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# AERB

## Newsletter

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## 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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## India Hosts IRRS Mission of IAEA



## From the Chairman's Desk



Greetings to all!!

As I have mentioned in the last edition on the Integrated Regulatory Review Service (IRRS), it's my pleasure and privilege to inform that AERB has successfully hosted the IRRS mission, which took place during March 16-27, 2015. After completing the peer review, the IRRS Mission has concluded that the Indian nuclear regulatory body, the Atomic Energy Regulatory Board (AERB) is an experienced, knowledgeable and dedicated regulatory body for the protection of the public and environment. The IRRS team acknowledged that AERB continues to enhance its regulatory programme to face the current and future challenges in regulating nuclear safety, such as reinforcing the safety of existing nuclear facilities, monitoring ageing and decommissioning, as well as providing oversight of the construction, commissioning and operation of new nuclear power plants. The acknowledgement of the effectiveness of India's safety regulation in the outcome of this IRRS mission has renewed AERB's resolve and commitment for ensuring a high level of safety in the facilities and activities. AERB is committed to pursuing the improvements suggested by the mission towards further strengthening the regulatory framework.

On the nuclear safety review front, the Rajasthan Atomic Power Project (RAPP) Units 7 & 8 were given Consent for Erection of Major Equipment. The safety review towards grant of licence for regular operation of the Kudankulam Nuclear Power Plant Unit-1 and siting consent for the Gorakhpur Haryana Anu Vidyut Pariyojana (GHAVP) unit 1-4 are in an advance stage.

AERB's continual measures for strengthening the regulatory control on radiation facilities which employ radiation sources/radiation generating equipment has begun to pay off. There has been a notable jump in the registration of x-ray diagnostic facilities through the e-governance portal, e-LORA (e-licensing of Radiation Applications). Another equally significant step that was taken by AERB was decentralizing the regulatory inspection of these diagnostic radiology facilities utilizing X-ray units through establishment of Directorate of Radiation Safety (DRS)/ Radiation Safety Cell (RSC) in various States/Union Territories through MoUs. On this part, AERB has recently issued authorisation for Radiation Safety Agencies at Punjab and Arunachal Pradesh. As on date, AERB has signed MoUs with 12 States (Kerala, Mizoram, Madhya Pradesh, Tamil Nadu, Punjab, Chhattisgarh, Himachal Pradesh, Gujarat, Maharashtra, Odisha, Arunachal Pradesh and Tripura) of which DRS/RSA in Kerala, Mizoram, Chhattisgarh, Tripura, Punjab and Arunachal Pradesh are now functional.

The global attention received by the issues related to nuclear safety has resulted in increased international co-operation in safety and regulatory practices. One such forum is the Convention on Nuclear Safety (CNS), to which India is a contracting party. A five member Delegation from India led by the Secretary, AERB represented India in the Diplomatic Conference of the Convention on Nuclear Safety (CNS), held at International Atomic Energy Agency (IAEA) in Vienna on February 9, 2015. The Diplomatic Conference adopted the Vienna Declaration on Nuclear Safety which seeks to achieve significant safety enhancements in the nuclear power plants all over the world, both new as well as the existing ones. India supported the Declaration by consensus and highlighted the efforts it has taken to enhance safety of the nuclear power plants in India.

However, as the saying goes "the reward for work well- done is the opportunity to do more", and thereby there is a lot to do further. The e- Licensing of Radiation Applications has definitely improved registration of such facilities, however, there is still a need for bringing continuous awareness amongst the stakeholders. Another area of internationally acknowledged concern is on the security of radiation sources, which unlike nuclear safety, is an area still evolving. In nuclear safety front, the challenges of regulating reactors with latest design features and reactors of older vintage has to be overcome through continual improvement in the generic and plant specific regulatory oversight for safety.

It is AERB's constant endeavour to orient itself towards national objectives. Thus, AERB strives towards "Minimum government and maximum Governance" by optimising regulatory mandate on its stakeholders through graded approach. The optimisation without compromising the safety objective is by imbibing the culture of periodic introspection and review of regulatory requirements. Within the framework of its mandate, AERB is also contributing towards a more noble "Swachh Bharat Abhiyan" by ensuring that the stakeholders carry out safe disposal of disused radiation sources used in medical/ industrial/ research areas.

Looking forward, AERB's consistent growth and advancement gives confidence that AERB is well poised to meet challenges head-on.

(S. S. Bajaj)

## SAFETY REVIEW AND REGULATION

### AERB Board Meeting

The 114<sup>th</sup> Board meeting of AERB was held on March 4, 2015 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 was apprised about the various initiatives taken by AERB for strengthening regulatory control on radiation sources in the country. Radiation sources are used in various applications in medicine, industry, research and agriculture.

The Board was briefed about the review and recommendations of the Integrated Regulatory Review Service (IRRS) Mission of the International Atomic Energy Agency (IAEA), which was held during March 16-27, 2015. The IRRS Mission peer reviewed the AERB

regulatory framework for safety of NPPs against IAEA safety standards as the international benchmark for safety. The Board Members complimented AERB in hosting the peer review Mission. Board expressed that AERB's robust regulatory framework coupled with the positive mission findings would auger well in enhancing its public perception as a competent and efficient regulator.

With regard to nuclear power projects, the major issues which emanated during the safety review for granting Major Equipment Erection clearance for RAPP 7&8 (Rajasthan Atomic Power Project) were briefed to the Board. The Board endorsed the recommendations of ACPSR-PHWR (the second tier review committee) and agreed to the proposal of granting clearance for Erection of Major Equipment for RAPP 7 & 8.



AERB Board Members discussing during 114<sup>th</sup> Board Meeting

### Consent for Erection of Major Equipment for Rajasthan Atomic Power Project (RAPP)

RAPP 7&8 is 700 MWe Pressurised Heavy Water Reactor (PHWR) type, twin units project located at Rawatbhata in Rajasthan. This is second in the series of 700 MWe PHWRs, the first being, Kakrapar Atomic Power Project 3&4 which are under construction at Kakrapar, Gujarat. AERB had earlier granted consents for Siting, Clearance for Site Excavation and Clearance for First Pour of Concrete for RAPP 7&8. These activities have been completed and next phase in the construction stage is Erection of Major Equipment. Three-tier review is carried out for granting clearance at this stage.

