



AERB

Newsletter

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ATOMIC ENERGY REGULATORY BOARD

Mission: The mission of Atomic Energy Regulatory Board is to ensure that the use of ionizing radiation and nuclear energy in India does not cause unacceptable impact on the health of workers and the members of the public and on the environment.

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From the Chairman's Desk

Season's Greetings to all our Readers! In this reporting period, AERB was brimming with many regulatory activities. 'Site Excavation Clearance' to install the next round of indigenous PHWR design of 700 MWe for Rajasthan units-7&8, was issued. Clearances were given at various stages for Kaiga unit-4 commissioning including Fuel loading, Heavy Water addition, First Approach to Criticality, and raising reactor power to 100% full power.

With regard to front-end nuclear fuel cycle facilities, AERB gave Licenses for Operation of Bagjata mine of Uranium Corporation of India and Operation of Turamdih mill of Uranium Corporation of India Limited.

In the international arena, a technical workshop was organized by AERB and ASN, the French Nuclear and Radiation Regulatory Organization, in AERB during November 22-23, 2010 on safety of European Pressurised Reactors.

On December 6, 2010, AERB entered into an agreement with ASN, the French Nuclear and Radiation Regulatory Organization and IRSN, the French Institute for Radiological Protection and Nuclear Safety for the exchange of Technical Information and Cooperation in the Regulation of Nuclear Safety and Radiation Protection and for collaboration in the area of nuclear reactor safety.

AERB's work on strengthening of safety analysis tools got a boost through use of methodology for external coupling of interdisciplinary computer codes. The system codes representing areas such as reactor physics, thermal hydraulics, structural mechanics, chemical and fire aspects can now be coupled for regulatory applications.

AERB issued a Directive on November 26, 2010 on the criteria for exclusion, exemption and clearance of radionuclides in solid materials within radioactive practices from the consideration of regulatory control.

Several awareness programmes were conducted by AERB on a spectrum of activities being carried out using sealed and unsealed radionuclides for its stakeholders.

Also, AERB has taken steps to strengthen the regulatory control on medical diagnostic X-ray installations in various States. During this period, AERB signed a Memorandum of Understanding (MoU) with the Government of Tamil Nadu on December 11, 2010 for establishing State-Level Radiation Safety Authority in Tamil Nadu.

As a part of safety promotional activities, 27th DAE Safety & Occupational Health Professionals Meet was held during November 25 - 27, 2010 at NFC, Hyderabad. It was jointly organized by AERB and Nuclear Fuel Complex with themes on Chemical Safety, Waste Management and Environmental Toxicology. Green Site Awards were distributed to the winning units during this Meet. A report is included in this Newsletter.

AERB's programme to expand its human resource base to keep pace with its increasing responsibilities is on track. Thirty personnel with Engineering/Science background were recruited and joined AERB during this period.

Three senior officers of AERB (Dr.Om Pal Singh, Director, ITSD; Dr. I.A.Patwagar, NPSD and Shri S.K.Warrier, NPSD) retired on superannuation and Dr. P.C.Basu, Director, CSED took voluntary retirement during this reporting period. Shri R.Bhattacharya took over as Secretary, AERB and Director, ITSD in addition to Director, IPSD.

This issue of AERB Newsletter covers the above issues, among others at some length.



(S. S. Bajaj)

AERB Board Meetings

The 102nd meeting of the Board of AERB was held on November 4, 2010. The Board reviewed the safety status of the operating plants of the Department of Atomic Energy. The Board approved publication of the two Safety Codes: one on "Safety Code on Nuclear Medicine Facilities (AERB/RF-MED/SC-2 (Rev.2), 2010)" and the other on "Safety Code on Radiation Therapy Sources, Equipment and Installations (AERB/RF-MED/SC-1 (Rev.1), 2010)" with some suggestions.

The status of Radiation Facilities in light of after Mayapuri Incident was reviewed. Several actions initiated by AERB for reinforcement, and further strengthening of its regulatory enforcement mechanism for radiation facilities and sources were discussed. In addition, the Board also noted the safety review status of Kaiga unit-4 and the status of KAPP-3&4 projects, the first twin-unit future project of series of 700 MWe PHWR based NPPs. Based on the review and

recommendations received from the Advisory Committees, the Board granted various Clearances/Authorisations with respect to nuclear and radiation facilities.

The proposal of increasing the budget of Safety Research Programme funded by AERB from Rs. 1 Crore to Rs. 2.5 Crores in the financial year was approved with effect from 2010-2011. This increase in the budget is due to increase in the number of research projects and associated cost of equipments for the project, the upward revisions in the salaries of the project staff and stipend of AERB graduate fellowship.

The Board also placed on record the significant contribution of Dr. Om Pal Singh, the former Secretary, AERB & Director, ITSD who retired on July 31, 2010 on superannuation. The Board welcomed Shri R. Bhattacharya, the new Secretary of AERB.

Consents Issued (July – December 2010)

- License for Operation of Bagjata mine of Uranium Corporation of India (**UCIL**) (July 9, 2010).
- Permission for Light Water Draining from Primary Heat Transport System of **KGS-4** (July 15, 2010).
- Site excavation Clearance for **RAPP-7&8** was issued (August 18, 2010).
- Licence for Operation of Turamdih mill and Clearance for Increase in the Height of Tailings Dam (September 1, 2010).
- Clearance for Initial Fuel Loading, Addition of Limited quantity (20 Te) of HW in Moderator System and HW filling of PHT system of **KGS-4** (September 14, 2010).
- Permission for Change in Sequence: Addition of 20 Te HW in Moderator System for flushing before Initial Fuel Loading at **KGS-4** (September 20, 2010).
- Clearance for raising reactor power to 100% FP for **RAPP-6** (October 9, 2010).
- Clearance for bulk addition of heavy water to Moderator System of **KGS-4** (November 19, 2010).
- Clearance for First Pour of Concrete (FPC) for **KAPP-3&4** (November 20, 2010).
- Clearance for First Approach to Criticality for **KGS-4** (November 25, 2010).
- Clearance to conduct Low Power Phase-B physics tests for **KGS-4** (November 27, 2010).
- Restart of NAPS-2 after completion of En-mass coolant channel replacement and other up-gradation activities. The unit was made critical and synchronized to grid on August 29, 2010 & September 6, 2010 respectively.
- Restart of KAPS-1 after completion of En-mass coolant channel replacement and other up-gradation activities. The unit was made critical and synchronized on December 31, 2010 & January 12, 2011 respectively.
- Renewal of authorisation for operation of KAPS-1&2 up to July 31, 2014.
- Authorisation for operation of MAPS, which was expiring on December 2010, was extended up to March 31, 2011 to facilitate completion of reviews.
- Extension of the construction clearance for Additional Away from Reactor (AAFR), spent fuel storage facility at TAPS-1&2, till June 30, 2011.

Regulatory Inspections (July - December 2010)

Unit	No. of Inspection
Nuclear Facilities	
KGS-4, RAPP 7&8, KAPP-3&4, KKNPP-1&2, DFRP, IFSB	1 each
PFBR	2
MAPS-1&2, RAPS-1&2, RAPS-3&4, NAPS-1&2, KAPS-1&2, TAPS-1&2, TAPS-3&4, KGS-1&2, KGS-3, FRTG, RCL, CORAL, IGCAR, RAPP COF	1 each
NFC-Hyderabad & ZC-Pazhyakayal, VECC, ECIL, IREL-Udyogamandal, Chavara & OSCOM	1 each
UCIL, RRCAT	2 each
Non-DAE Beach Sand Minerals Facilities	4
HWPs-Thal, Manuguru, Baroda, Hazira, Kota, TDP-Chembur	8
Special Inspections	
KAPS-3&4, RAPS-7&8, KKNPP, PFBR, DFRP, UCIL (TMP) (Special inspections on Industrial Safety)	25
TAPS-4, RAPP COF	1 each
KAPS-1, and NAPS-2 before restart of the units after completion of EMCCR activities.	1 each
KGS-1 to 4, NAPS and TAPS-1 to 4, AFR & AAFR Tarapur (Special inspections on Nuclear Security)	1 each
Industrial Radiation Facilities	
Industrial Radiography	54
Gamma chamber	58
Gamma Irradiators	10
Nucleonic Gauges	33
Medical Radiation Facilities	
Nuclear Medicine	35
Diagnostic X Rays	40
Radiotherapy Facilities	39
Others	9

Agreement between AERB - ASN and AERB - IRSN

An agreement on the arrangement between Atomic Energy Regulatory Board (AERB), India and Nuclear Safety Authority (ASN), France for the Exchange of Technical Information and Cooperation in the Regulation of Nuclear Safety and Radiation Protection was signed on December 6, 2010 at New Delhi during the visit of French President Mr. Nicolas Sarkozy. The Agreement was signed by Mr. S. S. Bajaj, Chairman, AERB and Mr. Andre Claude Lacoste, Chairman, ASN, France. This renews and updates the existing arrangement which is in force since 1999 and subsequently renewed in 2005.

