AERB BULLETIN 2015-16

Functions of Atomic Energy Regulatory Board

Chairman AERB is the Competent Authority under the following Rules issued under the Atomic Energy Act, 1962:

Atomic Energy (Radiation Protection) Rules, 2004
Atomic Energy (Working of Mines, Minerals and Handling of Prescribed Substance) Rules, 1984
Atomic Energy (Safe Disposal of Radioactive Wastes) Rules, 1987
Atomic Energy (Factories) Rules, 1996

Our mission is to ensure that the use of ionizing radiation and nuclear energy in India does not cause undue risk to the health of people and the environment.

- Develop safety policies in nuclear, radiation and industrial safety areas for facilities under its purview.
- Develop Safety Codes, Standard and Guides for siting, design, construction, commissioning, operation and decommissioning of different types of nuclear and radiation facilities.
- Grant consents for siting, construction, commissioning, operation and decommissioning, after an appropriate safety review and assessment, for establishment of nuclear and radiation facilities.
- Ensure compliance with the regulatory requirements prescribed by AERB during all stages of consenting through a system of review and assessment, regulatory inspection and enforcement.
- Prescribe the acceptance limits of radiation exposure to occupational workers and members of the public and acceptable limits of environmental releases of radioactive substances.
- Review the emergency preparedness plans for nuclear and radiation facilities and during transport of large radioactive sources, irradiated fuel and fissile material.
- Review the training program, qualifications and licensing policies for personnel of nuclear and radiation facilities and prescribe the syllabi for training of personnel in safety aspects at all levels.
- Take such steps as necessary to keep the public informed on major issues of radiological safety significance.
- Promote research and development efforts in the areas of safety.
- Maintain liaison with statutory bodies in the country as well as abroad regarding safety matters.
- Review the nuclear and industrial safety aspects in nuclear facilities under its purview.
- Review the safety related nuclear security aspects in nuclear facilities under its purview.
- Notifying to the public, the 'nuclear incident', occurring in the nuclear installation in India, as mandated by the Civil Liability for Nuclear Damage Act, 2010.

AERB Board meeting in progress

The Board of Atomic Energy Regulatory Board (AERB) consists of a Chairman, five Members of which four members are experts from IIT, Bombay, AIIMS, New Delhi, IICT, Hyderabad & NGRI, Hyderabad along with a Secretary. AERB Secretariat currently has a staff strength of more than 300 personnel organized in ten Divisions at its headquarter in Mumbai, Safety Research Institute (SRI) at Kalpakkam and Regional Regulatory Centers at Kalpakkam, Kolkata and New Delhi.

AERB is supported by the Safety Review Committee for Operating Plants (SARCOP), Safety Review Committee for Applications of Radiation (SARCAR) and Advisory Committees for Project Safety Review (ACPSR). ACPSR recommends to AERB issuance of consents at different stages of plants till its operationalisation, after reviewing the submissions made by the plant authorities, based on the recommendations of the associated Design Safety Review Committee. The SARCOP carries out safety surveillance and enforces safety stipulations in the operating facilities. The SARCAR recommends measures to enforce radiation safety in medical, industrial and research institutions, which use radiation and radioactive sources.

AERB also receives advice on safety codes and safety guides and on generic issues from the Advisory Committees. The administrative and regulatory mechanisms which are in place ensure multi-tier review by experts in the relevant fields available nation wide. These experts come from reputed academic institutions and governmental agencies.

The Atomic Energy Regulatory Board (AERB) was constituted on November 15, 1983 by the President of India by exercising the powers conferred by Section 27 of the Atomic Energy Act, 1962 (33 of 1962) to carry out certain regulatory and safety functions under the Act.

AERB's safety and regulatory requirements are brought out in a set of Codes and Guides; About 160 such documents have been developed and published by AERB over the years. Nuclear and radiation facilities and activities require Consents from AERB for various stages during the lifetime of the facility viz., siting, construction, commissioning, operation and decommissioning. These Consents are granted after ensuring that the regulatory requirements are met. At each stage a comprehensive review in a multi-tier structure of safety committees is carried out at AERB.

Preface

We at AERB are pleased to see the encouraging response to our initiative to bring out the annual edition of AERB Bulletin, which attempts to present information contained in the Annual Report, for a leisurely read.

In March 2015, AERB subjected itself to first ever peer review by an international team of IAEA, consisting of eighteen domain experts from various countries during twelve day long IRRS Mission. We are pleased to share that the general finding of the mission is an encouraging acknowledgement of the compliance of the regulatory regime established by AERB with the essential IAEA safety requirements. The exhaustive preparation, the experience and outcome of the peer review are covered in detail in the special feature included in this edition of Bulletin.

You will also be happy to know that our past efforts of launching e-governance for regulation of radiation facilities has met with stupendous success. With the e-LORA fully functional, AERB today has a user friendly interface for the applicants and licensees with AERB. The automation has also helped AERB in disposition of the applications at a much shorter time interval in comparison to earlier practice.

During the year, AERB continued its regulatory safety oversight on all regulated installations and activities i.e the entire gamut of nuclear fuel cycle facilities, namely uranium mines and mills, thorium mines and mills, fuel fabrication facilities, heavy water plants, nuclear power plants and research reactors, as well as the large spectrum of facilities involved in the application of radiation in the field of medicine, industry, agriculture and research, the facilities processing Naturally Occurring Radioactive Materials and activities such as radioactive waste management and transport of radioactive material in public domain, following a graded approach to safety regulation in line with international regulatory practices.

Focussed initiatives were taken to expand public outreach activities by participating in major science and technology exhibitions such as Nuclear Energy Expo, Indian Science Congress, Indo- Japan International Conference etc. We are pleased to inform that despite being relatively new entrants in such fora, our earnest efforts met with overwhelming response particularly from school children and their parents.

Retaining the essence of earlier editions, this annual bulletin provides in a nutshell the major activities of AERB during 2015-16. Efforts have been made to include more visuals and to keep the technical content simple. We would be happy to elicit feedback on this attempt and suggestions for further improving this bulletin.

Key Achievements During the Year

- **Completed the development and deployment of the AERB's e-governance initiative for e-Licensing of Radiation Applications 'e-LORA'**

- **Licensing/Consent/Review of Nuclear Facilities**
  - License for regular operation of Kudankulam Nuclear Power Projects Unit-1 (KKNPP Unit -1) issued for a period of five years
  - Siting consent issued for four units each of 700 MWe PHWR for Gorakhpur Haryana Anu Vidyut Pariyojna, Haryana
  - Consent for Site Excavation issued to KKNPP-3&4, first sub stage of construction clearance
  - Permission for melting of sodium in one of the Secondary Sodium Storage Tank and its recirculation for purification, as a part of Pre-commissioning activities for Prototype Fast Breeder Reactor, BHAVINI, Kalpakkam, Tamil Nadu
  - Pre-Consenting design review of Indian Pressurised Water Reactor (IPWR), a (900 MWe /2700 MWt indigenous Pressurised Water Reactor)
  - Renewal of licenses for operation of Tarapur Atomic Power Stations – 1 & 2, Madras Atomic Power Station, Rajasthan Atomic Power Stations -5&6
  - Renewal of License for operation of Bagjata,Jaduguda Mill and Turamdih Mill of Uranium Corporation of India Ltd.(UCIL), the Heavy Water Plants (HWP) at Manuguru,Kota, Talcher, Baroda and Hazira and ECIL.

