IAEA Ministerial Conference on Nuclear Safety

20-24 June 2011, Vienna, Austria

Working Session 2

Emergency Preparedness and Response

Fukushima Accident: Lessons Learned – Way Forward

Elena Buglova

Incident and Emergency Centre

IAEA

International Atomic Energy Agency

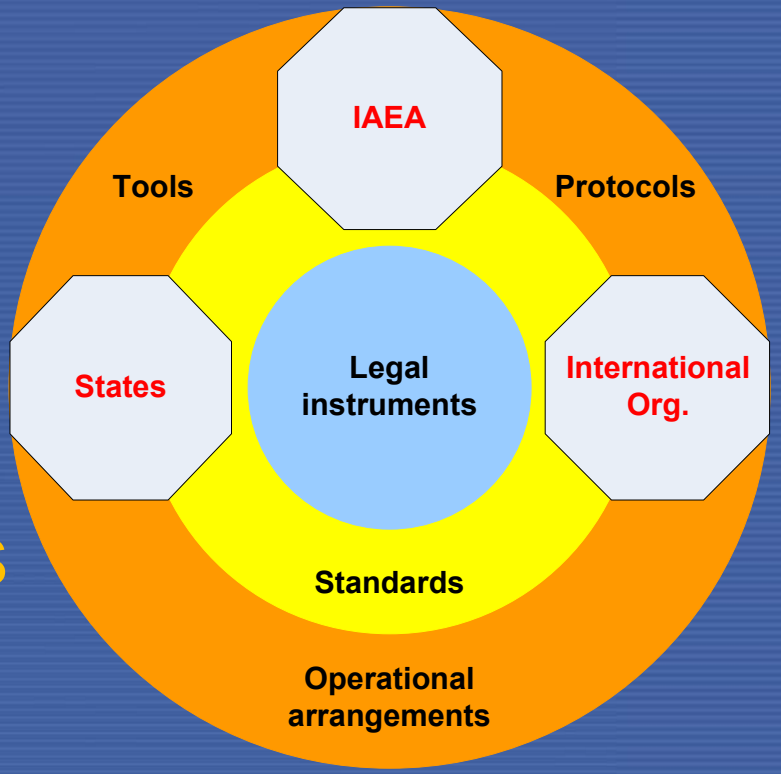
Contents

- International Emergency Preparedness and Response framework
- IAEA roles and responsibilities
- Response to Fukushima accident
- Lessons learned - Way forward

International EPR Framework

Overview

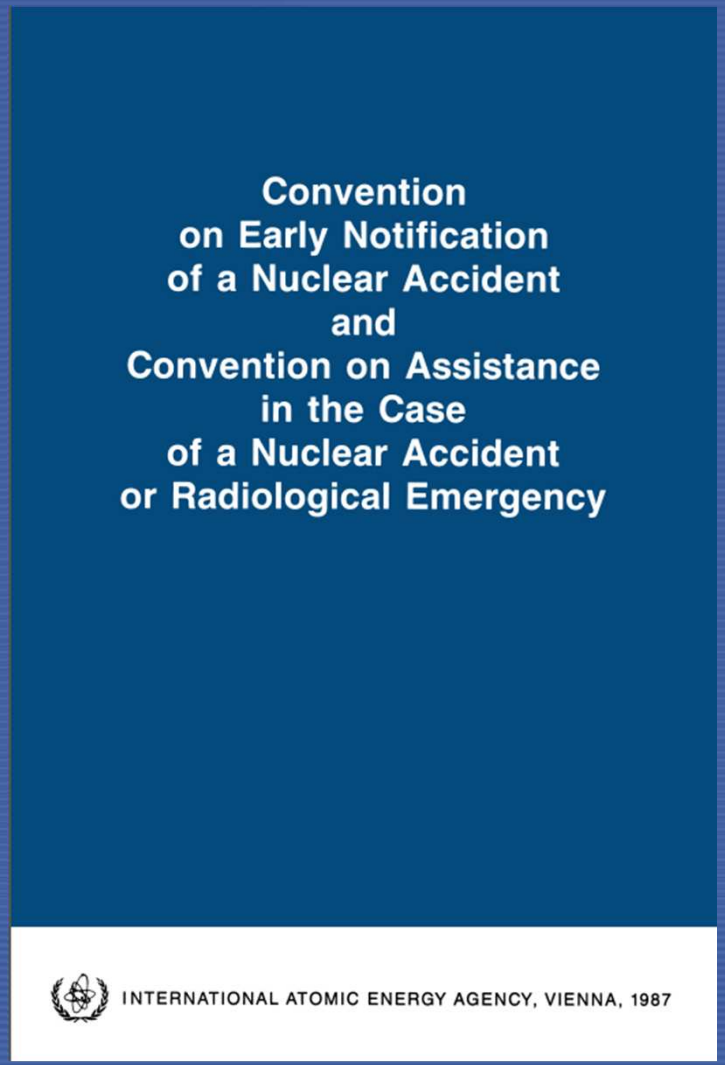
- Legal instruments
- Safety Standards
- Tools, protocols and operational arrangements