The Application for Erection of Major Equipment for Rajasthan Atomic Power Project (RAPP) 7&8 was reviewed. The Board granted clearance for Erection of Major Equipment for RAPP- 7 & 8, subject to compliance of the stipulations.



RAPP 7 & 8 site

## Radiation Facilities / Activities

## STATUS OF RADIATION SOURCES USED IN NON-DAE UNITS (Jan- June 2015)

Type of Facilities / Equipments	No of Facilities / Equipments	Type of Consents
Radio therapy facilities	12	License
Medical Cyclotron facility	02	Licence
PET-CT and SPECT-CT	07	Licence
Interventional Radiology	92	Licence
Computed Tomography	260	Licence
Manufacturing facilities of diagnostic X-ray equipment	04	Licence
Industrial Radiography Facilities	04	Licence
HDR Brachytherapy equipment	04	Authorisation
Well Logging facility	02	Authorisation
Supply of Diagnostic X-ray Equipment	07	Authorisation
Service Agencies for Diagnostic X-ray Equipment	13	Authorisation
Diagnostic X-ray equipment	3013	Registration
Self-shielded X-ray unit and PCB analyser facility	07	Registration
IRGD ( Nucleonic gauges) Facility	01	Registration
Facilities using unsealed radioisotopes for research	04	Registration

## Nuclear Facilities

The licenses and other consents issued during this reporting period (January – June 2015) are as follows.

- a) Renewal of license for operation of TAPS-1&2 up to March 2016.
- b) Renewal of license for operation of RAPS-5 & 6 up to May 2016.
- c) Renewal of license for operation of CORAL up to March 2016.
- d) Renewal of license for operation of RAPCOF up to July, 2016.
- e) Clearance for Hot run of Kudankulam Nuclear Power Project Unit-2 (Commissioning Phase- A3), issued dated February 26, 2015.
- f) Clearance for Erection of Major Equipment at RAPP 7 & 8 issued on March 5, 2015
- g) Extension of Validity Period up to July 31,2015 for Clearance for Operation of KKNPP-1 up to 100% FP for Limited duration issued on April 30, 2015
- h) Permission for construction of RAPP 7&8 ICW above 133m El issued on June 4, 2015.

## REGULATORY INSPECTIONS

AERB officials carried out periodic Regulatory Inspections as well as Special Regulatory Inspections at Nuclear and Radiation Facilities to review the safety status and verify compliance with the regulations. In addition, special inspections at construction sites of nuclear power projects and quarterly inspections at construction sites of other fuel cycle facilities and R&D units were carried out to ensure compliance to the safety requirements stipulated by AERB.

## INTERNATIONAL COOPERATION

International cooperation is an important measure to enhance effectiveness of regulatory control and harmonizing regulatory practices against international benchmarks. Recognizing this, AERB participates and contributes in the activities of several international agencies/organizations. AERB has entered into bilateral arrangements with regulatory authorities of other countries. Also, India is a contracting party in the framework of several international instruments promulgated for establishing a global regime for cooperation in promoting safety in various nuclear/ radiation facilities/ activities.

During the period, a five member Delegation from India led by the then Secretary, AERB represented India in the Diplomatic Conference of the Convention on Nuclear Safety (CNS), held on February 9, 2015. The Indian delegation supported the consensus on the Vienna Declaration on Nuclear Safety which seeks to achieve significant safety enhancements in the nuclear power plants all over the world, both new as well as the existing ones.

Another major noteworthy activity carried out by AERB in the direction of its commitment for benchmarking with best international regulatory practices, was the hosting of IAEA-Integrated Regulatory Review Service (IRRS) Mission.

The details on above are as follows:

### **Diplomatic Conference of the Convention on Nuclear Safety- Vienna Declaration on Nuclear Safety**

The Convention on Nuclear Safety (CNS) aims to legally commit participating States operating land-based civil nuclear power plants to maintain a high level of safety by setting international benchmarks. India is a contracting party to the CNS. The Convention obliges Parties to submit reports on the implementation of their obligations for "peer review" at the review meetings held every three years.

A five member Delegation from India led by Dr. R. Bhattacharya, the then Secretary, Atomic Energy Regulatory Board (AERB) represented India in the Diplomatic Conference of the Convention on Nuclear Safety (CNS), held at International Atomic Energy Agency (IAEA) in Vienna on February 9, 2015. The diplomatic conference was convened as decided by the 6th review meeting of CNS held during March-April, 2014, for considering the proposal for amendment to article 18 of the CNS. The diplomatic conference proposed to come out with the consensus formulation involving Vienna Declaration on Nuclear Safety. The Indian delegation supported the consensus on the Vienna Declaration on Nuclear Safety. The Declaration seeks to achieve significant safety enhancements in the nuclear power plants all over the world, both new as well as the existing ones. The diplomatic conference was attended by 71 member states. In its statement to the Diplomatic

Conference, the Indian Delegation extended its full support to the Declaration by consensus and highlighted the efforts it has taken to enhance safety of the nuclear power plants in India.

The Vienna Declaration calls for enhancements in the design, siting and construction of nuclear power plants, with the objectives of preventing accidents as well as mitigating possible radioactivity releases, should an accident occur and avoiding early and large radioactivity releases. It also calls for systematic and periodic safety assessments of existing plants, throughout its lifetime, for implementing reasonably practicable safety enhancements. These principles are being integrated in the review process of the CNS with immediate effect, with the requirement of reporting on the measures by the individual Contracting Parties and its peer review, from the next CNS Review Meeting in 2017.

The Vienna Declaration on Nuclear Safety was unanimously adopted by the Contracting Parties to the Convention on Nuclear Safety (CNS).

