

International Workshop on Seismic Safety of Nuclear Installations
17-19 March 2010
Kashiwazaki, Niigata, Japan.

***“Overview of IAEA Tsunami EBP
and International Workshop
in Kalpakkam 2010”***

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Overview - Tsunami EBP

In 2006, IAEA received a proposal for launching an Extrabudgetary Project from the Japan Nuclear Energy Safety Organization (JNES) in relation to the mitigation of tsunami disasters in nuclear power facilities.

IAEA expressed the need to also include the dissemination of tsunami hazard assessment methodologies for site evaluation to Member States.

It was decided to propose two activities:

- ***Activity 1: TIPPEZ (Tsunami and Post Earthquake Response in the External Zone) System Implementation***
- ***Activity 2: Tsunami Hazard Assessment***

Overview - Tsunami EBP

- Kickoff Meeting Japan Dec 2007
- 1st Steering Committee Meeting and JNES Code training Korea Jun 2008
- 2nd Steering Committee Meeting and JNES Code workshop Turkey Mar 2009
- NOAA ComMIT training Korea Oct 2009
- International Workshop in Commemoration of the 5 year Anniversary of the Indian Ocean Tsunami India Jan 2010
- 3rd Steering Committee Meeting Japan Mar 2010

Outcome - Tsunami EBP

- Participating Member States India, Korea, Turkey, Pakistan, Indonesia, Egypt, USA, and Japan
- The Tsunami IAEA EBP met its desired objectives.
- In working area 2, participating Member States were trained and carried out a series of validation benchmark problems and NPP-specific tsunami hazard assessments using the JNES code.
- In addition, participating Member States were trained in the NOAA ComMIT tsunami hazard assessment tool for use as an alternate or confirmatory method available to Member States.

Outcome - Tsunami EBP

In Working area 1, TiPEEZ system for disaster management was implemented in two Member States through the following actions:

- TiPEEZ system was transferred to Member States, Korea and India.
- Implementation activities were undertaken in the participating MS.
- Site visits were made by Japanese specialists to the participating MS to address technical issues and to meet with critical local officials.
- Customizations of TiPEEZ were undertaken by recipients.
- Assistance to India resulted in ongoing development of sufficient inputs for implementation of the TiPEEZ system
- An emergency exercise was held in India in February 2010, meeting the objectives of the EBP activity.

Outcome - Tsunami EBP

- Through the EBP meetings and workshops, Member States exchanged knowledge and information related to on-going research focused on developing state-of-the-art tsunami-related tools and techniques including:
 - tsunami hazard assessment approaches
 - historical tsunami databases
 - tsunami warning systems
 - sediment transport models
 - hydrodynamic loading models
 - floating material impact models
 - Scouring
 - NPP tsunami fragility curves
 - paleotsunami techniques
 - methods of assessment of impact on intake and other offshore components

Overview – India Workshop 2010

- International Workshop was held in Kalpakkam, India January 2010 in Commemoration of the 5 year Anniversary of the Indian Ocean Tsunami
- The workshop was attended by a variety of organizations which was important to meeting the goals to disseminate research results and build consensus (total 60 participants from 18 countries and 1 International Organization)
- Attendees represented a good combinations of participants from Regulatory, Research and Design Organizations and Utilities.

Conclusions – India Workshop 2010

General:

- The participants concur that an impressive progress was made during the last 5 years in the areas of hazards assessment, criteria and methods for flooding analysis, back-fitting and operational safety procedures, collection of data, and warning and notification systems. All this progress reflect the increased cooperation and collaboration at international level by all stakeholders of the nuclear and non-nuclear communities, in an open atmosphere, sharing widely the lessons learned from the occurrence real natural events.

Conclusions – India Workshop 2010

General Implementation and Progress of 2005 Recommendations:

- To IAEA:
 - Revision of related safety standards **Near Completion (DS417)**
 - Promote of international cooperation for sharing data, methodologies and experiences **Achieved (EBP implementation)**

Conclusions – India Workshop 2010

General Implementation and Progress of 2005 Recommendations:

- To Member States:
 - To promote sharing of data and experiences. **Achieved**
 - To perform periodic re-assessment of the external floods hazards **Depends on the regulatory policy of the Member States**
 - To participate in the development of tsunami warning systems, including its integration with the existing ones **Achieved in some Member States**
- Research Communities:
 - To promote historical and geological studies of past tsunamis **Ongoing**
 - To enhance and complete the Catalogue of Tsunamis. **Ongoing**

Conclusions – India Workshop 2010

Specific – Database and Warning Systems:

- Several sets of databases of past tsunami have been developed on global and country scales that include tsunami waveforms, runup heights and geological traces; providing useful data for tsunami hazard assessment and validation of simulation codes. Most of the databases are publically available.
- Over the last 5 years, significant improvements have occurred in both new and well established tsunami warning systems in all ocean basins. Incorporation of notification systems into relevant activities has occurred in IAEA and some Member States. Work is ongoing in this area.