IAEA

International EPR Framework

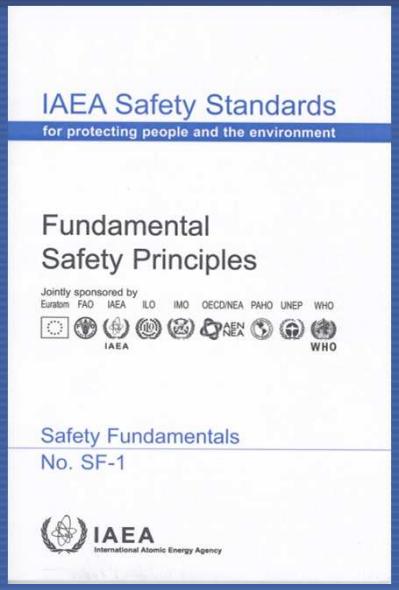
Legal instruments

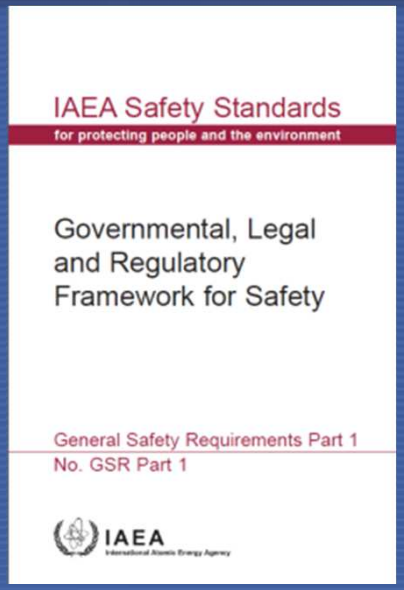


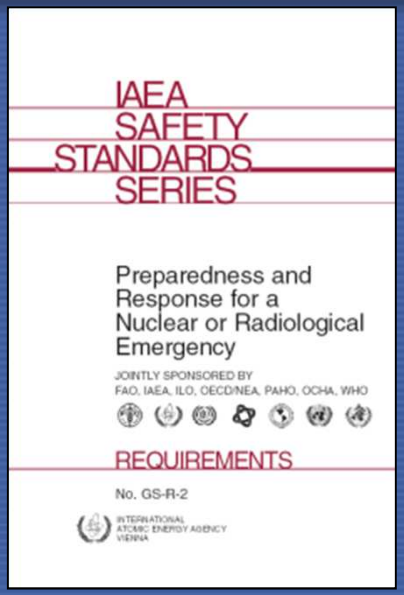
IAEA

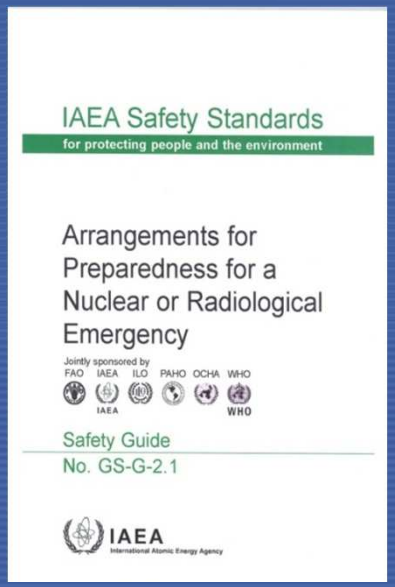
International EPR Framework

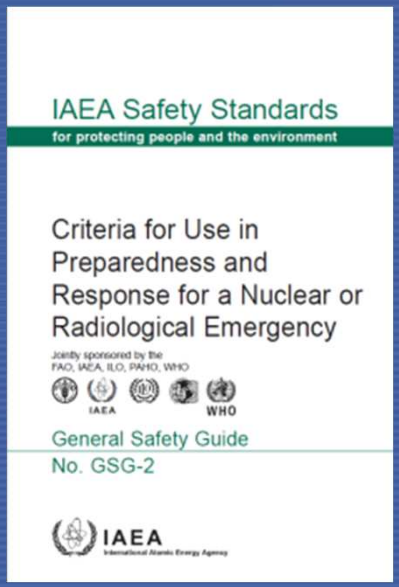
Safety Standards







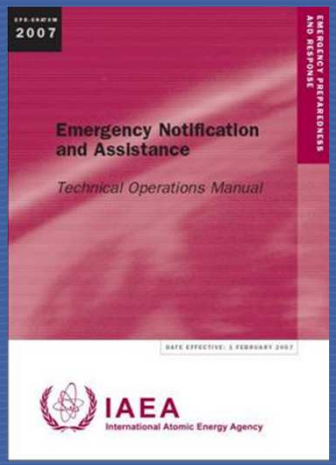


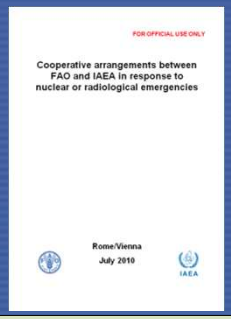


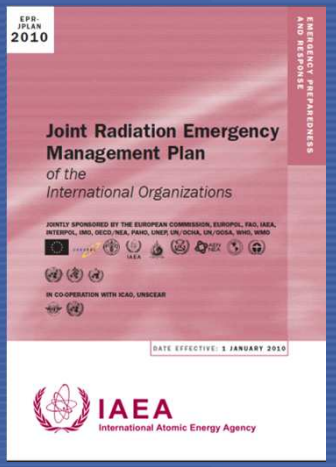
IAEA

International EPR Framework

Protocols and operational arrangements







REPLIE

Protocols

ENATOM

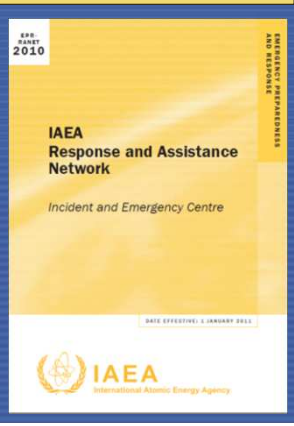
IAEA

JPLAN

States

RANET

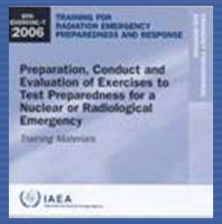
International Org.

