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AERB Newsletter

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July – December, 2014

ATOMIC ENERGY REGULATORY BOARD

Mission: The Mission of the AERB is to ensure the use of ionising radiation and nuclear energy in India does not cause undue risk to the health of people and the environment.

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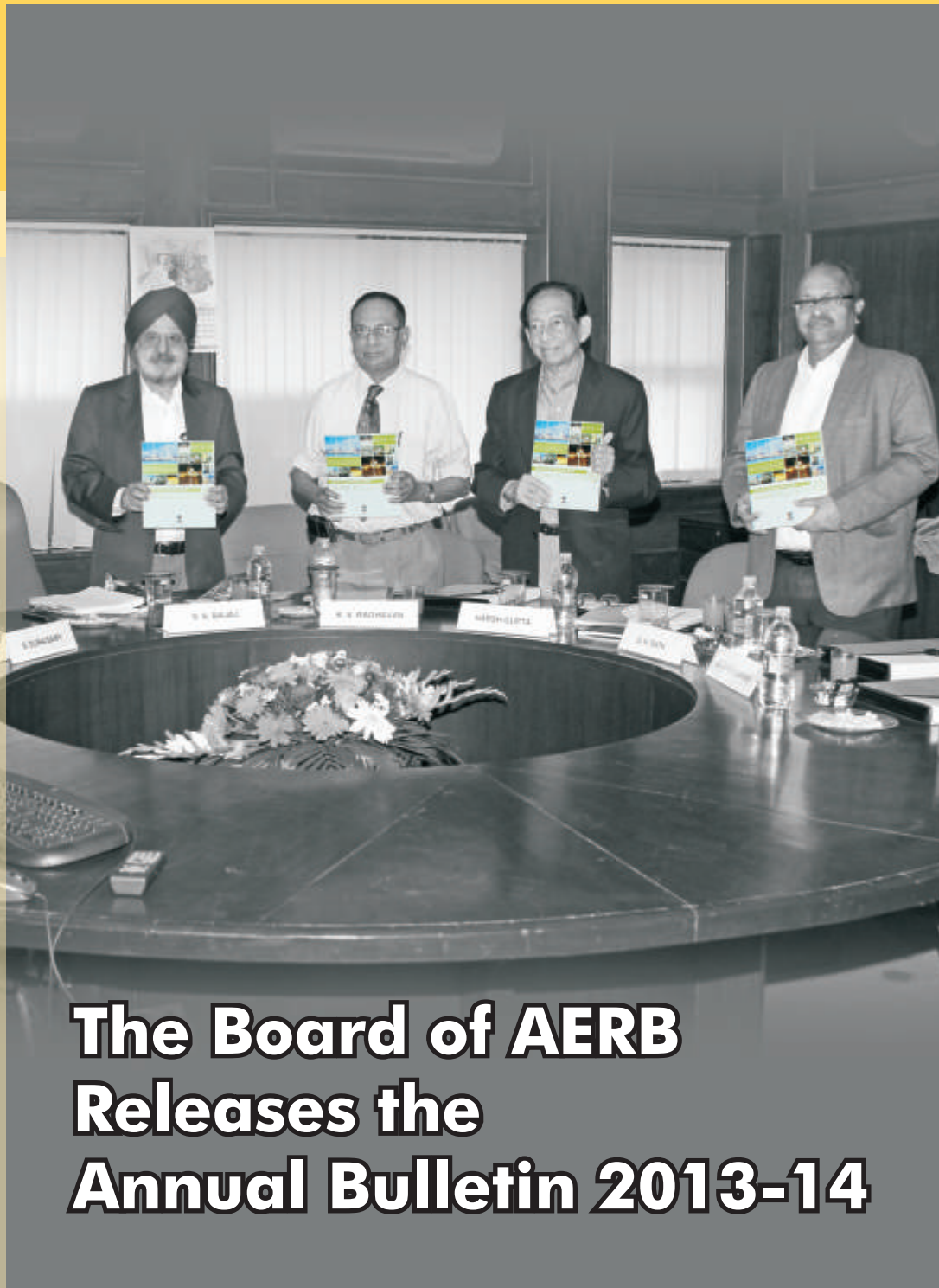


The Board of AERB Releases the Annual Bulletin 2013-14

From the Chairman's Desk

New Year greetings to all!!!

The New Year is usually a time for reflection and planning ahead for most of us. Looking back, over the years, AERB has made its mark in ensuring safety in the use of ionizing radiation, whether it is the high hazard Nuclear power plant or the relatively low hazard X-ray diagnostic unit. This is being achieved by a multi-pronged approach, such as a) Development of sound in-house regulatory mechanism b) codification of regulatory requirements b) Stake holder engagement c) International participation d) Public interaction e) Co-ordination with state and central authorities, amongst others.

AERB consolidates all the experience and expertise into a regulatory framework by routinely publishing/ updating safety Codes and Guides which codify AERB's requirements and expectations respectively. As a further step, AERB has prepared a Policy Document which consolidates the higher level policies on nuclear and radiation safety in "bite-sized"format.

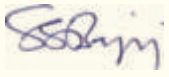
Here, it would be worthwhile to recollect that for Indian reactors in the light of accident at Fukushima, many short, medium and long-term generic & plant specific safety up-gradations were identified. These are implemented or being implemented, and monitored by AERB closely. Safety documents published recently (see this edition of newsletter), have incorporated renewed insights gained, as a result of the accident.

Notable strides have been made in the regulation of radiation facilities especially diagnostic x-ray equipment owing to the launching of e-governance portal, e-LORA (e-Licensing of Radiation Applications). The number of diagnostic x-ray facilities presently regulated by AERB which were hitherto outside the regulatory ambit has increased three fold, owing to a series of efforts in terms of streamlined regulations, increased regulatory inspections, ongoing awareness programs and continued presence in print media. The recently setup Northern Regional Regulatory Centre (NRRC), in addition to the Southern and Eastern Regional Regulatory centers is expected to further enhance effectiveness in regulation.

An important event for AERB in the coming days is Integrated Regulatory Review Service (IRRS) mission. The IRRS is an IAEA coordinated peer review conducted by a team of international reviewers led by a senior regulator from a Member State. The team peer reviews both regulatory technical and policy issues, and enables an objective comparison of the national regulatory infrastructure against IAEA Standards and Guidance. The next edition of newsletter will contain more details on the mission.

Alongside achieved milestones, key challenges remain. AERB is faced with a unique stance of regulating reactors with latest design features and reactors of older vintage. Similarly, in the use of radiation sources in public domain, there is fast evolving technology and innovative use of radiation sources. It is no doubt a challenge to ensure that regulatory competence keeps pace with such diversity and rapidity. Ensuring that stakeholders carry out safe disposal of disused radiation sources used in medical/ industrial/ research areas is a challenge in itself. Another internationally acknowledged concern is that of security of radiation sources, which unlike safety, is an area which is still evolving.

Looking forward, it can be said with confidence that with its robust regulatory framework, like in the past, AERB can meet new challenges head-on and to fruition in the years to come.



(S.S. Bajaj)

SAFETY REVIEW AND REGULATION

AERB Board Meeting

The Board of AERB held two meetings during the reporting period between July-December 2014.

The 112th Board meeting was held on July 8 & 9, 2014 at KAPP 3&4 Site during which the Board Members visited the construction site of KAPP 3&4 and the operational plants at KAPS 1&2. The 113th Board meeting of AERB was held on December 30, 2014 at AERB, Mumbai.

The Board reviewed the safety status of operating Nuclear Power Plants (NPPs), NPP projects, Fuel-Cycle Facilities/Projects and Radiation Facilities. The Board discussed Status of Commissioning of KKNPP Unit # 1 & 2, Erection of Major Equipment at RAPP # 7 & 8 and radiation facilities & radiation sources.

The Board also reviewed the R&D activities carried out by AERB including CSRP projects.

Approval of Safety Codes

The Board approved the Revised Code on 'Site Evaluation of Nuclear Facilities' (AERB/NF/ SC/S-Rev1) in its 112th meeting. This Safety Code supersedes the earlier Safety Code which was published in 1990.

The AERB Safety Code titled 'Design of Light Water Reactor based Nuclear Power Plants' (AERB/NPP-LWR/SC/D) was approved by the Board in its 113th meeting. This is a new Safety Code providing requirements related to design of Light Water Reactor Based NPPs.

Dose Criteria for normal operation and accident conditions

The Board approved the dose criteria which is aimed to spell out high level technology neutral requirements for all water cooled power reactors.

The dose criteria for normal operation remain unchanged with effective dose limit for any individual at offsite below 1.0 mSv/year.

For Design Basis Accidents the design target for effective dose should be met without any credit for offsite counter-measures involving public beyond exclusion zone. The design target for effective dose as calculated using realistic methodologies is to be less than 20.0 mSv/year following the event. For Design Extension Conditions, the same design target is to be met, but with credit taken for offsite counter-measures.

Policies Governing Nuclear and Radiation Safety

AERB prepared a policy document named as "Policies Governing Nuclear and Radiation Safety". The document was issued in July 2014 after it was approved by the Board of AERB. This document consolidates the high level safety requirements enshrined in AERB's Safety Codes and other Regulatory documents.

AERB Board Members in discussion during 113th Board Meeting

Consents Issued

Radiation Facilities / Activities

The licenses and other consents issued during this reporting period (July 2014-December 2014) are as follows.

Type of Facilities / Equipments	No of Facilities / Equipments	Type of Consents
Radio therapy facilities	13	License
Medical Cyclotron facility	1	License
PET-CT and SPECT-CT	14	License
Interventional Radiology	57	License
Computed Tomography	87	License
Manufacturing facilities of diagnostic X-ray equipment	8	License
Radiation Processing Facility (RPF)	6	License
Industrial Radiography Facilities	20	License
Research accelerators	0	License
HDR Brachytherapy	8	Authorisation
Supply of diagnostic equipment	18	Authorisation
Agencies for QA of Diagnostic X-ray equipment	24	Authorisation
Gamma Irradiation Chamber (GIC) Equipment	1	Authorisation
Well Logging	1	Authorisation
Diagnostic X-ray facilities	2696	Registration
Facilities using unsealed radio-isotopes for research	10	Registration
IRGD (Nucleonic gauges) Facility	20	Registration

Update on e-LORA: (As on December 31, 2014)

e-LORA system is aimed for complete automation of regulatory processes associated with the use of ionizing radiation in India. e-LORA system is built on web-based technology to ensure its availability across the globe through internet.

Updates: For Diagnostic Radiology facilities, the modules for supplier and service agency went live in July 2014 and module for new users went live in September 2014. Institute Registration, Radiation Professional registration and RSO approval has begun for Industrial radiography Nucleonic Gauge and Oil Well Logging and nuclear Medicine.

