Action Plan on Nuclear Safety

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IAEA response to Fukushima Daiichi accident includes:

**Nuclear Safety Action Plan:**
Defines a programme of work to strengthen the global nuclear safety framework.

**IAEA Fukushima Report:**
Assessment of the accident that is technically comprehensive, factual and balanced, addressing the causes and consequences as well as lessons learned.
Background

Action Plan built on:

- IAEA Ministerial Conference on Nuclear Safety *(Jun 2011)*
  
  *Ministerial Declaration*
  
  *DG Proposals*
  
  *Ministerial Working Sessions*

- 1st IAEA Fact Finding Mission to Japan *(May/Jun 2011)*

- INSAG Letter Report *(Jul 2011)*

- Consultation with Member States

Action Plan unanimously endorsed at the IAEA General Conference (September 2011)
Key facts:

- 12 key actions, including 39 sub-actions
- Current Status: 541 out of 906 IAEA activities have been completed (~ 59%)
- Dec 2011- Dec 2013: ~ 20 M€ expenditures

Focusing on transparency:  [http://www.iaea.org/newscenter/focus/actionplan/](http://www.iaea.org/newscenter/focus/actionplan/)
Action Plan success depends on Stakeholders involvement

Regulatory bodies
Operating Organizations
Nuclear industry
Technical Support Org. (TSO)
Research institutions
Education institutions

IAEA (NSAT)
Member States

Other International Organizations

European Commission
CTBTO
FAO
ICRP
ILO
INSAG
INSAG
OECD/NEA
WANO
WHO
WMO
UNSCEAR

Nuclear Energy
Nuclear Applications
Nuclear Safety
Technical Cooperation
Office of Legal Affairs
Monaco & Seibesdorf labs

SAFER
The IAEA Action Plan
Nuclear Safety Action Plan areas of work

- Safety Assessments
- IAEA Peer Reviews
- Emergency Preparedness and Response
- National Regulatory Bodies
- Operating Organizations
- IAEA Safety Standards
- International Legal Framework
- Member States Embarking on Nuclear Power
- Capacity Building
- Protection from Ionizing Radiation
- Communication
- Research & Development
IAEA Missions to Japan

Fukushima Accident
Mar 2011

Fact-Finding Mission
May 2011

IAEA Action Plan
Sept 2011

Remediation of large contaminated area off-site Fukushima NPP

1st Mission
Oct 2011

Review Japan Safety Assessments NPPs
Jan 2012

Expert Mission
Onagawa NPP
Aug 2012

Follow-up
Oct 2013

Peer Review Mid-and-Long-Term Roadmap towards Decommissioning

1st Mission
Apr 2013

2nd Mission
Dec 2013

2011

2012

2013

2014
Mission to Review NISA’s approach to the “Comprehensive Assessments for the Safety of Existing Power Reactor facilities”
(Tokyo and Ohi, Japan, 23 – 31 Jan 2012)

Review based on the IAEA Methodology to Assess the Safety Vulnerabilities of Nuclear Power Plants against Site Specific Extreme Natural Hazards.

- Several recommendations and suggestions to improve the effectiveness of their assessment
- Ohi NPP as example
- The regulatory process and guidance
- External hazards evaluation
- Safety margins
- Plant vulnerabilities: station blackout, loss of ultimate heat sink
- The need for Severe Accident Management (SAM) programs

Final Report Available online
Expert mission to Onagawa NPP to examine performance of SSC’s following the earthquake and tsunami

(Onagawa, 30 July - 11 August 2012)

To examine the performance of SSC’s following the Great East Japan Earthquake and Tsunami:

- Earthquake Damage to Systems
- Systems Interactions
- Seismic Interactions
- Retention of Pressure Boundary & Interconnections
- Seismic Experience Data Collection

“remarkably undamaged given the magnitude, distance and duration of ground motion”

IAEA Mission report

Report available [here](#)
International Experts’ Meetings (IEM’s)

Action on communication: enhance transparency and effectiveness of communication and improve dissemination of information

Main goal of the IEM’s:

- Analyse relevant technical aspects from the Fukushima Daiichi accident
- Learn the lessons from the Fukushima Daiichi accident
- Share lessons learned

<table>
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IEM 8: Research and Development - Q1 2015
IEM 1 - Reactor and Spent Fuel Safety in the Light of the Accident at the Fukushima Daiichi NPP
(19-22 March 2012)

Focus:

• Defense in Depth (DiD)
• Protection against extreme events and external hazards
• Station blackout and loss of ultimate heat sink
• Hydrogen management
• Containment systems and venting
• Instrumentation and control (I&C)
• Safety of spent fuel pools

Conclusions:

• Preventing accidents, but also on mitigating them
• Multi-unit nuclear power plant sites
• Improve plant resistance to hazards beyond the design basis
• Consider lessons learned for incorporation into the IAEA safety standards
• Still much to be learned and shared: Need to stronger international interaction
Focus:

- Seismic, tsunami hazard assessment & Special flooding issues
- Uncertainties associated with hazard assessments
- Approaches to establishing design values
- Addressing beyond design basis events
- Safety against earthquakes and tsunamis

Conclusions:

- Appropriate safety margins in NPP
- Probabilistic assessments in evaluation of safety margins
- Deterministic seismic design basis for safe shutdown not less than 0.1g
- Failure modes of critical SSCs
- Hazard assessments for each site
- Periodic re-evaluation of extreme natural hazards and NPP response
- Consider complex combinations of natural hazards and effects on multi-unit sites
- Exchange of information and dissemination of results worldwide
Focus:
Ways to improve nuclear safety culture across a range of key institutions, including operators and regulators.
- Integrated approach to safety / Safety culture
- Relationship between regulator and operating organization
- Role of human and organizational factors in emergency preparedness and response

Conclusions:
- Integrated or systemic approach to safety
- Flexibility in the response to events and Preparation for managing the unexpected
- Safety culture: Regulators, Operating organization and operators
- The interaction between Individuals, Technology and Organizations (ITO)
- Support for newcomer countries
- Safety culture during phase out of a national nuclear energy programme
Focus:
- Improvements to SAMGs
- Equipment and Training Needs for Severe Accident Response
- Appropriate Regulatory Treatment of SAM Measures
- The link between On-Site and Off-Site Response
- Challenges in Severe Accidents and Link with SAMGs

Conclusions:
- Need for robust training programs SAM
- SAM Guidance based on plant symptoms
- Regulatory requirements related to SAM
- EQ of severe accident I&C is essential
- Guidance for management of on-site and off-site response
- Need for effective communications (common operational picture)
- Off-site plans must have provisions for expansion beyond detailed planning
  Ensure provisions for, if required, extend current arrangements beyond these zones.
- Risk of loss of key personnel should be reflected in SAM
Other activities


• DiD remains valid after the Fukushima but has to be strengthened & applied.
• DiD concept should be periodically re-examined over the entire life of a NPP

Technical Meeting on Source Term Evaluation for Severe Accidents (October 2013)

• Multi-unit sites & spent fuel pools
• Impact on the regulatory and licensing processes
• Methods used to determine source terms

Technical Meeting on Evaluation of Nuclear Power Plant Design Safety in the Aftermath of the Fukushima Daiichi Accident in Vienna in (August 2013)

• Share information on approaches to the evaluation of NPP design and “stress tests”.

Methodology for PSA against external events Feb 2013

• Framework for multiple NPPs exposed to multiple hazards
• Guidelines for tsunami data collection + Analysis and design of tsunami protection measures
Other activities

International Workshop: Safety of Multi-Unit NPP Sites against External Natural Hazards (Bhabha Atomic Research Centre in Mumbai, India, October 2012)

New safety report: Safety Culture in Preoperational Phases of Nuclear Power Plant Projects (SRS No. 74) (September 2012)

Accident Monitoring Systems for NPPs Sept 2012 and March 2013
  • Current knowledge, practices, operating experience
  • Technical Report + Technical Meeting May 2013

Design and safety margins for NPPs
  • Establish technical basis for expanded definition of ‘safety margin’
  • Derivation of safety margin definitions relate to DSA + PSA
  • Provide practical examples
Nuclear Safety Action Plan areas of work

IAEA Peer Reviews

Safety Assessments

Emergency Preparedness and Response

4. National Regulatory Bodies

Operating Organizations

International Legal Framework

Member States Embarking on Nuclear Power

Capacity Building

Protection from Ionizing Radiation

Communication

1Research & Development
Strengthen IAEA peer reviews

IEM’s: IAEA Safety Standards and peer reviews play an essential role in supporting MSs. Increase request for Peer Reviews since NSAP.

Enhance Transparency

Reports on the results of peer reviews carried out in the past ten years have been shared by making them available on the Agency’s website with consent of Member States.

OSART Upgrade

- Established in 1982.
- 175th OSART mission during 2013.
- OSART guidelines on SAM revised in consultation with MSs.
- First Corporate OSART Organization (October 2013).