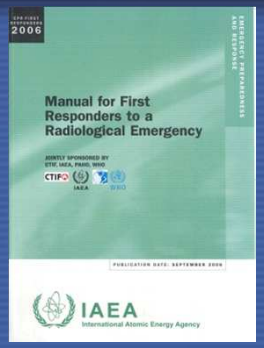


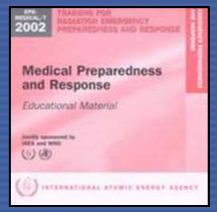
IAEA

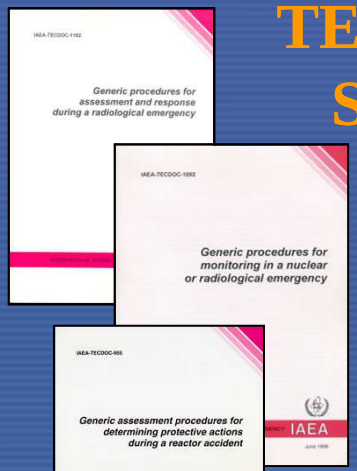
International EPR Framework

Tools

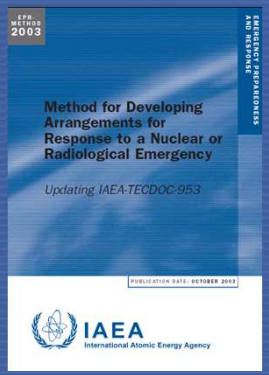




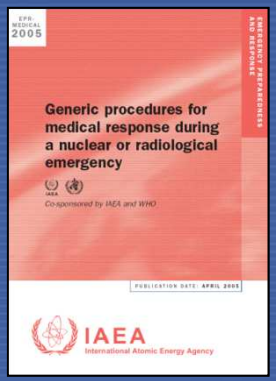


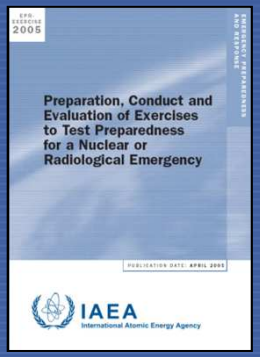


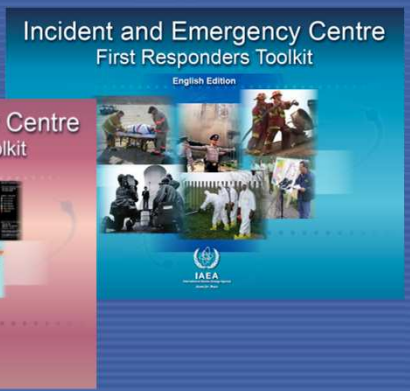
TECDOC Series



EPR Series







IAEA

IAEA Roles and Responsibilities
Preparedness

- EPR standards, guidance, arrangements and tools
- Emergency Preparedness Review Missions
- EPR capacity building:
  - Development of human resources
  - Organizational and infrastructural development
  - Institutional and legal framework development
- IAEA's in-house and inter-agency preparedness

IAEA

IAEA Roles and Responsibilities
Response (1)

- Notification and official information exchange
  - IEC Emergency Database of Contact Points (CPs): 416 entries
  - CPs in 173 States and IGOs
  - Of 416 CPs:
    - 408 supplied primary contact fax numbers (98%)
    - 393 supplied primary contact phone numbers (94%)
    - 331 supplied primary contact email addresses (80%)

IAEA Roles and Responsibilities
Response (2)

- Provision of assistance on request:
  - Facilitate and coordinate
- Provision of public information:
  - Timely, accurate and appropriate
- Coordination of inter-agency response:
  - Achieve synergy, speak with ‘one voice’

Incident and Emergency Centre (IEC)

Global focal point for international preparedness and response for nuclear and radiological safety or security related incidents, emergencies, threats or events of media interest and for coordination of international assistance

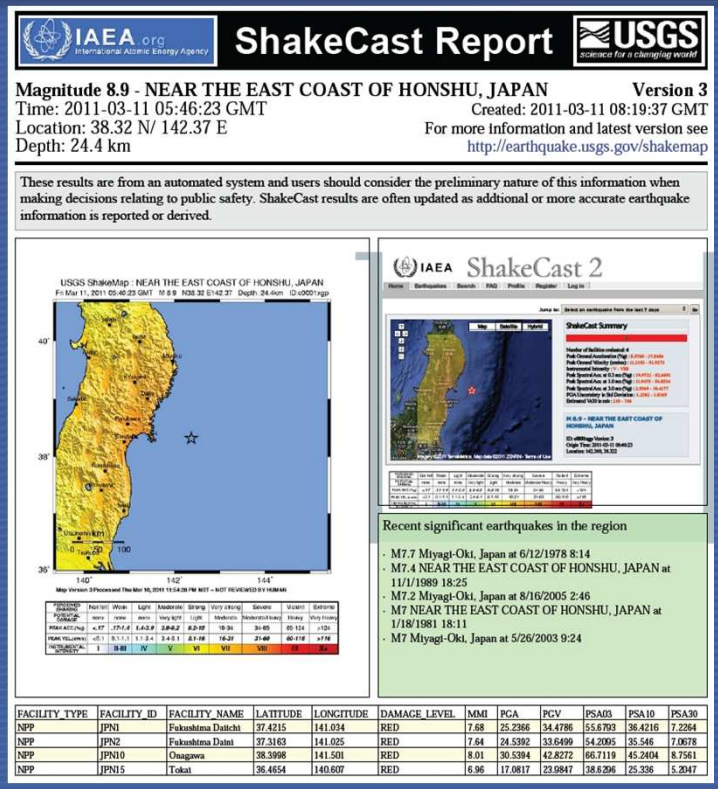
Implementing IAEA functions in EPR

IAEA

Response to Fukushima Accident

11 March

- 05:46 UTC
  - Earthquake of magnitude 9.0 occurred near East coast of Honshu, Japan
- 06:42 UTC
  - On-call external event specialist informed/alerted on-call ERM about earthquake
  - Possible damage at 4 NPPs and potential for tsunami anticipated
- 07:21 UTC
  - IEC made first phone contact with METI-NISA



IAEA.org International Atomic Energy Agency — ShakeCast Report — USGS science for a changing world

Magnitude 8.9 - NEAR THE EAST COAST OF HONSHU, JAPAN **Version 3**
Time: 2011-03-11 05:46:23 GMT
Location: 38.32 N/ 142.37 E
Depth: 24.4 km
Created: 2011-03-11 08:19:37 GMT
For more information and latest version see
http://earthquake.usgs.gov/shakemap

These results are from an automated system and users should consider the preliminary nature of this information when making decisions relating to public safety. ShakeCast results are often updated as addtional or more accurate earthquake information is reported or derived.