Both the countries agreed to exchange experts and technical and regulatory information related to radiation protection and to the safety of Nuclear Facilities.

Another framework agreement on technical cooperation between AERB and Institute for Radiation Protection and Nuclear Safety (IRSN), France was also signed by Mr. S. S. Bajaj, Chairman, AERB and Mr. Jacques Repussard, Director General of IRSN for collaboration in the area of nuclear reactor safety covering areas such as exchange or secondment of staff, exchange of materials or software, joint studies and joint projects etc.



Mr. Jacques Repussard, Director General of IRSN and Mr. S. S. Bajaj, Chairman, AERB (Right) exchanging a framework agreement on cooperation in the area of nuclear safety on December 6, 2010 at New Delhi



Mr. S. S. Bajaj, Chairman, AERB and Mr. Jacques Repussard, Director General of IRSN (Right) signing a framework agreement on cooperation in the area of nuclear safety on December 6, 2010 at New Delhi

Human Resource Development

One hundred and three Scientific & Technical posts were sanctioned for AERB as part of the XI Plan Expansion Project. SO (D)/SO (E) and TO (D)/TO (E) posts are being filled up through direct recruitment. Advertisement was issued in September 2009 and interviews conducted in March 2010. After completing all the formalities, seventeen officers joined during this period.

Newly sanctioned SO/C posts are being filled up from the Training Schools of BARC, NPCIL, NFC-HWB and IGCAR.

Technical Talks / Refresher Courses

- (a) A technical talk on 'Radiological Incident in Delhi' by Dr. A. U. Sonawane, RSD, AERB was arranged on July 29, 2010. A radiological incident occurred in metal scrap market in Mayapuri area of Delhi, resulting in radiation over exposure to seven people due to presence of Co-60 sources in metal scrap. AERB, units of DAE, Crisis Management Group (CMG) of DAE and National Disaster Management Authority (NDMA) carried out detailed search operation in the affected area of Mayapuri and recovered all the radioactive sources. The talk addressed the description of the incident, the measures and the regulatory actions taken to prevent recurrence of such incident.
- (b) A technical talk on the topic 'Right to Information Act-2005' by Shri Achleshwar Singh, Assistant Director (OL), ATI, DAE was arranged on October 14, 2010. The talk covered several important aspects of RTI.
- (c) AERB Refresher Course on "Stainless Steel (SS) Fabrication" by Shri P.K. John, Technology Development Group, NPCIL was arranged on October 15, 2010. In this talk, genesis of SS, different grades of SS and their selection for specific applications were addressed. Material degradation mechanism like Intergranular Stress Corrosion Cracking (IGSCC), Transgranular Stress Corrosion Cracking (TGSCC) and Irradiation Assisted Stress Corrosion Cracking (IASCC) were also addressed. The talk also dealt with other aspects like techniques available to mitigate the degradation, interim repair of affected welds, requirements regarding welding of SS materials, selection of electrodes for SS welding, distortion control, cleaning & passivation and newer welding techniques like Last-Pass-Heat-Sink welding. Difficulties faced in Ultrasonic Testing of SS welds and Castings were also discussed.

Three trainees each were allotted to AERB from BARC and NPCIL training schools, two from NFC-HWB and one from IGCAR. All these officers joined AERB on September 1, 2010. In addition two officers joined as SO/C from IIT, Mumbai and IIT, Madras under AERB Graduate Fellowship Scheme.

Two NPCIL officers in the grade of SO/F who were working in AERB on secondment basis were permanently absorbed in AERB on September 23, 2010 and two officers from other units of DAE were transferred to AERB during this period.

New Safety Guidelines Published

The AERB Safety Guidelines titled 'Renewal of Licence for Operation of Nuclear Fuel Cycle Facilities other than Nuclear Power Plants and Research Reactors' (No. AERB/FE&BE-FCF/SG-1) was published in September 2010. The guidelines provide detailed guidance for renewal of licence for operation of the front end and back end of nuclear fuel cycle facilities. Preparation of systematic application and supporting documents to be submitted to regulatory body for safety review and licensing are detailed in the document. The criteria for periodic safety review are provided. For this purpose eight factors such as plant performance, safety performance, procedures, waste management and radioactive waste disposal, management of ageing, emergency preparedness, environmental impact assessment and organisation & administration are considered to provide comprehensive safety assessment of plant. The objective and review basis for these factors along with the format for application for renewal of licence is also given in the guidelines.

Commission on Safety Standards, IAEA

AERB is the nodal coordinator to arrange for reviewing comments on IAEA draft documents. These drafts are finalised by the Commission on Safety Standards (CSS), IAEA, Vienna. Meetings of the representatives from Member States are held quarterly to finalise the drafts. The Document Preparation Profile (DPPs) for new documents are also finalised in these meetings. A meeting of CSS was held on September 30, 2010-October 1, 2010 at IAEA, Vienna. Shri S.S. Bajaj, Chairman, AERB participated in the meeting and presented Regulatory Events of National Importance during 2009-2010 meetings. The comments sent on India for three drafts (DS 396, DS 417 and DS 424) were incorporated in the final draft.

Awareness Programmes/Workshops

1.0 One Day Awareness Programme for Research Facilities using Open Radioisotopes

The Nuclear Medicine Group of Radiological Safety Division arranged a One Day Awareness Programme for Research Facilities using Open Radioisotopes on July 30, 2010 and August 06, 2010 at AERB, Mumbai. The Group had identified following difficulties while regulating research facilities such as current regulation, staff requirement, planning research facility, handling radioactive material, waste disposal procedure and decommissioning research facility.



Shri. R. Bhattacharya, Secretary, AERB addressing the delegates at the One Day Awareness Programme conducted for Research Facilities using open Radioisotopes

(L to R): Dr. Pankaj Tandon, RSD, and Dr. (Smt.) Meera Venkatesh, Head, RPhD, BARC.

The objective of the programme was to generate awareness amongst the users and to enhance good safety practice for effective implementation of regulatory measures at the user level. 115 delegates actively participated in the same.

Dr. Om Pal Singh, Secretary, AERB delivered the opening remarks on July 30th meet and Shri R. Bhattacharya, Secretary, AERB delivered the opening Remarks on August 06th meet. On both the occasions, Dr. (Smt.) Meera Venkatesh, Head, Radiopharmaceuticals Division, BARC delivered Inaugural Address and emphasized the necessity of increasing safety culture in the research works, especially using open radioisotopes.

There were lectures on regulatory requirements, radiation safety aspects in the use of open radioisotopes for research purposes and radioactive waste disposal. Invited talks were also delivered by the representatives from four institutions wherein open radioisotopes are extensively used for research activities.

2.0 Awareness programme on "Radiation Safety" at Reliance Industries, Nagothane

Radiological Safety Division of AERB conducted one day awareness programme on radiation safety at Nagothane Manufacturing Division of RIL, Nagothane, Raigad on July 20, 2010. The programme was organised for the workers of the Poly Propylene (PP) plant on the request of RIL, Nagothane. The programme was organised due to elevated radiation levels

observed at the PP plant of RIL, Nagothane. The objective of the programme was to educate and explain the workers about the necessary safety measures required to be followed while carrying out job in the radiation area.

The programme was conducted in two batches at two locations in the PP plant; about 100 workers attended the programme. The workers were explained about different types of radiation, hazards associated with radiation, its evaluation procedures and control measures like time, distance and shielding. Criteria for health surveillance of radiation workers as per the existing regulations were clarified.

The queries raised by workers on health effects, availability of any pathological tests to estimate doses received by them due to elevated levels of radiation in PP plant were duly answered by the AERB officials.

3.0 Refresher programme on "Radiation Safety in Industrial Radiography"

Radiological Safety Division of AERB organized a one day refresher programme on radiation safety in industrial radiography on November 10, 2010 in AERB, Mumbai for industrial radiography personnel (radiographer / site-in-charge) who were not in the field of radiography for more than five years.