IRRS Upgrade

- Additional module to record regulators response to Fukushima with Short and long-term measures introduced.
- Revised guidelines on preparation and conduct of IRRS.
- Revised IRRS module on EPR. Self-Assessment enhanced.
- Basic IRRS Training (BIT) course for reviewers (First, Oct-2013).
Strengthen IAEA peer reviews

EPREV Upgrade
- Enhancement of the process and tools & guidelines revision
- Training for potential EPREV team members carried out.
- Transparency: unless requested mission reports declassified after 90 days

INIR Upgrade
- Updated INIR Guidelines incorporating lessons from previous missions and Fukushima Accident
- An evaluation methodology and guidance for INIR Phase III has been developed

Site and External Events Design (SEED)
- SEED review service has replaced the Site Safety Review Service,
  incorporating improvements to better address site selection, hazard assessment and the design of structures, systems and components.
- Importance for Countries embarking or expanding nuclear programme

SEED and DSARS request from Member States not as expected
Nuclear Safety Action Plan areas of work

- Safety Assessments
- IAEA Peer Reviews
- Emergency Preparedness and Response
- 4. National Regulatory Bodies
- Operating Organizations
- IAEA Safety Standards
- International Legal Framework
- Member States Embarking on Nuclear Power
- Capacity Building
- Protection from Ionizing Radiation
- Communication
- Research & Development
Safety Standards and guidelines in EPR

- Review of the GS-R-2 is in the final stage
- Two new Safety Guides are under development
  - Arrangements for the Termination of a Nuclear or Radiological Emergency
  - Emergency Public Communications
- IAEA Report on Preparedness and Response for a Nuclear or Radiological Emergency in the Light of the Accident at the Fukushima Daiichi Nuclear Power Plant published

Designation of IAEA Response and Assistance Network (RANET) Capacity Building Centre in Fukushima

- Fukushima Prefecture, May 2013
- To coordinate several training activities related to nuclear and radiological emergency preparedness and response
- Workshop May 2013, 40 experts from 18 countries
Strengthening Emergency Preparedness and Response

Review and revision of the operational tools for international EPR framework

- Operations Manual for Incident and Emergency Communications (Operational June 2012)
- Joint Radiation Emergency Management Plan of International organizations (Operational July 2013)
- IAEA RANET (Operational Sept 2013)
- IAEA Response Plan for Incidents and Emergencies (Operational Jan 2014)
- ConvEx exercises were held to test arrangements
- International Radiation Monitoring Information System development is in pilot phase
Strengthening Emergency Preparedness and Response

IAEA Secretariat’s expanded response role

- GOV/INF/2013/13 on IAEA's Assessment and Prognosis in Response to an Emergency at a NPP
  - ✔ Process is established
- New Functional Area in RANET on Nuclear Installation Assessment and Advice
  - ✔ MSs are encouraged to register
- Set of data to be exchanged is developed
- MSs are invited for bilateral exercises in 2014

IAEA Secretariat’s expanded response role

- Fukushima Monitoring Database developed
  - ✔ [https://iec.iaea.org/fmd/](https://iec.iaea.org/fmd/)
- EPR-Public Communication Toolkit published
  - ✔ EPR-Public Communications, 2012
  - ✔ CD with lectures, work sessions and exercises for 1-week course
  - ✔ Explanatory materials
- USIE website further enhanced
- Guidelines on Use of INES as a communication tool developed
- INES Rating Interactive Learning Tool developed
Nuclear Safety Action Plan areas of work

- Safety Assessments
- IAEA Peer Reviews
- Emergency Preparedness and Response
- 4. National Regulatory Bodies
- Operating Organizations
- IAEA Safety Standards
- International Legal Framework
- Member States Embarking on Nuclear Power
- Capacity Building
- Protection from Ionizing Radiation
- Communication
- 1Research & Development
Conclusions:

- Regulators must increase peer pressure
- The need for a regulatory operating experience program
- The safety of spent fuel pools should be reviewed
- Implementation of IAEA Safety Standards on EPR
- Early involvement of regulatory bodies in long term spent fuel management
- Regulatory bodies must promote safety and security cultures.
IAEA Report on Strengthening Nuclear Regulatory Effectiveness

IAEA Published a report based on the outcomes of the:

- Ottawa Conference,
- 2nd Extraordinary CNS Meeting
- “Stress Tests” results
- IRRS Findings since Accident

Conclusions:

- Regulators as driving force for continuous safety improvements
- IAEA peer reviews and Cooperation - IRRS key role
- Enduring safety culture
- More comprehensive regulatory framework
- Regulators enhance communication, transparency and sharing

Report available
Other activities

Managing Regulatory Body Competence Safety Reports Series No. 79
(Published February 05, 2014)

National and regional workshops related to strengthening regulatory effectiveness in Member States
Human resource management, use of external TSOs, Legislation and regulation, EPR, Practical arrangements with Nuclear Regulatory Bodies, etc.