### **Integrated Regulatory Review Mission of IAEA carries out peer review of AERB's activities**

The International Atomic Energy Agency (IAEA) offers several services to strengthen safety regime of the Member States for various nuclear and radiation facilities/ activities. One such service is the Integrated Regulatory Review Service (IRRS) to carry out assessment of governmental framework and regulatory infrastructure for nuclear and radiation safety against the IAEA safety standards. The IRRS Mission is a peer review carried out by a team which comprises of senior regulators of Member States as well as IAEA officials.

The Government of India invited the IRRS mission to India, following which the mission took place during March 16-27, 2015.

The IRRS Mission was preceded by an extensive self – assessment by AERB, which lasted for about a year, using SARIS (Self-Assessment of Regulatory Infrastructure for Safety), a software-tool developed by IAEA. AERB submitted all the required responses along with the explanations and necessary references to IAEA as Advance Reference Material as per the agreed time-line.

The Mission to India, coordinated by the IAEA, was led by Mr. Ramzi Jammal, Executive Vice-President and Chief Regulatory Officer of the Canadian Nuclear Safety Commission (CNSC). The team comprised 16 experts from the nuclear regulatory bodies of Bulgaria, Canada, Czech Republic, Finland, Hungary, Israel, Netherland, United Kingdom, United States of America, and the IAEA itself.

The peer review mission involves verification by an international team having domain experts from all over the world, of the regulatory regime against the very comprehensive safety requirements of IAEA.

The mission commenced with an entry meeting of IRRS team with the officials of AERB, Bhabha Atomic Research Centre (BARC) and Department of Atomic Energy (DAE) on March 16, 2015. Over the next two weeks, the IRRS team interacted with the officials and senior management of AERB for seeking more clarification and verifying the relevant information for corroborating the facts as reflected in the submissions made to IAEA. The Mission also interacted with the Chiefs of Atomic Energy Commission, BARC and the Nuclear Power Corporation of India Limited. A few team members witnessed AERB's regulatory inspection activities at the Kakrapar Atomic Power Station to evaluate the inspection practices of AERB. The team also checked the aspects related on-site facilities/arrangements related to Emergency Preparedness and Response.

**Outcome of the IRRS Mission**

The Team Leader, Mr. Ramzi Jammal observed after the mission "...there is a strong commitment to safety in India... India's Atomic Energy Regulatory Board is an experienced, knowledgeable and dedicated regulatory body for the protection of the public and the environment. It continues to enhance its regulatory programme to face the current and future challenges in regulating nuclear safety, such as reinforcing the safety of existing nuclear facilities, monitoring ageing and decommissioning, as well as providing oversight of the construction, commissioning and operation of new nuclear power plants."

The IRRS team acknowledged AERB's continuous enhancement of regulatory programme by which it could address the challenges in regulating nuclear safety, such as reinforcing the safety of existing nuclear facilities, monitoring ageing and decommissioning and providing oversight of the construction, commissioning and operation of new nuclear power plants.

The team identified several good practices in relation to following areas:

- Competence of the personnel,
- Recruitment and training of personnel,
- Operating experience feedback,
- Research and development infrastructure related to regulatory activities,
- Use of systematic database for tracking the recommendations from emergency exercises.

The team identified a few areas for further strengthening of regulatory framework:

- Promulgation of the established policies and strategy for safety and the strategies for radioactive waste management as statements of the government's intent,
- Embedding in law the regulatory independence of AERB,
- Review of implementation of the policy and arrangements to ensure maintenance of independence in the performance of regulatory functions,
- Enhancing the frequency of routine on-site inspections at NPPs to allow for additional independent verification and

- Development and implementation of its own internal emergency arrangements including detailed procedures to fulfill its roles related to emergency response.
- Formalizing the good practices of AERB into formal written down procedures and to strengthen internal management processes.

Shri S.S. Bajaj, former Chairman of Atomic Energy Regulatory Board, at the conclusion of the mission, said:

"The acknowledgement of the effectiveness of India's safety regulation in the outcome of this IRRS mission has renewed AERB's resolve and commitment for ensuring a high level of safety in the facilities and activities. AERB is committed to pursuing the improvements suggested by the mission towards further strengthening the regulatory framework."



Team Leader, Mr. Ramzi Jammal, hands over the draft report of IRRS mission to Chairman, AERB Shri S. S. Bajaj in the presence of Mr. Denis Flory, Deputy Director General, IAEA

A press briefing about the overall outcome of the IRRS Mission was held on March 31, 2015 in AERB, immediately after the conclusion of the mission. The briefing was attended by major media houses.



Shri S.S. Bajaj, Chairman, AERB addressing the Press Conference at AERB, Mumbai following the IRRS Mission of IAEA to AERB

AERB has received the final report and has initiated development of action plans for implementing the recommendations/suggestions to further enhance its regulatory framework.

## Theme Meeting on “Quality Assurance during Design and Manufacturing of Safety Critical Equipment of Nuclear Power Plant”

A Nuclear Power Project (NPP) in India is required to undergo an elaborate system of in-depth safety review during its various consenting stages; i.e. siting, design, construction, commissioning & operation. AERB follows a multi-tier safety review system and has specified safety requirements at every stage. The one aspect that features in all stages is the Quality Assurance Programme, which is an important component in ensuring safety. Quality Assurance Programme for different stages of nuclear power plants (NPPs) are reviewed by AERB as part of regulatory safety review process for obtaining consents at various stages. The AERB Safety Code on “Quality Assurance in Nuclear Power Plants” (AERB/NPP/SC/QA, Rev.1. February, 2009) provides the requirements to be complied by the utility for establishing and implementing quality assurance programme for assuring safety.

AERB organized a one day theme Meeting on ‘Quality Assurance during Design and Manufacturing of Safety Critical Equipment of Nuclear Power Plants’ with an objective to extend the regulatory oversight on QA aspects during design, procurement and manufacturing and formulate an action plan in this direction. The meet was organized on June 16, 2015 involving experts from the DAE organizations.

Nine speakers with expertise on the subject of QA from AERB, BARC, IGCAR, NFC and NPCIL made presentations on different topics related to the theme of the meeting. While the presentation on current regulatory practices brought out areas needing enhancement of regulatory oversight, other presentations highlighted the experiences of QA experts during design and manufacturing at different DAE units. The Theme meeting was attended by 118 participants from AERB and other DAE Units.