USGS ShakeMap : NEAR THE EAST COAST OF HONSHU, JAPAN

IAEA ShakeCast 2

Recent significant earthquakes in the region

- M7.7 Miyagi-Oki, Japan at 6/12/1978 8:14
- M7.4 NEAR THE EAST COAST OF HONSHU, JAPAN at 11/1/1989 18:25
- M7.2 Miyagi-Oki, Japan at 8/16/2005 2:46
- M7 NEAR THE EAST COAST OF HONSHU, JAPAN at 1/18/1981 18:11
- M7 Miyagi-Oki, Japan at 5/26/2003 9:24

FACILITY_TYPE	FACILITY_ID	FACILITY_NAME	LATITUDE	LONGITUDE	DAMAGE_LEVEL	MMI	PGA	PGV	PSA03	PSA10	PSA30
NPP	JPN1	Fukushima Daiichi	37.4215	141.034	RED	7.68	25.2366	34.4786	55.6793	36.4216	7.2264
NPP	JPN2	Fukushima Daini	37.3163	141.025	RED	7.64	24.5392	33.6499	54.2095	35.546	7.0678
NPP	JPN10	Onagawa	38.3998	141.501	RED	8.01	30.5394	42.8272	66.7119	45.2404	8.7561
NPP	JPN15	Tokai	36.4654	140.607	RED	6.96	17.0817	23.9847	38.6296	25.336	5.2047

IAEA

11 March

- 07:48 UTC
  - Offer of Agency's assistance sent to METI-NISA Japan (cc PM of Japan to IAEA)
- 08:06 UTC
  - First EMERCON message for MSs and IGOs published on ENAC web site
- 08:20 UTC
  - IEC declares Full response mode operations


ENAC
Emergency Notification and Assistance Convention
USIE will replace ENAC in 14 days. For more info, please go here.
IAEA
Emergencies | Submitted Messages | My Tasks | Documents | External Links | Address Book | Help | Logout
Standard Report Form
This form is used for reporting on a nuclear or radiological emergency, except general emergency at a nuclear installation.
IAEA MESSAGE HEADER
HEADER
Free for publication
EMERCON ADVISORY
Instantly
Verified by IAEA
1. REPORTING STATE
Japan
2. OFFICIAL NOTIFICATION / INFORMATION
No
3. COMPETENT AUTHORITY
Ministry of Economy,
4. NATURE OF EVENT
Other (described below)
NPP
Earthquake
EVENT CHARACTERISTICS
No
Has not occurred and unlikely to occur
No
0
5. FACILITY / EVENT LOCATION
ONAGAWA
Coordinates
38.40 ° N
141.50 ° E
6. DATE AND TIME OF OCCURRENCE
2011-03-11
06:46 UTC
7. VALIDITY OF INFORMATION
2011-03-11
08:45 UTC
8. EVENT DESCRIPTION
See attached file
9. ACTIONS BEING TAKEN / PLANNED
There is no report of abnormal monitoring readings around NPPs that indicate irregular value at this time. There are no reports of fire or failure. Staff of NISA are gathering information
10. MEDIA INFORMATION
11. OTHER RELEVANT INFORMATION

IAEA

11 March

- 08:30 UTC
  - First IAEA's press statement published on IAEA web site
- 09:29 UTC
  - First request for information from MS
- 09:33 UTC
  - First info to MS provided by phone

Earthquake Hits Japan (11 March 08:30 UTC)

11 March 2011

Announcements, Featured

The IAEA's Incident and Emergency Centre received information from the International Seismic Safety Centre (ISSC) at around 07:15 UTC this morning about the earthquake of magnitude 8.9 near the east coast of Honshu, Japan.

The Agency is liaising with the Japanese Ministry of Economy, Trade and Industry (METI) to confirm further details of the situation. Japanese authorities reported that the four nuclear power plants closest to the quake have been safely shut down.

The Agency has sent an offer of Good Offices to Japan, should the country request support.

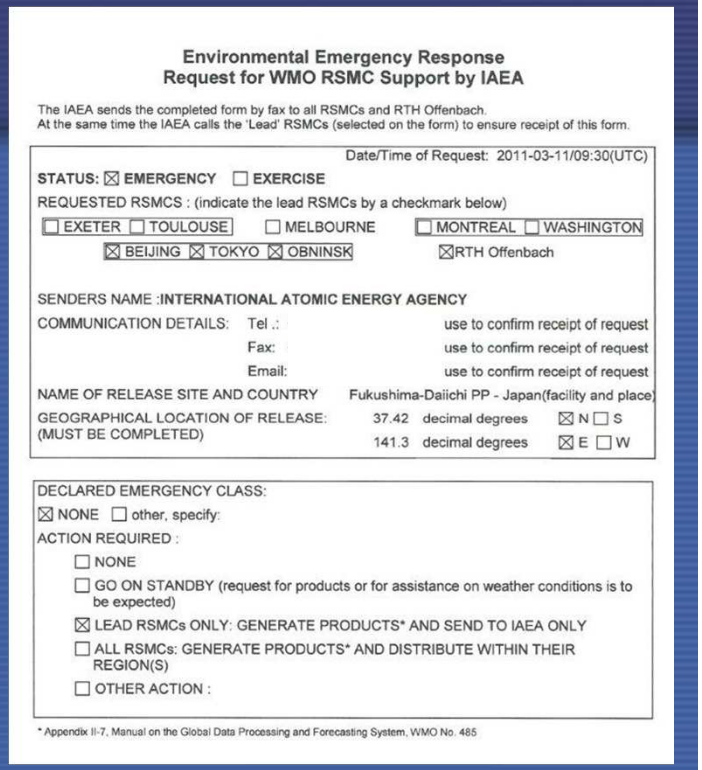
Current media reports say a tsumani alert has been issued for 50 countries, reaching as far as Central America. The Agency is seeking further information on which countries and nuclear facilities may be affected.