Regulatory Cooperation Forum (RCF)
Improve collaboration and coordination for capacity building

Self-Assessment of Regulatory Infrastructure for Safety (SARIS)
2014 Edition IAEA Services Series No. 27 (Published March 26, 2014)
Nuclear Safety Action Plan areas of work

- Safety Assessments
- IAEA Peer Reviews
- Emergency Preparedness and Response
- 4. National Regulatory Bodies
- Operating Organizations
- IAEA Safety Standards
- International Legal Framework
- Member States Embarking on Nuclear Power
- Capacity Building
- Protection from Ionizing Radiation
- Communication
- Research & Development
IAEA-WANO Memorandum of Understanding *(Sep 2012)*
signed at the 56th Regular Session of the General Conference:
- Coordinate the timing of OSART and WANO peer reviews
- Support each other’s peer review teams
- Cooperate on the respective performance indicator programmes
- Exchange information and support in the event of an NPP or fuel cycle facility accident

**IAEA-WANO workshop on operating experience at NPPs (Sep 2013)**
To enhance cooperation and exchange of information

**Nuclear Operating Organization Cooperation Forum (Sep 2012)**
Sharing experience safety related aspects during NPP construction

to promote a sustainable management system and IAEA SS

**Flexible (non-baseload) Operation Approaches for Nuclear Power Plants**
Other activities

Approaches to Ageing Management for Nuclear Power Plants: International Generic Ageing Lessons Learned (IGALL) Final Report
IAEA TECDOC Series No. 1736, Published March 26, 2014

SALTO Peer Review Guidelines: Guidelines for Peer Review of Safety Aspects of Long Term Operation of Nuclear Power Plants IAEA Services Series No. 26
Published February 03, 2014
Nuclear Safety Action Plan areas of work

- Safety Assessments
- IAEA Peer Reviews
- Emergency Preparedness and Response
- 4. National Regulatory Bodies
- Operating Organizations
- IAEA Safety Standards
- International Legal Framework
- Member States Embarking on Nuclear Power
- Capacity Building
- Protection from Ionizing Radiation
- Communication
- Research & Development
Review and strengthen IAEA Safety Standards

Safety Standards Review Task Force established
Systematic review of Safety Standards in light of Fukushima Accident:

- Safety Assessment for Facilities and Activities (GSR Part 4);
- Governmental, Legal and Regulatory Framework for Safety (GSR Part 1);
- Site Evaluation for Nuclear Installations (NS-R-3);
- Safety of Nuclear Power Plants: Design (SSR-2/1); and
- Safety of Nuclear Power Plants: Commissioning and Operation (SSR-2/2).

Chair of the Commission on Safety Standards Reported on the review (Nov 2012)

- No significant areas of weakness had been identified.
- Revisions were proposed to strengthen Requirements (through addenda)

Draft addenda approved by Safety Standards Committees (June - July 2013) Final review expected in June 2014, review and approval by CSS expected in November 2014. Revisions submitted to submission to the Board of Governors in March 2015
Review and strengthen IAEA Safety Standards

Draft Safety Requirements submitted to Safety Standards Committees for approval to be sent to Member States:

- Preparedness and Response for a Nuclear or Radiological Emergency GS-R-2;
- The Management System for Facilities and Activities GS-R-3.

Safety Guides identified for a pilot review:

- Design of the Reactor Coolant System and Associated Systems in NPPs (NS-G-1.9)
- Design of Reactor Containment Systems for NPPs (NS-G-1.10)
- Severe Accident Management Programmes for NPPs (NS-G-2.15)

- Establishing the Safety Infrastructure for a Nuclear Power Programme (No. SSG-16) was reviewed in October 2013 in the light of the changes proposed to the relevant Safety Requirements and proposals for changes to supplement the existing publication as an addendum were made.
Nuclear Safety Action Plan areas of work

1. Member States Embarking on Nuclear Power
2. International Legal Framework
3. Safety Assessments
4. IAEA Peer Reviews
5. Emergency Preparedness and Response
6. 4. National Regulatory Bodies
7. Operating Organizations
8. IAEA Safety Standards
9. Protection from Ionizing Radiation
10. Communication
11. Research & Development
12. Capacity Building
13. Nuclear Safety Action Plan areas of work
International Legal Framework

• Support to States Parties in their review of the Conventions procedures
• Support International Expert Group on Nuclear Liability (INLEX) with regard to establishing a global nuclear liability regime.

INLEX meeting (May 2013):
  • Liability in transport of nuclear material - the rights of non-nuclear transit States
  • Liability issues in respect of transportable NPPs.
  • The impact of the 2012 revision of the IAEA transport regulations:
    • The Board decision excluding small quantities of nuclear material from the scope of nuclear liability conventions.