Practice	Approved Radiation professionals
Diagnostic Radiology	3779
Radiotherapy	3384
Industrial Radiography	1358
Nuclear Medicine	271
Nucleonic Gauge	139
Well Logging	25
Gamma Irradiation Chamber	2
Total	**8958**

Nuclear Facilities

The licenses and other consents issued during this reporting period (July 2014-December 2014) are as follows.

Type of Facilities	Consents
NPP	Clearance for Operation of Kudankulam Nuclear Power Project Unit-1 upto 100% FP for Limited duration (Phase - C3 stage), issued on August 30, 2014
NPP	Permission for Grouting the End-shields of KAPP-3&4, issued dated Sept. 29, 2014
NPP	Renewal of licence for operation of RAPS-1&2 up-to Dec 2016
NPP	Renewal of license for operation of MAPS-1&2 up to Dec 2015
NPP	Renewal of licence for operation of KAPS-1&2 up to July 2019

Regulatory Safety Documents Published by AERB

AERB published three Regulatory Safety documents during the reporting period. Two of these regulatory safety documents fall under the category of "Safety Codes" while the other under "Safety Guidelines".

AERB Safety Code titled 'Site Evaluation of Nuclear Facilities' (AERB/NF/ SC/S-Rev1)

AERB had issued a Safety Code titled 'Code of Practice on Safety in Nuclear Power Plant Siting' (AERB/SC/S) in 1990, to spell out the requirements to be met during siting of nuclear power plants in India for assuring safety. The present Safety Code is revised to reflect developments, which have taken place since then. The revised code supersedes the earlier version.

Previous version of the Safety Code was related to land based stationary nuclear power plants (NPP) while the scope of the revised Safety Code has been extended to cover a comprehensive range of land based nuclear facilities: nuclear power plants and research reactors, as well as nuclear fuel cycle facilities.

The revised Safety Code prescribes requirements for site evaluation for limiting the radiological impact. It also covers assessment of site characteristics, natural events and human-induced events specific to the site, which will have a bearing on the safety of the nuclear facility and the radiological impact on the environment and population due to the nuclear facility at the site during normal operation and accident conditions.

AERB Safety Guidelines titled 'Criteria for Planning, Preparedness and Response for Nuclear or Radiological Emergency' (AERB/SG/EP-5)

This Safety Guidelines provides criteria for establishing an emergency preparedness and response plan for nuclear and radiation facilities to deal with nuclear and radiological emergency. The criteria provided in this guidelines is to undertake protective actions and other response actions in precautionary action zone (PAZ), urgent protective action planning zone (UPZ), extended planning distance (EPD) and ingestion and commodities planning distance (ICPD) which replace existing Space-Time Domains.

This Safety Guidelines provides reference levels, generic criteria, emergency action levels, operational intervention levels including numerical values for these criteria for protective actions and other response actions in the event of a nuclear or radiological emergency. This Safety Guidelines also provides guidance dose value for protection of emergency workers and the public in the event of a nuclear or radiological emergency.

This Safety Guidelines supersedes the present safety guide AERB/SG/HS-1 titled "Intervention Levels and Derived Intervention Levels for Off-Site Radiological Emergency" published in the year1992.

AERB Safety Code titled 'Design of Light Water Reactor Based Nuclear Power Plants' (AERB/NPP-LWR/SC/D)

This Safety Code presents the requirements for the design of light water based Nuclear Power Plants (NPP) and is intended to ensure the highest level of safety that can reasonably be achieved for the protection of workers, the public and the environment from harmful effects of ionising radiation arising from nuclear power plants.

This Code is primarily meant for land based stationary nuclear power plants with light water based reactors designed for electricity generation or for other heat utilization applications (such as heating or desalination).

This Safety Code establishes design requirements for the structures, systems and components.

(SSC) of a light water based nuclear power plant for safe operation and for preventing events that could compromise safety, or for mitigating the consequences of such events, if they do occur and organizational processes important to safety, that are required to be met.

REGULATORY INSPECTIONS

AERB officials carried out periodic Regulatory Inspections as well as special inspections at Nuclear and Radiation Facilities to review the safety status and verify compliance with the regulations. Unplanned inspections were also carried out for selected nuclear and radiation facilities.

INTERNATIONAL COOPERATION

Cooperation between AERB and USNRC

A bilateral meeting between Atomic Energy Regulatory Board (AERB) of India and Nuclear Regulatory Commission (NRC) of United States of America was held during September 10-11, 2014 at Rockville, Maryland USA. Officials from Bhabha Atomic Research Center (BARC), Nuclear Power Corporation of India Ltd. (NPCIL) and Embassy of India also participated in the meeting as part of the Indian delegation. The purpose of the meeting was to continue bilateral cooperation between AERB and NRC in the areas of nuclear regulatory safety, regulatory safety research including severe accident prevention and lessons learned from Fukushima nuclear accident.

In addition, the areas to be considered for future bilateral cooperation and exchange were identified. The Indian Delegation accompanied by NRC staff also visited North Anna Nuclear Power Plant in Virginia, USA on September 12, 2014.

U.S. NRC and Indian Delegation Visit to North Anna Power Station, USA

Participants at the Annual Meeting of CSRG for the year 2014 at Mumbai

CANDU Senior Regulator's Meeting

IAEA had instituted a programme under the auspices of 'CANDU Senior Regulators Group' (CSRG) for Member States having CANDU-based nuclear power programme. The members of CSRG are Argentina, Canada, China, India, Republic of Korea, Pakistan and Romania.

The Annual Meeting of CSRG for the year 2014 was hosted by AERB at Mumbai during 10 to 14 November, 2014. The areas of common interest to CANDU operating countries were discussed such as (i) I&C aspects of CANDU reactors, (ii) source term assessment methodology, (iii) radiological impact assessment, (iv) possible measures for avoidance of long term offsite contamination. A site visit to 540 MWe PHWR (TAPS-3&4) was also arranged for CSRG participants.

58th General Conference of IAEA

The General Conference is the highest policymaking body of the IAEA. It is composed of representatives of all Member States of the Agency. The General Conference meets annually to consider and approve the Agency's programme. As a part of Indian delegation led by Chairman Atomic Energy Commission, Shri R. K Sinha, Chairman AERB, Shri S. S. Bajaj participated in the 58th General Conference of IAEA held during September 22-26, 2014 at IAEA headquarter, Vienna, Austria.

The Indian Delegation at the plenary of the Fifty-Eighth Regular Session of IAEA General Conference.

AERB signs agreement with Regulatory body of Finland (STUK)

An agreement was signed between AERB and the Regulatory body of Finland (STUK) on October 15, 2014 during the visit of Honorable President of India, Shri Pranab Mukherjee to Finland. The agreement includes exchange of information between the two organisation on the peaceful uses of nuclear energy and radiation safety issues, safety issues related to the construction, operation and decommissioning of nuclear power plants, as well as security assessments, emergency preparedness and radioactive waste disposal.

Honb'le President of India Mr. Pranab Mukherjee with Honb'le President of Finland Mr. Sauli Niinistö in Helsinki

IRRS Mission to INDIA

The IAEA Integrated Regulatory Review Service (IRRS) is designed to strengthen and enhance the effectiveness of the national regulatory infrastructure of States for nuclear, radiation, radioactive waste and transport safety and security of radioactive sources. IRRS is a type of peer review carried out by a team which comprises senior regulators of the other member countries and IAEA staff. The IRRS peer review mission for India is scheduled during March 16-27, 2015 for reviewing the activities of AERB with respect to safety regulation of Nuclear Power Plants (NPPs).

Preparations for IRRS Mission

Preparatory meeting with IAEA officials

A preparatory meeting for IRRS Mission was held on October 7-8, 2014 at AERB, Mumbai. Meeting was attended by designated IRRS team officials, Counsellor (AE) of India at Vienna and AERB officials. The team discussed all the aspects related with the IRRS Mission including the identification of the policy issues and expressed the mission's expectations. The team leader for IRRS Mission to India mentioned that since India has established its indigenous regulatory infrastructure, evaluation of the Indian regulatory practices will set an example for the other embarking countries and in showcasing its good practices to other nuclear regulators around the world. The team also appreciated the arrangements in place for training of AERB officials at operating NPPs.

Self Assessment using SARIS tool

One of the pre-requisites of the IRRS Mission is carrying out the self assessment using SARIS (Self-Assessmentof Regulatory Infrastructure for Safety) tool. This comprised of different modules having detailed questionnaire which helps in assessing individual country's regulatory infrastructure against the IAEA standards. AERB carried out the self assessment using this tool and prepared answers to the questionnaires for all modules.

AERB's participation in IRRS Missions for other countries

Two officers from AERB, one as reviewer and other as observer were invited for IRRS Mission to Netherland conducted during November 02-14, 2014. Another officer from AERB had also participated in the IRRS Mission to France conducted during November 16- 28, 2014 as an observer.

One officer from AERB participated in workshop held in Moscow on lessons learnt from IRRS and follow-up missions since 2011.

The experience gained during these interactions proved to be very useful and these presented opportunities for AERB to understand modalities of conduct of an IRRS mission.

IRRS team officials, Counsellor (AE) of India at Vienna and AERB officials during preparatory meeting for IRRS Mission

DISCUSSION MEET/SEMINAR/AWARENESS PROGRAMME

Indo-Japan IJAA Conference MHS-2014, Chennai

Dignitaries at the Indo-Japan IJAA Conference MHS-2014

International Conference on "Advancements in Materials, Health and Safety towards Sustainable Energy & Environment (MHS-2014)" was organized by Indian JSPS Alumni Association in association with Atomic Energy Regulatory Board (AERB) and with support from IGCAR and BHAVINI at Kohinoor Asiana Hotel, Chennai during August 7-8, 2014. The conference was sponsored by Japan Society for the Promotion of Science (JSPS) and co-sponsored by Toyo University, Japan.

The objective of the conference is to provide a platform for scientific interaction and sharing of information on the recent advancements in Materials, Health and Safety to meet the Energy demand and sustainability and to promote and strengthen the Indo-Japan Science & Technology programs. Eminent scientists, academicians from India and Japan along with Indian JSPS Fellows participated in the conference. The organizing secretary for the conference was Dr. C. Gurumoorthy, AERB-SRI who is also a JSPS Fellow.

Inaugural address was delivered by Mr. Jumpei Watanabe, Executive Director, JSPS and presidential address by Dr. Baldev Raj, Former Director, IGCAR. Dr. R. Chidambaram, Principal Scientific Advisor to Government of India and Former Chairman, AEC, India and Professor Emeritus Yoichi FUJIIE, Representative Director, Nuclear Salon Fujii and Former Chairman, AEC, Japan were the distinguished keynote speakers. Souvenir for the conference was released by Dr. R. Chidambaram and Professor Emeritus Y. Fujiie received the first copy. Dr. Baldev Raj inaugurated the exhibition stall. About 175 participants including Scientists and Academicians from various Government organizations and from AERB, IGCAR and BHAVINI delivered talk and took part in the poster presentations.