- **Conducted nationwide campaign of surprised inspections of Medical diagnostic X-ray Units**

- **Four new Safety Codes and Six Safety Guidelines/ Guides published**

- **Public Communication and Information**
  - Implemented mechanism for obtaining comments from the general public on Safety Codes
  - Regular updates were provided during KAPS Unit-1 PT leak incident

Contents

Regulatory Requirements

One of the major elements of AERB's safety supervision process is specifying regulatory requirements in the form of safety codes and standards for nuclear and radiation facilities and related activities. Compliance to Safety Codes and Standards is mandatory.

Guidance to meet the requirements are further elaborated in AERB Safety Guides , Safety Manuals and Technical Documents.

AERB involves experts, utility and interested parties in the development of the regulations and guides through whom the comments and feedback are received throughout the development stage. Technological advances, international guidelines, research and development work, relevant operational lessons learned and institutional knowledge are considered as appropriate in development/revision of the regulations and safety documents. Feedback from nuclear and radiation facilities is also considered while preparation of new document or for revision of an existing document.

"Four new Safety Codes and Six Safety Guidelines/Guides were issued this year, taking the total of published regulatory documents to about 160

AERB revised Safety Code on 'Radiation Processing Facilities' [AERB/RF-RPF/SC-1(Revision-1)]

This safety code consolidates all the regulatory requirements relevant to radiation processing facilities utilizing sources of ionizing radiation including radioactive sources and radiation generating equipment in a single document. It supersedes the earlier safety code 'Operation and Maintenance of Land Based Stationary Gamma Irradiator' (AERB/SC/IRRAD; 1993).

AERB revised Safety Code on 'Safe Transport of Radioactive Material' [AERB/NRF-TS/SC-1 (Rev.1)]

This revised safety code, supersedes the earlier code AERB/SC/TR-1 (1986), and additionally provides requirements on design and test requirements for low dispersible radioactive material, Type C packages, fissile-excepted material and management system in line with the applicable international standards.

AERB revised Safety Code titled 'Industrial Radiography' [AERB/RF-IR/SC-1 (Rev.1)]

This revised safety code, supersedes the earlier code AERB/SC/IR-1 (2001) and consolidates all the regulatory requirements relevant to industrial radiography.

AERB revised Safety Code titled 'Radiation Safety in Manufacture, Supply and Use of Medical Diagnostic X-Ray Equipment' [AERB/RF-MED/SC-3 (Rev. 2)]

The safety code stipulates radiological safety requirements for indigenous manufacturers of X-ray equipment/X-ray tubes, suppliers of imported/indigenous medical diagnostic X-ray equipment/X-ray tubes and facilities using these equipment. It supersedes the earlier safety code titled 'Medical Diagnostic X-ray Equipment and Installations' (AERB/SC/MED-2) which was issued in December 1986, and subsequently revised in 2001.

Regulatory Decisions

The safety reviews related to the consenting decisions and safety monitoring during various stages are carried out through multi-tier system of safety committees. It follows the principle of "management by exception", following graded approach and is based on principles, requirements and criteria specified by AERB in its regulatory documents.

The committees include experts in a host of relevant fields, including process design, control and instrumentation, thermal hydraulics, structural analysis, reactor physics, seismology etc, relevant to nuclear and radiation safety. The higher level Committees include experts from academia, national R&D institutes, and government bodies.

The multi-tiered system of safety reviews:
In this approach, the issues of greater significance are given consideration at higher level committees for their satisfactory resolution. Recommendations of these committees concerning the various safety issues and consents are further considered by AERB for arriving at regulatory decisions. This arrangement ensures comprehensiveness of the reviews and checks compliance with the specified requirements.

Safety Review and Licensing

Siting	Construction	Commissioning	Operation	Decommissioning
chosen site is suitable for the proposed type and capacity of the plant from environmental considerations	plant design, applicant's statements and commitments meet regulatory requirements, construction meets quality requirements	performance of the plant is as per design intent, results of tests confirm the adequacy of the design for regular operation of the plant	operational limits & conditions are consistent with regulatory equirements, adequate level of safety is maintained during operation	decommissioning process and organisational commitments meet regulatory requirements

Safety Surveillance of Nuclear Projects

Kudankulam Site

1000MWe LWR Unit 2 of the Kudankulam Nuclear Power Plant (KKNPP-2) is under commissioning. During 2015-16, AERB issued clearance for Hot-Run of the unit. AERB reviewed the results of the Hot- Run, the pre-service inspections of important equipment and systems and status of the compliance to the recommendations and stipulations of AERB. AERB also took up review of the applications for Initial Fuel loading (IFL) and First Approach to Criticality (FAC) of the Unit-2 of KKNPP. (After satisfactory resolution of various issues related to these, AERB issued clearances for IFL and FAC on May 24, 2016 and June 27,2016 respectively. The unit achieved criticality on July 10, 2016).

AERB had earlier issued the Siting Consent for LWR Units 3 & 4 of Kudankulam Nuclear Power Project (KKNPP-3 & 4), 1000 MWe VVER type reactors of similar design as KKNPP -1 &2, in February, 2011. After satisfactory completion of the review of relevant aspects, AERB issued the clearance for Site Excavation of KKNPP-3&4, which is the first sub stage of construction clearance.

Kakrapara and Rawatbhata Site

Four units of 700 MWe PHWR are under construction, two each at Kakrapar and Rajasthan sites. The AERB had issued clearances for erection of Major Equipment in these units during the year 2014 and 2015, respectively. Currently, AERB is reviewing the safety aspects with respect to design of these projects according to the relevant sub stages of construction clearances as well as compliance to the relevant codes & standards, and recommendations /stipulations of AERB in the construction consents.

Kalpakkam Site

The 500 MWe Prototype Fast Breeder Reactor (PFBR) is undergoing preparations for taking up commissioning activities. AERB has been reviewing the preparedness of PFBR project for taking up of commissioning activities and safety review of the commissioning procedures. Application seeking Siting Consent for the proposed FBR-1&2 that is proposed to be set up at Kalpakkam in Tamil Nadu.

Gorakhpur Site

After satisfactory completion of review of Site Evaluation Report & associated submissions, AERB issued the Siting Consent for four units of 700 MWe PHWRs (GHAVP-1 to 4) at Gorakhpur in July, 2015. Review of the application for construction consent for the first two units is in progress.

Jaitapur Site

AERB is currently reviewing the Application and other related submissions with respect to Siting Consent for six units of European Pressurised Reactor (EPR) each of 1650 MWe proposed to be setup at Jaitapur, Maharashtra.