• Joint IAEA/INLEX missions to inform national policy-makers about the international legal instruments relevant for achieving a global nuclear liability

• Joint Protocol on the Application of the Vienna and Paris Conventions
  Explanatory Text for the published as IAEA International Law Series No. 5. (may 2013)

• Support MSs under its legislative assistance programme: 2nd Treaty Event (sep 2012)

• Nuclear Law Institute:
  • Comprehensive two-week course addressing all areas of nuclear law:
  • Meets increasing demand by MSs for legislative assistance
  • Assist participants drafting, amending or reviewing their national legislation
  • 3rd session October 2013
Nuclear Safety Action Plan areas of work

- Safety Assessments
- IAEA Peer Reviews
- Emergency Preparedness and Response
- 4. National Regulatory Bodies
- Operating Organizations
- IAEA Safety Standards

- International Legal Framework
- Member States Embarking on Nuclear Power
- Capacity Building
- Protection from Ionizing Radiation
- Communication
- 1Research & Development
Embarking Countries and Capacity Building

- IAEA Guidance on establishing Safety Infrastructure for a Nuclear Power Programme
- Lessons Learned being incorporated in several IAEA documents e.g. Milestones and Infrastructure Status Evaluation
- More participation in the Regulatory Cooperation Forum
- Self-assessment methodology for capacity building issued
- A document on managing regulatory body competence has been developed
- **International Ministerial Conference on Nuclear Power in the 21st Century** (Jun 2013) Importance of establishing an appropriate nuclear power infrastructure.
- Interactive e-learning training modules
  - Support Member States in using the IAEA Milestones Approach.
- **TM Resources Development among Embarking and Experienced Countries** (Jun 2013)
  - Share experience/knowledge through cooperation with experienced countries.
  - Demand for training in embarking countries and suitability of available training courses.
- **Safety Education and Training Peer Review Service (ETReS)**
  - Assist Member States in developing and maintaining a sustainable and adequate Education and Training programme in nuclear safety consistent with IAEA Safety Standards.
Nuclear Safety Action Plan areas of work

- Safety Assessments
- IAEA Peer Reviews
- Emergency Preparedness and Response
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- International Legal Framework
- Member States Embarking on Nuclear Power
- Capacity Building
- Protection from Ionizing Radiation
- Communication
- Research & Development
IAEA International Expert Mission on Remediation of large contaminated area off-site the Fukushima Dai-ichi NPP

Main Mission 2011 - Follow-up 2013

- Remediation strategies, plans and activities, including contamination mapping
- Share findings and lessons learned

Main Aspects

- General Aspects
- Institutional aspects and public
- Radiation doses 1 to 20 mSv/y is acceptable and explain
- Stakeholder involvement
- Forest and food issues
- Monitoring of freshwater and marine environments

1st Mission
(7 – 15 Oct 2011)
Report available [here](#)

Follow-up Mission
(14 – 21 Oct 2013)
Report available [here](#)
International peer review of the Mid-and-Long-Term Roadmap towards the Decommissioning of Fukushima Daiichi NPP Units 1-4
(First Mission, Apr 2013 / Second Mission, Dec 2013)

Focus:

• Roadmap
• Fuel Removal
• Contaminated water management issues
• Stability and Reliability

Main Aspects:

• Monitoring radiation in marine environment
• Holistic review of Roadmap
• Social Communication Office
• Communication strategy
• Alternative options fuel storage operations and future fuel disposition
• Contaminated water and the Advanced Liquid Processing System (ALPS)
• Reliability SSC until decommissioning

2nd mission preliminary Report available here
IEM 4 - Decommissioning and Remediation After a Nuclear Accident
(28 January – 1 February 2013)

Focus
The complex technical, societal, environmental and economic issues that need to be considered for decommissioning, remediation and radioactive waste management after a nuclear accident

Conclusions
• the need to develop a strategy in advance to support the recovery phase of a potential accident was recognized as crucial
• Importance of stakeholder participation in advance planning
• characterization and monitoring programmes are needed for post accident recovery decision making
• The regulatory regime must be prepared to be adaptable and to include a risk-informed approach in decision making
• The international community should strive to develop a practical definition of ‘safe’ as an aid for communicating with the public.

Final Report available here
IEM 6 - Radiation Protection after the Fukushima Daiichi Nuclear Power Plant Accident (17 to 21 February 2014)

Focus:
Radiation protection issues highlighted by the Fukushima accident and how these should be addressed at national and international levels.