Awareness programme on 'Security of Radioactive Material (RAM) at Radiation Facilities (RFs) and during Transport of RAM' for the security officials of DCSEM; INS-Tanaji, Navy; CISF, BARC; IB and Police officials, Trombay.

The use of ionising radiation sources for various applications in industry, medicine, agriculture, research and education are increasing steadily. Thus, ensuring security of radioactive source(s) has an important role on overall protection of radiation workers, public and environment, the primary responsibility of which is with the radiation facility owner.

AERB organized an awareness programme on 'Security of Radioactive Material (RAM) at Radiation Facilities (RFs) and during Transport of RAM' for Law & Enforcement Authorities on September 26, 2014 at AERB Auditorium.

The objective of the programme was to create awareness among law & enforcement authorities on different applications of radiation source(s) for societal benefits, safety and security associated with these practices as well as familiarize them with the requirements for security of radioactive material in radiation facilities (RFs) and during transport including roles and responsibilities.

About 50 participants that included participants from Security officials of DCSEM; INS-Tanaji, Navy, Mankhurd; Mumbai Police, CISF, IB and Indian Air Force (IAF) attended the awareness programme.

Dr. A.U. Sonawane, AERB outlined many important applications of radiation for societal benefits and explained the requirements of safety and physical security measures at different radiation facilities.

Shri Amit Sen, AERB Shri Fredic Lall, AERB Shri G.L.Huriwal, Director, Security, DCSEM and Dr. A.U.Sonawane, AERB at the inauguration ceremony

Shri Fredric Lall, AERB, informed the participants on the stringent regulatory control in place over use of radiation sources and the physical security measures recommended in the AERB security guides and their implementation. He also elaborated about the role of RFs, Law & Enforcement Authorities and radiation source / equipment manufacturer / supplier for ensuring the security of radioactive sources.

Chief Guest of the programme, Shri G.L. Huriwal, Director, Security, DCSEM delivered the key note address.

Awareness programme on 'Security of Radioactive Material (RAM) at Radiation Facilities (RFs) and during Transport of RAM' for Law & Enforcement Authorities and owner of Radiation Facilities (RFs) of Eastern & North-Eastern States.

AERB along with its Eastern Region Regulatory Centre (ERRC) organized one-day awareness programme on 'Security of Radioactive Material (RAM) at Radiation Facilities (RFs) and during Transport of RAM' for Law & Enforcement Authorities and Radiation Facility owners (mainly Category-1 & 2) of West Bengal, Bihar, Odisha, Jharkhand, Assam, Meghalaya, Manipur, Mizoram September 18, 2014 at Meghnad Saha Auditorium, Saha Institute of Nuclear Physics (SINP), Kolkata.

Total about 157 participants attended the programme which included participants from Police officials of the rank of Dy. SPs, Addl. SP, ACPs and Sr. Police Officers and from different RFs (category-1 & 2) Handouts in the printed booklet form, containing the training material were distributed to all the participants and copy of AERB Security Guides were distributed to the participants from Law and enforcement authorities.

Shri Anil Kumar, IG, DAE delivering lecture at the awareness programme


Participants at the workshop

Prevention of radioactive contamination in metal recycling industries

As part of AERB's continuing endeavor towards prevention of radioactive contamination in metal recycling industries, AERB in association with National Institute for Secondary Steel Technology, carried out an awareness program for about 30 Induction furnace owners on 20.9.2014, in Jaipur. (Photographs awaited from the organizers)

Live demonstration of e-LORA at AMPI conference

The 35th National Annual conference of Association of Medical Physicists of India (AMPICON 2014) was held at Pravara Institute of Medical Sciences, Loni, Maharashtra during 20-22 November, 2014 The conference was attended by around 550 delegates. AERB had arranged for live demonstration of procedure for submission of applications through eLORA. Guidelines for online submission through eLORA and set of FAQ's were distributed to the visitors of the stall. AERB officials resolved issues related to on-line submission for some of the users.


AERB officials along with the visitors during the awareness programme

AERB has undertaken series of awareness programs to disseminate information on e-LORA

End User Coverage	
Sending information of eLORA to end users through letters	From the list of end users obtained from suppliers, 10,570 (as on date) letters have been sent to diagnostic radiology institutes
Sending information of eLORA to end users through email	27, 200 emails sent as on November 25, 2014
Community / Media Coverage	
Publication of advertisement in health care related magazines - Health Care Radius July up to December 2014 and Express health care and Patrika (Marathi Science magazine)	
e-LORA advertisement published in leading newspapers on 25th July 2014 and 23rd August 2014	

Health Physics Professional Meet-2014

Health Physics Professional meet is a forum that provides opportunity to the professionals working in nuclear facilities in exchanging their experiences and developments. AERB organised one day Health Physics Professional Meet-2014 on November 20, 2014 at Niyamak Bhawan, Mumbai. The objective of the meet was to achieve high standards in radiological safety by constantly perusing techniques, update & enrich the knowledge and create opportunities for continual improvement. Around 130 numbers of Health Physics professionals participated in the meet from various DAE units like BARC, IREL, IGCAR, NFC, NPCIL and UCIL.

Shri P. R. Krishnamurthy, Director, OPSD welcomed the dignitaries, invitees and other delegates with opening remarks in which he stressed the objectives of the discussion meet for promoting interaction between the HP professionals and sharing and widening of knowledge base in the profession. Shri S.G. Ghadge, Director (T), NPCIL, in the inaugural address, emphasized the need of radiation protection requirements & implementation mechanism and also pointed out the various aspects of Radiation protection principles at NPPs which are proved to be of immense benefit in the area.

Keynote address was given by Dr. D.N. Sharma, Director, HS&E Group, BARC. He pointed the challenges in radiation protection of new facilities and high energy accelerators. He also conveyed the lessons & challenges from post Fukushima scenarios for health physics professional. He emphasized the importance of sharing of experience and information through networking and challenges in dealing with radiation emergency.

Shri S. S. Bajaj, Chairman, AERB, appreciated health physics professionals and their sincere efforts in a competitive environment. He stressed on the public perception on radiation and understanding of radiation risk. He emphasized on the challenges involved in implementing new requirements on eye lens dose limit, monitoring C-14 emission from NPPs, post accident decontamination, waste management and intervention levels and harmonization of radiation dose assessment of public. He also touched upon the epidemiological studies and interpretation of risk to the public.

During the event, ten invited lectures were arranged from eminent personalities of health physics profession and from various experts in the field of nuclear energy in front end & bank end. Twenty two papers were submitted on various aspects of Radiation protection. The compendium of these papers, was jointly released by Shri S. S. Bajaj, Chairman, AERB, Dr. D.N. Sharma, Director, HS&E Group, BARC, Shri S.G. Ghadge, Director (T), NPCIL and Shri S.Duraisamy, Vice Chairman, AERB. The Discussion Meet was highly beneficial to the target audience. The Meet brought out several identified improvements in radiation protection program and areas for future work.

Shri P. R. Krishnamurthy, Director, OPSD, AERB, Shri S. S. Bajaj, Chairman, AERB, Shri S.G. Ghadge, Director (T), NPCIL, and Dr. D.N. Sharma, Director, HS&E Group, BARC during the Health Physics Professional Meet-2014.

ISO 9001:2008 Quality Management System (QMS)

AERB has opted for certification under ISO 9001 standard by Bureau of Indian Standards (BIS) for its consenting activities, regulatory inspection and preparation of regulatory documents since November 15, 2006. Again, AERB was recertified for ISO 9001: 2008 during the years 2009 & 2012. Under the purview of ISO standard, surveillance audit by BIS is carried out every year and internal audit is carried by trained auditors of AERB twice in a year.

Executive Committee (EC) of AERB conducts the management review to ensure suitability, adequacy and effectiveness of QMS at AERB. This review includes assessing opportunities for improvement and the need for changes to the QMS, including the quality policy and quality objectives. Accordingly, the observations of first internal audit of the divisions carried out during May 12 - 23, 2014 were presented by MR office of AERB in the EC meeting of AERB on December 17, 2014. 2nd internal audit of the divisions for the year 2014 was conducted during November 2014.

Surveillance audit of AERB was carried out on December 17, 2014 as a part of evaluation of the performance and effectiveness of IS/ISO 9001:2008 Quality Management System (QMS) at AERB. The function/activities of MR/Top Management, IPSD, OPSD and NPSD were audited. No NC was reported by BIS auditors.

31st DAE Safety and Occupational Health Professionals Meet

The 31st DAE Safety & Occupational Health Professionals Meet was organised at Kalpakkam jointly by AERB and Bhartiya Nabhkiya Vidyut Nigam ltd. (BHAVINI) during October 15 - 17, 2014 with industrial safety theme as 'Safety and Emergency management at Coastal Site" and occupation health safety theme as "Diabetes Mellitus and Metabolic Syndrome". The Meet was inaugurated by Shri S.S. Bajaj, Chairman, AERB. More than 200 delegates along with Chief Executives and Directors of various DAE units attended the Meet. A monograph on "Safety & Emergency Management at Coastal Site & Diabetes Mellitus and Metabolic Syndrome" as well as technical proceedings of the Meet was released by was released by Shri R. Bhattacharya, Secretary, AERB. Dr. Baldev Raj, Director, National Institute for Advanced Studies, Bengaluru and Former Director, IGCAR delivered the Dr. Ramaswamy memorial Endowment Lecture on 'Tsunami management at Kalpakkam Nuclear site". Narora Atomic Power Station, IREL-OSCOM and Rajasthan Atomic Power Project-7&8 were presented with the Environment Protection Awards for the year 2013. Dr. Prabhat Kumar, Chairman & Managing Director, BHAVINI, Kalpakkam & Chairman, Steering Committee distributed prizes to winners of logo competitions conducted for the Meet and addressed the gathering.

The three day Meet had technical sessions with lectures from renowned experts from DAE as well from medical practitioners from non-DAE facilities dealing various topics related to this year's themes and plenary sessions dealing with presentations and lectures from various participants on Injury and Occupational Health Statistics, emergency management at coastal sites, lessons learnt from natural calamities, preparedness for handling radiological emergencies and life style management.

Dr. Baldev Raj, Director, National Institute for Advanced Studies, Bangaluru & Former Director, IGCAR, Kalpakkam, Shri S.S. Bajaj, Chairman, AERB, Dr. Prabhat Kumar, Chairman and Managing Director, BHAVINI, Kalpakkam, Shri K. A. David, Executive Director (Operations), BHAVINI, Kalpakkam and Shri R. Bhattacharya, Secretary AERB and Director, IPSD & ITSD, AERB

A technical exhibition on nuclear technology, industrial and fire safety appliances, safety and regulatory aspects was also organsied during the Meet to enhance the awareness and facilitate interactions between industries and DAE units. About ten exhibitors including AERB, BARC, BHAVINI and other manufacturers/suppliers had displayed their exhibits.