Panel discussion in progress during theme meet on “Quality Assurance during Design and Manufacturing of Safety Critical Equipment of Nuclear Power Plant”

## Theme meeting on “Safety Culture focussing on Roles and Responsibilities of Nuclear Regulators”

Safety culture is core values and behaviors resulting from commitment by leaders and individuals to emphasize safety over competing goals. Safety culture got impetus in nuclear industry after the accident that happened at Chernobyl nuclear power plant and further after the Fukushima accident. Individual’s attitudes and organizational characteristics plays vital role in regulators perspective to the safety culture.

Towards this, a theme meeting on “Safety Culture focusing on Roles and Responsibilities of Nuclear Regulators” was arranged on on Jan 23, 2015 at Niyamak Bhavan, Mumbai. The objective of this meet, was to apprise individuals with the processes/assessment methodologies related to safety culture within AERB as well as the licensees. The meet addressed the importance of strengthening the safety culture of both the facilities regulated by AERB and also within AERB itself.

The presentations highlighted the methodology for assessment of Safety Culture of NPPs. The assessment was based on the indicators identified by OECD-NEA with certain modifications to suit the Indian practices. Six safety culture attributes were identified & evaluated and subsequently ranked as per a ‘Safety Culture Assessment (SCA)’ rating scale. In order to validate the methodology, a case study was carried out for two operating NPPs.

The assessment of Safety Culture of one of the technical divisions was based on a questionnaire survey at three different levels. Nine safety culture attributes had been assessed based on the survey results. Likert’s scale method, which is an internationally

recognized method for evaluating surveys, was used for evaluating the responses obtained from the individuals in the survey.

The Discussion Meet was highly beneficial to the target audience.



Shri S. S. Bajaj, Chairman AERB, emphasized that culture is embedded in all aspects of an organization. He pointed out that the biggest challenge lies in the safety culture of contract workers at the utility.

Shri S. Duraisamy, Chairman SARCOP in his address emphasized on the safety culture aspects within AERB staff right from the entry level. Proper communication between utility and the regulator is important for developing a strong safety culture. For continual improvement, assessment of safety culture is necessary to highlight the areas of improvements.

## AERB's Enforcement Actions against unauthorized use of Medical Diagnostic X-ray Facilities

In our country, there are a large number of diagnostic X-ray units/facilities spread across the country. The radiation hazard involved in such facilities is generally small. However, certain situations such as inappropriate design of equipment or operational practices could lead to unwarranted radiation exposure. AERB has established the safety requirements to be met by the utilities so as to ensure radiation safety of: a) operator (i.e. the individual who operates the x-ray equipment, it could be a technologist, medical practitioner or a dentist) b) the patient undergoing diagnosis as well as the c) general public

Over the years, AERB has facilitated various ways in order to ease the regulatory process and encourage the utility towards compliance. Thus, AERB has

- a) Optimised the regulatory requirements to be followed by utilities.
- b) Commissioned an easy and approachable interface for the utility. The web based system enables easy filing of applications and issuance of Registration, (e-Licensing of radiation applications (e-LORA) for faster and on-line processing of licensing applications).
- c) Authorised more than 30 Quality Assurance service providers to provide QA services to the utilities.
- d) Spread awareness through various communication channels.

These sustained efforts of AERB has resulted in yielding positive results with more and more utilities being aware of the radiation safety practices and complying with AERB requirements.

However, non-compliance with AERB requirements is still rampant. Hence, in the past few months (April-May, 2015), AERB has initiated a series of surprise inspections of the medical

diagnostic facilities at Mumbai, Jaipur, Raipur, Pune, Nagpur and Chennai. During these inspections, AERB noted that some of the X-Ray facilities at the aforesaid cities did not possess the requisite 'Licence' from AERB and also not conforming to radiation safety requirements. In view of above, AERB has sealed medical diagnostic equipment in 27 medical diagnostic facilities and warned nearly 18 medical diagnostic X-ray facilities to comply with the requirements. AERB unseals/ revokes the warning as and when compliance report is duly submitted by the utility. AERB is also advising the public to avoid visiting the X-ray facilities which are not having valid License issued by AERB. With these steps in place it is expected that a significant number of utilities would be in the regulatory purview, because of which radiation safety is widely established.

AERB would be continuing similar inspections of Medical diagnostics X-Ray facilities in other areas of the country in a phased manner.

Mumbai  
Jaipur  
Raipur  
Pune  
Nagpur  
Chennai



## Establishment of State Level Directorates of Radiation Safety/Radiation Safety Agencies

In view of the 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 regulatory inspection 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 (RSA) in various States/Union Territories. The various stages for establishment and towards operation of DRS

Signing of Memorandum of Understanding (MoU) between the States/UTs and AERB

- i. Notification by the respective States/UTs to form DRS establishment
- ii. Recruitment of DRS/RSA personnel

iii. Training of DRS personnel by AERB

iv. Issuance of Authorisation to the Director, DRS or Head, DRS of States/UTs by AERB on their request/readiness.

During the first half of the year 2015, AERB has issued authorization for Radiation Safety Agency/Cell for the State of Chhattisgarh, Punjab and Tripura.

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, Tripura) of which DRS in of which DRS/RSA in Kerala, Mizoram, Chhattisgarh, Tripura, Punjab and Arunachal Pradesh are now functional.



## False Alarm on Radioactivity Leakage from Consignment arrived at Indira Gandhi Cargo Terminal, New Delhi

On 29th May 2015, a consignment containing radioactivity in small amount, used for diagnosis and treatment in Nuclear Medicine, arrived at Indira Gandhi Cargo terminal, New Delhi. The consignment consisted of 7 vials of I-131 (Liquid Sodium Iodide) and 3 Mo-99- Tc-99m generators. I-131 is used routinely for diagnosis and for treating thyroid cancer patients, while the Mo99-Tc99m generator is used widely for diagnosis.