Conclusions
• Radiation doses received by public and workers appear too low to detect any health effects directly related to radiation exposure
• As observed after the Chernobyl accident, the psychosocial impact can outweigh the direct radiological consequences.
• Differences in national and international standards of radioactivity concentrations in specific foodstuffs need to be resolved
• Optimal decision-making for remediation needs to take account of all relevant factors (societal, environmental and economic).
• Need a firm basis for communicating and promoting a better understanding of radiation risks and the System of Radiation Protection
Other activities

- **Experts mission on Marine Monitoring to Japan (6 – 12 Nov 2013)**
  - To observe sea water sampling and data analysis in Fukushima
  - Collect detailed information about marine monitoring by Japan under its Sea Area Monitoring Plan

- **Modelling and Data for Radiological Impact Assessment (MODARIA)**
  1st TM November 2012. 2nd TM November 2013. Enhance the capabilities of Member States to simulate radionuclide transfer in the environment.

- **Project on Rapid environmental mapping of the Fukushima Prefecture**
  Using unmanned aerial vehicle with mobile gamma spectrometer

- **Review of generic criteria for radioactive material in food, animal feed, drinking water** (in cooperation with WHO, FAO and other relevant international organizations)

- **Update of MARIS (Marine Information System)**
  New marine environmental radioactivity data relevant to the Fukushima Daiichi accident

- **Practical arrangement with the Fukushima Medical University**
  To undertake collaborative activities in the area of radiation effects on human health and radiation risk management in Fukushima Prefecture.
Nuclear Safety Action Plan areas of work

- Safety Assessments
- IAEA Peer Reviews
- Emergency Preparedness and Response
- 4. National Regulatory Bodies
- Operating Organizations
- IAEA Safety Standards
- International Legal Framework
- Member States Embarking on Nuclear Power
- Capacity Building
- Protection from Ionizing Radiation
- Communication
- Research & Development
IEM 2 - Enhancing Transparency & Communication Effectiveness in the Event of a Nuclear or Radiological Emergency

(18 - 20 June 2012)

**Focus:**

Discuss challenges in communication during the Fukushima emergency. Analyse case studies on:

- National regulator and affected operator experiences during emergencies
- Inter-agency response in support of effective public communication during emergencies

Highlight Best practices:

- Effectively addressing public concerns
- Delivery of easily understandable information during emergencies by national authorities, and other bodies

[Final Report available here](#)
Preparedness planning and preparation are key determinants for effective communications during an emergency:

• Communication strategies need to be developed and adjusted to different groups. These groups should be identified in advance of an accident.

• Reinforce messages early and often. Ensure that is heard, understood and accepted. Need to monitor communication outcomes via social media to adjust messaging and focus, to accommodate current public concerns.

• Effective communication ensures decision makers as well as public, understand the situation and have sufficient actionable information. Sufficient information will allow them to protect people and the environment.

• Public trust is the basis for organizational credibility. Focus before, during and after an emergency should be on building, strengthening, maintaining and, when necessary, rebuilding trust.
Enhance transparency and effectiveness of communication and improve dissemination of information

Enhancing Transparency

Fukushima Report

International Experts’ Meetings IEMs

Fukushima Ministerial Conference (Dec 2012)

INES Scale

- Guidance for the use of INES under publication.
- Development of e-learning tool for INES to support its application
- INES Advisory Committee: INES Strategy to be updated in 2014

USIE

- upgraded version of the USIE has been deployed.
- Total number of registered external users on USIE increased.
- 56 Member States have not yet registered any user.
Nuclear Safety Action Plan areas of work

- Safety Assessments
- IAEA Peer Reviews
- Emergency Preparedness and Response
- National Regulatory Bodies
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- IAEA Safety Standards
- International Legal Framework
- Member States Embarking on Nuclear Power
- Capacity Building
- Protection from Ionizing Radiation
- Communication
- Research & Development
Research and Development

Technical Support Organizations Forum (TSO) Forum
• To strengthen scientific and technical collaboration among Member States, including countries in the process of expanding or embarking on a nuclear programme, especially for R&D, taking into account the lessons learned from the Fukushima accident.
• International Conference on Challenges Faced by Technical and Scientific Support Organizations (TSO) in Enhancing Nuclear Safety and Security (27 - 31 October 2014)

International Expert’s Meeting on Research and development (Q1 2015)

Technical Meeting on Degradation of Primary System Components of Pressurized Water Cooled Nuclear Power Plants: Current Issues and Future Challenges
(Vienna, November 2013)

Symptom-based accident management toolkit (SAMT)
Development of a symptom-based accident management toolkit (SAMT) for NPPs for use by Member States.
Conclusion and Future Challenges

• Momentum on Nuclear Safety;

• With the implementation of the AP Member States have systematically been more informed as well as more actively involved in strengthening the Nuclear Safety framework;