At the close of this Meet, a valedictory session was held wherein prizes were distributed for poster/cartoon/slogan competition among DAE employees.

AERB Signs MoU with the Government of Tripura

Diagnostic radiology facilities utilizing X-ray units are widely available in the country (approx. 50000) and a large number of persons undergo diagnostic X-ray procedures every year. These X-ray units if not designed or operated properly may lead to unwanted radiation exposure to the patients as well as the operators. The safety review and assessment of these machines is carried out by AERB of India which is the national regulatory body for enforcement of radiological safety regulations in the country. AERB has stipulated various regulatory requirements for such X-ray facilities such as Design Certification, Type Approval / No Objection Certificate, Approval of Layout, Registration of X-ray Equipment, Commissioning of X-ray Installations, Certification of Radiological Safety Officers (RSOs) and Certification of Service Engineers.

In view of the tremendous increase in the medical diagnostic installations using medical X-ray units in the country, AERB has taken proactive steps to exercise regulatory control over all such installations by decentralizing the regulation of these units by having an Memorandum of Understanding (MoU) with State Government and Union Territories to set up Directorate of Radiation Safety (DRS)/ Radiation Safety Cell (RSC) in various States/Union Territories.

Towards this, Shri R. Bhattacharya, Secretary, AERB and Shri M. Nagaraju, Principal Secretary, Department of Health & Family Welfare, Government of Tripura signed an MoU for establishment of RSC for effective regulator control on medical diagnostic X-ray facilities on September 25, 2014.

As on date, AERB has entered with agreements with a total of 12 States (Kerala, Mizoram, Madhya Pradesh, Tamil Nadu, Punjab, Chhattisgarh, Himachal Pradesh, Gujarat, Maharashtra, Odisha, Arunachal Pradesh and Tripura) of which DRS in Kerala, Mizoram and Chhattisgarh are already functioning.

Shri R. Bhattacharya, Secretary, AERB with Shri M. Nagaraju, Principal Secretary, Department of Health & Family Welfare, Government of Tripura after signing the MoU

NOTICE

FOR USERS OF RADIOACTIVE SOURCES & RADIATION GENERATING EQUIPMENT

IT IS AN OFFENCE TO POSSESS OR USE RADIOACTIVE SOURCES* OR RADIATION GENERATING EQUIPMENT# WITHOUT A VALID CONSENT, ISSUED BY ATOMIC ENERGY REGULATORY BOARD (AERB), UNDER THE PROVISIONS OF ATOMIC ENERGY ACT, 1962 AND ATOMIC ENRGY (RADIATION PROTECTION) RULES, 2004.

Statutory requirements to possess or use radioactive source or radiation generating equipment are:

- Must have a valid consent (licence) from AERB
- Install only type-approved equipment
- Ensure safety and security of radiation sources at all time
- Follow radiation protection requirement
- Ensure periodic Quality Assurance checks as applicable
- Send periodic safety report to AERB
- Ensure safe disposal of sources not in use with due approval from AERB

***Radioactive Sources include, radioisotopes used in:**

- Radiation Processing Plants
- Radiotherapy
- Gamma Chamber
- Industrial Radiography
- Nucleonic Gauge
- Well Logging
- Nuclear Medicine
- Research Applications etc.

#Radiation Generating Equipment includes, all accelerators and X-ray devices used in:

- Radiotherapy
- Medical Cyclotron
- Industrial & Research Accelerator
- Diagnostic Radiology - CT/ Cath Lab/ X-ray machines
- Industrial Radiography
- X-ray Baggage Scanner etc

For detailed information, relevant application forms and accessing eLORA system, visit AERB website www.aerb.gov.in

NOTICE FOR X-RAY EQUIPMENT USERS

IT IS AN OFFENCE TO USE MEDICAL X-RAY EQUIPMENT WITHOUT A VALID LICENCE, ISSUED BY ATOMIC ENERGY REGULATORY BOARD (AERB), UNDER THE PROVISIONS OF ATOMIC ENERGY ACT 1962 AND ATOMIC ENRGY (RADIATION PROTECTION) RULES 2004.

Users of the following Medical X-ray equipment such as

- Computed Tomography unit
- Interventional Radiology unit
- X-ray Radiography unit
- Fluoroscopy X-ray unit
- Mammography X-ray unit
- Orthopantomography unit
- Dental X-ray unit
- Bone Densitometer unit
- X-ray unit for Veterinary applications must approach AERB to obtain regulatory consent (licence/registration).

Obtaining Licence for medical X-ray equipment is now online through AERB's web application

e-LORA (e-Licensing of Radiation Applications) System

For more information and obtaining Licence, visit AERB website www.aerb.gov.in and click on eLORA

Issued by:

Atomic Energy Regulatory Board

Niyamak Bhavan, Anushaktinagar, Mumbai - 400094

HUMAN RESOURCE DEVELOPMENT AND SAFETY RESEARCH PROGRAMME

AERB Training Activities

AERB Orientation Course for Regulatory Processes (OCRP-2014)

AERB Orientation Course for Regulatory Process (OCRP-2014) was conducted for thirty two newly recruited scientific officers/scientific assistants from various divisions of AERB. As a part of the course, one day visit to TAPS 3 & 4, Dhruva, BARC and ACTREC, Kharghar were arranged. Valedictory Function for OCRP was conducted on August 11, 2014 at AERB, Mumbai for distribution of certificates.

On-Job Training

On-Job Training was given to two officers, one to MAPS and another to IGCAR, for familiarization with operational reactor physics aspects of NPPs and reactor physics computer codes. The training covered various aspects of operational reactor physics activities of 220 MWe PHWR, use of TRIVENI code to calculate fluxes, bundle and channel power profiles and familiarization of reactor physics computer codes for the core calculations of Prototype Fast Breeder Reactor (PFBR) developed at IGCAR.

Training of BARC Safety Council officers

AERB organized a two week familiarization training for twenty two BARC Safety Council officers, on request, during October 09-30, 2014 at AERB, Mumbai. The training program included class room lectures delivered by AERB officers. The training program was well received.

Competency Mapping Exercise at AERB

In order to identify the competencies required to perform the regulatory activities, AERB decided to carry out an exercise on competency mapping for its staff. A pilot exercise was conducted and decided to implement competency mapping for continual up gradation of Human Resource. The competence framework for AERB was launched on August 22, 2014; which was followed by the familiarization lectures on the subject.

AERB Collaqium

i. A colloquium on "PT & CT ballooning during heat up with moderator heat sink" by Smt. Ritu Singh, S/Shri P.K. Baburajan, Anuj K. Deo, Avinash J. Gaikwad, NSAD, AERB was organized on July 31, 2014.

ii. A Colloquium on the "Current Status of Fukushima Daiichi NPPs, Japan with emphasis on Strategy for Fuel Removal & De-Commissioning, Radioactive Waste Handling and Emergency Measures" was organized in AERB Auditorium on November 27, 2014. Lectures were delivered by J. Koley, D. Bhattacharya, S. Awasthi, N. Tyagi, OPSD, AERB.

iii. A invited talk on "POWER OF Subconscious Mind by Dr. Pankaj Mehta, BRIT, Mumbai was organized on December 05, 2014 in AERB.

AERB Efforts for Competency Development and Knowledge Management

AERB, as a part of its staff training programme, deputed five engineers (having experience in PWR and Fast Reactor), along with three scientific assistant (having diploma in engineering) to Kaiga site for one month to get the exposure of Indian standard PHWRs. At Kaiga Nuclear Training Center, they undergone classroom training as well as plant visit for familiarization with various systems of Indian PHWRs. Basic training at simulator was also provided to them for better understanding of normal operational activities as well as certain transient conditions.

Safety Research Programme (SRP)

AERB's Committee for Safety Research Programme (CSRP) held two meetings in presence of project coordinators to review progress of on-going projects, and to consider new project proposals for funding. The Committee approved 3 new project proposals and renewed 8 on-going projects. The details of approved new projects and renewals are given below.

Approved New CSRP Projects

Sr. No.	Title	PI/Institute
1.	Study of Radiation Safety Measures of X-Ray Installations in Mizoram	Dr. Kham Suan Pau Mizoram State Cancer Institute Campus, Mizoram
2.	Biological effects of low dose alpha particle radiation exposure to blood lymphocytes for bio-dosimetry	Prof. P. Venkatachalam Dept of Human Genetics, Sri Ramachandra University, Porur, Chennai
3.	Study of Dosimetric Evaluation of Optically Stimulated Luminescence in the Advanced Radiation Therapy	Dr. M. Ravi Kumar Kidwai Memorial Institute of Oncology, Bangalore

Renewed ongoing CSRP Projects

Sr. No.	Title	PI/Institute
1.	Seismic fragility of the primary containment considering structural integrity and leakage through the damaged containment.	Dr. Siddhartha Ghosh IIT, Bombay
2.	Fabrication of Nano Oxide based Sensor on stabilized Nano Zirconia for Detection of Hydrogen Sulfide.	Dr. T. M. Sridhar Rajlakshmi Engineering College
3.	Markov approach for Reliability Assessment of Safety.	Dr. R. Sujatha SSN College of Engineering Kalavakkam
4.	Thermo luminescence Characterization of phosphors used in display devices for possible use in accident dosimetry.	Dr. A. S. Sai Prasad Vasavi College of Engg., Hydearabad
5.	Image Quality /Patient - Staff dose Studies & development of Dose audit procedures in interventional cardiology.	Dr. K. N. Govindrajan PSG College of Technology
6.	Numerical Simulation of the Response of Nuclear containment subjected to Aircraft Crash.	Dr. Pradeep Bhargava IIT, Roorkee
7.	Reliability Assessment of the Passive system and its integration into PSA	Dr. Suneet Singh IIT, Bombay
8.	Development of Novel Polymeric Detectors for Selective Dosimetric Analysis	Dr. V. S. Nadkarni Goa University

Setting up a new Engineering Hall at SRI, Kalapakkam

Over the last 15 years, the research at Safety Research Institute at Kalpakkam has focused on key areas of nuclear safety to support the regulatory decision making by AERB. The Institute has gained expertise in reactor physics, radiological safety, reactor engineering & safety, environmental & fuel chemistry, probabilistic & reliability analysis, and several other areas of importance to AERB. Lately, need for a facility at SRI to carry out dedicated in-house experiments in the above areas has been felt. In order to address the need, an engineering hall is being set up under the XII plan. The engineering hall is designed with high and low bays. The construction of the engineering hall will usher the institute into its next phase, in which it will endeavour to conduct safety significant experiments in collaboration with other divisions of AERB and TSOs like IGCAR and BARC. In the first phase, three experimental facilities, namely Hydrogen Mitigation Facility (HYMIF), Water and Steam Interaction Facility (WASIF) and Calandria Vessel under Core Collapse (CVCC) facility are envisaged to come up within the high bay of the hall and radiation shielding experiments are planned within the low bay. Also, additional ground space for possible future expansion of the engineering hall is earmarked adjacent to the current location of the facility.