Please refer to this webpage for future updates from the Incident and Emergency Centre regarding this event.

IAEA

11 March

- 09:39 UTC
  - First IEC request to WMO's Regional Specialized Meteorological Centres standard meteorological products
- 10:39 UTC
  - First fax to METI requesting detailed info info on declaration of emergency
- 12:50 – 16:47 UTC
  - First replies to inquiries from MSs sent by e-mails
- 17:03 UTC
  - Fifth EMERCON message published; confirmation of reading requested
  - Emails were sent in parallel to all existing primary and primary back up email addresses



Environmental Emergency Response
Request for WMO RSMC Support by IAEA

The IAEA sends the completed form by fax to all RSMCs and RTH Offenbach.
At the same time the IAEA calls the 'Lead' RSMCs (selected on the form) to ensure receipt of this form.

Date/Time of Request: 2011-03-11/09:30(UTC)

STATUS: ☒ EMERGENCY ☐ EXERCISE

REQUESTED RSMCS : (indicate the lead RSMCs by a checkmark below)

☐ EXETER ☐ TOULOUSE ☐ MELBOURNE ☐ MONTREAL ☐ WASHINGTON
☒ BEIJING ☒ TOKYO ☒ OBNINSK ☒ RTH Offenbach

SENDERS NAME :**INTERNATIONAL ATOMIC ENERGY AGENCY**

COMMUNICATION DETAILS:	Tel .:	use to confirm receipt of request
	Fax:	use to confirm receipt of request
	Email:	use to confirm receipt of request
NAME OF RELEASE SITE AND COUNTRY		Fukushima-Daiichi PP - Japan(facility and place)
GEOGRAPHICAL LOCATION OF RELEASE: (MUST BE COMPLETED)	37.42 decimal degrees	☒ N ☐ S
	141.3 decimal degrees	☒ E ☐ W

DECLARED EMERGENCY CLASS:
☒ NONE ☐ other, specify:

ACTION REQUIRED :
- ☐ NONE
- ☐ GO ON STANDBY (request for products or for assistance on weather conditions is to be expected)
- ☒ LEAD RSMCs ONLY: GENERATE PRODUCTS* AND SEND TO IAEA ONLY
- ☐ ALL RSMCs: GENERATE PRODUCTS* AND DISTRIBUTE WITHIN THEIR REGION(S)
- ☐ OTHER ACTION :

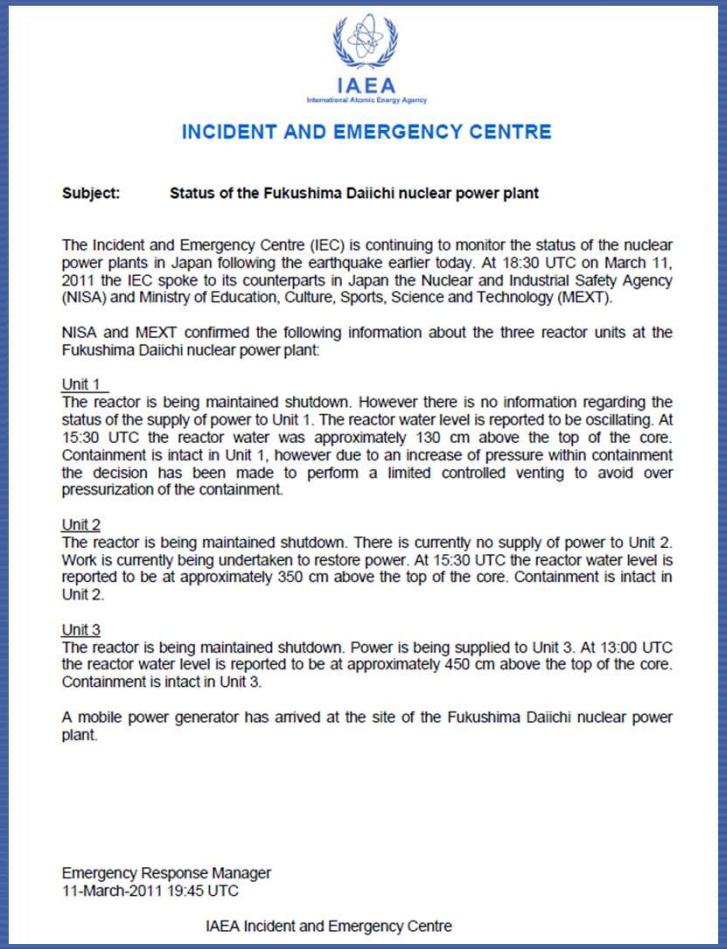
* Appendix II-7, Manual on the Global Data Processing and Forecasting System, WMO No. 485

IAEA

11 March

- 19:38 UTC
  - First IEC Status Summary Report distributed by fax to all CPs
- 20:02 UTC
  - First IEC Status Summary Report published on ENAC

First IEC Status Summary Report – 1 page



IAEA
International Atomic Energy Agency

INCIDENT AND EMERGENCY CENTRE

Subject: **Status of the Fukushima Daiichi nuclear power plant**

The Incident and Emergency Centre (IEC) is continuing to monitor the status of the nuclear power plants in Japan following the earthquake earlier today. At 18:30 UTC on March 11, 2011 the IEC spoke to its counterparts in Japan the Nuclear and Industrial Safety Agency (NISA) and Ministry of Education, Culture, Sports, Science and Technology (MEXT).

NISA and MEXT confirmed the following information about the three reactor units at the Fukushima Daiichi nuclear power plant:

Unit 1
The reactor is being maintained shutdown. However there is no information regarding the status of the supply of power to Unit 1. The reactor water level is reported to be oscillating. At 15:30 UTC the reactor water was approximately 130 cm above the top of the core. Containment is intact in Unit 1, however due to an increase of pressure within containment the decision has been made to perform a limited controlled venting to avoid over pressurization of the containment.