• Continue to make significant progress in implementing the Action Plan;

• IAEA will continue reporting to the IAEA Board of Governors and General Conference;

• More work still to be done.
Introduction: Nuclear Safety Action Team

IAEA response to Fukushima Daii-chi accident includes:

**Nuclear Safety Action Plan:**
Defines a programme of work to strengthen the global nuclear safety framework

**IAEA Fukushima Report:**
Assessment of the accident that is technically comprehensive, factual and balanced, addressing the causes and consequences as well as lessons learned.
September 2012

IAEA will prepare a report on the Fukushima Daiichi accident, to be finalized in 2014
Fukushima Report

IAEA plays the leading role in producing a technically comprehensive report based on the understanding of the facts and Agency’s assessment of the accident.

The Report will consist of:

- **Summary report:**
  Informative and easily understandable for decision makers and the general public

- **Scientific/technical section:**
  - includes in an understandable balanced manner, nuclear safety and radiological aspects focusing on scientific/technical data;
  - provides a description of the accident, its causes and consequences and address relevant key issues;
  - will be authoritative, factual and balanced with sufficient technical depth but easily understandable.
The Report aims to:

• Provide a technically comprehensive description and assessment of the accident, its causes and consequences and address key issues;

• Be authoritative, factual and balanced with sufficient technical depth;

• Provide direction to strengthen nuclear safety worldwide.
Target Audience

• Member States;
• Regulators;
• Designers;
• Operators;
• Stakeholders;
• General Public.
IAEA Fukushima Report

IAEA Core Group

IAEA/NSAP coordination
G. Caruso

ITAG
INSAG Chair, R. Meserve
FAO
ICRP
ILO
INSAG
OECD/NEA
UNSCEAR
WANO
WMO

External reviewers

WG Co-Chairs, External Experts and IAEA/NSAT

Description and Context of the Accident/What Happened
R. Jammal (Canada)
P. Vincze (IAEA)

Safety Assessment
S. Chande (India)
P. Hughes (IAEA)

Emergency Preparedness and Response
D. Drábová (Czech Republic)
E. Buglova (IAEA)

Radiological consequences
A. González (Argentina)
R. Chhem (IAEA)
M. Pinak (IAEA)

Post-Accident Recovery
G. Williams (Australia)
I. Mele (IAEA)
G. Proehl (IAEA)

Lessons learned
Core Group

- To validate the preparations and the work progress;
- Composed of the IAEA DDGs (NA, NE, NS and TC) and DGOC;
- Led by DDG-NS, Mr Denis Flory.
International Technical Advisory Group (ITAG)

- To advice and review the formulation and finalization of the report, particularly its technical/scientific aspects and accuracy of its content, including preparation of a draft outline of the report.
- Composed of FAO, ICRP, ILO, INSAG, OECD/NEA, UNSCEAR, WANO and WMO experts.
- Led by the Chairman of INSAG, Mr Richard Meserve.
Global Perspective

Approximately **180 experts** from over 40 Member States and various international organizations (including IAEA staff)
Working Groups

Experts divided into Five Working Groups (WG);

Each WG is led by an external Co-Chair and one or two IAEA Co-Chairs;

Each WG is responsible for a different chapter;

- **Chapter 1**: Description and context of the accident
- **Chapter 2**: Safety assessment
- **Chapter 3**: Emergency preparedness and response
- **Chapter 4**: Radiological consequences
- **Chapter 5**: Post-accident recovery;

The experts meet in Vienna every quarter to discuss the progress made and deliberate the way forward in order to finalize the Report by the end of 2014;
Working Groups

5 Working Groups

1. Description and Context of the Accident
2. Safety Assessments
3. Emergency Preparedness and Response
4. Radiological Consequences
5. Post-Accident Recovery
Working Group 1

Description and context of the accident (what happened?)

Areas:

- Site characteristics;
- Description of Fukushima Daiichi reactors;
- Japanese nuclear framework prior to the accident;
- Plant resources at the time of accident;
- Description of the earthquake and tsunami;
- Sequence of events and site-to-site event comparison;
- Off-site actions;
- Energy situation prior and following the accident;
- Radionuclide releases;
- Aftermath actions.
Chapter 1: Interface with assessments of other chapters

1.1 Description of Fukushima Site
1.2 Description of Fukushima Units
1.3 Japanese Nuclear Framework prior to the Accident
1.4 Plant Resources and Capacity at the Time of the Accident
1.5 Description of the Earthquake and Tsunami
1.6 Sequence of Events
1.7 Radionuclide Inventory and Releases
1.8 Off-site Actions during the Accident
1.9 Aftermath Actions
Working Group 2

Safety assessment (why did the accident happen?)