The groundbreaking ceremony for the construction of SRI Engineering Hall was performed on 28th Aug, 2014. This building will house a high bay (160 sq. m, height 8.5 m), a low bay (160 sq. m, height 4.25 m), an office space (160 sq. m) along with an entrance lobby. Chairman, AERB kindly graced the occasion and laid the foundation for the building. Several senior officials of IGCAR and SRI including Dr. T. Jayakumar (Dir., MMG & Officiating Dir., IGCAR), Shri K.K. Rajan (Dir., ESG, IGCAR), Shri. C. Sivathanu Pillai (AD, CEG) and Shri V. Balasubramaniyan (Dir., SRI) were present on the occasion. The staff members of SRI, CEG and ESG of IGCAR were also present during the event. Display boards were installed near the construction site to provide technical information on the layout of the building and the proposed experiments to be conducted within it. Chairman, AERB evinced keen interest in the details and addressed the gathering highlighting the benefits of having a dedicated in-house experimental facility.

Shri S.S. Bajaj, Chairman, AERB, being briefed by Shri V. Balasubramaniyan, Dir., SRI, on the details of the SRI Engineering hall followed by laying of foundation for the building

Regulatory Competence Framework for AERB

Rakesh Kumar & Hemant K. Kulkarni, ITSD, AERB

Availability of adequate number of competent staff and maintaining the competence for current and future needs of AERB is important for efficient and effective discharge of its mandate. AERB follows a Systematic Approach to Training (SAT) that provides a logical progression from the identification of the competencies required to perform a job to the design, development and implementation of training to achieve these competencies, and subsequent evaluation of this training. As a continual improvement process, AERB initiated development of a document for developing a competence framework and infrastructural needs. In this regard, a document titled "Regulatory Competence Framework for AERB" was prepared by AERB. This document provides guidelines for developing a competence framework and infrastructural needs. It address competence requirements, analysis of available competences to conduct gap analysis, systematic identification of training needs and establishment of a staff qualification system.

In preparing the Competence framework for AERB, a four quadrant competence model based on Knowledge, Skills and Attitudes (KSA) was adopted from IAEA publications like 'Managing Regulatory Body Competence' (Safety Report Series No. 79) and SARCON Guidelines for regulatory functions. Many international documents and practices on the competence development, followed in the nuclear industry worldwide, were also referred.

Competence mapping of all officers at AERB would be carried out using four quadrant model. Each quadrant represents a group of coherent and consistent competences. Proposed quadrant model of competences for AERB employees is presented below:

Four Quadrant Model for AERB

IV. Personal and interpersonal effectiveness competences IV.1 Personal effectiveness IV.2 Analytical thinking and problem solving IV.3 Soft skills IV.4 Strategic thinking, leadership and management IV.5 Safety culture	**I. Legal and Regulatory basis competences** I.1 Legal basis I.2 Regulatory policies and procedures I.3 Regulations and Regulatory documents
III. Regulatory practice competences III.1 Consent and consenting process III.2 Inspection process III.3 Enforcement process III.4 Safety documents development process	**II. Technical disciplines competences** II.1 Basic technologies II.2 Applied technologies II.3 Specialized technologies

The roles and responsibilities of various divisions have been defined as per the mandate and the functions of the AERB. For the purpose of developing competence framework, these functions have been grouped into two major categories as listed below:

Major functions

- Safety review and assessment to grant consents to nuclear/radiation facilities and activities
- Regulatory inspection and enforcement
- Development of safety regulations

Supplementary functions

- Coordinating and monitoring research and development related to safety and regulatory matters
- Liaison with other statutory bodies and public regarding matters related to nuclear and radiological safety and oversee emergency preparedness of the nuclear facilities
- International cooperation

Regulatory processes have been identified corresponding to each of the major & supplementary functions of AERB; and roles required for each of these processes have been divided into management and/or lead roles and working level roles. The level of competence needed for these roles under the same functional category (i.e. same quadrant) differs according to the roles of individuals.

In this connection, a pilot study was carried out after preparing three formats for all the technical divisions of AERB for collecting, compiling and analyzing the competence data. At present, this exercise, in addition with other ongoing human resource activities, is being carried out on full fledged scale covering all the officers of the technical divisions in AERB.

The mapping analysis will result in recommendations for short term and long term recruitments and/or outsourcing plans as well as specialized training plans and/or modification of basic and refresher training modules.

International Collaborative Standard Problem Exercise to Demonstrate Heat Sink Capabilities of PHWR Moderator During Accidents

P K Baburajan, Balbir Singh, Prashant Sharma, Ritu Singh, Anuj Kumar Deo and A J Gaikwad NSAD, AERB

Pre-test predictions for the Pressure Tube (PT), and Calandria Tube (CT) heat up experiment was carried out as an International Collaborative Standard Problem (ICSP) exercise. The objective is to assess the capability of safety analysis computer codes in predicting the associated phenomena namely; radiation heat transfer from fuel to PT, heat transfer from PT to CT, PT deformation or failure, heat transfer from CT to moderator and CT deformation or failure. Three different computational codes were used for modeling and analysis of the ICSP: system thermal hydraulic code RELAP5/Mod3.4, finite element code ABAQUS and multiphysics code COMSOL.

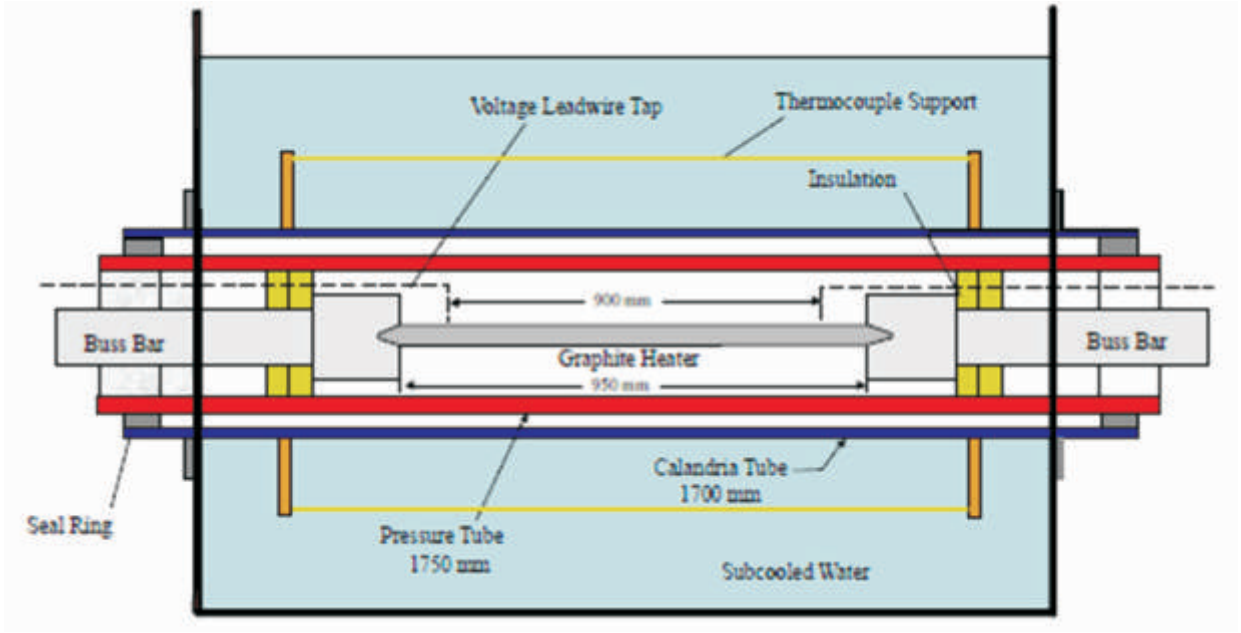


Figure 1 Schematic of the experimental setup

The schematic of the experimental setup is shown in Fig.1. The test section was of Zr2.5Nb PT concentrically mounted inside Zircaloy 2 CT. A graphite rod heater was used to heat the test section. The test section was immersed in an open tank filled with distilled light water. Argon was supplied to the inside of the PT at a pressure of 3.6 MPa from a surge tank via pressure control system. The PT/CT annulus was filled with carbon dioxide (CO_2) from gas cylinders.

The experiment was conducted by linearly varying the heater power from 0 to 140 kW in 20 seconds and then constant, 140 KW, till the end of the test. The PT gets heated up due to radiative heat transfer from the graphite heater and ballooning of the PT results in PT-CT contact. PT-CT contact initiates the heat transfer from CT to moderator and reduces the PT temperature significantly. The experiment demonstrated partial CT dry-out, rewet phenomena and effectiveness of moderator as a heat sink for the fuel channel in mitigation of severe accident progression. The test setup was modeled and the test was analysed with the initial and boundary conditions of the experiment. The results are presented here.

RELAP5 analysis was carried out by modeling the radiation heat transfer between the heater and the PT, PT-CT contact was estimated by incorporating the strain calculations into the code. The calandria tube surface temperature predicted by RELAP5 analysis is shown in Fig.2 and it demonstrates the moderator as an effective heat sink as the surface temperature is maintained at around 400 K after the PT-CT contact was established at 72 s into the transient. The comparison of the dry-out and rewet phenomena predicted and observed in the experiment is shown in Fig.3. A parametric study for a range of parameters as given in Table 1 was also carried out to investigate the effect of moderator temperature, PT-CT contact time and PT-CT contact resistance on CT dryout and rewet phenomena.