Unit 2
The reactor is being maintained shutdown. There is currently no supply of power to Unit 2. Work is currently being undertaken to restore power. At 15:30 UTC the reactor water level is reported to be at approximately 350 cm above the top of the core. Containment is intact in Unit 2.

Unit 3
The reactor is being maintained shutdown. Power is being supplied to Unit 3. At 13:00 UTC the reactor water level is reported to be at approximately 450 cm above the top of the core. Containment is intact in Unit 3.

A mobile power generator has arrived at the site of the Fukushima Daiichi nuclear power plant.

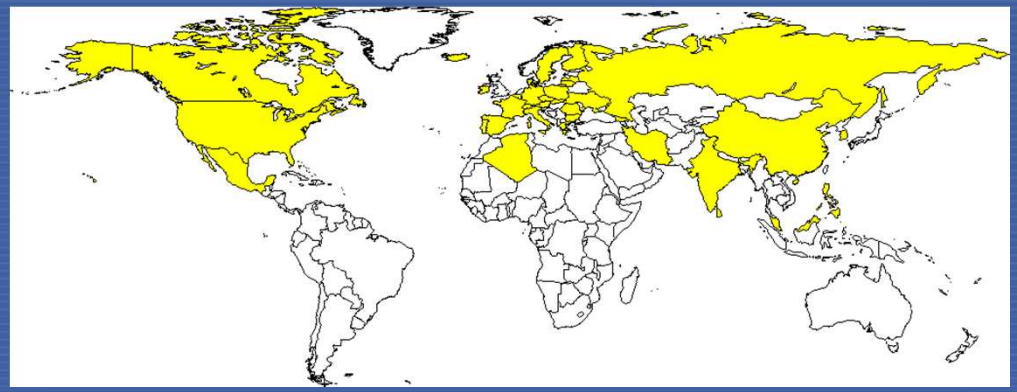
Emergency Response Manager
11-March-2011 19:45 UTC

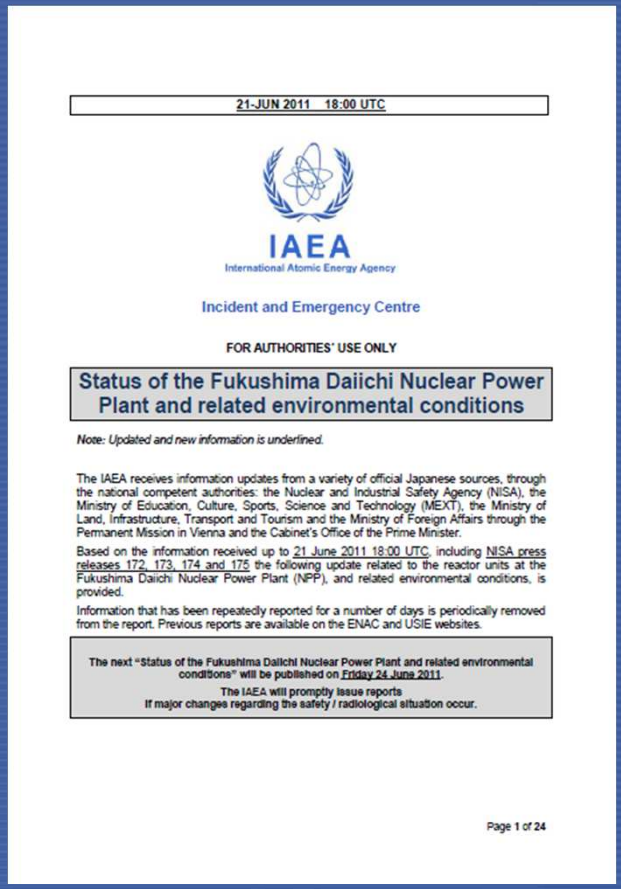
IAEA Incident and Emergency Centre

IAEA

March 11- June 20

- More than 110 Status Summary Reports prepared
- Monitoring data gathered from 37 Member States





21-JUN 2011 18:00 UTC

IAEA
International Atomic Energy Agency

Incident and Emergency Centre

FOR AUTHORITIES' USE ONLY

Status of the Fukushima Daiichi Nuclear Power Plant and related environmental conditions

Note: Updated and new information is underlined.

The IAEA receives information updates from a variety of official Japanese sources, through the national competent authorities: the Nuclear and Industrial Safety Agency (NISA), the Ministry of Education, Culture, Sports, Science and Technology (MEXT), the Ministry of Land, Infrastructure, Transport and Tourism and the Ministry of Foreign Affairs through the Permanent Mission in Vienna and the Cabinet's Office of the Prime Minister.

Based on the information received up to 21 June 2011 18:00 UTC, including NISA press releases 172, 173, 174 and 175 the following update related to the reactor units at the Fukushima Daiichi Nuclear Power Plant (NPP), and related environmental conditions, is provided.

Information that has been repeatedly reported for a number of days is periodically removed from the report. Previous reports are available on the ENAC and USIE websites.

The next "Status of the Fukushima Daiichi Nuclear Power Plant and related environmental conditions" will be published on Friday 24 June 2011.
The IAEA will promptly issue reports
if major changes regarding the safety / radiological situation occur.