Areas:

• Assessment of the plant in relation to external events;
• Assessment of the design features and plant design basis;
• Assessment of the treatment of beyond design basis events;
• Accident management provisions and their implementation;
• Defence in depth;
• Assessment of the effectiveness of regulatory programmes;
• Human and organizational factors and safety culture;
• Application of operating experience to improve plant design and operation.
Working Group 3

Emergency preparedness and response

Areas:

• EPR framework in Japan;

• Japan’s response to the emergency:
  ✓ Managing emergency response operations;
  ✓ On-site mitigatory actions;
  ✓ Protecting emergency workers, helpers and public;
  ✓ Managing contaminated waste during the emergency;
  ✓ Providing information, instructions and warnings to the public;

• International response to the emergency.
Working Group 4

Radiological Consequences

Areas:

- Radioactivity in the environment;
- Radiation exposure;
- Radiological protection;
- Health consequences;
- Impact on the environment.
Working Group 5

Post-Accident Recovery

Areas:

• Remediation;
• Decommissioning;
• Waste management;
• Revitalisation and stakeholders involvement.
Working Groups and ITAG meetings

Working Group:

1st meeting – March 2013:
• Topics defined and tasks distributed to the experts according to their expertise;

2nd meeting – June 2013:
• draft table of contents developed;

3rd meeting – September/October 2013:
• extended outline developed and information gaps identified;

4th meeting – December 2013:
• initial raw draft sections produced;

5th meeting – February 2014:
• overlaps between the chapters and repetitions minimized;

6th meeting – April/May 2014:
• To prepare the master file approved by the Co-Chairs.
**ITAG:**

1\textsuperscript{st} ITAG meeting – March 2013:
- guidelines and methodology to be applied for the preparation of the Report provided;

2\textsuperscript{nd} ITAG meeting and 1\textsuperscript{st} Joint ITAG/Co-Chairs meeting – June 2013:
- draft table of contents reviewed and comments provided;

2\textsuperscript{nd} Joint meeting of ITAG and Co-Chairs – December 2013:
- key technical aspects of each Chapter discussed and drafting progress positively appraised;

3\textsuperscript{rd} Joint ITAG/Co-Chairs meeting – May 2014:
- To review and discuss mature drafts of the Chapters.
Consultancy meetings and visits to Japan

**Source term (August 2013):**
- Recommendation to address carry on work since the closure of UNSCEAR report, especially answering the novel or additional issues observed after then;
- Recommendation to include an assessment of uncertainties in the source term calculations;

**Human and organizational factors and safety culture (October 2013)** with Prof. Hatamura (former Chairman of the Investigation Committee on the Accident at the Fukushima NPP):
- Identification, in a comprehensive manner, how human and organizational factors and safety culture contributed to the accident;
- Major lessons learned in this field identified and included in the Report;

**Remediation (October 2013):**
- Progress in the coordination of remediation activities with reconstruction and revitalisation efforts assessed;
- Specific topics in the remediation programme assessed;

**Radiological protection (November 2013):**
- Radiological data received from respective Japanese Authorities;
Consultancy meetings and visits to Japan

**Decommissioning (November/December 2013):**
- First-hand information on decommissioning planning and the implementation of pre-decommissioning activities provided;
- Most challenging issues identified: contaminated water management, nuclear fuel removal, and fuel debris removal;

**Regulatory activities and operating experience (January 2014):**
- Missing information and documents to fill information gaps related to regulatory activities and operating experience obtained;

**Meetings with Reconstruction Agency and Team in Charge of Assisting the lives of Disaster Victims - Cabinet Office (January 2014):**
- Issues related to revitalization and stakeholders involvement identified as an important part to be included in the Report;

**Meetings with Institute of Energy Economics of Japan (January 2014):**
- Energy market situation prior and following the accident identified to be included in the Report.
Progress until March 2014

- Significant progress has been made on all parts of the Report;
- Consultancy meetings in Japan and Vienna have provided much more information and a clearer understanding of the topics on which more information is needed;
- To date, experts have concentrated on preparing detailed subsections;
- All conclusions must be based on facts from verifiable sources;
- IAEA Safety Standards series were recognized as a valuable tool for the preparation of the Report;
- Focus is now on how to start to consolidate the material - including identifying any outstanding gaps and interactions and improving the flow of information;
- Information must be updated as much as possible before the finalization of the Report.
Next steps

The Report is on track to be finalized by the end of 2014:

- September 2015 → Launch of the Report at the IAEA General Conference;
- LESSONS LEARNED for further strengthening nuclear and radiation safety and emergency preparedness and response worldwide
Thank you!