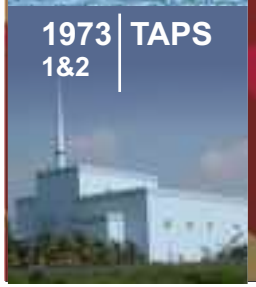
Design Review of IPWR

The Bhabha Atomic Research Centre (BARC), jointly with NPCIL, is developing the design of Indian Pressurised Water Reactor (IPWR). IPWR is an indigenous PWR design with a power rating of 2700 MWt – 900 MWe, incorporating advanced safety features, including passive safety systems similar to the ones developed for the Advanced Heavy Water Reactor (AHWR). The IPWR also incorporates layout features of the 700 MWe PHWRs being constructed in India. AERB has taken up pre-consenting review of the design of IPWR. In this regard, AERB has reviewed the technical design document (TDD) of IPWR based on the request from BARC

Tarapur Site

2005 | TAPS 3&4

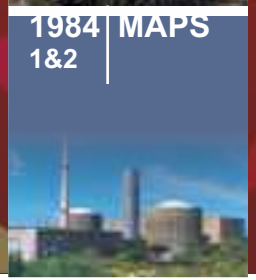
1973 | TAPS 1&2



Kalpakkam Site

Commissioning PFBR

1984 | MAPS 1&2



Narora Site

1991 | NAPS 1&2

Kakrapara Site

Constructing KAPS 3&4

1993 | KAPS 1&2

Kaiga Site

2007 | KGS 3&4

2000 | KGS 1&2

Rawatbhata Site

Constructing RAPS 7&8

2010 | RAPS 5&6

2000 | RAPS 3&4

1973 | RAPS 1&2

Kudankulam Site

2014 | KKNP 1&2

Safety Surveillance of Operating Nuclear Plants and Research Reactors

Operating plants undergo continuous safety review through periodic reports and regulatory inspections supplemented by exhaustive five yearly reviews which takes place during review of application for renewal of license. This review involves detailed safety review of safe operation of Nuclear Power Plant (NPP) as per its design intent, safety systems performances and improvements in safety etc.

There are twenty one nuclear power plants in operations. AERB continued its regulatory supervision of these plants as well as the two research reactors, FBTR and KAMINI, which are under the purview of AERB.

Nuclear Power Plants

During the year, AERB issued License for regular operation of Unit -1 of Kudankulam Nuclear Power Plant (KKNPP-1) after satisfactory completion of the requisite commissioning tests and steady operation of the unit at the rated power for the specified period.

In addition to this, a periodic safety review (PSR) is carried out once in ten years, which is a much more comprehensive safety review and includes additional factors like advancement in technology, feedback of operating experience from within India as well as from other countries, comparison of safety standards, cumulative effects of plant ageing, probabilistic safety assessments etc.

During the year, AERB reviewed the applications for renewal of license for operation of RAPS-5&6 and PSRs for TAPS-1&2 and MAPS. Based on the review, the license for operation of these reactors were extended.

Research Reactors

Initial authorization for regular operation of KAMINI was granted on June 29, 1998. On recommendation of AERB, IGCAR carried out Periodic Safety Review (PSR) of the KAMINI. While the regulatory review of PSR is continuing, AERB extended the license for operation to KAMINI for a limited period i.e. up to June 30, 2016, based on preliminary review. AERB also permitted the commencement of 24th irradiation campaign of sodium bonded metallic fuel pins at FBTR.

Safety Surveillance of Nuclear Fuel Cycle Facilities

During the year, AERB continued to review the safety aspects of the Nuclear Fuel Cycle under its purview.

Front-end of Nuclear Fuel Cycle and associated Industrial Plants

These facilities include the atomic minerals exploration units of Atomic Minerals Directorate for Exploration and Research (AMD) facilities, mines & uranium ore processing mills of Uranium Corporation of India Ltd. (UCIL), thorium mining, mineral separation plants & mills of Indian Rare Earths Ltd. (IREL), Nuclear Fuel Complex (NFC) at Hyderabad, Zirconium Complex (ZC) at Pazhayakayal and the industrial units such as Heavy Water Plants (HWP), Electronics Corporation of India Limited (ECIL), Board of Radiation and Isotope Technology (BRIT) and diversified projects of Heavy Water Board. In addition, AERB also reviewed the radiological safety aspects in the facilities handling Beach Sand Minerals (BSM) and other Naturally Occurring Radioactive Materials(NORM).

AERB issued/renewed License for operation of Bagjata, Jaduguda Mill and Turamdih Mill of Uranium Corporation of India Ltd. (UCIL), the Heavy Water Plants (HWP) at Manuguru, Kota, Baroda, Hazira and various plants operational at HWP-Talcher. AERB has also issued the License for regular operation of plants of Electronics Corporation of India Ltd (ECIL), Hyderabad.

Back-end of Nuclear Fuel Cycle

The back end nuclear fuel cycle facilities namely, Demonstration Fast Reactor Fuel Reprocessing Plant (DFRP) and Fast Reactor Fuel Cycle Facility (FRFCF) at IGCAR, Kalpakkam, Tamil Nadu are under construction. AERB is reviewing the design safety aspects of these facilities with respect to clearances for relevant stages of construction. AERB is also reviewing an Application for Construction Consent for a Demonstration Facility for Metallic Fuel Fabrication (DFMF) that is proposed to be set at IGCAR, Kalpakkam, Tamil Nadu.

Safety Surveillance of Radiation Applications in Medicine

AERB reviews the safe use of radiation sources widely used in health sector for diagnosis and treatment.

RADIOTHERAPY

In tele-therapy (branch of Radiotherapy), radiation is used to treat malignancy. The radioisotopes like Co-60 and radiation generators such as Linear Accelerators are used. Certain specialised equipment like Gamma knife, tomotherapy and Cyber-knife are also used.

The number of teletherapy equipment operating in the country are 588 of which the Co-60 based units are 216 and Linear accelerators are 372. They are of high radiation hazard potential.

AERB issues Licence for operation of these equipment after elaborate verification of design of equipment, infrastructure and operating personnel qualifications and relevant transport permissions in case of isotope based equipment.

BRACHYTHERAPY

In brachytherapy (branch of radiotherapy in which the source is kept very near to the lesion) the isotopes used are Ir-192, Cs-137, Sr -90, Ru-106, I-125 with activity range is MBq to GBq . They are of moderate hazard potential. Brachytherapy equipment are of two types Remote Afterloading Units (HDR/MDR/LDR which are 260 in number presently and Manual Afterloading Intracavitary kits (Cs-137) which are 60 in number presently.

NUCLEAR MEDICINE- RADIO PHARMCEUTICALS

In Nuclear Medicine, radio-pharmaceuticals, such as Tc-99m, I-131, Tl-201 and F-18 are used for diagnosis and treatment. F-18 Radio-pharmaceuticals are routinely used in PET-CT facilities, while I-131 is used for diagnosis and treatment of thyroid cancers. The facilities using pharmaceuticals are of moderate-low hazard. Presently there are 240 Diagnostic Nuclear Medicine and 41 Ca-thyroid treatment centres. AERB issues licence for operation of these centres after due verification of design of the equipment, layout of the facility, personnel qualifications and transport permissions.

MEDICAL CYCLOTRONS:

Radio-isotopes that are used in Nuclear Medicine are generally produced in Medical Cyclotron facilities. The medical cyclotron facilities are of moderate- high radiation hazard potential. Presently there are 15 Medical Cyclotrons operating in the country. These facilities are licenced for operation after stage-wise verification of requirements during Siting, Construction and trial runs.