The topics covered in the lecture during the one day programme were related to Regulatory, Safety & Security Aspects of Industrial Radiography Practice in India, Biological Effects of Radiation, Radiation Hazard Evaluation in Industrial Radiography, Radiation Accidents involving Radiography Sources and Transport of Radiography Sources. A formal written examination and viva-voce were conducted after the lectures. Seventeen participants from different parts of the country attended the programme. AERB approved the participants to work as Site-in-Charge / Radiographer in authorized radiography agencies.

4.0 Awareness programme on "Radiation Safety for the Members of Indian Gas Mantle Manufacturers' Association"

Awareness programme on Radiation Safety for the members of Indian Gas Mantle Manufacturers' Association was conducted on November 11, 2010 in AERB. Manufacturing of gas mantles using thorium nitrate, which is radioactive, is one of the oldest cottage industries in India. There are about forty such active manufacturers in the country mainly concentrated in Mumbai region. The mantles thus manufactured are mainly for domestic consumption. However, there are still some European countries which deploy such gas mantles for lighting in the rural areas. The need of such countries is met mainly with the supply from Indian exporters.

The potential hazard involved is mainly internal hazard that may arise due to the inhalation (in the storage room) of the gaseous daughter products in the decay chain of thorium and ingestion of the radionuclides released during the process of manufacturing gas mantles. As such proper care is taken by using personal protective equipments to avoid intake of radionuclides through

Awareness Programmes/Workshops

such pathways. AERB regulates such manufacturing facilities by stipulating radiation protective measures, while issuing regulatory clearances in the form of Authorisation.

There were twenty four participants representing industries located in Mumbai and Gujarat regions. Shri S.A. Hussain, Head, RSD, inaugurated the programme. In his inaugural speech, he emphasized that AERB will support such small scale industries; but without compromising the safety and other regulatory requirements.

There were lectures on the radiation safety for the gas mantle manufacturing, transport of gas mantles while complying with the international transport regulations by AERB officials and by Secretary of Indian Gas Mantle Manufacturers' Association about the gas mantle industry in India.

5.0 One day Awareness Programme on "Safety and security of radioactive sources used in oil well logging and nucleonic gauges" at M/s Oil India Ltd., Dibrugarh

AERB has conducted one day awareness programme on "Safety and security of radioactive sources used in oil well logging and nucleonic gauges" at M/s Oil India Ltd., Dibrugarh on November 24, 2010 as requested by the management of M/s Oil India Ltd., Dibrugarh.

Oil well logging is a technique for finding hydrocarbon zones in the geological formations below the Earth's crust. High activity sources such as Neutron sources (Am-Be, Pu-Be, Neutron generator etc. ~20Ci), Gamma source (Cs-137, ~ 2Ci) are being handled in Oil well logging application. Hence safety and security of the sources are great concern in this application. Skilled operators of oil well logging handle the radiation sources under the supervision of Radiological Safety Officer (RSO) of the institution. The educational qualifications of the operators are mostly matriculate (10th standard) and do not have formal training on radiological safety. But their personnel doses are monitored by neutron badges, TLD badges and use of suitable survey meter during routine operation. It is very essential that operators should have knowledge on basic radiation safety and regulation of using oil well logging sources. Moreover, security of the sources is of great concern. The licensee or registrant shall ensure security of the sources during storage, transport and use to prevent loss, tampering, or unauthorized removal of the sources.

Hence, an awareness programme was designed and the lectures were delivered in Hindi. The topics covered in the lectures were Basic Radiation Safety while handling of oil well logging and nucleonic gauge sources, Biological Effects of Radiation, Regulatory aspects in oil well logging and nucleonic gauge practice and Case studies of unusual occurrences (national / international) in oil well logging and nucleonic gauge practice

About 40 operators, RSO of M/s Oil India Ltd., Dibrugarh participated in the programme. At the end of the programme, the participants were awarded participation certificate issued by M/s Oil India Ltd., Dibrugarh.

6.0 One day Workshop on "Implementation of Requirements of IS 13450 for Equipment Manufacturers / Suppliers /Vendors of R&F / CT /Interventional Radiology /Mammography /C-arm/Dental/OPG/BMD units"

The Radiological Safety Division (RSD) organised a one day Workshop on December 21, 2010 for manufacturers of medical X-ray equipment in India. The certification of BIS from conventional safety view point is pre-requisite for Type Approval by AERB. Recently, BIS had adopted new IEC standards as Indian



Dignitaries on the Dais at the One Day Awareness Programme

(L To R): Dr. A.U. Sonawane, RSD, AERB, Shri Kacheria Raja, Director and Scientist, CMDI, BIS, Mumbai, Dr. Y.S. Mayya, Head, RP&AD, BARC, Dr. K.S. Parathasarthy, Ex Secretary, AERB, Shri S.A. Hussain, Head, RSD and Ms. Aarti Kulkarni, RSD, AERB

Standards (IS 13450) and accordingly, AERB had issued a circular to all manufacturers/suppliers directing them for immediate implementation of IS 13450 from radiological safety view point.

In view of above, this workshop was organised with an objective to familiarize the participants with QA performance test procedures as per IS 13450 for CT/Conventional radiography & fluoroscopy/mammography and revised regulatory and radiation safety requirements in the diagnostic X-ray installations.

The workshop was inaugurated by Dr. K.S. Parathasarthy, former Secretary, AERB. He explained the importance of quality assurance programme in diagnostic radiology for achieving optimization of radiation protection of patient and the staff without compromising quality of the clinical information. There were more than 40 participants for the workshop.

Shri S.A. Hussain, Head, RSD in his welcome address briefed the participants about the objectives of the workshop and stressed the need for implementation of requirements of IS 13450. Shri Kacheria Raja, Director and Scientist, CMDI, BIS, Mumbai addressed the audience on the role of BIS in laying down safety standards for manufacturing x-ray units and BIS certification procedures. Dr. Y.S. Mayya, Head, RP&AD, BARC in his advisory remarks emphasized the need for built-in safety features of x-ray units and trained personnel for operation, maintenance and carrying out periodic QA performance tests on x-ray unit.

Awareness Programmes/Workshops

Five presentations on the IS 13450 were delivered by experts from RSD, AERB and BIS. In the concluding session it was informed that a position paper on implementation of IS 13450 would be made by AERB and BIS.

6.0 Awareness programme on "Radiation Safety Aspects in open field Industrial Radiography"

One day awareness programme on "Radiation Safety Aspects in open field Industrial Radiography" at M/s Jhajjar Power Limited (JTPS), Jhajjar, Haryana was conducted by officers of RSD, AERB on December 24, 2010. JTPS, Jhajjar organized this programme in view of anticipated increase in the radiography activities owing to expansion of their power projects.

The objective of the awareness programme was to generate awareness amongst the people (civil workers, fabricators, mechanical contractors, their employees and casual labors) working at site about the industrial radiography activity and to enhance safety practice for effective implementation of regulatory provisions.

The awareness programme covered broadly the topics such as Regulatory, Safety & Security Aspects of Industrial Radiography Practice in India, Safety & Security of Radioactive Sources, Biological Effects of Radiation, Radiation Hazard Evaluation in Industrial Radiography, Radiation Accidents involving Radiography Sources. The programme was followed by demonstration for safe handling of radioactive exposure device and use of radiation measuring instruments and finally feedback session.

About thirty-five participants with diversified skills such as Engineers, Doctors and Security personnel of JTPS, personnel of contract awarding agencies and RSOs/site-in-charges of radiography agencies attended the programme. Jhajjar Power Limited, Jhajjar conveyed that the programme was highly appreciated by the participants.

7.0 Training Programme on "Radiation Safety Aspects of use of Ionising Radiation in Research Applications"

Post Mayapuri radiological incident in April 2010, use of radioactive materials at University of Delhi (DU) has been suspended by AERB. AERB officials carried out regulatory inspection during November 1-2, 2010 and observed that many



Dr. Pankaj Tandon delivering the lecture conducted at the University of Delhi

departments though having the facility to use radioactive materials but only few departments have the qualified Radiological Safety Officer (RSO). During inspection, the AERB officials recommended that each department intended in using radioactive materials should have an approved RSO from AERB. In view of this, on request from the Registrar, DU, a training programme on "Radiation Safety Aspects of use of Ionising Radiation in Research Applications" was conducted by AERB during December 1-3, 2010 at Institute of Life Long Learning (ILLI), DU.

About 35 delegates comprising Professors, Associate Professors, Lecturers and Technical Officers attended the training programme. 28 participants appeared for RSO Certification Examination and out of which 22 participants successfully completed the same.