Conclusions – India Workshop 2010

Specific – Tsunami Hazard Assessment:

- Efforts towards implementation of PTHA techniques are increasing; with the challenges including standardization of approach and determination of appropriate rate activity.
- Appropriate tsunami hazard assessment techniques incorporate both a review of past events and assessment of impact of potential tsunamigenic sources on the site.
- Lack of known tsunami evidence does not preclude the requirement to perform an appropriate hazard analysis for a site.

Recommendations – India Workshop

- *To IAEA:*
 - Continue to promote international cooperation for sharing data, methodologies and experiences through the ISSC.
 - Network with additional academic and regulatory bodies to pull additional expertise into the nuclear community.
 - Preparation of a TECDOC on the outcome of the EBP tasks.
 - Preparation of a TECDOC providing detailed guidance as deterministic and probabilistic approaches for tsunami hazard assessment, including definition and practices.
 - Provide support to implement warning systems and emergency response through the ISSC.
 - Include in the ISSC a topical study including:
 - Hydrodynamic forces
 - Sedimentation and scour
 - Tsunami fragility in PSA

Recommendations – India Workshop

- *To Member States:*

- To integrate existing tsunami warning systems into NPP as part of the operational safety, according to the specific plant locations and conditions; and to continue to support the development of new tsunami warning systems as appropriate.
- To establish and implement specific operating plant procedures for dealing with external flood events, including tsunami.
- Review instrumentation adequacy to support the initiations of procedures
- Develop better characterization of near shore topography and bathymetry
- To continue to promote sharing of data and experiences.
- Continued financial and in-kind support is requested from participating Member States, particularly JNES and NRC

Recommendations – India Workshop

- *To the Research Communities:*
 - To continue to further develop tools and methods for tsunami hazard assessment including:
 - Probabilistic tsunami hazard assessment methods including treatment of uncertainties and rate assessment techniques
 - Methods to assess hazard from tsunamigenic landslides and volcanic actions; with a possible project on capacity building of Member States
 - Develop better characterization of tsunamigenic sources
 - Historical and geological studies of past tsunamis
 - Catalogues of Tsunamis

Recommendations – India Workshop

- *To the Research Communities:*
 - To continue to further develop tools and methods for assessment of impact and risk to plants, including:
 - Deposition and scour
 - Impact of floating materials
 - Loading and response of intake and related structures
 - Tsunami PSA
 - To continue to develop tsunami warning systems and notification services.

FUTURE: AREA TSUNAMI HAZARD ASSESSMENT

- Sharing lessons and experience to MSs “newcomers” - through training courses and workshops- related to tsunami hazard assessment codes and methodologies.
- Benchmark exercise on the 27th February 2010 M8,8 Chile earthquake, using available collected data, at ocean basin scale, at specific sites (to be defined).
- Development and completion of related supporting documentation, e.g. safety reports and TECDOCs.
- Areas/issues for which additional research is needed: (a) PTHA methodology and uncertainties treatment; (b) landslide and volcanic generated tsunamis, (c) dynamic effects of tsunamis waves, (d) debris effects, etc.
- Development of External Events Notification System in relation to tsunami occurrence.

FUTURE: AREA ON EMERGENCY PREPAREDNESS TO NATURAL EVENTS

1. Sharing lessons and experience to MSs “newcomers” through training courses and workshops- related to impact on site selection of feasibility on implementing emergency plans.
2. Appraisal of Tsunami Warning System and response to the emergency caused by the 27th February 2010 M8,8 Chile earthquake.
3. Development and completion of related safety reports (experts services).
4. Support for the advance stage of TiPEEZ System implementation in India and Korea.
5. Agreement letters exchange with JNES, DiMSIS Consortium and MSs for Activity 1 and 2 computer codes.
6. Application/Use of External Events Notification System in relation to tsunami occurrence.