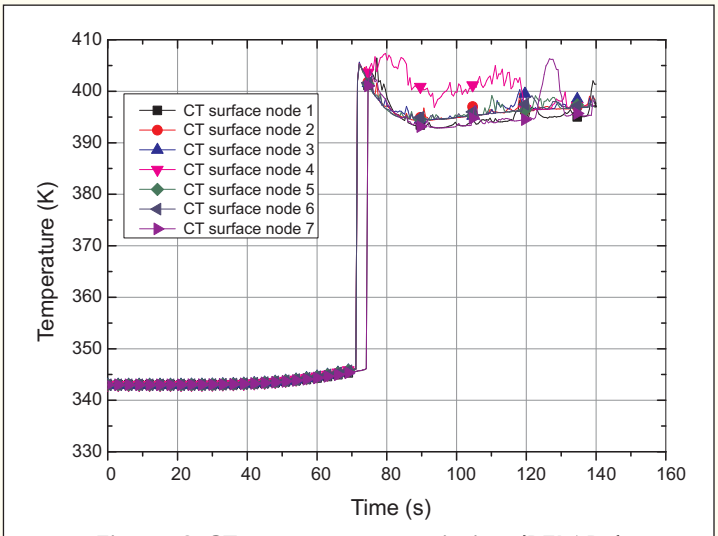


Figure 2 CT temperature variation (RELAP5)

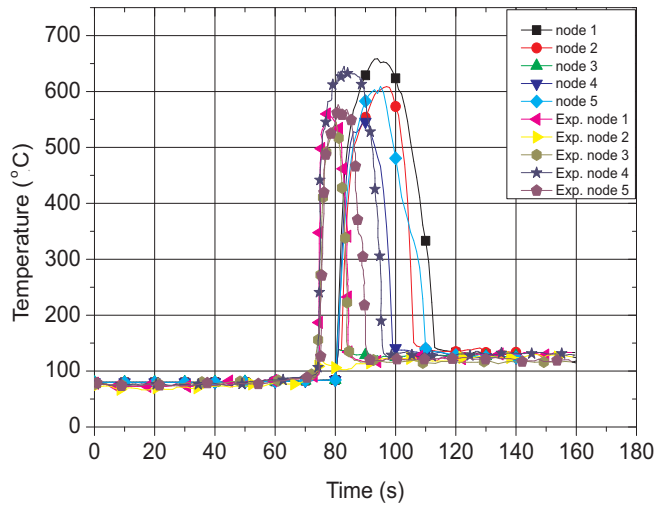


Figure 3 CT temperature comparison between estimated (RELAP5) and experimental data

Coupled thermal and structural analysis was performed using finite element method in ABAQUS. The heat transfer analysis implemented radiation heat transfer from heater to PT, from PT to CT, contact conductance between PT-CT when in contact and convection from outer surface of CT to water. Structural analysis included elasto-plastic analysis including thermal creep of the individual PT-CT assembly under thermal and mechanical loading. Contact pairs were used to simulate the PT and CT interaction. Temperature dependent true stress-strain value given for elasto-plastic analysis and CREEP is modeled to account creep in structure.

A contour plot of radial displacement of PT is shown in Fig.4. At the end of 88 s the maximum radial displacement obtained is 8.412 mm which is more than the inner radius of the CT thus predicting the deformation of CT as observed in the experiment. The PT, CT temperature variation shown in Fig.5 indicated that after the PT-CT contact at around 78 s, the PT temperature got reduced and CT temperature was maintained at around 400 K. The physical phenomena of uneven ballooning as observed in the experiment, for high heat up rates was predicted by ABAQUS.

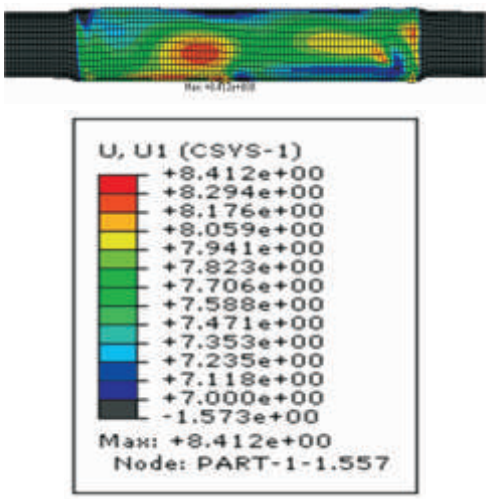


Figure 4 contour plot of PT radial displacement (ABAQUS)

Case No.	Description
1	(a) PT-CT contact on strain rate with moderator temp 70°C (Nominal Case)
	(b) PT-CT contact on strain rate calculation with moderator temp 80°C
	(c) PT-CT contact on strain rate calculation with moderator temp 95°C
2	(a) PT-CT contact at 75 s with moderator temperature 70°C
	(b) PT-CT contact at 75 s with moderator temperature 80°C
	(c) PT-CT contact at 75 s with moderator temperature 95°C
3	(a) PT-CT contact at 80 s with moderator temperature 70°C
	(b) PT-CT contact at 80 s with moderator temperature 80°C
	(c) PT-CT contact at 80 s with moderator temperature 95°C
4	(a) PT-CT contact with contact conductivity as 50% of zircaloy conductivity
	(b) PT-CT contact with contact conductivity as 60% of zircaloy conductivity
	(c) PT-CT contact with contact conductivity as 80% of zircaloy conductivity

Multiphysics code COMSOL was also used for modeling the test setup. A 2D transverse case with Argon was solved to observe the effects of Argon on the temperature distribution. Figures 6 (a) through 6 (c) show the velocity field of Argon and CO_2 at various times and Figures 7 (a) through 7 (c) show the temperature field for various components. As expected, the heated Argon gas rises up and transfers heat to PT inner surface. Slowly, the conduction becomes the mode of heat transfer through Argon in place of convection. However, the bottom portion of the PT receives more heat because of radiative heat transfer due to eccentric position of the heater rod and therefore shows a higher temperature as compared to top of the PT.

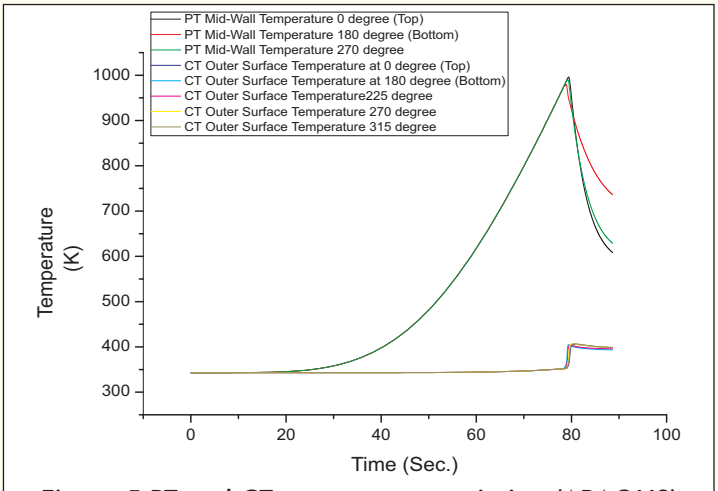


Figure 5 PT and CT temperature variation (ABAQUS)

One 2D axisymmetric case with conduction in Argon and CO_2 was solved. In this case conduction in Argon and CO_2 is modeled along with creep model. Figure 8 (a) through 8 (c) show the central cross sectional view of temperature field at different times. The major ballooning of the PT takes place only after 65 s. The PT inner surface temperature and outer surface temperature are 1102K and 1073K respectively at the time of contact, the contact between PT and CT was observed at around 72.77 s.

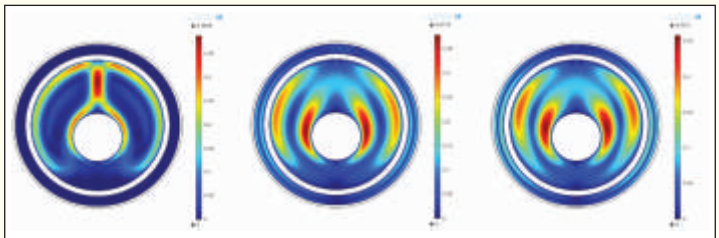


Figure.: 6 (a), (b) & (c) Velocity Field at 10 s, 50s and 70 s (COMSOL)

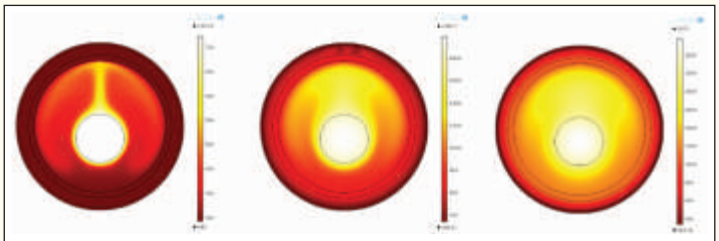


Figure.: 7 (a), (b) & (c) Temperature Field at 10 s, 50 s and 70 s (COMSOL)

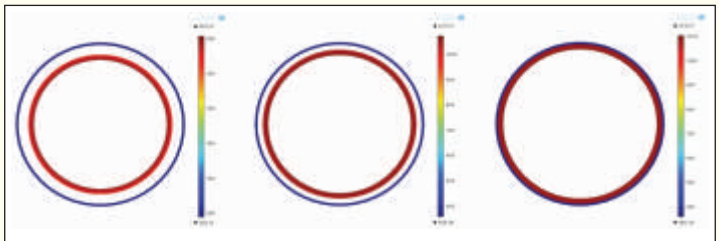


Fig. 8 (a), (b) & (c): Temperature Field at 50 s, 71.5 s and 72.77 s

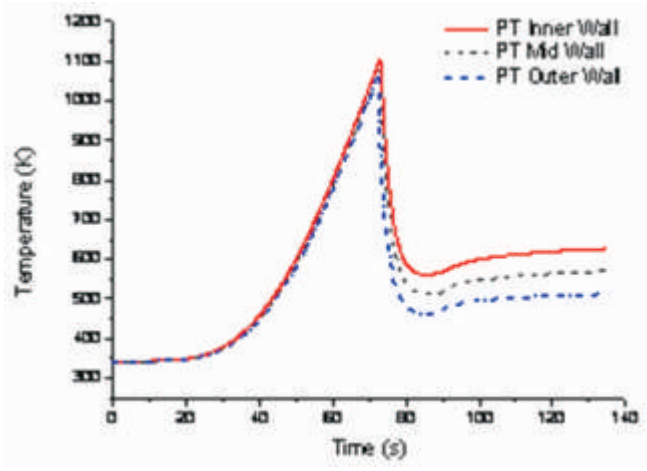


Figure 9 PT temperature variations (COMSOL)

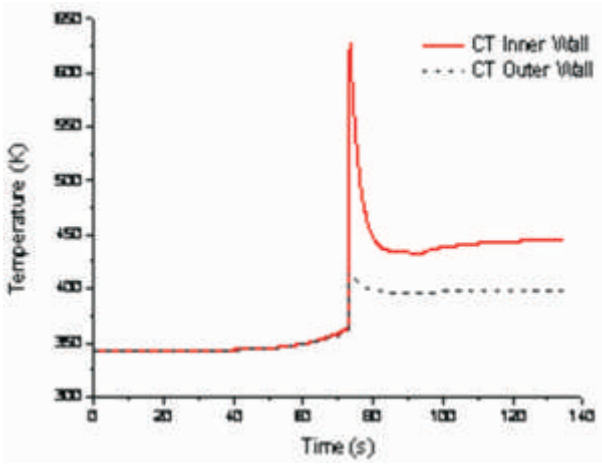


Figure 10 CT temperature variation (COMSOL)

Figure 9 shows the temperature variation of PT inner, mid and outer wall at central cross section. After contact with CT at 72.77 s, the PT temperature falls immediately, however, a sudden increase in PT temperature is observed at around 87 s which is due to decrease in gap conductance due to depressurization of PT at that time which in turn decreases the contact pressure between PT and CT. CT inner and outer wall temperature variation is depicted in Figure 10. After PT-CT contact, there is a sudden increase in CT temperature which is due to very high heat transfer from PT to CT. To capture uneven heating and ballooning of the PT due to the eccentric heater 3D COMSOL model was developed.