The training programme included the topics such as legislation and regulatory requirements in handling radioisotopes used in research applications and planning of research laboratories, operational limits, disposal of radioactive waste and workplace monitoring of research laboratory, transport of radioactive materials, radiation hazard evaluation and control and emergency Preparedness in handling radioisotopes and radiation emergency preparedness. In addition, practical / demonstration on contamination monitoring & decontamination procedures and properties of radiation (attenuation characteristic of β and γ radiation) were also conducted.

8.0 AERB-ASN Workshop

An AERB-ASN Technical workshop was organized in AERB during November 22-23, 2010 on safety of European Pressurised Reactors (EPRs). The topic of the workshop was "Information Exchange on Nuclear Safety" in relevance to the future LWR programme. A five member delegation of ASN, the French Nuclear and Radiation Regulatory Organization and IRSN, the French Institute for Radiological Protection and Nuclear Safety, led by Mr. Olivier Gupta, Deputy Director General, ASN visited AERB for this workshop. A total of sixty-nine officials from AERB, BARC and NPCIL participated in the workshop. This workshop was conducted under the Nuclear Safety Co-operation Agreement between AERB and ASN.

A pre-workshop meeting was held between Shri S.S. Bajaj, Chairman, AERB, Senior AERB officials and French delegation in the presence of DAE representative where topics for future cooperation between AERB and ASN were identified. This meeting was followed by the workshop, where Dr. Sunil Felix read out the message on behalf of Ambassador of France to India. Presentations were made by French delegates, AERB, BARC & NPCIL.

IRSN is the technical support organization of ASN and submits its assessment to the Advisory Committee for nuclear reactors for review. ASN takes its decisions on the basis of the review of assessment report by the Advisory Committee. Technical assessment program related to the authorization is mainly built on the safety objectives such as reduction of core melt down risk; reduction of the radiological impact of accidents through design of the reactor building containment, the peripheral buildings containment and the core catcher.

Awareness Programmes/Workshops

There were presentations from Indian delegates covering safety review of Reactor Pressure Vessel of KKNPP, overview of JNPP and experiences during construction of PHWRs & VVERs. During the feedback session, certain new topics were identified by the participants, which may be covered in the future workshops.



Senior Officials of AERB and French delegates at the AERB-ASN Workshop

In a separate meeting of AERB management with ASN officials after the workshop, both the parties agreed to have bilateral meetings and technical workshops on a regular basis, at least once in a year. It was also proposed to form a Steering Committee comprising of AERB and ASN officials to monitor the conduct of these programs. Each technical workshop may be prefixed/suffixed by a meeting of the Steering Committee to formulate the plans of future activities. It was felt that exchange of ideas on regulation of radiation facilities should also take place. The draft text of arrangement between AERB & ASN: 2010 was also reviewed by the senior officials of AERB & ASN in presence of DAE representative.

IRSN briefed AERB top officials about the technical activities carried out by them and offered to collaborate for information exchange in areas of interest to AERB in this regard by signing an agreement, through which available information could be exchanged.

ISO 9001 : 2008 QMS

ISO 9001:2008 Quality Management System (QMS) at AERB

AERB is an ISO 9001 certified organization by Bureau of Indian Standards (BIS) for its consenting activities, regulatory inspection and preparation of regulatory documents since November 15, 2006. 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.

AERB prepared Quality Manual as level-I document and 13 numbers of procedures as level-II documents for implementation of Quality Management System (QMS) as per ISO 9001 standard at AERB. All the Level-I and Level-II documents were revised and the QMS of AERB was recertified as per new ISO 9001:2008 standard in November 2009. As per the requirements laid in the ISO procedures and Quality Manual for AERB, internal audit for various divisions of AERB were carried out in May 2010 and December 2010. Similarly, surveillance audit by BIS was carried out in December 2010 and no Non-Conformance (NC) was reported by BIS.

QMS Monitoring Committee (QMS-MC) of AERB met four times and reviewed the audit observations arising from internal audits carried out in the year 2010. Suggestions of BIS Auditor in the surveillance audit were also discussed in the 4th meeting of QMS-MC for improvement in the QMS in AERB. Demonstration of continual improvement through analysis of data by setting more measurable and achievable 'Quality Objectives' for the various divisions of AERB were highlighted during the surveillance audit.

A program on promotion of awareness on ISO 9001:2008 QMS was held on August 16, 2010 in the Auditorium of Niyamak Bhavan-B, Atomic Energy Regulatory Board to enhance

awareness levels on QMS requirements and to improve competence of AERB personnel in performing their QMS functions. The program was jointly organised by the QMS Monitoring Committee (QMS-MC) and the Official Language Implementation Committee (OLIC) of AERB. The participation was open to all of AERB.

Management Representative (MR) for QMS of AERB, Shri R. Bhattacharya, Secretary, AERB and Director ITSD & IPSPD, welcomed the participants and emphasised that conducting awareness program on ISO 9001:2008 QMS is a requirement as per Quality Manual of AERB. Shri K. Ramprasad, Scientific Officer (G) of Industrial Plants Safety Division delivered a talk on 'Guidelines for Auditors'. Shri R. P. Gupta, Scientific Officer (F) of Nuclear Plants Safety Division delivered a talk in Hindi on 'Quality Assurance in NPPs'. Dr. Devendra Mohan, Scientist (F) & MSCO (W), Bureau of Indian Standards gave a talk on 'Changes between ISO 9001:2008 and ISO 9001:2000'.

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 internal audit were presented by MR office of AERB in the EC meeting of AERB. AERB has its well planned 'Quality Policy' that commits for improvement in its QMS to enhance the efficacy of its consenting processes, making its safety reviews and regulatory inspections more effective and furthering the development of regulatory documents, using its dedicated and motivated human resources.

- Shri Sekhar Bhattacharyya, MR Office (QMS), AERB

DAE Safety & Occupational Health Professionals Meet

27th DAE Safety & Occupational Health Professionals Meet at NFC, Hyderabad

The 27th DAE Safety & Occupational Health Professionals Meet was jointly organized by the Atomic Energy Regulatory Board, Mumbai and the Nuclear Fuel Complex (NFC), Hyderabad at NFC, Hyderabad during November 25 - 27, 2010. The themes for this year's Meet were "Chemical Safety, Waste Management" for Industrial Safety and "Industrial Toxicology" for Occupational Health Safety. The Meet was attended by galaxy of dignitaries such as Shri S.S. Bajaj, Chairman, AERB, Shri S. K. Chande, Vice Chairman AERB and Chairman SARCOP, Shri R. N. Jayaraj, Chief Executive, NFC, Shri A.L.N. Rao, Chief Executive, HWB, Shri Y.S. Mayya, Chairman and Managing Director, ECIL, Shri P.B. Maithani, Director, AMD, Dr. Prabhat Kumar, Project Director, BHAVINI, Dr. K. Balaram Moorthy, Shri K.K. Sinha, Dr. C. Ganguly, former Chief Executives, NFC, Shri Mohinder Singh former Sr. Manager (Safety), NFC, Shri M. Narayan Rao, Chairman and Managing Director (MIDHANI), Shri N.S. Gabhane, Director, DCSEM and Shri R. Bhattacharya, Secretary, AERB and Director, IPST & ITSD, AERB amongst others. Dr. S. Banerjee, Chairman AEC and Secretary, DAE could not attend the Meet due to certain exigency.

Shri R. N. Jayaraj, Chief Executive, NFC welcomed all the delegates. In his welcome address Shri Jayaraj recollected the progress of NFC from the initial days, mentioned about the large number of chemicals handled at NFC and the quanta of waste generated from various processes and enumerated the numerous safety related changes made over the years. He also appreciated the relevance of the theme and appropriateness of NFC as the venue for discussing issues on chemical safety, waste management and industrial toxicology. This was followed by an address by Shri R. Bhattacharya, Secretary AERB and Director, IPST & ITSD, AERB. Shri Bhattacharya briefed about the important milestones of the Meet and explained in detail the overall technical programme of this year's meet. He stressed upon the importance of safe handling of the chemicals and also urged the utilities to take appropriate measures to protect the workers, the public and the environment from the adverse effects of chemicals and the hazardous wastes.