The consignment which arrived by Turkish Airlines was for supply to different hospitals across the country. These materials were imported after fulfilling requirements specified by AERB, i.e. packaging requirements (Type A) and AERB import permission.

On receipt of information on suspected leakage, a team from the Department of Atomic Energy Emergency Response Centre at New Delhi, representatives of AERB's Northern Regional Regulatory Centre (NRRRC) at Delhi, and the National Disaster Management Authority (NDMA) and National Disaster Response Force (NDRF), Delhi Police and Fire departments immediately arrived at the spot for investigation.

The investigation revealed that there was no radioactivity leakage from the consignment and an organic liquid leaking from the nearby container had caused the wetting of the above consignment which the workers handling the packages mistook as a radioactivity leakage.

## Awareness programme on 'Radiological and Operational Safety Aspects for Research Accelerator Facilities'

A particle accelerator is a machine that accelerates elementary particles, such as electrons or protons, to very high energies. Particle Accelerators play a key role as a source of intense photons, neutrons and heavy ion beams that can be used for a variety of research purposes. The accelerator facilities of the Department of Atomic Energy (DAE) are used for various research activities, including institutes like IIT Bombay, DRDO and ISRO. In addition to this, some universities have installed research accelerators under the regulatory control of AERB and have obtained license for the same. Currently there are eight such accelerators.

AERB, in association with Tata Institute of Fundamental Research (TIFR), organized an awareness program on 'Radiological and Operational Safety Aspects for Research Accelerator Facilities' on March 31, 2015. The objective of the workshop was to generate awareness among the stakeholders on the regulatory and radiation



Participants from various accelerator facilities during workshop on 'Radiological and Operational Safety Aspects for Research Accelerator Facilities'

safety requirements owing to the increasing number of Research Accelerator facilities in the country. Total about 27 participants attended the programme which included participants from different universities and research facilities, BARC, TIFR and AERB.

## HUMAN RESOURCE DEVELOPMENT

As a part of competence development, AERB continued to train its staff by organizing various training programmes, workshops, on-job training at nuclear facilities, refresher courses, technical talks, colloquia etc. AERB also imparts training on regulatory and safety aspects with respect to nuclear and radiation facilities to other organizations, on request.

### Training Activities

Refresher training course on 'Regulatory and Safety Aspects' was organized for AERB officers involved in the various regulatory activities during February 11 and 12, 2015 at AERB Mumbai. The course lectures were designed to cover a wide range of regulatory activities including the current developments at AERB in the areas of Severe Accident, Post Fukushima Siting aspects, new requirements specified in the AERB Light Water Reactor Code, Legal aspects (Nuclear Law), Quality Assurance in NPPs, Basic concepts on Radiological Impact Assessment (RIA) and discussion on issues identified during review process w.r.t. RIA, Industrial & Fire design considerations for NPP, Personnel and Inter-personnel aspects (Code of Ethics) etc. The lectures were delivered by in-house experts and experts in the relevant fields from other institutions.

A Fundamental Course on Nuclear Energy (FCNE) was organized by the Nuclear Power Corporation of India Ltd. for officers from Bangladesh Atomic Energy Commission and Bangladesh Atomic Energy Regulatory Authority. AERB officers delivered 16 lectures under the module on 'Regulatory framework for Nuclear Power Plants, during 18 to 21 February, 2015. The lectures were well appreciated by the participants.

As a part of authorization process for the establishment of Directorate of Radiation Safety/Radiation Safety Agency in India, AERB officers conducted training programme for the staff of Radiation Safety Cell, Tripura and Radiation Safety Agency (RSA), Punjab.

As a part of its training programme focusing on aspects enhancing personal & interpersonal effectiveness, three invited talks by renowned speakers/institutions on "Power of the Subconscious Mind", "SEBI Financial Awareness Programme" and "Dignity of Women in Humanity" were arranged during the period.

**AERB Efforts for Competency Development and Knowledge Management**

AERB, as a part of its competence development, deputed six engineers having prior experience in Pressurised Heavy Water Reactor and Fast Reactor type reactors and three Scientific Assistants to KKNPP, for training in VVER type reactor. Initial class room training was imparted by the AERB officers who have already acquired Level-III certification for KKNPP. The staff further underwent class room training for various systems, basic simulator training and field training at KKNPP.



Director OPSD, along with AERB officers undergoing training at Nuclear Training Centre, KKNPP

**AERB Participation in OECD/NEA HYMERES Project - Hydrogen Distribution and Mitigation Aspects in NPP Containment**

Vivek Kale, Aniket Gupta, R. S. Rao, Avinash J Gaikwad

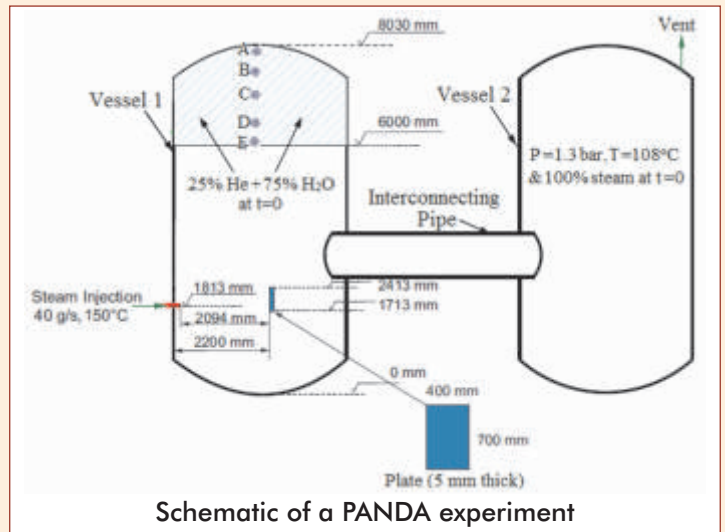
The OECD/NEA HYMERES (HYdrogen Mitigation Experiments for REactor Safety) Project involves a series of experiments being conducted at PANDA and MISTRA (Mitigation and Stratification) containment experimental facilities located at Paul Scherrer Institute, Switzerland and CEA, France respectively. The objective of HYMERES project is to investigate complex safety relevant issues for mitigation of severe accident leading to release of hydrogen into the reactor containment. PANDA and MISTRA are large scale facilities and represents multi-compartment geometry of typical nuclear reactor containment.