Page 1 of 24

Status Summary Report on June 21 – 24 pages

IAEA

March 11 – June 20

- Oral briefings for MSs, press briefings have been provided and Update Briefs posted on IAEA's web site

- Missions to Japan

IAEA

March 11- June 20

- MSs offers for assistance gathered, provided to Japan and published on ENAC web site

OVERVIEW of CAPABILITIES OFFERED TO JAPAN as of 2011-Mar-23

Details of the offers are kept at IAEA IEC

		REMOTELY CONTROLLED EQUIPMENT		ENVIRONMENTAL MONITORING			EFFECTS OF RADIATION ON HUMAN HEALTH		OTHER OFFERS
State	Institution	Equipment	Services	Radiation survey	Environmental sampling and analysis	Assessment and advice on the radiological consequences	Medical support (medical management of casualties, recommendations, treatment, KI supplies, etc)	Dose assessment	
Argentina	Comision nacional de energia atomica					Experts		Experts	Experts (atmosperic dispersion, severe accident management)
Canada	Permanent Mission of Canada	Considering (robots and remotly controlled ground vechicle)	Considering (operators, remote platforms)	Mobile surveillance experts/equipment for car/ship/helicopter/airplan e	sampling and analysis (water,soil,food) experts/equipment	Experts in health physics/radiation protection	Population screening/ experts and screening equipment		Offers in specific equipment (hand-held survey meters, dosimeters, mobile survey systems, gamma spectrometers, biodosimetry capabilities), experts and liaison officers
China	PM of the People's Republic of China			Radiation monitoring			Nuclear medical assistance		Others
European Commission	ECHO			YES (protection and survey)			YES		
Finland	STUK						YES (chromosome analysis)		
France	IRSN			Any kind of assistance	Any kind of assistance	Any kind of assistance	Any kind of assistance	Any kind of assistance	Any kind of assistance
	PM/AGN/CEA					[To IAEA]: expert from ASN on technical assessment expert from CEA on rad consequences expertise (home based) from IRSN]]			Satellite images
	GIE-INTRA (EDF, AREVA, CEA)	1 ECLE Robotitized Device for Observation 1 EROS Robotitized Device for Observation 1 ELIOS measuring vehicle 1 GUEPARD remote vehicle Outdoor Robots 1 ERASE Outdoor reconnaissance Shielded vehicles-dump trucks excavators							
Germany	Ministry of Environment and Nuclear Safety and KHG capabilities in Karlsruhe	Specialised equipment for handling on highly irradiated or contaminatedf areas, e. g. inside the nuclear power plant		YES (unmanned aerial vehicle)	YES (robot in high dose rate area)				
	Ministry of Environment						drugs for radiation damage prevention (potassium iodide-1,000,000 doses) decorporating agents		
Hungary	PAKS NPP				YES (isotope, activity, air sample, dose rate)	YES	YES (whole body counting)		
	NRIR						YES (advisory, consultation) YES (surgery, chromosome analysis, dose reconstruction)	YES (internal dose assessment)	
	NDGDM				YES (various measurements)			YES	
	ADKI				YES (mobile equipment)		YES (whole body counting)	YES (gamma dose rate measurement)	
Kazakhstan	Permanent Representitive of the Republic of Kazakhstan to the Organization for Security and Co-Operation in Europe				YES				"Humanitarian aid, rescue teams and other necessary specialist"
Korea	Ministry of Education, Science and Technology, Permanent Mission			YES (The offer arrives in a generic way)			YES (The offer arrives in a generic way)		"Severe accident management"
Mexico	Comision nacional de seguridad nuclear y salvaguardias			YES(radiation exposure level)	YES (qualitative radionucleides analysis)				
Pakistan	PNRA			YES	YES				Source Search and Recovery Assessment and advice on Emergency Response
	NWP			Any kind of assistance	Any kind of assistance	Any kind of assistance	Any kind of assistance	Any kind of assistance	Any kind of assistance
Russia	Federal Environmental, Industrial and Nuclear Supervision Service of Russia								Unspecified: "Assistance and support"
Sweden	SSM			Any kind of assistance	Any kind of assistance	Any kind of assistance	Any kind of assistance	Any kind of assistance	Any kind of assistance
USA	DOE			YES (aerial)	YES (field monitoring team)				Consequence mangement response team 10 PEOPLE IN-SITU IN JAPAN

March 11- June 20

- Information on ‘soft countermeasures’ in MSs have been gathered, evaluated by OECD/NEA and made available on ENAC web site

Emergency Response Governmental Decision and Recommendations Information Exchange

Governmental Decisions and Recommendations

	Country	Decision taken or Recommendation made	Applicable Date	Applicable Population
Q1: What has your government recommended with regard to your citizens living in or visiting Japan?	Australia	As a precautionary measure, that Australians within an 80 km zone from the Fukushima nuclear power plant move out of the area. As the situation continues to develop, all Australians in Japan are strongly encouraged to follow the protective measures recommended by the Japanese and Australian Governments. This may include sheltering. Australians returning home from Japan are highly unlikely to be contaminated or exposed to significant radiation and will not require checks for radioactivity. However, if people wish to seek medical advice they should contact their local GP. ARPANSA and the Chief Medical Officer advise that iodine tablets are only required when exposed to substantial radiation doses from radioactive iodine. There is no current need for those returning from Japan or those in Japan outside the exclusion Zone to consider the use of potassium iodide tablets. At the present time, Australia's food standards Regulator, Food Standards Australia New Zealand (FSANZ), considers the risk of Australian consumers being exposed to radionuclides in food imported from Japan to be negligible. Australia does not import fresh produce from Japan. In fact Australia imports very little food from Japan. Imports are limited to a small range of specialty products, for example seaweed-based products, sauces etc. A joint communique for the World Health Organization, the International Atomic Energy Agency, the World Meteorological Organization, the International Maritime Organization and the International Civil Aviation Organization advises that there is no current restriction) on international flight and maritime operations can continue normally into and out of Japan's major airports and sea ports Full text at www.arpansa.gov.au	Last Updated 0900 AEDST (UTC+11) March 19	Various categories - Australians in Japan; Australian Passengers returning from Japan; Medical Practitioners; Food Imports; Advise to Airlines and Shipping
	Austria	Partial travel warning for the north east of Japan. It is also recommended that Austrians should leave this area and in addition the Tokio Province The Austrians in Japan are recommended to strictly follow the instructions of authorities in Japan.	Since 15.03.2011	Travelers; Austrians in Japan
	Belgium	Travel advice for Japan runs as follows: All trips to Japan are advised against till further notice. Belgian citizens whose stay in Japan is not essential are being advised to leave the country. organized consular assistance of Belgian citizens from Japan on a voluntary basis		