Conclusions from the exercise

- PT-CT contact time estimated is in good agreement with the experimental findings.
- ABAQUS prediction could capture the physical phenomena of uneven ballooning for high heat up rates along with the CT deformation observed experimentally.
- The uneven heating of the PT due to the eccentric heater is also correctly captured in the 3D COMSOL model along with Argon effect.
- PT temperatures are under predicted due to uncertainty in contact conductance. The experimental findings can be used to obtain models for contact PT-CT conductance.
- Moderator temperature at 70°C is predicted as an effective heat sink and is able to maintain the PT-CT temperature below 400 K.
- Moderator temperature above 80°C and PT-CT contact timing above 75 s CT dryout is predicted in some locations.
- CT dryout and rewet phenomena is predicted for contact time 80s, 90% of contact resistance and 80°C moderator temperature
- Natural convection and mixing phenomena of water in the tank is predicted by the RELAP5 model.

Policies Governing Nuclear and Radiation Safety

AERB has published a policy document named "Policies Governing Nuclear and Radiation Safety" which consolidates the safety policy objectives that are stated in the Atomic Energy Act, 1962, the Rules and the Codes and Standards of AERB, which form the framework for regulation of safety, into a single document. Such a policy document as a single reference is intended to enhance openness in the conduct of regulatory activities and to reduce communication gaps while interacting with its stakeholders as well as outside agencies. These polices are:

(1) Fundamental objective of AERB is to ensure that the use of ionising radiation and nuclear energy in India does not cause undue risk to health of people and the environment. Towards this, the activities related to nuclear and radiation facilities shall be regulated through a system of regulatory consents that allows activities with stipulated conditions.

(2) AERB shall be responsible for ensuring through safety reviews and inspections that the consented activities of the nuclear and/or radiation facility comply with the safety requirements and conditions of consent. This however does not diminish the responsibility of the consentee for safety, who shall be solely responsible for ensuring safety of the nuclear and/or radiation facility / activity and shall demonstrate that safety is ensured at all times.

(3) The regulatory processes for nuclear and radiation facilities shall have the objectives to ensure that:

Only such practices are permitted which are justified in terms of their societal and/or individual benefits,

Radiation protection is duly optimised in all nuclear/ radiation facilities,

Radiation doses to the personnel in these facilities, and to the members of the public in their vicinity, do not exceed the prescribed limits, and the potential for accidental exposures from the facilities remains acceptably low.

(4) Decisions related to regulatory consent for the facilities / activities shall be based on review and assessment by the Regulatory Body of the demonstration of compliance to the regulatory requirements by the applicant for consent. The consent issued by the regulatory body shall have a validity period. The regulatory process shall have provision for periodic renewal of consent, for which the review and assessment should ensure that safety of the facility / activity is judged after comparison with the current safety standards and practices.

(5) The regulatory process shall provide for review and assessment, including conduct of inspections, of the consented facilities and activities on a continuing basis to ensure that the facility / activity is being done with due regard to safety and in compliance to the regulatory requirements and the conditions laid down in the consent.

(6) The regulatory control over the nuclear and radiation facilities shall follow a graded approach, based on the radiological hazard potential.

(7) All activities pertaining to nuclear and radiation facilities shall be in accordance with requisite Quality Assurance Programmes, establishing the goals, strategies, plans and objectives as well as identifying the organisational and individual responsibilities towards safety. The overall responsibility for establishment, implementation, assessment and continual improvement of the programme shall be with the consentee.

(8) All nuclear and radiation facilities shall implement appropriate radiation protection programmes, to ensure safety of occupational personnel, the public and the environment. The programmes should provide for monitoring of radiation exposures as well as for environmental surveillance, as necessary.

(9) The radioactive waste generated during operation, maintenance and decommissioning of nuclear and radiation facilities shall be managed in a safe manner to ensure protection of human health and the environment from the undue effects of ionising radiation in the present and in the future, without imposing undue burden on future generations.

(10) All nuclear and radiation facilities / activities shall have arrangements for development of adequate plans and preparedness for responding to emergency situations, for protection of the occupational personnel, the public and the environment, in accordance with the hazard potential of the facility / activity.

(11) When a nuclear / radiation facility or radiation generating equipment ceases to be in use, it shall be ensured that it undergoes safe decommissioning. Remediation of a contaminated site shall be carried out if the radionuclide concentration exceeds the reference levels specified by the Regulatory Body.

(12) The Regulatory Body may resort to enforcement actions on the consentee for securing timely compliance to the regulatory requirements and conditions of consent or corrective actions, based on review and assessments of the submissions from the consentee and/or findings during review or inspection. The enforcement options should follow graded approach, taking account of aspects such as safety significance of the deficiency, seriousness of violations, the repetitive nature and/or deliberate nature of the violations. The enforcement actions may include initiation of penal provisions as provided under section 17 of the Atomic Energy Act, 1962.

(13) Radiation exposures resulting from naturally occurring radionuclides present in the human body, cosmic radiation

at the earth surface, unmodified concentrations of radionuclides in raw materials, except the radioactive materials / waste generated from operation of uranium and thorium mining and milling facilities, are excluded from regulatory control. The regulatory body may 'exempt' certain sources or practices involving artificial radionuclides from regulatory control, the radiation exposure from which is too small to warrant such control. Also certain radioactive materials or radioactive objects arising from / within the consented practices may be considered for clearance from any further regulatory control, provided that the continued regulatory control of which would yield no net benefit in terms of reduction of individual doses or of health risks. The decisions with respect to exemption and clearance shall be based on the prescribed criteria.

(14) On the issues of Safety, Health and Environment at work place, in relation to the factories owned by the Central Government and engaged in carrying out the purposes of the Atomic Energy Act, 1962, the objectives of the "National Policy on safety, health and environment at work place" issued by the Ministry of Labour and Employment, Government of India and the provisions of the Atomic Energy (Factories) Rules, 1996 shall prevail.

(15) The Regulatory Body shall take steps as necessary, to keep the public informed on safety issues of radiological safety significance. It shall also be responsible for notifying to the public, the 'extraordinary nuclear events', occurring in the nuclear facilities in India, as mandated by the Civil Liability for Nuclear Damage Act, 2010.

(16) In the conduct of regulatory activities, the Regulatory Body shall be governed by the provisions of the 'Right to Information Act, 2005, as applicable to the 'public authority'.

Notification of Nuclear Incidents under Civil Liability for Nuclear Damage Act, 2010

The Civil liability for Nuclear Damage Act, 2010 promulgated by the Government of India came into force on November 11, 2011. The Act was framed to provide civil liability for nuclear damage and prompt compensation to the victims of a nuclear incident. The Atomic Energy Regulatory Board (AERB) was given the additional responsibility under this Act to notify the nuclear incidents within 15 days of its occurrence and cause wide publicity of the incident.

In order to enable AERB to promptly notify a nuclear incident, the Civil Liability for Nuclear Damage Rules, 2011 required the operator of a nuclear installation to report immediately the occurrence of nuclear incident in his nuclear installation or during transportation of nuclear material to AERB, where such nuclear installation is under its jurisdiction, in the manner as the Board may, by order, specify.

The practice of reporting of safety related events or that exceeding the regulatory limits to AERB is already in place. However, the various regulatory limits prescribed by AERB are not appropriate for direct application in the reporting of an event for the purpose of the said rules as they were arrived at with other purposes in mind, and those limits have been set at a level which is conservatively arrived at by incorporating a significant safety factor. Thus, a discharge or dispersal of radioactivity or exposure to ionizing radiation which exceeds the regulatory limits prescribed by AERB, although possible cause for concern, is not one which would be expected to cause substantial injury or damage unless it exceeds by some significant multiple the appropriate regulatory limit.

Hence AERB, as mandated under the Civil Liability for Nuclear Damage Rules, 2011 have categorically specified through a gazetted order the requirement of reporting of 'extraordinary nuclear events'. The reporting of extraordinary nuclear events under this Order shall be in addition to, and in no way in derogation of the existing regulatory mechanism of reporting of events to the AERB. The order also sets forth the responsibilities of Radiological Safety Officers and Environmental Survey Laboratories of nuclear installations with respect to assessment of off-site and on-site radiological conditions respectively and promptly reporting of any abnormal radiological conditions to AERB.

The set of extraordinary nuclear events specified by AERB are as follows:

i) Any single event (including that caused by natural disaster) resulting in stack release of radiologically equivalent I-131 corresponding to a quantity of radioactivity 500 times or more of I-131 annual release limit prescribed in technical specifications for operation of the plant, or

ii) Any single event (including that caused by natural disaster) where in one or more person offsite were, could have been, or might be exposed to radiation or to radioactive material, resulting in a dose or in a projected dose of 1 mSv, or

iii) Any event (including that caused by natural disaster) leading to injury or death of a person off site due to exposure to ionizing radiation emanating from a nuclear installation, or

iv) Any event (including that caused by natural disaster) requiring evacuation as a part of counter measure following an off-site emergency, or

v) Any event (including that caused by natural disaster) leading to a surface contamination of at least a total of any 100 square meters of offsite property due to release of

radioactive material from nuclear installation of 1000 Bq/sq.m or more from alpha emitting radionuclides, or leading to radiation level of 10 μGy/h (1 mR/h) at 1m or more above natural background from beta or gamma emitting radionuclides.

vi) Any event (including that caused by natural disaster) in the course of transportation by road, air or water ways leading to release of nuclear material or injury or death of a person due to exposure to ionizing radiation emanating from the release of nuclear material.