DIAGNOSTIC X-RAY EQUIPMENT:

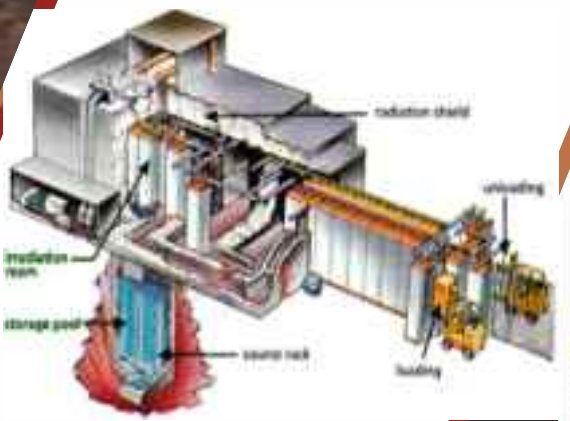
Interventional Radiology equipment (Cath-Lab and C-Arm):

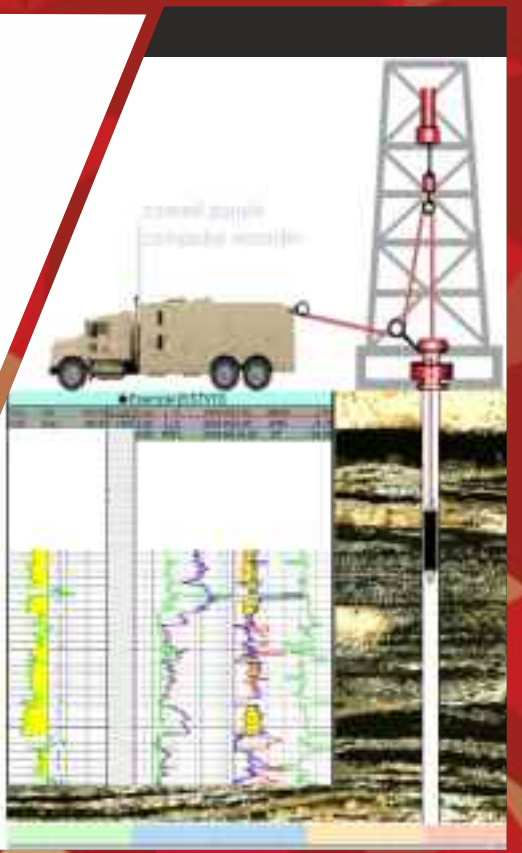
X-rays are used in Medicine as an important diagnostic tool. These equipment are used in operation theatres for various interventional procedures and pose moderate radiation hazard to patients and medical professionals operating the equipment. The C-Arm equipment is of low to moderate hazard potential.

Computed Tomography (CT), general purpose radiography and fluoroscopy equipment and dental equipment:

These equipment are of moderate to very low radiation hazard potential to both worker and patient.

These constitute around 70-80% of all x-ray equipment that are used.


radiation shield
unloading
irradiation room
storage pool
source rack
loading

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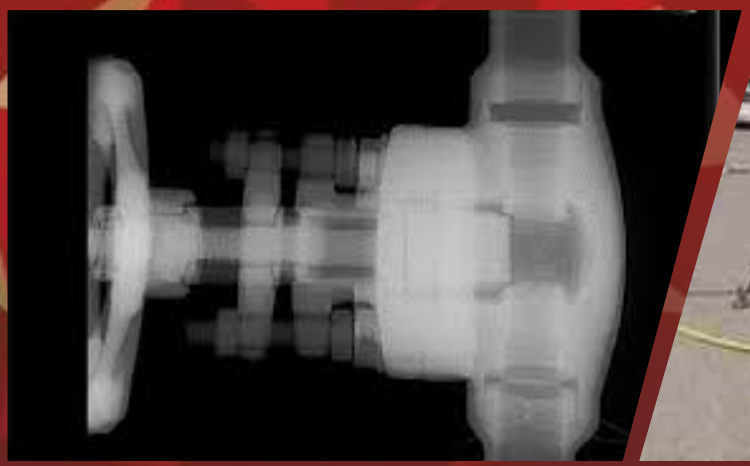


Safety Surveillance of Radiation Applications in Industry

AERB reviews the safe use of radiation sources widely used in the Industry wherein they are extensively used in NDT, food preservation, sterilization of medical equipment and as nucleonic control systems for level, density and thickness measurements etc. They are also used for oil well logging.

Small sources are used in Consumer products.

RADIATION PROCESSING FACILITIES

Radiation Processing Facilities(RPF) including Gamma Irradiators and Electron Beam Accelerators which are used mainly for radiation processing of food, sterilisation of healthcare products and crosslinking of polymers in cable industries. Radiation processing of food items includes inhibiting sprouting, delay in ripening, microbial decontamination, insect disinfestation, shelf line extension etc. The activity range is about few PBq. They are of high radiation hazard potential. Presently there are 25 RPFs operating in the country. AERB issues Licence for operating these facilities after detailed licensing .

INDUSTRIAL RADIOGRAPHY

Industrial Radiography using Industrial Radiography Exposure Device (IRED), is one of the important non-destructive (NDT) methods used for study of weld joints, castings etc. Radioisotopes like Ir-192, Co-60, Tm-170, Se-75 and different energies of X-rays in the field of industrial radiography. The activity range is from few TBq to few tens of TBq. The X-ray energy range is from few hundreds of keV to few MeV. They are of high to moderate radiation hazard potential. Presently there are 510 facilities with 2719 equipment.

NUCLEONIC GAUGES AND WELL LOGGING SOURCES

The Industrial Radiation Gauging Device (IRGD) are used for online monitoring of quality control parameters such as thickness, level, density, coating thickness, elemental analysis etc. Sources used for nucleonic gauges consist of gamma sources such as Co-60, Cs-137, Am-241 etc., beta sources such as Sr-90, Kr-85, Pm-147, Tl-204, etc, and neutron sources such as Am-241-Be. The activity range is from MBq to GBq. They are of low radiation hazard potential. There are about 9000 such sources mostly belonging to the Category 3, 4 and 5. This indicates they are of low hazard potential.

Radioactive sources are used in well logging application for exploration of oil, coal, geophysical logging etc. The sources used are mainly Cs-137, Am-241-Be, some calibration sources such as Co-60, Ra-226, Th-232 etc. and neutron generators e.g. Deuterium-Tritium Generators. The activity range is from kBq to GBq. They are of moderate-low radiation hazard potential.

CONSUMER GOODS

Consumer goods such as smoke detectors Thorium gas mantles and starters use exempt quantity of radioactive sources. They are of very low hazard potential. However, regulatory control exists on the manufacturing facilities of this devices. There are 15 consumer goods manufacturing facilities operating in the country.


AM-241
500 MCi

Safety Surveillance of Radiation Applications in Research

AERB regulates the safe use of radiation sources and radiation generating equipment used for research

RESEARCH ACCELERATORS

Particle accelerators are used for research in nuclear physics, material science, nuclear chemistry and biology and various other fields. Particle accelerators are of electro-static, linear or cyclic types. Cyclic accelerators are generally of radio frequency or microwave type. Further, the accelerators are either electron accelerators or charged particle accelerators. Van de graff generators are example of electro-static accelerator and linear accelerators and microtrons are examples of electron accelerators. Pelletrons and cyclotrons are examples of particle ion accelerators. Electron accelerators are associated with photon generation either directly or as synchrotron radiation. Similarly charged particle accelerators are source of neutrons and secondary particles such as mesons and pions. The accelerators are being used and developed not only in DAE units such as VECC, Kolkata, RRCAT, Indore, IGCAR but also in premier academic institutes like TIFR, IOP, SINP and other universities.