Shri S.K.Chande, Vice-Chairman, AERB and Chairman, SARCOP delivered the Introductory Address. In view of the rapid expansion of the nuclear power programme in the country which would eventually lead to multifold increase in the consumption of chemicals in DAE units. Shri Chande emphasized the need to share the past operational experiences of handling various chemicals and to incorporate the possible improvements in the new plants. He enlisted few unusual occurrences such as red oil explosion and retort failure at NFC and the fire incident at ECIL. Shri Chande also requested the safety professionals to utilize the platform to deliberate on the structural stability aspects of old chemical plants. Shri Chande then announced the winners of Green site award for the year 2009 i.e NFC, Hyderabad and IREL Manavalakurichi in Category A (≤ 400 hectares) and IGCAR site in Category B (> 400 hectares). He informed that in view of the excellent performance of IREL OSCOM which has been winning this award in succession for the last few years, it was decided to declare IREL OSCOM as an 'Evergreen Site'. He also distributed

prizes to the winners of logo completion of this year's meet. He released the booklet on 'Chemical Safety and Waste Management' prepared by the Industrial Plants Safety Division of AERB.

Shri S.S. Bajaj, Chairman, AERB, in his inaugural address, stressed that the prime responsibility of safety rests with the utility and hence, utility should go beyond the statutes for attaining high safety standards. He also joined Shri Chande in congratulating the winners and informed that next year onwards, the green site award would be renamed as Environment Protection Award and shall consider not only greenery of the site as one of the factor but also other parameters such as environmental awareness, discharges etc. He highlighted that chemical safety in laboratories requires more attention because of the dynamic nature of the research work and difficulty in adherence to a rigid procedural approach. Shri Bajaj distributed the Green Site Awards to the winning units and evergreen site award to IREL OSCOM and also congratulated the other DAE units for their excellent efforts put in to maintain greenery at their site. He then released the compendium of the proceedings of this year's Meet.

Dr. K. V. Ragahavan, Distinguished Professor, Indian National Academy of Engineering (INAE), Board Member of AERB and HWB and Former Director, Indian Institute of Chemical Technology delivered the Dr. Ramaswamy Memorial endowment lecture. In his talk he briefed on the safety related lessons learnt from Bhopal gas disaster on the technology front, management front, disaster mitigation front and functioning of government machinery. He summarized the major changes in the legislative framework nationally as well as internationally post Bhopal gas disaster. He then went on to explain the growth of process safety, the recent scientific advances in assessing the magnitude and vigour of exothermic chemical reactions, use of micro-calorimetry, phenomenon of confined explosion, modeling of dust explosion, recent trends in modeling dense gas dispersion and innovative strategies for process emergency management. He suggested linking of process hazard to chemical release and consequence models for evolving three tier safety strategy.



Dignitaries on the Dais at the 27th DAE Safety & Occupational Health Professionals Meet in Hyderabad

(L to R: Shri R. Bhattacharya, Secretary AERB and Director, IPST & ITSD, AERB; Shri R. N. Jayaraj, Chief Executive, NFC; Shri S.S. Bajaj, Chairman, AERB; Dr. K. V. Ragahavan, Distinguished Professor, Indian National Academy of Engineering (INAE) and Board Member of AERB; Shri S.K.Chande, Vice Chairman, AERB and Shri R. S. Jha, DGM (SAFETY and EPC), NFC)

DAE Safety & Occupational Health Professionals Meet

Shri R. S. Jha, DGM (SAFETY and EPC), NFC and Member Secretary of Local Organizing Committee proposed the vote of thanks. The dignitaries then visited the stalls installed by various exhibitors. Shri Bajaj, Chairman AERB inaugurated the exhibition.

The inaugural session was followed by three technical sessions. Technical Session on Chemical Safety had invited lectures by Dr. G.S. Grover from National Chemical Laboratory, Pune and by Shri R. Bhattacharya, Secretary AERB and Director IPSD, & ITSD, AERB on hazards of chemicals and their control. Technical Session on Waste Management has lectures by Dr. K. Srinivas from Vishnu Chemicals Ltd., Hyderabad and Shri Kanwar Raj, Head, Waste Management Division, BARC. Technical Session-III on Industrial Toxicology had invited lectures by renowned occupational health professionals namely Dr.(Prof.) V.V.Pillai from All India Institute of Medical Management (AIMS) Cochin, Dr. (Prof.) P. Mahendra Reddy from Dept. of Forensic Medicine, Kamineni Medical College, Narkatpalli and by Dr. S.K. Rastogi from Indian Institute of Toxicology Research, Lucknow.

On the second day, there were two plenary sessions. The first session had presentations and lectures from various participants

on Injury and Occupational Health Statistics and Serious and Near Miss Accident cases. The second session dealt with the chemical safety management practices in nuclear installations as well as in laboratories, challenging experiences, hazard identification, risk assessment and control, good practices followed and cases studies on some chemical incidents. In addition, there were four parallel sessions, one each on Chemical Safety and Waste Management and two on Occupational Health. On the third day, there was a plenary session on 'Regulatory Requirement on Chemical Safety & Waste Management' with presentations from AERB, HWB and NFC. This was followed by a poster session by Tradesman/Supervisors on Innovative Measures taken to make "Safe" the Unsafe Jobs, Conditions, and Equipment. The meet was concluded by a Valedictory Session where prizes for Posters, Cartoon, Slogan Competition among DAE Employees were distributed and the feedback received from various participants were reviewed. It was decided to hold the next year's meet at IREL, OSCOM with 'Emerging trends in Environment Protection' as one of its theme.

-Shri. S.R.Bhave and Shri Soumen Sinha, IPSD, AERB

Awards & Honours



Shri S. S. Bajaj, Chairman, AERB receiving the SRESA Life Time Achievement Award

Shri S. S. Bajaj, Chairman, AERB was honored with Society for Reliability and Safety (SRESA) Life Time Achievement Award in recognition of his significant and multifarious contributions in the area of Nuclear reactor safety. Shri Bajaj has done several pioneering works in the field of nuclear reactor safety during his tenure at Nuclear Power Corporation of India (NPCIL) by guiding the team of experts in the field of deterministic and Probabilistic Safety Analysis (PSA). He led the team for developing several Thermal-Hydraulic computer codes at NPCIL. The first Level-1 PSA study (internal events, full power) for representative Pressurised Heavy Water Reactor and Boiling Water Reactor from NPCIL have been carried out under his leadership. In addition, work on level-2 PSA of PHWR has also been carried out under his leadership.

The Award was conferred by SRESA at the second International Conference on Reliability, Safety & Hazard (ICRESH-2010) on December 16, 2010 in Navi Mumbai.

Regional Workshop on Deterministic Best Estimate Safety Analysis for Advanced NPPs

Regional Workshop on Deterministic Best Estimate Safety Analysis for Advanced NPPs was organised jointly by International Atomic Energy Agency (IAEA) and Atomic Energy Regulatory Board (AERB). The regional workshop was held at Mumbai on 13-17 December 2010. It was designed for professional staff from regulatory authorities, utilities and technical support organizations involved in the deterministic safety analyses of NPPs from the Asian region. The purpose of the workshop is to address the application of best estimate analyses with uncertainty evaluation by designers, operators, regulators and technical support organizations for the assurance of safety and reliability.

The workshop was inaugurated by Chairman, AERB. He stressed the need for qualified deterministic safety analyses to confirm the adequacy of safety provisions. He also discussed the current

conservative approaches being followed internationally and the need to eventually switch over to the use of best estimate analysis together with an evaluation of uncertainties. Dr. M. Dusic, IAEA presented the objectives of the workshop, IAEA activities in the field and documents developed by IAEA related to this subject. Prof. F. D'Auria, Italy, Dr. H. Glaeser, Germany and Prof. N. Cavlina, Croatia were the faculty identified by IAEA and delivered lectures on various aspects including current methods in deterministic safety analysis for operational and postulated initiating events. The on-going activities and capabilities on the deterministic safety analysis in NPCIL, BARC and AERB were also presented. Scientific staff from Vietnam and Bangladesh participated in this workshop. Scientific staff from AERB, NPCIL, IGCAR and BARC also attended the workshop.