AERB participated in one of the project with an objective to investigate pertinent safety issues for the analysis and mitigation of a severe accident leading to release of hydrogen into nuclear reactor containment mainly with respect to hydrogen distribution. These experiments were also aimed to generate a database for the assessment of the capabilities of the computer codes (mainly CFD codes) to simulate thermal-hydraulic conditions during severe accidents in the containment.

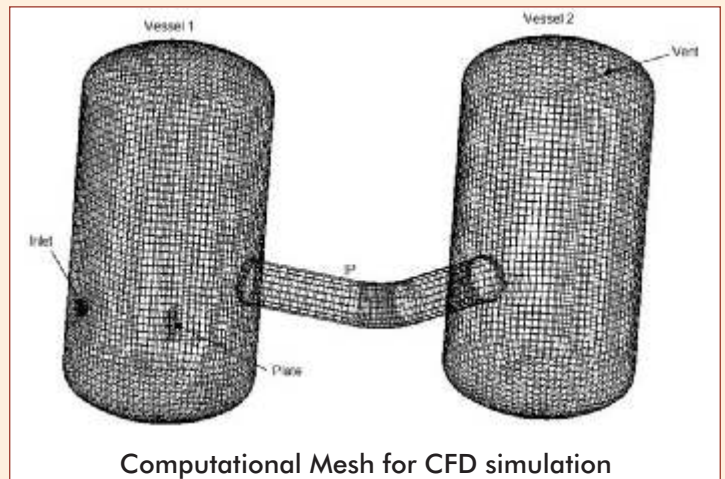
In the time frame of this program, total 24 experiments are being conducted in the PANDA facility and 9 experiments in the MISTRA facility. The tests being performed under this project address several phenomena relevant to severe accident scenarios such as steam-H<sub>2</sub> release and distribution, effect of obstructions and heat sources on gas flow, spray and coolers, steam condensation, natural circulation and stratification of gases, etc.

These experiments aid in the distribution analysis of steam-helium-air mixtures under different conditions such as in presence of steam jets, heaters etc. Scoping, pre-test and post-test simulations have been performed at AERB. An example of CFD calculation of a PANDA test is presented here.

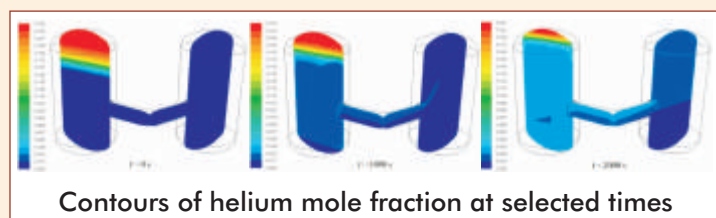
One of the PANDA tests addresses the interaction of a steam jet with an obstruction and its effect on distribution of stratified helium layer present at the top of PANDA vessel. This is representative of a situation where a steam jet released from a break interacts with containment structures affecting the distribution of the gases inside. Schematic of the test is shown in the following figure.



Initially, 2m thick helium layer is created at the top of the vessel and rest of the vessel is filled with steam. The test is started by injecting superheated steam and the injection is continued for certain period which causes erosion of helium layer with time. During this transient process, mole fractions of gas species and fluid temperature are continuously recorded at different points. The computational mesh for this simulation is shown in the following figure.



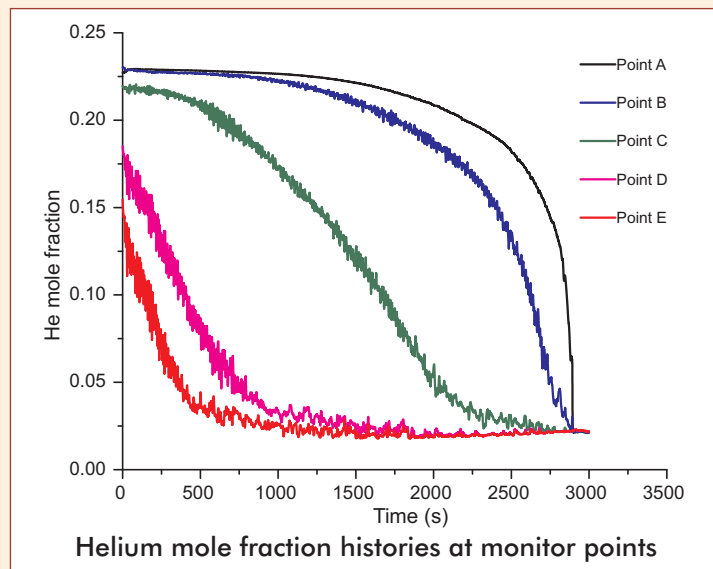
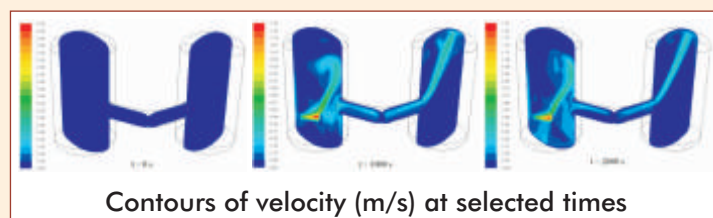
The transient process is simulated by solving Navier-Stokes equations along with the transport equations for gaseous species and turbulence. The test is simulated for about 3000s where



The erosion of helium layer is captured by recording helium mole fraction with time at different elevations (at points A, B, C, D and E) along the axis of vessel 1. Comparison of the CFD simulation results with the experiments shows good agreement between the two (experimental data is not shown in the plot).

