushima Decontamination Promotion team with related authorities
 - ➢ Decontamination Promotion Team (Sep. 2011) → Fukushima Office for Environmental Restoration (Main Actor; MOE with cooperation of related ministries)
 - the Special Act enforced on January, 2012
 - ✓ Lesson learned : Required regulatory framework for nuclear disaster with Setting evacuation zone, Evacuation of residents, Environmental remediation, Management of radiation dose, etc.
- Early efforts on remediation independently by municipality, NPOs, etc, just after the accident
 - Active efforts on remediation by prefectural gov. and municipality; school field, kindergarten, municipality office as a base of decontamination
 - ✓ Lesson learned: arbitrary announcement of radiation dose → distrust by municipality and resident Different decontamination means, How to treat contaminated materials, Contamination of workers, Prevention of unnecessary radiation exposure

関係ガイドライン

- Preparation of consolidated decontamination catalogue based on decontamination model tests
 - Decontamination guideline (issued on Dec, 2011, and revised on May, 2013)
 - Contaminated waste guideline (issued on Dec. 2011)
 - Lesson learned: Preparation for safety secure on nuclear disaster UK: Recovery handbook 2009
 - (For inhabited areas, Drinking water, Food production)
 - EU: EURANOS 2006

Main Highlights Pointed out at the First Mission (Oct. 2011)

除沙盲

- Integration of monitoring, mapping \rightarrow disclosure of real-time dose rate to the public
- Transition of radiation dose, real-time dose by a monitoring post set-up in municipality
- Follow-up remediation in hot-spot areas around houses and roads required by residents

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◆富岡町内における空間線量率の状況(空間線量率 1m 平均値(µSv/h))

富岡町除染検証委員会報告書(令和元年6月26日)より引用



New Regulation on Radioactive Cesium in Foods/Water

	Drinking water (Bq/kg)	Milk (Bq/kg)	Foods (Bq/kg)	Foods for Infant (Bq/kg)
Japan (New regulation, Expected from April) Under discussion	10	50	100 (incl. Dairy product	50
Japan (Provisional regulation (*))	200	200 (incl. dairy product)	500	300 (incl. power milk)
USA	1200	1200	1200	1200
EU (**)	1000	1000	1250	400
Codex Alimentarius	1000	1000	1000	1000

Main issues advised at the First Mission (Octo. 2011)

- Advice : Practical implementation of "Justification and Optimization" principle
 - Refer to 1 mSv/y as additional dose at early stage (political remark)
 - Misleading residents that remediation will achieve 1 mSv/y

Lesson learned:

- An intermediate target level to be achievable may be set that is scientifically acceptable;
 What level is reasonable ? What is the basis?
- ✓ Generation of remarkable amount of low-level contaminated soil and waste
- Advice : Realistic setting of clearance level that can be recycled and reuse
 - Demonstration tests in Minami-soma and litate
 - > Key issue; promoting acceptance of residents

(General waste of 8000Bq/kg or less can be disposed of at existing waste landfill facilities in municipalities)

Lesson learned:

- ✓ Applying the principle of "Justification and Optimization"
- ✓ What is an optimized remediation means?
- Determination of measures by involvement of residents





Main issues advised at the First Mission(Oct. 2011)

- Advice : exploring appropriate "end-point" for wastes
- Operation of controlled landfill facility for waste in the Countermeasure Areas, designated waste, etc. (8,000Bq/kg-100,000Bq/kg)
- Operation of Interim Storage Facility

Future issues:

- ✓ Volume reduction, recycle and reuse, exploring countermeasures of final diposal
- $\checkmark~$ Restoration of temporary storage site in original form
- Advice : appropriate remediation for forest; before investing substantial time and efforts, it should consider to bring greater benefit
 - Policy: remediation up to 20m from house boundary, and area with human activity
 - Follow-up remediation if necessary, mainly based on by request of residents
- Advice: stakeholder involvement (central government, local government, residents, academia, etc.
 Lesson learned
- ✓ Holistic and comprehensive dialogue with residents
- ✓ To avoid confusion caused by different voices that accelerate the distrust of residents



Follow-up remediation in Namie Town)

Main Highlights Pointed out at the First Mission (Oct. 2013)

- Involvement of a wide range of ministries and agencies to support remediation by providing financial resources, technical guidance and institutional assistance toward return of evacuees
- Good progress of remediation in the Intensive Contamination Survey Area and the Special Decontamination Area, currently,
 - > Lifting evacuation order until April 1, 20172017 except the unforeseen area of return
 - Lifting evacuation order in a part of the unforeseen area of return on April 10, 2019 (Okumatown)
- Setting up a team to conduct a study on "Safety and Security Measures towards Evacuees Returning Home"
 - Counseling system, etc.
- Measurement of individual external dose is beneficial to confirm the expected decreasing trend and justify the remediation decision
- Good progress of remediation of farmland, and intensive monitoring of foodstuff,
 - Currently, reopening of farming
 - Returning is not so much progressing, (Tomioka, Namie, Katsurao)