Convention on Nuclear Safety

Indian National Report to the fifth Review Meeting of 'Convention on Nuclear Safety'

The Convention on Nuclear Safety (CNS) was adopted in Vienna on 17th June 1994 by a Diplomatic Conference convened by the International Atomic Energy Agency (IAEA) at its Headquarters from 14th to 17th June 1994. CNS is an incentive convention that aims to legally commit participating countries operating land-based nuclear power plants to maintain a high level of safety. Under the convention, the obligations of the Contracting Parties (CPs) are based to a large extent on the principles contained in the IAEA Safety Fundamentals document "The Safety of Nuclear Installations". These obligations cover siting, design, construction, operation, the availability of adequate financial and human resources, assessment and verification of safety, quality assurance, radiation protection and emergency preparedness. The Convention obligates Contracting Parties to submit a national report on the safety of their NPPs every 3 years to demonstrate that the obligations under the various articles of the CNS are appropriately fulfilled. Other CPs raise questions on the report and these are responded to by the reporting CP. The National Reports are then orally presented and further discussed in the Country Groups in the Review Meetings (RM) of CPs that are convened every 3 years. The Convention entered into force on October 24, 1996. As of November 2010, there are 72 Contracting Parties to the convention. India ratified the Convention on March 31, 2005. The first National Report of India was submitted in September 2007 for the review meeting of the convention held in April 2008.

India has submitted second national report in August 2010 for the fifth review meeting of the convention to be held in April 2011. The report will be reviewed by the contracting parties to the convention along with national reports of other contracting parties.

Besides presenting compliance with the obligations of CNS, the report also presents revision of some of the regulatory requirements on design, operation and quality assurance of nuclear power plants, augmentation of manpower at AERB to meet the future challenge of emerging nuclear power scenario in the country wherein AERB may have to issue consents for siting, construction commissioning and operation of large number of nuclear power plants. The report also brings out the progress on the challenges and planned measures to improve safety identified by India during the 4th Review meeting of CNS. Accordingly the report presents updates on reliability and safety of digital instrumentation and control, licensing of the new designs for upcoming plants, reliability of passive systems, developments on severe accident management programmes, probabilistic safety assessments, en-masse replacement of coolant channels at NAPS-2 and KAPS-1, primary heat transport system feeder thinning, flow assisted corrosion of secondary system piping and development of seismic qualification programme by experience data base. The report also presents the safety related activities like

containment model testing, maintenance of equipment qualification in older NPPs, regulatory review of 700 MW PHWR, periodic safety review of operating NPPs and revision of AERB safety code on siting.

India has now received a total of 122 questions / comments from the various contracting parties. The Indian National Report to the 5th review meeting of CNS has been very much appreciated. One of the country's remarked that the report is potentially an edifying reading for all other countries with less developed nuclear programme and nuclear legislation and some of its most remarkable outstanding features are open description of difficulties and events of international interest, detailed and specific description of all important aspects of the Indian civilian nuclear arrangements, logical and detailed presentation of the Indian legal and regulatory structures and convincingly specific and detailed descriptions of the national safety procurement of the nuclear industry. The report is available on the AERB website (www.aerb.gov.in).

- Shri D.Ojha, OPSD, AERB

Farewell

AERB bids Farewell to Dr. Prabir C. Basu



Shri S.S. Bajaj, Chairman, AERB presenting a flower bouquet to Dr. P.C. Basu at the farewell function

Dr. Prabir C. Basu, Director, C&SED laid down his office on December 27, 2010 after about 21 years of distinguished service in AERB. A farewell function was organized on the same day in AERB Auditorium to bid a fond farewell to Dr. P.C. Basu. Many distinguished guests from various units of DAE and AERB staff attended the function. Shri L.R. Bishnoi, AERB welcomed all the guests. The dignitaries who spoke on the occasion include Dr. A.K. Ghosh, Shri S.K. Mehta, Shri U.S.P. Verma, Directors of Divisions of AERB, Shri S.K. Chande, Vice-chairman, AERB and Shri S.S. Bajaj, Chairman, AERB. The speeches brought out the significant contributions made by Dr. Basu towards regulatory review and the pioneering research activities conducted in AERB. Dr. Basu was felicitated with an AERB memento. Dr. Basu was also given a fond farewell by the Executive Committee (EC) of AERB during the meeting of EC on December 27, 2010.

Computer Codes

Regulatory Assessment through External Coupling of Computer Codes for Mechanisms of Interdisciplinary Areas

Subrata Bera, K. Srivasista and S.K. Gupta
Safety Analysis and Documentation Division, AERB

Regulation of activities of atomic energy requires capabilities for analysing physical phenomena such as reactor physics, thermal hydraulics, structural mechanics, chemical and fire aspects. These safety analyses need multi-disciplinary expertise. As an example, accident analysis of a nuclear power plant involves simultaneous use of neutronics inside the reactor core, thermal hydraulics and structural mechanics. Similarly assessment against fire safety requires kinetics of chemical reaction, fire propagation mechanism, radiation streaming depending on source term inventory, details of radiation shielding etc.

A thermal hydraulic code estimates accurately thermal hydraulic parameters like pressure, temperature of the coolant circuit. It can also estimate neutronics parameters but less accurately. A three dimensional kinetics code performs detailed estimation of neutronics parameters but not capable of predicting thermal hydraulic behavior. In an interdisciplinary approach, simultaneous use of different reliable codes is possible by way of coupling. In computer science coupling means the degree to which each code relies on the input parameters of the other code. External coupling refers to two codes which share an externally imposed data.

The advantages of external coupling include possibility for simultaneous use of any number of independent codes without need for further development, preservation of each code without any modification, improving each code independently, and easy implementability. The coupling can be done manually by manual exchange of data or automatically using a computer interface program. Some examples of internationally coupled codes are RELAP5/PARCS, RELAP/NESTLE etc.

The methodology of code coupling involves selecting an interdisciplinary phenomena of different mechanisms for which coupled analysis is required, selecting reliable codes for each mechanism, identification of parameters to be exchanged between codes, establishing entire range of each parameter to be exchanged, performing test of each code with exchanged parameters in the entire range, application of interface exchange program for proper exchange of data, achieving converged results for discretized steps of coupling time, and finally performing analysis of interdisciplinary phenomena.

Safety Analysis and Documentation Division, AERB coupled an interface program TRIP between three dimensional neutronics code TRIHEXFA and thermal hydraulics code RELAP. Validation of TRIP against accident analysis of Kudankulam nuclear power plant is now in progress. In future, code coupling methodologies will be extended to other interdisciplinary phenomena also.

Indigenous Development of a Multiphysics Kinetics Code, TRIKIN for VVERs

Obaidurrahman K.
Information and Technical Services Division, AERB

Deterministic safety analysis is an essential tool for demonstrating the safety of nuclear power plants. Core physics, kinetics, thermal hydraulics and structural dynamics studies have remained the main pillars of reactor safety analysis. However traditionally these individual physical models were developed and used independently to pursue different objectives and with little or no common connections. But nowadays with recent computer developments resulting in the availability of powerful computation capabilities, the interconnection between the different physical disciplines has become feasible. This type of detailed multiphysics simulation transient capability for nuclear power plants will provide a basis to undertake a more in-depth evaluation of the safety margins found in previous core simulations for which simple conservative models were used. Consistent with this objective a number of projects to upgrade the quality of deterministic safety analysis have been undertaken by the nuclear industry.

With induction of many reactors of innovative design in Indian nuclear map, a need was felt to develop in-house detailed multiphysics core modeling capability in AERB. Consistent with this objective a comprehensive 3D kinetics code (TRIKIN) with a dedicated core thermal hydraulic model has been developed in AERB. TRIKIN model solves multigroup neutron diffusion to the highest level of approximation in full 3D core domain. Formulation of TRIKIN is based on Improved Quasi Static flux factorization (IQS) method, where neutron flux totals is factored into two components, shape function (slowly varying with time) and amplitude (rapidly varying with time). Shape function solution is based on simple finite differencing scheme over triangular meshes for hexagonal lattice fuel assemblies. Kinetics equations are solved by Generalized Runge-Kutta method, an efficient solver for stiff differential equations. A dedicated fuel pin based thermal hydraulic model has been developed and coupled internally to space-time neutronics module for incorporating real time reactivity feedbacks and to evaluate thermal safety parameters. A power weighted novel coupling scheme has been incorporated in TRIKIN model to couple neutronics and thermal hydraulics modules. This scheme generates best estimate results with mere single channel core simulation thus minimizes bulk of computation to great extent. Complete coupled model has been validated against a series of AER international benchmark problems on rod ejection accident in VVER reactors. The Code can be used to analyze vast array of transients' problems involving reactivity and power distribution related anomalies in VVER reactors.