Pre-test and post-test CFD calculations of several HYMERES tests have been carried out at AERB. These tests have helped in assessing the influence of different geometrical configurations and initial and boundary conditions on steam-hydrogen distribution inside large containment compartments. Simulation of these tests has also helped in development and validation of models/methods for simulating multi-species, turbulent gaseous flows in large scale geometries. Methodology developed for simulation of these tests can be extended to simulation of steam-hydrogen release, distribution and mitigation in NPP containment. These calculations are an important step in addressing hydrogen related safety issues such as formation and evolution of combustible hydrogen-air clouds inside the containment during a severe accident, assessment of number and locations of hydrogen management devices and estimation of pressure and temperature loads on containment structures due to such events.

complete erosion of the helium layer takes place. The evolution of flow field and distribution of species with time is apparent from the adjoining contour plots.



### Official Language Implementation

AERB has an established programme for the implementation of official language, Hindi. AERB is committed to the cause of Rajbhasha and have been continually improving in its endeavor of implementing Hindi in the regular official works, in accordance with official language provisions in the Constitution. In addition to the regular official works and various translations in to Hindi, AERB proactively initiates a series of activities throughout the year which include: publications, conducting training programmes, workshops, talks, annual competitions and divisional inspections for enhancement of Hindi use in the divisional activities.

The prize distribution ceremony for the Hindi competitions conducted in AERB was held on January 9, 2015. The highlight of the day was a presentation by Miss Aditi Bhagwat, "The Kathak Katha- a journey of Kathak through the ages". Ms. Bhagwat is one of the popular names from the cultural circles of Mumbai, Film and Television personality and is an Empanelled Member, Indian Council of Cultural Relations. The presentation, involving an amalgam of conversation, rendition, jugalbandi and a tiny rhythm workshop enlightened the audience on the rich heritage of the Kathak form of dance.



Hindi Prize Distributions

## AERB Industrial and Fire Safety Awards

The annual function for presentation of Industrial Safety Awards and Fire Safety Awards for Department of Atomic Energy (DAE) units was held on April 17, 2015 at Atomic Energy Regulatory Board (AERB), Mumbai. AERB has instituted these awards to honor and recognize the DAE units which have set up a new benchmark towards industrial & fire safety performances through their proactive efforts and commitment towards safety.

The Industrial Safety Awards for 'Production Units Group' comprising Nuclear Power Plants and Heavy Water Plants was bagged jointly by Narora Atomic Power Station (Narora in Uttar Pradesh) and Madras Atomic Power Station (Kalpakkam in Tamilnadu). In the production units group comprising of other than Nuclear Power Plants & Heavy Water Plants, the winners were Zirconium Complex (Pazhayakayal in Tamilnadu) and Indian Rare Earths Limited (Udyogamandal in Kerala).

Fire Safety Awards are given for achieving high levels of performance in the fire safety aspects. The award for 'high fire risk units group' was given to Kaiga Generating Station 1&2 (Kaiga in Karnataka).



**Compilation of "Occupational Injury & Fire Statistics for the year 2014"**  
(L to R: Shri K. Ramprasad, Head, IPST, AERB, Shri S.S. Bajaj, Chairman, AERB, Shri R. Bhattacharya, Vice-Chairman, AERB and Shri H. Ansari, IPST, AERB)

Shri S. S. Bajaj, Chairman - AERB presented the awards to the winning units and released a compilation of "Occupational Injury & Fire Statistics for the year 2014" for DAE units. This compilation provides the information on industrial and fire safety performance of DAE units. It was once again observed that the industrial safety indicators of DAE units were better than that of other similar industries in the country.



AERB Galleria

On the occasion, an 'AERB Galleria' on the theme of the Mission of the Board was organized. The exhibits were well appreciated by the visitors.

## Release of Booklet on SRI Highlights (2010-2014)

A booklet 'SRI Highlights' highlighting the research activities carried out in SRI during the past five years (2010-2014) was released by Chairman, AERB on March 02, 2015 at Sarabhai Auditorium, IGCAR, Kalpakkam. The significant contributions in wider range of safety related topics that include reactor and

radiological safety, probabilistic safety assessment, remote sensing & GIS applications, structural and seismic safety, fire safety, hydrogen safety, thermal hydraulic analyses, environmental & fuel chemistry, etc. are highlighted in the booklet.



Shri S.S.Bajaj, Chairman AERB releasing "SRI Highlights 2010-2014"

## INS(K)-IGCAR Colloquium lecture and visit to IGCAR facilities by Chairman, AERB

As part of the DAE Diamond Jubilee celebration (1954-2014), Chairman, AERB delivered the INS (K)-IGCAR Colloquium lecture on "Safety Regulation of Nuclear and Radiation Facilities in India" on 24 Feb, 2015 at IGCAR. He also visited various facilities at IGCAR.



Shri S.S. Bajaj, Chairman AERB visiting various facilities at IGCAR  
(RDG: Reactor Design Group, FRTG: Fast Reactor Technology Group, CG: Chemistry Group)

## New Developments at Safety Research Institute of AERB, Kalpakkam Visit of Chairman AERB to the construction site of SRI Engineering Hall

To facilitate experiments pertaining to safety research, an engineering hall is being set up in SRI, Kalpakkam. This hall comprises of a high bay, a low bay including an office space. Additional space for future expansion of the engineering hall has also been allocated in the master plan.

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. The foundation stone for this hall was laid by the Chairman, AERB on 28th August, 2014.



Shri S.S. Bajaj, Chairman AERB along with Shri C. Sivathanu Pillai (AD, CEG), Shri V. Balasubramaniyan (Dir. SRI) and Shri B. Hari Krishnan (Head, CWMD, CEG) during the unveiling ceremony of the Plaque in the SRI Engineering Hall under construction.



## 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](http://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](http://www.aerb.gov.in) and click on eLORA



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## Step towards Digitization through OPSD-Star

Operating Plants Safety Division (OPSD) of AERB is the nodal agency responsible for carrying out Licensing, Safety Review and Assessment, Regulatory Inspections and Enforcement of operating Nuclear Power Plants & Research Reactors as well as regulatory oversight of Emergency Preparedness & Response in these facilities. Multi-tier review approach is followed during these regulatory processes.