GAMMA IRRADIATION CHAMBERS

Gamma Irradiation Chambers (GIC) are used in research to study the characteristics of samples after high irradiation. Usually Co-60 radioisotope is used in this application. These chambers are also increasingly being used in Hospitals for irradiation/ sterilization of blood samples and tissues for immune-compromised patients. The activity range from few tens of TBq-few hundreds of TBq. They are of high to moderate radiation hazard potential. There are 122 Irradiation chambers of which around 25 are blood irradiators.

RESEARCH LABS

Though, sealed radioactive sources are used in various industrial and medical applications, but under this heading, sealed source means those that are used in education, research and calibration purposes. The activity range is from kBq to GBq. They are generally of low radiation hazard potential. There are around 470 research centres using unsealed and sealed forms of radio isotopes.

Unsealed sources are used in various research and academic institutions, such as agriculture, veterinary science etc. They are of low radiation hazard potential.

Success of ELORA

As part of its e-Governance initiatives, and with the objective to enhance the efficiency and transparency in the regulatory processes, AERB has put into operation a web-based system called "e-Licensing of Radiation Applications (e-LORA)" which enables automation of the regulatory processes for various Radiation Facilities located across the country. AERB has completed the development phase of e-LORA on December 31, 2015.

With the e-LORA fully functional, AERB today has a user friendly interface for the applicants and licensees with AERB. The automation has also helped AERB in disposition of the applications at a much shorter time interval in comparison to earlier practice. Around 35,000 X-ray equipment have been declared in the e-LORA system of which, around 23,500 equipment are licensed.

In recognition of this initiative, AERB received the "SKOCH Smart Governance Award -2015.

eLORA ensures WIN-WIN

REGULATOR

Radioactive sources being monitored and tracked
Increasing number of x-ray installations under regulation
More number of Radiation Safety officers approved
Compliance monitored closely
Enhanced safety status of radiation sources in the country

STAKEHOLDER

Significant reduction in time to obtain Licences
Real-time status display exists
Easy and user friendly process
No need for interfaces
All guidelines displayed
Improved Radiation safety in the institution

PUBLIC

Registered X-ray installation status displayed.
Improved patient welfare in diagnosis and treatment

Support for Decision Making

AERB carries out independent safety analysis and research on important areas of nuclear and radiation safety which facilitate the regulatory review and constitute one of the inputs for regulatory decision making during licensing process. These studies are carried out at Headquarters as well as in Safety Research Institute (SRI) established by AERB at Kalpakkam, Tamil Nadu. In addition to its own safety research, AERB receives technical support from premier research institutes such as BARC, IITs etc. AERB also promotes and funds radiation safety research and industrial safety research as part of its programme.

During the year, AERB focused on areas covering Severe Accident studies for PHWR and VVER, hydrogen distribution & Mitigation studies, reactor physics studies, source term estimation for radiological impact assessment, environmental safety, coupled thermal-hydraulics & structural studies, and probabilistic comparison of risk in Multi-unit NPP sites.

Several important developmental studies were taken up and completed during this year. A state-of-the-art Compartment Fire Test Facility (CFTF) has been established at AERB's SRI, Kalpakkam, for carrying out experimental studies relating to enclosure fires. AERB also participated and contributed in various internal collaborative exercises aimed at new knowledge development.

AERB continued to promote and fund research projects at various reputed universities and academic institutions under the Safety Research Programme. During the period six new projects were approved and twelve on-going projects were renewed.

Regulatory Oversight

The Regulatory Oversight Process includes the program to inspect, measure, and assess the safety performance of nuclear and radiation facilities and activities under the purview of AERB, and to respond to any decline in their performance.

AERB has established a regulatory framework, which involves stipulating the safety requirements, issuance of regulatory consents, verification of compliance through safety reviews & inspections during various stages namely siting, design, construction, commissioning, operation etc. and takes necessary enforcement measures, as necessary.

Regulatory Inspections

Regulatory Inspections are carried out to ensure compliance with consenting conditions and AERB safety requirements. Generally, the inspections are carried out with prior announcement. AERB also carries out special unannounced/surprise inspections with specific objectives as deemed necessary following an event, depending on the safety significance or after major modifications in the plant and form the basis for considering clearance for restart of the unit.

In addition to normal regulatory inspections, AERB identifies a list of important activities during construction and commissioning as hold points for which the facility is required to inform AERB in advance for deputing its representatives/experts in the respective areas to witness the relevant activities.

Areas covered during a typical regulatory inspection of an operating facility are:

- Operation, Maintenance and Quality Assurance Programme
- Adherence to the technical specifications for operation
- Compliance to various regulatory recommendations
- Adequacy of licensed staff
- Performance of safety related systems
- Radiation safety and ALARA practices
- Emergency Preparedness
- Industrial Safety
- Physical protection systems

Facilities Inspected	No.of inspection conducted
Operating NPPs and associated facilities	*40 (including 7 special & 3 unannounced inspections*
Nuclear Power projects & associated facilities	31
Fuel Cycle Facilities, R&D units & industrial plants of DAE	67 (*including 3 special & 2 unannounced inspections*
Radiation facilities	759 487 (by DRS)*

* State-level Directorate of Radiation Safety (DRS) are being set up to strengthen the safety regulatory control over medical diagnostic X-ray facilities in view of the large number of diagnostic X-ray units/facilities spread across the country and the accelerated growth in their numbers. AERB has signed agreements with 13 States and presently DRS are authorised in the States of Kerala, Chhattisgarh, Arunachal Pradesh, Mizoram, Punjab and Tripura.

Implementation of Post-Fukushima Safety Enhancements in Nuclear Power Plants

The safety reviews carried out for Indian NPPs following the accident at Fukushima NPP, have shown that Indian NPPs have inherent strengths in dealing with external hazards. However, based on the review, certain safety enhancements were identified for further strengthening the defenses against external hazards of extreme magnitude exceeding the plant design bases and to strengthen the severe accident management capabilities. These actions were classified as short term, medium term and long term activities for their implementation. AERB has been closely monitoring the progress of implementation of these safety enhancements. As of now, implementations of the short term and medium term enhancements have been mostly completed in all the NPPs. The long term activities mostly involve those which need significant development/manufacturing/procurement efforts involving long lead times.

The status of implementation of long term measures is as follows:




Enhancing severe accident management programme

Preventive measures that are required to be taken under severe accident condition such as hook up provisions to important system have been implemented. Station specific accident management guidelines have been prepared for all sites. Surveillance program have been established for monitoring the healthiness of all the provisions required for implementing these guidelines. The enhanced Accident Management Guidelines for TAPS-1&2 (BWR units) is presently being reviewed in AERB.