AERB Safety Directive

Exclusion, Exemption and Clearance of Radionuclides in Solid Materials

AERB Directive No. 01/2010

[Under Rule 3, 5 and 6 of the Atomic Energy (Radiation Protection) Rules 2004]

Ref.No. No.CH/AERB/OPSD/25125/2010 dated November 26, 2010

Subject: Exclusion, Exemption and Clearance of Radionuclides in Solid Materials

Radioactive practices in India are governed by the Atomic Energy (Radiation Protection) Rules 2004. As per sections 5 and 6 of the rules and the current IAEA strategy, some of the radioactive practices and sources within practices need not be subjected to regulatory control based on the principle of exclusion, exemption and clearance.

The terms exclusion, exemption and clearance are defined as;

- Exclusion means the deliberate exclusion of a particular category of exposure from the scope of an instrument of regulatory control on the grounds that it is not considered amenable to control through the regulatory instrument in question.
- Exemption is the determination by the regulatory body that a source or practice need not be subject to some or all aspects of regulatory control on the basis that the exposure (including potential exposure) due to the source or practice is too small to warrant the application of those aspects.
- Clearance is the removal of radioactive materials or radioactive objects within authorized practices from any further regulatory control by the regulatory body.

The criteria for exclusion, exemption and clearance of radionuclides in solid materials within radioactive practices have been examined by AERB from the consideration of regulatory control. Accordingly, the following directives are hereby issued:

- Solid materials containing unmodified concentrations of naturally occurring radionuclides in raw materials, except the radioactive materials / waste generated from operation of Uranium and Thorium mining and milling facilities, are excluded from the regulatory requirements. 40K in the human body and cosmic radiation on the surface of the earth also come under exclusion.
- Exemption of artificial radionuclides in moderate amount of solid materials (upto one tonne) shall be based on the radionuclide levels prescribed in Table-1. For radionuclides of natural origin Table-1 applies if these radionuclides are incorporated into consumer products, or used either as a radioactive source (e.g. ²²⁶Ra, ²¹⁰Po) or for their elemental properties (e.g. thorium, uranium).
- Exemption / clearance of artificial radionuclides in bulk amount of solid materials shall be based on the radionuclide levels prescribed in Table-2.
- Clearance of naturally occurring radionuclides in bulk amount of solid materials from any authorized practice shall be based on the radionuclide levels prescribed in Table-3.
- For exemption / clearance of a mixture of radionuclides in solid materials, the sum of the ratios of the concentration of individual radionuclides present in the solid material to the levels prescribed for the corresponding radionuclide in the respective table shall be less than unity.
- Exemption / clearance of radionuclides in solid materials in excess of the levels prescribed in the respective tables or those not prescribed shall be subject to the specific approval of AERB.

TABLE-1: EXEMPT CONCENTRATION AND ACTIVITIES FOR NATURAL AND ARTIFICIAL RADIONUCLIDES IN MODERATE AMOUNTS (1 TONNE) OF MATERIAL

Radionuclide	Activity concentration (Bq/g)	Activity (Bq)
H-3	1x10 ⁶	1x10 ⁹
Be-7	1x10 ³	1x10 ⁷
C-14	1x10 ⁴	1x10 ⁷
Na-22	1x10 ¹	1x10 ⁵
Na-24	1x10 ¹	1x10 ⁵
P-32	1x10 ³	1x10 ⁵
S-35	1x10 ⁵	1x10 ⁸
Cl-36	1x10 ⁴	1x10 ⁵
Ar-41	1x10 ²	1x10 ⁹
K-40*	1x10 ²	1x10 ⁵
V-48	1x10 ¹	1x10 ⁵
Cr-51	1x10 ³	1x10 ⁷
Mn-51	1x10 ¹	1x10 ⁵
Mn-52	1x10 ¹	1x10 ⁵
Mn-54	1x10 ¹	1x10 ⁵
Fe-59	1x10 ¹	1x10 ⁵
Co-57	1x10 ²	1x10 ⁶
Co-58	1x10 ¹	1x10 ⁶
Co-60	1x10 ¹	1x10 ⁵
Ni-63	1x10 ⁵	1x10 ⁸
Cu-64	1x10 ²	1x10 ⁵
Zn-65	1x10 ¹	1x10 ⁵
Ga-72	1x10 ¹	1x10 ⁵
Br-82	1x10 ¹	1x10 ⁶
Kr-87	1x10 ²	1x10 ⁹
Kr-88	1x10 ²	1x10 ⁹
Sr-89	1x10 ³	1x10 ⁵
Sr-90	1x10 ²	1x10 ⁴
Y-90	1x10 ³	1x10 ⁵
Zr-95	1x10 ¹	1x10 ⁶
Nb-94	1x10 ¹	1x10 ⁶
Nb-95	1x10 ¹	1x10 ⁶
Mo-99	1x10 ²	1x10 ⁵
Tc-99	1x10 ⁴	1x10 ⁷
Ru-103	1x10 ²	1x10 ⁶

Radionuclide	Activity concentration (Bq/g)	Activity (Bq)
Ru-106	1x10 ²	1x10 ⁵
Rh-105	1x10 ²	1x10 ⁷
Ag-110m	1x10 ¹	1x10 ⁶
In-115m	1x10 ²	1x10 ⁶
Sb-122	1x10 ²	1x10 ⁴
Sb-124	1x10 ¹	1x10 ⁶
Te-129	1x10 ²	1x10 ⁶
Te-131	1x10 ²	1x10 ⁵
I-129	1x10 ²	1x10 ⁵
I-131	1x10 ²	1x10 ⁶
Cs-134	1x10 ¹	1x10 ⁴
Cs-137	1x10 ¹	1x10 ⁴
Ba-140	1x10 ¹	1x10 ⁵
La-140	1x10 ¹	1x10 ⁵
Ce-141	1x10 ²	1x10 ⁷
Ce-144	1x10 ²	1x10 ⁵
Pm-147	1x10 ⁴	1x10 ⁷
Eu-154	1x10 ¹	1x10 ⁶
Ir-192	1x10 ¹	1x10 ⁴
Hg-203	1x10 ²	1x10 ⁵
Po-210*	1x10 ¹	1x10 ⁴
Ra-226*	1x10 ¹	1x10 ⁴
Th-230*	1x10 ⁰	1x10 ⁴
Th-nat* (incl.Th-232)	1x10 ⁰	1x10 ³
U-233	1x10 ¹	1x10 ⁴
U-234*	1x10 ¹	1x10 ⁴
U-235*	1x10 ¹	1x10 ⁴
U-238*	1x10 ¹	1x10 ⁴
U-nat*	1x10 ⁰	1x10 ³
Np-239	1x10 ²	1x10 ⁷
Pu-239	1x10 ⁰	1x10 ⁴
Am-241	1x10 ⁰	1x10 ⁴
Cm-242	1x10 ²	1x10 ⁵
Cf-252	1x10 ¹	1x10 ⁴
-	-	-

* Naturally Occurring Radionuclides

Note: For radionuclides of natural origin the Table-1 applies only to their incorporation into consumer products or for their use either as a radioactive source (e.g. ²²⁶Ra, ²¹⁰Po) or for their properties as chemical elements (e.g. thorium, uranium).

AERB Safety Directive

TABLE-2: EXEMPTION /CLEARANCE LEVEL FOR RADIONUCLIDES OF ARTIFICIAL ORIGIN IN BULK QUANTITIES

Radionuclide	Activity concentration (Bq/g)
H-3	100
Be-7	10
C-14	1
Na-22	0.1
Na-24	1
P-32	1000
S-35	100
Cl-36	1
V-48	1
Cr-51	100
Mn-51	10
Mn-52	1
Mn-54	0.1
Fe-59	1
Co-57	1
Co-58	1
Co-60	0.1
Ni-63	100
Cu-64	100
Zn-65	0.1
Ga-72	10
Br-82	1
Sr-89	1000
Sr-90	1
Y-90	1000
Zr-95	1
Nb-94	0.1
Nb-95	1
Mo-99	10
Tc-99	1

Radionuclide	Activity concentration (Bq/g)
Ru-103	1
Ru-106	0.1
Rh-105	100
Ag-110m	0.1
In-115m	100
Sb-122	10
Sb-124	1
Te-129	100
Te-131	100
I-129	0.01
I-131	10
Cs-134	0.1
Cs-137	0.1
Ba-140	1
La-140	1
Ce-141	100
Ce-144	10
Pm-147	1000
Eu-154	0.1
Ir-192	1
Hg-203	10
U-233	1
U-236	10
U-237	100
U-239	100
Np-239	100
Pu-239	0.1
Am-241	0.1
Cm-242	10
Cf-252	1

TABLE-3. CLEARANCE LEVEL for radionuclides of natural origin IN BULK QUANTITIES

Radionuclide	Activity concentration(Bq/g)
⁴⁰ K	10
*All other radionuclides of natural origin	1

*This is valid for natural decay chains headed by ²³⁸U, ²³⁵U and ²³²Th

AERB Staff Club Activities - 2010

The AERB Day Programme was celebrated on November 20, 2010 on AERB Lawns. Around three hundred and fifty persons, which included AERB staff and their family members, graced the occasion. The programme started with the welcome address from the Secretary, AERB Staff Club. This was followed by a musical and dance programme from AERB Staff and family members. The winners of various sports tournaments conducted by Staff Club in the year 2010 were presented prizes. The artiste of the programme was presented with mementos in appreciation of their talent and nice performance. A festive dinner hosted by AERB followed this programme.