During these regulatory processes, numerous types of data and documents are required or gets generated. The number of operating NPPs is increasing continuously. Maintaining the records of data and documents manually & its retrieval require tremendous effort. The situation demanded for a state of art computerized system, where update of data and documents and archival of information for the purpose of analysis can be done efficiently & effectively.

Towards this direction, an in-house user friendly, centralized computerized document control / management system for Tracking, Assessment & Report generation system was designed and developed, termed as 'OPSD-STAR'.

Presently, OPSD maintains all the records necessary to support its regulatory decisions through this established documentation and record keeping system. This system has inter alia features of sharing of documents, defining access, interweaving structure wherein the same document can be accessed by various safety committees. This web application runs on AERB intranet.

OPSD-STAR outlines the processes, related guidance, assessments, results and development actions in a very comprehensive and sophisticated way. OPSD-STAR links the regulatory processes and management system guidance, together with clear definition of supporting processes. The system offers to regulators a direct link to the procedures that they use in their daily work. The web-based system also provides outputs and records of

the processes (like regulatory consents in the form of license, authorization, approval, regulatory inspection report and AERB regulatory documents). All these actions steps of regulatory process (i.e. Licensee submissions, reportable events, letters, minutes, plans, review materials, decisions etc.) are duly recorded in this well-structured electronic documentation system which ensures proper traceability and easy retrievability.

This system covers all the core activities, management processes and international commitments of OPSD. It provides the information about progress of safety review and compliance of recommendations made. Most of the records are available in electronic formats with adequate back up storage arrangements.

OPSD-STAR also has other records relating to the safety reviews of facilities and activities such as archival of accidents (like Chernobyl, TMI, Fukushima etc.), significant events etc.

The new electronic database is an easy to use system where not only all the necessary data of each NPP (inspection reports, documents related to consents, event reports, etc.) can be found, but also national reports for discharging the international obligations etc. can be accessed. The database is accessible to those that need to make use of the data for different purposes (e.g. to improve the regulatory primary processes). The database also has the potential to become a tool for education and knowledge management and preservation of lifetime records.

OPSD-STAR is a highly user-friendly database that, among others provides a full overview of the status of ongoing regulatory actions. The systems of maintenance of the documents in electronic format have evolved in terms of efficiency by taking advantage of technological advancements. OPSD-STAR is modular system, which can be expanded and modified, as and when new requirements arises.

Licenses status of regulated entities by OPSD					Current Events		
Facility	Operating License	Industrial License	Waste Authorization	RSO			
Nuclear Power Plants					AERB 3rd bulletin Regarding Fukushima Updates		
TAPS-1&2	March 2016	31/07/2016	31/12/2015	30/11/2017	Comparative study on post Fukushima actions taken / identified by other countries and India		
RAPS-1&2	December 2016	08/01/2017	31/12/2015	08/07/2019	IAEA Questionnaire on Individual Monitoring and National Dose Registry 29.10.2014		
MAPS-1&2	December 2015	17/01/2017	31/12/2015	28/02/2016	Policies Governing Regulation of Nuclear and Radiation Safety		
NAPS-1&2	June 2018	12/07/2018	31/12/2015	10/01/2018	Basis for the safety limit on fuel bundle number for		
KAPS-1&2	July 2019	30/11/2018	31/12/2015	07/01/2018	Tentative Schedule of Regulatory Inspections		
RAPS-3&4	October 2017	23/09/2017	31/12/2015	30/10/2017	Unit	First Inspection Date	Second Inspection Date
KGS-1&2	May 2017	31/12/2015	31/12/2015	31/05/2017	KAPS-1&2	Mar 16-20, 2015	Nov 17-20, 2015
TAPS-3&4	August 2016	18/05/2017	31/12/2015	01/04/2020	RAPS-5&6	Apr 07-10, 2015	Nov 03-06, 2015
KGS-3&4	April 2018	05/01/2019	31/12/2015	01/01/2019	NAPS-1&2	Apr 21-24, 2015	Dec 13-16, 2015
RAPS-5&6	May 2016	31/03/2020	31/12/2015	03/07/2019	TAPS-1&2	May 12-15, 2015	Dec 01-04, 2015
KK-1	July 2020	10/10/2018	31/12/2015	31/10/2019			
Research Reactors							
FBTR	June 2018	-	31/12/2015	31/08/2015			
KAMINI	June 2016	-	31/12/2015	31/08/2015			

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### Personnel Joined During the Period January-June 2015

Sr. No.	Name	Designation	Division	Date of Appointment
1.	Shri Dinesh Kumar Shukla	OS	GD (RR)	29/05/2015 (Transfer from BARC)
2.	Shri Haradhan Ghosh	SO/C	OPSD	20/01/2015 (Transfer from BARC)
3.	Shri Krishna Reddy	SO/C	OPSD	20/01/2015 (Transfer from BARC)
4.	Kum. Seepika Soin	SO/C	IPSD	20/01/2015 (Transfer from BARC)
5.	Smt. Suchita Modi	UDC	ADMIN	22/01/2015
6.	Shri L. H. Pawar	DCA	ACCOUNTS	16/03/2015 (Transfer from DPS)
7.	Shri Ajeesh S.	SA/B	RSD	06/4/2015 (Transfer from NFC, Hyderabad)
8.	Shri Sameer Shaikh	TECH. B	R & DD	15/6/2015 (Transfer from IGCAR, Kalpakkam)

### Personnel Retired/Resigned/Transferred During the Period January-June 2015

Sr. No.	Name	Designation	Date of Retirement / Resignation / Transfer
1.	Shri K. J. Vakharwala	OS	28/02/2015
2.	Shri Neeraj Hanumante	SO/D	20/01/2015
3.	Shri Lalit Mohan Sharma	SO/D	Transferred to NRRC, Delhi
4.	Shri Ajeet Singh	SO/C	Transferred to NRRC, Delhi
5.	Shri S. M. Gaikwad	DCA	09/03/2015 (Transferred to Tarapur on Promotion)
6.	Shri M. Madhu	SA/B	08/04/2015 (Transfer to NFC, Hyderabad)

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