Strengthening hydrogen management provisions

The proposed hydrogen management scheme in Indian PHWRs includes provision of suitable number of Passive Catalytic Recombiner Device (PCRD) along with provisions for homogenizing the containment atmosphere. PCRD have been indigenously developed and performance checks and qualification was carried out at the Hydrogen Recombiner Test Facility at Tarapur. The technology transfer for large scale manufacturing of PCRD has been carried out. NPCIL has proposed to install the PCRD at all NPPs in a phased manner.

Provision of containment filtered venting

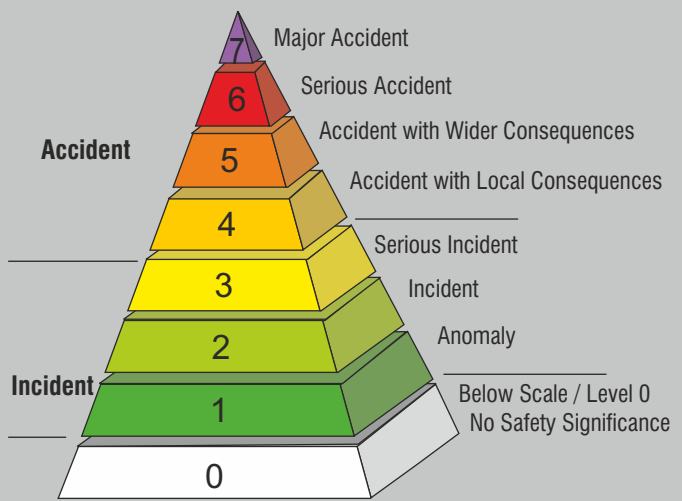
Containment Filtered Venting Systems (CFVS) for Indian NPPs are planned to be installed to prevent containment pressure exceeding the design pressure. This system is based on wet scrubbing concept and has been developed indigenously through extensive experimentation. The system design is currently being reviewed by AERB. Construction activities of CFVS for TAPS-1&2 are in progress.

On-site emergency support centre

AERB has framed requirements and guidelines for establishing On-site Emergency Support Centers (OESC) at all NPPs. This facility will have capability to remain functional under radiological conditions following a severe accident and should be capable of withstanding extreme external events (flood, cyclone, earthquake, etc.). This facility will be in addition to the existing emergency control centers at the plants. The design basis for the facility has been finalised and the work for construction of the facility at sites is in progress.

Significant Events

Significant Events in Nuclear and radiation facilities are reviewed and categorized based on International Nuclear & Radiological Event Scale. The INES system of the International Atomic Energy Agency (IAEA) rates events at seven levels (1 to 7) depending on their safety significance.



During the calendar year 2015, there were 42 significant events reported from the operating NPPs. All the events were of INES level-0 (corresponding to deviations below scale).The event of leakage from a coolant channel at Unit-1 of Kakrapar Atomic Power Station (KAPS -1) which took place on March 11, 2016 was provisionally rated as Level-1 (corresponding to Anomaly).The event is under investigation.

Incidents of Pressure Tube Leaks in KAPS

On March 11, 2016, there was an incident of leakage from a coolant channel at KAPS Unit-1. Following the leak from primary coolant system; the reactor underwent an automatic shutdown. The safety systems, viz. emergency core cooling and containment isolation got actuated and performed as intended. Following the event, plant emergency was declared, which was terminated after safely discharging the fuel from the leaky channel and isolating this channel from the primary coolant system on March 21, 2016. There was no fuel failure. The event did not result in any radiation over-exposure to plant personnel. The radioactivity releases were within the specified limits for normal operation. During the course of the plant emergency, the environmental surveillance carried out within the site, as well as in the off-site domain up to 30-km from the plant, confirmed that there was no increase in the background radiation levels and there was no radioactive contamination. Currently, the unit is under shutdown for investigations. Based on the incident, AERB has stipulated expeditious inspection of coolant channels in all other operating reactors as well as thorough review of design and leak detection capability of Annulus Gas Monitoring System (AGMS) to detect any vulnerability of such events in other operating units.

Radiological Events

Incident of discharge of untreated effluent from Turamdih mill

There was an event of discharge of untreated effluent from Turamdih mill of UCIL into public domain in December 2015. The root cause of the incident was lack of proper provision for flushing choked pipeline. AERB asked UCIL to establish the mechanism for flushing the choked pipeline with water after isolating the system and implement preventive measures at other vulnerable routes that may lead to discharge of untreated effluent.

Incident of theft of industrial gamma radiography exposure devices at New Delhi

An incident involving theft of two industrial gamma radiography exposure devices housing Ir-192 sources of activity about 0.15 TBq and 0.37GBq was reported to AERB on July 10, 2015. The above theft incident is under investigation by the local Law & Enforcement Authority.

AERB issued show-cause notice to the concerned industrial radiography institution for committing violations of stipulated regulatory provisions and lack of physical security measures provided for radiography exposure devices during storage.

Dental X-ray examination for age determination

Following certain news reports regarding use of dental X-ray examinations with the aim of age determination or birth registration, AERB issued an advisory to medical/dental and the general public against indiscriminate use of dental x-ray examinations solely for the purpose of non-diagnostic applications such as age determination or birth registration. As the regulator for radiation safety in the use of medical x-rays for medical diagnostic applications, AERB considers such a practice as “unjustified”.

Industrial Accidents

There were four fatalities at construction sites at IGCAR, Kalpakkam (one), RAPP 7&8 Project, Rawatbhatta (one) and NFC, Hyderabad (two) mainly due to fall from height. These accidents were investigated by AERB and reviewed by Fatal Accident Assessment Committee (FAAC) and recommendations were made to prevent such recurrences. The analysis and recommendations of these accidents were forwarded to all units of DAE for information and lessons to be learnt.

Other industrial mishaps

An incident of H_2S leakage took place on March 03, 2015 during pre-start-up of booster no. 1 at Heavy Water Plant, Kota. The root cause of the incident was identified as combined effect of thermal and alternative stresses, compounded by H_2S service over a period of time. The portion of the affected pipeline has been replaced. Further detailed analysis of the cracked pipeline is in progress at BARC.

An incident of acid leakage from HCl storage tank took place on September 02, 2015 at HWP, Kota. The root cause of the incident was identified as the failure of rubber lining between two rubber sheets’ butt joint which could have caused localized corrosion and subsequent failure. AERB has recommended for enhancing the frequency of inspection of repaired rubber lining of HCl tanks, adequate surveillance of transfer pump and ensuring proper Quality Assurance (QA), workmanship and supervision during rubber lining and providing additional acid storage tank for transfer of acid from affected tank.

An incident of snapping of hook from the wire rope of 15 Ton under slung EOT crane took place on December 15, 2015 at HWP-Thal. The root cause of the incident was over travelling of the hook beyond the safe limit, leading to its snapping from rope due to pull by the hoist motor. This has occurred due to failure of limit switch/ or relay contact. There was no injury to any person working in the vicinity of the work area. Recommendations were made for establishing reliability and design life of the systems/components, increasing the frequency of periodic maintenance/component replacement and incorporate additional safety systems in consultation with experts in EOT crane.

Waste Management

The disposal of radioactive wastes to the environment is governed by the Atomic Energy Safe Disposal of Radioactive Wastes Rules, 1987 (G.S.R.125). These rules are applicable to all the facilities generating radioactive wastes and provide the legal basis for regulation of safe disposal/transfer of radioactive wastes.