ファントムに取り付けた個人線量計(A1~D)から求めた積算個人線量(縦軸)と、空間 線量率から推定した積算空間線量(横軸)との相関

東京電力(株)福島第一原子力発電所事故に係る個人線量の特性に関す る調査、放射線医学総合研究所、日本原子力研究開発機構、NIRS-M-270, 平成26年4月

Summary

- Accepted the mission from IAEA to review and advise on the progress of the environmental remediation in contaminated areas by the 1F accident on two occasions in October 2011 and October 2013
- Received many highlighted points and advices for the next stage
- The first mission was an essential opportunity because of preparation of remediation strategy and its implementation, waste treatment, and adaptation of radiation dose standard, since much time has not passed after the accident.
- The second mission acknowledged that many of the first advice was achieved in practical implementation.
- Some issues should be followed institutionally and technically in next stage. In that case, dialogue and discussion with stakeholders concerned are essential.
- Lots of lessons learned were produced, and it is extremely important to share this knowledge and experience not only domestically but internationally.

References:

- Decontamination Projects for Radioactive Contamination Discharged by Tokyo Electric Power Company Fukushima Daiichi Nuclear Power Station Accident, March 2018, MOE, ISBN 978-4-600-00139-1
- FY2014 Decontamination Report A compilation of experiences to date on decontamination for the living environment conducted by the Ministry of the Environment -, March, 2015, MOE

Examples of advices from the IAEA International Mission, the Follow-up IAEA Mission and MOE-IAEA Experts' Meetings

<Advice about communication (examples)>

- ◆ To enhance communication as following points (Follow-up IAEA Mission)
- Any level of individual radiation dose in the range of 1 to 20 mSv per year is acceptable and in line with the international standards
- An additional individual dose of 1 mSv per year is a long-term goal, and that it cannot be achieved in a short time solely by decontamination work
- Establishment of a mechanism to share the achievements and lessons learned obtained in a municipality to the others (MOE-IAEA Experts' Meeting)

<Advice about environmental remediation activity (example)>

Before investing substantial time and efforts in remediating forest areas, a safety assessment should be carried out to indicate if such action leads to a reduction of doses for the public. If not, efforts should be concentrated in areas that bring greater benefits. This safety assessment should make use of the results of the demonstration tests. (IAEA International Mission)

<Advice about monitoring (example)>

 It is important to implement continuous efforts to utilize of the individual exposed dose (effective dose measured by personal dosimeter) (Follow-up IAEA Mission)

<Advice about management and sharing information (examples)>

- To encourage the establishment of a mechanism and platform for learning and sharing the lessons from the development and implementation of Temporary Storage Sites between municipalities (Follow-up IAEA Mission)
- Information management concerning the environmental remediation and the management of waste (storage, transportation, treatment technology) and sharing between municipalities and international societies (MOE-IAEA Experts' Meeting)

Examples of advices from the IAEA International Mission,

the Follow-up IAEA Mission and MOE-IAEA Experts' Meetings (continued)

<Advice about Interim Storage Facility (ISF) (example)>

 Conducting safety assessment and review by an independent agency for the construction of facilities (e.g. ISF, treatment plants) (MOE-IAEA Experts' meeting)

<Advice about management of removed soil (examples)>

- Consideration for an independent evaluation for the safety of the facilities for the long-term management of contaminated substances (IAEA Follow-up mission)
- The Mission Team encourages the Japanese authorities to actively pursue appropriate end-points for the waste in close cooperation with stakeholders. The national and local governments should cooperate in order to ensure the provision of these facilities. A lack of availability of such an infrastructure would unduly limit and hamper successful remediation activities, thus potentially jeopardizing public health and safety. (IAEA Follow-up mission)

<Advice about recycling of the removed soil (examples)>

- Radiation protection training for construction workers is required, including the particular methods to minimize external and internal dose (from inhalation). When handling radioactive material (e.g. Cs-137), workers' personal exposure dose should be monitored. (MOE-IAEA Experts' meeting)
- Recycling soils directly from the Temporary Storage Site without transporting them to the ISF to ease resource constraints. (MOE-IAEA Experts' meeting)

<Advice about institution, review and evaluation (example)>

To review the Act of Special Measures in a way to provide alignment with the IAEA GSR Part 3. (Specifically by addressing the requirements contained in the chapter related with "Existing Exposure Situations")