Once the reports of extraordinary nuclear events are received in AERB, these will be further reviewed to assess whether they qualify for being notified as 'nuclear incidents'. For this purpose, AERB has issued a safety directive on "Criteria and Assessment Procedures for Notification of Nuclear Incident under the Civil Liability for Nuclear Damage Act, 2010". As per this Directive, an Expert Review Committee consisting of relevant experts in the field will be constituted to review the extraordinary nuclear events. Necessary guidance for this purpose has been provided in the Directive. Those extraordinary nuclear events, which satisfy the following criteria will be notified as 'nuclear incident' after obtaining approval from the Board of AERB:

i) Any single event (including that caused by natural disaster) resulting in stack release corresponding to a quantity of radioactivity radiologically equivalent to a release of 1000 TBq of I-131 or more

ii) Any single event (including that caused by natural disaster) where in one or more person offsite were, could have been, or might be exposed to radiation or to radioactive material, resulting in a dose or in a projected dose of 100 mSv, or

iii) Any event (including that caused by natural disaster) leading to injury or death of a person offsite due to exposure to ionizing radiation emanating from a nuclear installation or during transportation of nuclear material

iv) Any event (including that caused by natural disaster) requiring evacuation and having potential economic loss as a part of countermeasure following an off-site emergency at an nuclear installation, or

v) Any single event (including that caused by natural disaster) leading to a surface contamination of at least a total of any 100 square meters of offsite property due to release of radioactive material from nuclear installation of 10000 Bq/sq.m or more from alpha emitting radionuclides, or leading to radiation level of 100 μGy/h (10mR/h) at 1 m or more above the natural background from beta or gamma emitting radionuclides, or

vi) Any event (including that caused by natural disaster) in the course of transportation leading to release of nuclear material resulting in a surface contamination of off-site property of 10,000 Bq/sq.m or more from alpha emitting radionuclides, or leading to radiation level of 100 μGy/h (10mR/h) at 1 m or more above the natural background from beta or gamma emitting radionuclides, or

Any event, other than those mentioned above, and in the opinion of the Event Review Committee is of sufficient safety significance to cause damage to personnel or property, can be recommended to the Board of AERB for notification.

In addition, on receipt of any information from any source on suspected occurrence of any extraordinary nuclear event, AERB may initiate suo-moto action to determine whether or not there has been any such event and determine whether such an event qualifies for notification under the Act.

Remembering Shri S. K. Sharma...

The Board of AERB in its meeting held on 30th December, 2014 mourned the sad passing away of Shri S. K. Sharma, former Chairman, Atomic Energy Regulatory Board in the evening of December 16, 2014.

Shri Sharma will always be fondly remembered by the entire nuclear fraternity, both nationally and internationally, for his immense contribution to regulation of Indian nuclear programme and activities of International Atomic Energy Agency. His visionary approach and leadership instinct were the backbone which set Shri Sharma apart from the rest. He was a technical man to the core and had balanced beautifully the regulatory activities with strong technical reasoning. Shri Sharma's calm, composed, systematic and disciplined approach coupled with enormous faith on his team had helped AERB prepare to face the upcoming regulatory challenges.

The Board of AERB observed two minutes silence in memory of Late Shri S. K. Sharma. The Board extended its deepest condolences to the family members of Shri Sharma and wished all strength and support to endure this great loss.

AERB Annual Day Programme - 2014

AERB Day Programme was celebrated on November 15, 2014 on AERB Lawns. Around five hundred and forty persons, which included AERB staff and their family members, graced the occasion. The family members of AERB staff presented a good cultural programme consisting of dances, songs, music etc. The prize distribution was held for winners of various sports tournaments, meritorious children of AERB employees and employees under awards scheme of AERB. The artistes of the programme were presented with mementos in appreciation of their talent. A festive dinner was hosted for all by AERB.

Cultural programme during AERB Day

AERB Annual Awards - 2014

AERB started its award scheme from the year 2012 to promote excellence among its staff and recognize outstanding achievements of those engaged in regulatory and associated research and development activities. AERB award scheme comprises of individual awards as well as group achievement awards. The categories of awards are: Young Scientific Officer Award, Outstanding Performance / Special Contribution Award, Leadership Award-1 (higher than SO/G), Leadership Award-2 (lower than SO/G), Meritorious Service Award and Group Achievement Award. In all these categories, awards for the year 2013-14 were distributed during the annual function of AERB.

LIST OF AERB AWARDEES (2014)

Cat.1: Young Scientific Officer Award
1. Dr. Obaidurrahman Khalilurrahman, SO/E, NSAD
2. Shri Anand R. Pinjarkar, SO/D, RSD

Cat.2: Outstanding Performance/ Special Contribution Award.
1. Shri J. Koley, SO/G, OPSD
2. Shri V. Mohan, Head SRRC

Cat.3: Leadership Award-2
1. Shri Lala Ram Bishnoi, Director, SSED

Cat.4: Meritorious Service Award:
1. Shri Madhav Shridhar Sathe, APRO, Admn.

Cat.5: Group Achievement Award:

Group 1: (Seismic Margin Assessment of Nuclear Structures)
1. Shri A. D. Roshan, SO/F, SSED
2. Shri Ajai S. Pisharady, SO/F, SSED
3. Smt. P. Shylamoni, SO/F, SSED
4. Shri Sourav Acharya, SO/E, SSED
5. Shri Moloy K. Chakraborty, TO/E, SSED
6. Shri Somnath Jha, SO/D, SSED

Group 2: (Radiation Protection & Emergency Preparedness)
1. Shri S.K. Pawar, SO/F, OPSD
2. Shri Shyam Vyas, SO/E, OPSD
3. Shri Narendra Khandelwal, SO/E, OPSD
4. Shri Vipin Chander, SO/D, OPSD

Group-3: (Legal Matters)
1. Shri Utkarsh S. C., SO/E, NPSD
2. Shri Soumen Sinha, SO/E, IPSD
3. Shri Parikshat Bansal, SO/E, ITSD
4. Shri Rahul Porwal, SO/E, NPSD
5. Shri Srinivasan Venkatachalam, Assistant, Administration
6. Smt. Deepika Kushwaha, Steno-II, ITSD

Group-4: (Diagnostic Radiology)
1. Dr. P. K. Dash Sharma, SO/G, RSD
2. Dr. Pankaj Tandon, SO/F, RSD
3. Shri R. K. Singh, SO/F, RSD
4. Kum. Arti Kulkarni, SO/E, RSD
5. Smt. Anuradha V. SO/E, RSD
6. Shri R. K. Chaturvedi, SO/D, RSD
7. Smt. Rajeshri Pai, SO/D, RSD
8. Shri Mahesh M, SO/D, RSD
9. Shri Rajendra Shete, SO/C, RSD

Chairman AERB presenting Leadership Award to Shri Lala Ram Bishnoi, Director, SSED

Chairman AERB presenting Outstanding Performance award to Shri J. Koley, SO/G, OPSD


Chairman AERB presenting Outstanding Performance award to Shri V. Mohan, Head SRRC


Chairman AERB presenting Young Scientific Officer Award to Dr. Obaidurrahman Khalilurrahman, SO/E, NSAD

Chairman AERB presenting Young Scientific Officer Award to Shri Anand R. Pinjarkar, SO/D, RSD

Chairman AERB presenting Meritorious Service Award to Shri Madhav Shridhar Sathe, APRO, Admn.


Chairman AERB presenting Group Achievement Award to group on 'Seismic Margin Assessment of Nuclear Structures'


Chairman AERB presenting Group Achievement Award to group on 'Radiation Protection & Emergency Preparedness'


Chairman AERB presenting Group Achievement Award to group on 'Legal Matters'


Chairman AERB presenting Group Achievement Award to group on 'Diagnostic Radiology'

Official Language Implementation

AERB is committed towards implementation of Official Language. The highlights of various activities during July-December, 2014 are:

1. Two Hindi workshops were conducted by the Joint Official Language Co-ordination committee of the five units of DAE situated in Anushaktinagar during the above mentioned period. The first one was held between September 23 and 25, 2014 at BRIT, Vashi. One Scientific Officer of AERB was nominated. The second was held from December 15 to 17, 2014 at ATI, Anushaktinagar. Three Scientific Officers from AERB were nominated for this workshop.

2. Hindi Day Celebration was held on January 16, 2014 in Multipurpose Hall, TSH Anushaktinagar under the auspices of the Joint Official Language Co-ordination committee of the five units of DAE situated in Anushaktinagar. The event was organised by AERB in which Shri S. Duraisamy, the then Vice Chairman, AERB was the Chief Guest. The major highlight of the event was a talk by Padmashri Dr. S.P Kale on "Dainik Jeevan mein Vigyan" (Science in Daily Life).

3. Eight regulatory safety documents were translated & published in Hindi during this reporting period. The total number of AERB regulatory safety documents translated in Hindi stands at 94. Four documents are in advanced stage and three are under various stages of translation.

4. Annual report for the year 2013-14 and AERB Bulletin 2013-14 has been published in Hindi.

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Personnel Joined During the Period July 2014 to December 2014

Sr. No.	Name	Designation	Date of Appointment
1.	Shri Rakesh Edumukkala	SO/C	22/07/2014
2.	Kum. Monalisha Nayak	SO/C	01/08/2014
3.	Kum. Shalaka S. Vatare	Steno Gr. III	01/08/2014
4.	Smt. Parvathy Harikrishnan	CAO, AERB	18/11/2014 (Transfer from BARCF, Kalppakam)

Personnel Retired/ Transferred/ Resigned during the Period July 2014 to December 2014

Sr. No.	Name	Designation	Date of retirement/ Transfer
1.	Shri S. Duraisamy	OS	31/10/2014
2.	Dr. A. Ramakrishna	SO/H+	31/10/2014
3.	Shri A.P. Bapat	Senior Technician (H)	30/11/2014
4.	Shri P. Mohan Babu	CAO, AERB	18/11/2014 (Transfer to BARCF, Kalppakam)
5.	Smt. Smita S. Haryan	UDC	19/11/2014 (Transfer to BARC)
6.	Shri Ravikant N. Karda	SO/E	16/07/2014 (Resigned)

AWARDS & HONORS

1) Kum. Ananya Mohanty was awarded M.Tech. degree in Mechanical Engineering from Homi Bhabha National Institute.

2) Shri Suvadip Roy was awarded M.Tech. degree in Electronics and Instrumentation Engineering from Homi Bhabha National Institute.

3) Shri Vivek Piplani of AERB was deputed to IAEA for a duration of six months to work with its Operating Experience (OE) team at IAEA Headquarter, Vienna. During this period, he worked as 'Consultant' with 'Operational Safety Section' of IAEA and performed assignments related to planning, development and implementation of the IAEA programs in the area of operating experience. He contributed in operation of IAEA's Incident Reporting System (IRS) for operating experience and the revision/development of IAEA Safety Guide NSG 2.11 on 'Operating Experience Feedback for Nuclear Installations' and IAEA TECDOC on 'Root cause analysis following an event at a nuclear installation'.

Edited and Published by Shri R. Bhattacharya, Secretary, Atomic Energy Regulatory Board, Niyamak Bhavan, Anushaktinagar, Mumbai-400 094.
Tel. & Fax No. 25576255, E-mail: rbhattacharya@aerb.gov.in.
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