AERB issues the authorization for safe disposal / transfer of radioactive waste under the Atomic Energy Safe Disposal of Radioactive Wastes Rules-1987 (GSR-125). These authorizations are valid for a period of maximum 3 years. The number of units of various DAE organizations for which authorizations for safe disposal/transfer of radioactive waste were issued during the year 2015-16 is brought out in Table given below:

S. No.	Name of DAE Organisation	No. of facilities
1	Uranium Corporation of India Ltd. (UCIL)	10
2	Indian Rare Earth Ltd (IREL)	03
3	Nuclear Fuel Complex (NFC)	05
4	Nuclear Power Corporation of India Limited (NPCIL)	14
5	Indira Gandhi Center for Atomic Research (IGCAR)	05
6	Board of Radiation & Isotopes Technology (BRIT)	04
7	Technology Demonstration Plant (HWB)	01
	Total number of authorizations	42

Any radioactive source or equipment containing radioactive source which is lying in an unused condition for more than one year without any reasonable possibility of using it in the near future is considered a "disused source". This situation sometimes arises in certain hospitals, industries and research centres. Various factors for source become disused are bankruptcy, non-availability of requisite manpower leading to non utilisation of the equipment. Such sources, especially if they are of high activity, become a safety concern owing to their possible neglect and likelihood of disposal of source in an unauthorised manner. To pre-empt such undesirable situations, these institutions are identified by AERB and are immediately directed to initiate process for decommissioning of equipment housing the source and its safe disposal by obtaining requisite consents for:

a) decommissioning of the equipment, and

b) transport of the source for safe disposal.

Disposal of Radioactive sources (Permission for transport of radioactive material for safe disposal)	
662 no. of sources Exported to the original supplier	**601 no. of sources + 255 Nos. of Tritium filled sources disposed of at authorized waste management facilities within the country**

Emergency Preparedness

AERB reviews and approves the emergency preparedness and response plans for both plant and on- site emergency situation whereas off-site emergency plans are reviewed by AERB and approved by the District authority / Local Government. Site-specific emergency preparedness plans of the respective stations are tested by carrying out periodic emergency exercises involving the station authorities, district administration, and the members of public on sample basis.

These exercises are used for following purposes:

- Familiarization of personnel concerned with the management and implementation of emergency response and protective measures.
- Assess the adequacy of these plans and improve them based on feedback from exercises. Plant Emergency Exercises (PEE) are carried out once in a quarter by each NPP. Site Emergency Exercise (SEE) and Off-Site Emergency Exercise (OSEE) are carried out by each site once in a year and once in two years respectively. During the periodic regulatory inspections of NPPs, AERB reviews the preparedness of plants to handle emergencies to verify that this is in accordance with the approved plans.

Site Emergency Exercises were conducted at all NPP sites and Off-Site Emergency Exercises were conducted at Tarapur, Kalpakkam, Narora and Kaiga site. AERB officials carried out special regulatory inspections on emergency aspects and participated in these emergency exercises as observers. AERB also participated in emergency exercises conducted by IAEA under the 'Convention on Early Notification of Nuclear Accident and Convention on assistance in Nuclear Accident or Radiological Emergency'.

Transport of Radioactive Material

The widespread use of ionizing radiation has brought in the necessity of voluminous transport of the radioactive material from one place to another, many a times through public domain.

The transportation of radioactive material (including that of nuclear material from nuclear facilities), is governed by regulations specified by AERB in Safety Code for the transport of radioactive materials and is line with the International requirements specified by IAEA for safe transport of radioactive material.

The design of the radioactive package should be such that during the entire process of transport, it is ensured that the radioactive material remains contained and shielded to avoid unacceptable radiation exposure to cargo handlers and public. As the activity and nature of radioactive material to be transported varies over a wide range i.e. from few kBq (few μCi) to few PBq (thousands of Ci), a graded approach is used in selection of the packaging. "Type A packages", are used for transport of radioactive material of activity not exceeding the specified limits and need to be registered with AERB. "Type B packages" are subjected to a stringent approval procedure and are required to fulfill the safety standards.

Transportation Cask

Enforcement Actions

As a part of the nation-wide campaign to ensure increased compliance and regulatory coverage of Medical diagnostic x-ray equipment, AERB carried out surprise inspection of these facilities in major cities/towns in the country. AERB carried out inspections of medical diagnostic facilities at Mumbai, Navi-Mumbai, Jaipur, Nagpur, Raipur, Pune, Chennai, Bengaluru, Hyderabad, New Delhi, Kolkata, Patna, Ranchi, Gaya, Goa, and Ahmadabad.

AERB has suspended operation of some of the medical diagnostic facilities at cities and towns across India in view of their non-compliance with the specified regulatory and radiation safety requirements.

Before start of the campaign in April 2015, AERB had put notices in various leading national dailies, directing utilities who have not yet obtained License /Registration to come forward and first declare their x-ray equipment in the e-governance portal e-LORA, and within 6 months obtain the requisite license /Registration. The surprise inspections carried out at various cities/towns in the country, revealed that certain diagnostic x-ray facilities have still not complied with the regulatory requirements of AERB and accordingly requisite enforcement actions were taken against such facilities. The above actions taken by AERB received wide media attention.

Though the X-ray equipment are of low radiation hazard potential, it is important that they are installed and operated in accordance with the radiological safety requirements specified by AERB. AERB issues the requisite Licence/Registration after ensuring that they conform to the specified safety requirements.


Atomic energy team seals X-ray units in city hosps

Crackdown on MYH, Several Pvt Hospitals


Atomic energy team seals three X-ray units in Bhopal


एटॉमिक रेडिएशन रेगुलेटरी के निरीक्षण में खुलासा

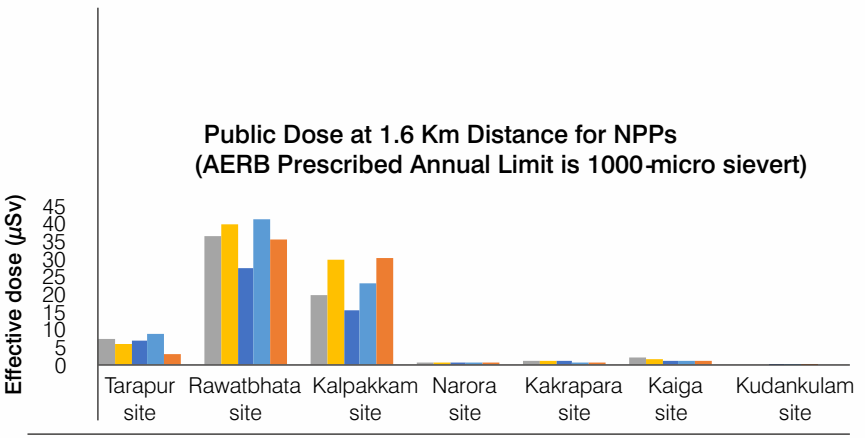
बिना लाइसेंस चल रही एक्स-रे मशीन सील

Safety Statistics

The radioactivity releases from all the nuclear power plants were below the limits specified in the technical specifications for operation. Effective dose to public in the vicinity of NPP sites was far less than the annual limit of 1 mSv (1000 micro-Sievert) prescribed by AERB. Public dose limit of 1000 micro-Sv per year is an International benchmark, based on the recommendation of International Commission on Radiological Protection (ICRP). The radiation exposure to occupational workers in these plants was also well below the prescribed limit of 30 mSv in a year. AERB dose limit of 30 mSv in a year for the occupational workers is more conservative as compared to the ICRP recommended limit of 50 mSv in a year.