IAEA

March 11- June 20
ENAC web site

- Actively used:
  - Close to 10.000 visits with more that 1.8 million hits
- More than 110 EMERCON messages (mostly from Japan) received and published
- More than 1300 documents published:
  - More than 1000 from Japan
  - 31 from MSs
  - 74 from WMO
  - 110 Status Summary Reports

IAEA

Inter-agency Coordination

IACRNE and JPLAN

- March 11 - IGOs notified and JPLAN activated
- March 15 - first IACRNE coordination video meeting conducted:
  - Briefings, exchange of information, coordination of response activities, joint press releases, assignment of commonly agreed activities
  - 13 coordination video meetings since March 11
- Liaison officers working in IEC:
  - Staff members of FAO and WHO, experts from WMO

IAEA

March 11- June 20

- Around 200 IAEA's staff worked in IEC in shifts

IAEA

Current situation

- IEC operating in Basic response mode:
  - Day shift, on-call over night
  - Ready to move rapidly back to Full response mode
- Liaising with counterparts in Japan
- Continuing to prepare/publish Status Summary Reports
- Continuing to coordinate inter-agency activities under JPLAN

IAEA

Lessons from Response

International EPR framework

- IAEA's Incident and Emergency System proved to work well overall
- IAEA can respond 24/7 for sustained period
  - 54 days around the clock – first time in Agency's history
- IAEA's existing/formal role in sharing of information largely limited to distributing information validated by State concerned
- IAEA's existing/formal role in response appears not to be in line with perceived/expected role

IAEA

Lessons from Response

International EPR framework

- Additional gains could be obtained by effective implementation of relevant international instruments such as Convention on Early Notification of a Nuclear Accident and Convention on Assistance in Case of a Nuclear Accident or Radiological Emergency

IAEA

Way Forward
International EPR framework

- Role of IAEA in EPR requires broadening of responsibilities:
  - To conduct analysis of emergency conditions, progression (possible scenarios of crisis development), consequences and associated radiological impact, and response actions during course of an emergency
  - To expand information sharing with MSs including results of those analysis

IAEA

Way Forward

International EPR framework

- Responsibility of MSs for providing prompt, factual, transparent and continuous information during course of emergency needs to be emphasized
- Broader scope of information should be provided - State concerned and other States will need to share available data, analysis and other information with IAEA

Way Forward
International EPR framework

- IAEA EPR standards and guidelines need to be carefully reviewed and enhanced as appropriate, (once Fukushima accident is fully understood):
  - Severe accident progress, consequences and appropriate emergency response should be reviewed with MSs in near future
  - Additional guidance on taking protective and other actions based on environmental data analysis and assessment following release to ensure public safety should be developed

IAEA

Way Forward
International EPR framework

- Active utilization of IAEA Unified System for Incidents and Emergencies (USIE) to ensure emergency notification, reporting, information sharing and effective activation of international assistance
  - Conduct training, drills and exercises and evaluate response times against established performance criteria

IAEA

Way Forward

International EPR framework

- Standardized and reliable methodologies need to be in place in MSs to analyse and evaluate radiological monitoring data, and to assess radiological impacts to population
- Real-time on-line radiation monitoring systems are operational in some States
- Integrated, word-wide, real-time radiation monitoring platform based on existing national and international systems to be established

IAEA

Way Forward
International EPR framework

- International assistance mechanisms must be strengthened and assistance compatibility and effectiveness assured through enhancement of IAEA RANET
- Extend registered capabilities
  - Establish international register of special technical capabilities (e.g. robotics, etc.) and expertise (e.g. experts in different NPP design, etc.)
  - Establish national accident response teams
- Ensure extensive regional RANET coverage (regional emergency response arrangements)
- Appraise RANET registered capabilities (regular reviews)
- Conduct emergency exercises regionally and internationally

IAEA

Way Forward

International EPR framework

- Strengthening international EPR framework should take into account recommendations in final report of International Action Plan for Strengthening the International Preparedness and Response System for Nuclear and Radiological Emergencies

Lessons from Response

National EPR

- Universal implementation/application of IAEA safety standards is crucial
- Application of EPR safety standards at national level improves emergency preparedness and response, and facilitates communication
- States are using different (not harmonised) criteria for implementing protective actions

IAEA

Way Forward
National EPR

- NPP States should agree to systematic and regular Emergency Preparedness Review (EPREV) and follow up missions
  - Conduct comprehensive national self-assessments and provide to IAEA regularly
  - Focus in particular on enhancement of national capabilities and arrangements
  - Development of country-specific activity plans to enhance national EPR based on safety standards

IAEA

Way Forward
National EPR

- Strengthen cooperation among national authorities, technical support organizations and all other national EPR players
  - Train and drill all emergency responders at facility, local and national levels
  - Conduct national exercises with various scenarios
  - Participate in international Conventions Exercises (ConvEx)

IAEA

Way Forward
National EPR

- Establishment of EPR Capacity Building Centres
- Establishment of stockpiles of emergency equipment (e.g. mobile diesel generators)
- Building rosters of experts
- Development of supporting guidelines and technical manuals

IAEA

Lessons from Response

Inter-agency EPR

- Inter-Agency Committee on Radiological and Nuclear Emergencies (IACRNE), and its related JPLAN, demonstrated and proved effective and comprehensive inter-agency mechanism
- All relevant IGOs are not members of IACRNE
- Consistent "one voice message" between IGOs is achievable and proved to have positive impact on public understanding
- Established ad-hoc topical groups demonstrated efficient way for solving common issues

IAEA

Way Forward
Inter-agency EPR

- Ensure participation of all relevant IGOs within IACRNE and co-sponsorship of JPLAN
- Build improved preparedness and coordination of all relevant IGOs based upon central IAEA's role
- Regularly test preparedness for efficient / coordinated response by using ConvEx regime
- Establish standing working groups to address common issues (e.g. transport)
- Develop additional operational procedures to support JPLAN implementation

IAEA

Conclusion

Experience gained in response to Fukushima accident will provide valuable input for enhancing and harmonizing EPR framework at all levels: facility, local, national, regional and international


Thank you