Director General of IAEA visits AERB - SRI



The Director General Mr Yukiya Amano, Chief De Cabinet Mr Rafael Crossi, and Director, Office of External Relations & Policy Co-ordination Mr S. Akbaruddin of International Atomic Energy Agency (IAEA) accompanied by Dr Baldev Raj Director IGCAR and other senior DAE officials visited Safety Research Institute (SRI) Kalpakkam on January 18th, 2011. Shri V.Balasubramaniyan Head, SRI made a brief presentation on the overall objectives and the status of research activities currently being pursued in the domains of nuclear and fire safety, environmental studies etc. at SRI.

Director General evinced keen interest in the activities of SRI and made specific enquiries with respect to ongoing research on seismic evaluation of nuclear plants. The active involvement of SRI in seismic re-evaluation of FBTR was highlighted with details. Further, Director General enquired about the involvement of the regulatory body with respect to the security of nuclear installations. Director IGCAR briefed the delegates about the national action plan relating nuclear safety and highlighted the involvement of regulatory body in ensuring the same.

Official Language Implementation

AERB continued its efforts to ensure effective Implementation of Official Language Policy and increase the use of Hindi in Official Work. Unicode system was uploaded/ activated in total 151 computers of various divisions of AERB.



Dignitaries on the Dais during Joint Hindi Day Celebrations in December 2010

(L to R: Shri P.R.Madhavan Kutti, CAO, DCS&EM; Shri A.L.N.Rao, Chairman & CE, HWB; Shri S.S.Bajaj, Chairman, AERB; Shri H.C.Soni, Director, Purchase & stores; Dr. Anjali Kulkarni, BARC Hospital)

Hindi Workshops

Two Hindi workshops were conducted jointly with DCS&EM, HWB and DPS. The first Workshop was organised during July 21-23, 2010 and the Second Workshop was conducted during December 14-16, 2010. A Special Workshop was organised on September 01, 2010 to impart training to the participants of four units regarding use of Unicode system for doing Official Work in Hindi.

Glossary of Scientific & Technical Terms used in regulatory process

AERB is preparing a bilingual Glossary of Scientific & Technical Terms used in regulatory process. One meeting was organised during October 25-29, 2010 at AERB with the experts of Scientific & Technical Glossary Commission, New Delhi and Departmental representatives. A total 812 words were discussed during the meeting.

Joint Hindi Competitions and Hindi Day Celebrations

Various Hindi competitions were held during September 6-9, 2010 by Joint Official Language Co-ordination Committee of four DAE units



Shri S.S.Bajaj, Chairman, AERB giving away the prize to Shri Lalit Mohan Sharma, SO(C), RSD, AERB

(AERB, DCS&EM, HWB and DPS). These competitions included joint quiz, Debate, Extempore speech, Self written Poetry reading. Shri Lalit Mohan Sharma stood first in the Debate and Team of AERB (s/Shri Gopal Krishna Panda, Rajendra Kumar Chaturvedi, and Amit Sen) secured second position in the quiz.

Hindi day was celebrated jointly by the four units of DAE i.e. AERB, DCS&EM, HWB and DPS on September 14, 2010. A talk on 'Diabetes & Health' was delivered by Dr. Anjali Kulkarni, Medical Division, BARC Hospital on this occasion. Prizes were distributed to the winners of various joint competitions held during the month.

Scientific/Technical Talk in Hindi

Shri R.P.Gupta, NPSD delivered a talk in Hindi on 'Quality Assurance in Nuclear Power Plants' on August 16, 2010 during the Awareness Programme on Quality Management System of AERB.

New Appointment

Shri V.M.Thomas, Chief Administrative Officer



Shri V.M.Thomas, Administrative Officer-III, AERB was promoted to the post of Chief Administrative Officer, AERB on August 30, 2010. Shri Thomas joined AERB in the post of Administrative Officer-III on April 23, 2007 on transfer from IGCAR, Kalpakkam. Prior to his

promotion and posting as Administrative Officer-III at IGCAR, Kalpakkam in March 2005, Shri Thomas had served in the Department in various capacities in DPS, DAE Secretariat and BARC.

Shri L.R. Bishnoi, New Head, S&SED



Shri L.R. Bishnoi, Scientific Officer (H) of this Board has been designated as Head, Siting & Structural Engineering Division (S&SED), previously known as Civil & Structural Engineering Division, with effect from December 31, 2010. Shri Bishnoi is a recipient of INS medal-2003 for his contribution in civil engineering safety review of NPP. Shri Bishnoi has made important contributions in structural engineering, containment safety, siting and external events including seismic safety, geotechnical engineering and ageing management of concrete structures. Currently he is also pursuing studies in containment thermal hydraulics and safety during severe accidents.

Personnel Joined (July – December, 2010)

Sr. No.	Name	Designation	Date of Appointment
1.	Shri N. Chintalapati	SO(C), SRI	01/07/2010
2.	Shri Y.V. Sudhakar	Assistant Accountant	05/07/2010
3.	Shri Moloy Kumar Chakraborty	TO(E)	14/07/2010
4.	Shri T. Dewan Singh	SO(D)	14/07/2010
5.	Smt. Pinki Choudhary	TO(D)	19/07/2010
6.	Shri Gour Mohan Behara	SO(E)	20/07/2010
7.	Shri Mayank Verma	SO(D)	26/07/2010
8.	Smt. S. Mahalakshmi	SO(E)	30/07/2010
9.	Shri D.K. Mohapatra	SO(F), SRI	04/08/2010
10.	Shri S.P. Lakshmanan	SO(D)	06/08/2010
11.	Shri S. Chockalingam	SO(D)	17/08/2010
12.	Shri Amar M. Kulkarni	SO(D)	19/08/2010
13.	Shri Neeraj Hanumante	SO(C)	25/08/2010
14.	Shri Subrata Pathak	SO(C)	01/09/2010
15.	Shri M. Mahesh	SO(C)	01/09/2010
16.	Shri Ganesh Bokam	SO(C)	01/09/2010
17.	Shri Nirdosh Kumar Gupta	SO(C)	01/09/2010
18.	Shri Soumyadip Dey	SO(C)	01/09/2010
19.	Shri Siddharatha Gauba	SO(C)	01/09/2010
20.	Kum. Paridhi Aggarwal	SO(C)	01/09/2010
21.	Shri Allarakha Y. Vora	SO(C)	01/09/2010
22.	Shri Prashant Sharma	SO(C)	01/09/2010
23.	Shri Debasis Mukherjee	SO(D)	06/09/2010
24.	Smt. Susmita Mukherjee	SO(D)	06/09/2010
25.	Shri Pradip Kumar Dixit	SO(D)	21/09/2010
26.	Shri Rajib Lochan Sha	SO(D)	21/09/2010
27.	Smt. Smriti Sharma	SO(D)	22/09/2010
28.	Shri Vikas Grover	SO(E)	04/11/2010
29.	Shri Mukesh Manglani	TO(D)	26/11/2010
30.	Smt. Rajeshri H. Pai	SO(D)	01/12/2010
31.	Shri S.K. Pawar	SO(F)	08/12/2010

Personnel Retired (July - December 2010)

Sr. No.	Name	Designation	Date of Retirement
1.	Dr. Om Pal Singh	Secretary, AERB & Director, ITSD	31/07/2010
2.	Dr. I.A. Patwegar	SO/G, NPSD	31/08/2010
3.	Shri S.K. Warriar	SO/H+, NPSD	31/10/2010
4.	Dr. Prabir C. Basu	Director, CSED	28/12/2010

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Shri R. P. Gupta, Smt. Sonal Gandhi,
Smt. Manisha Inamdar, Shri Soumen Sinha,
Shri K. Ravi and Smt. Bharati Sant

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