Public Exposure

Radiation dose to members of the public near the operating plants is estimated based on measurements of radionuclide concentration in items of diet, i.e., vegetables, cereals, milk, meat, fish, etc and through intake of air and water. Public dose estimated from NPP is found to be only a fraction of public dose limit (1000 micro-sieverts) prescribed by AERB.



	Tarapur site	Rawatbhata site	Kalpakkam site	Narora site	Kakrapara site	Kaiga site	Kudankulam site
2011	7.42	36.30	19.50	0.48	0.88	1.90	
2012	5.52	39.88	29.88	0.56	0.78	1.24	
2013	6.94	27.40	15.52	0.56	0.92	0.8	0.001
2014	8.71	41.01	23.14	0.44	0.76	1.10	0.081
2015	3.04	35.58	30.39	0.36	0.42	1.10	0.022

Note:Public dose at Rawatbhata and Kalpakkam site is relatively higher as compared to other reactor sites, due to release of Ar-41 from RAPS-2 and MAPS.

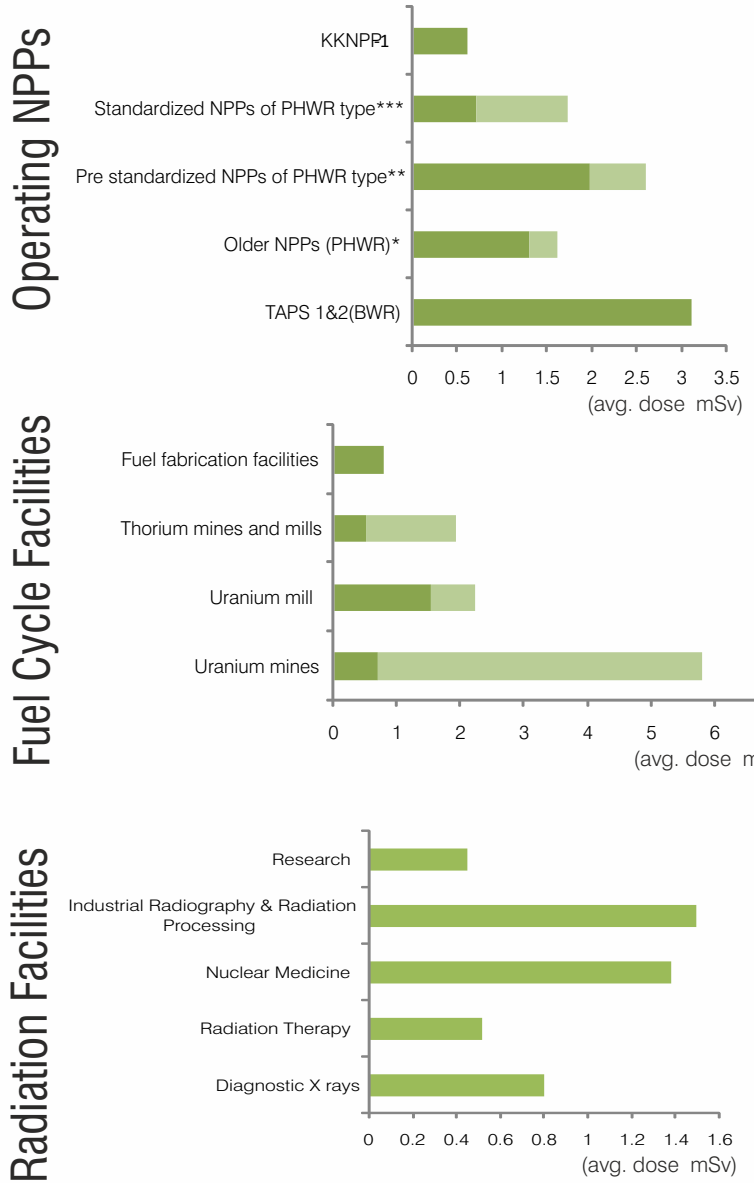
Perspective of Doses

Threshold for Mortality	2,000,000
Radiation Sickness Appears	1,000,000
First Signs of Radiation Effects	500,000
Emergency Worker Dose Limit/year	250,000
Risk of Health Effects insignificant	100,000
Thyroid Scan	43,000
Thallium Cardiac Stress Test	36,000
Occupational Dose Limit/year	30,000
One Chest CT Scan	7,000
Natural Background/year	2,400
Public Dose Limit/year	1,000
One Chest X-ray	100
One 10 hr. Air flight	50
Actual Annual Radiation Dose from Operation of NPPs at Exclusion Boundary	< 15

All Values in micro-Sievert

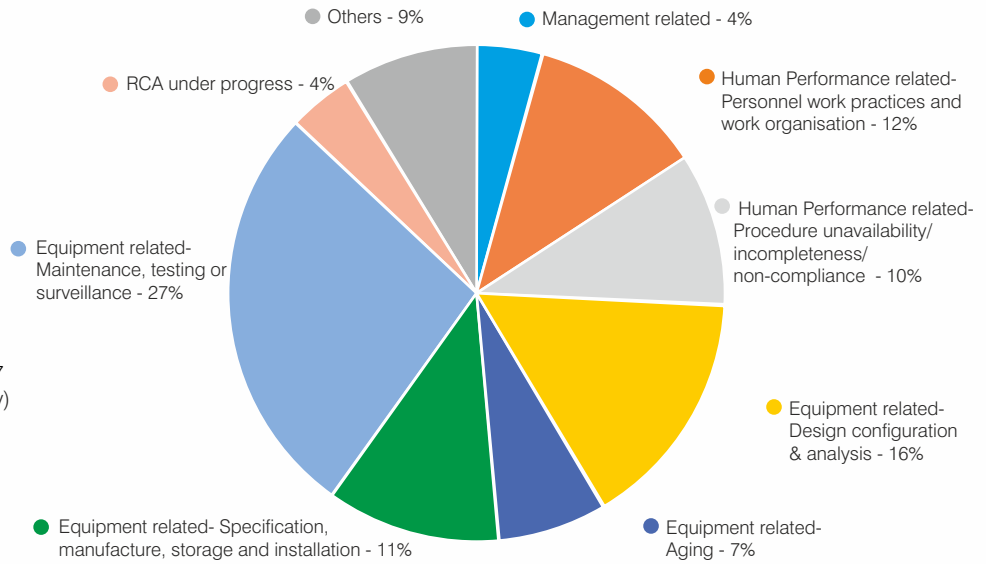
Occupational Exposure

* Older plants consists of RAPS 1&2 and MAPS 1&2
** Pre-standardized NPPs consist of NAPS 1&2 and KAPS 1&2
*** Standardized NPPs consists of KGS 1-4, RAPS 3-6, TAPS 3&4



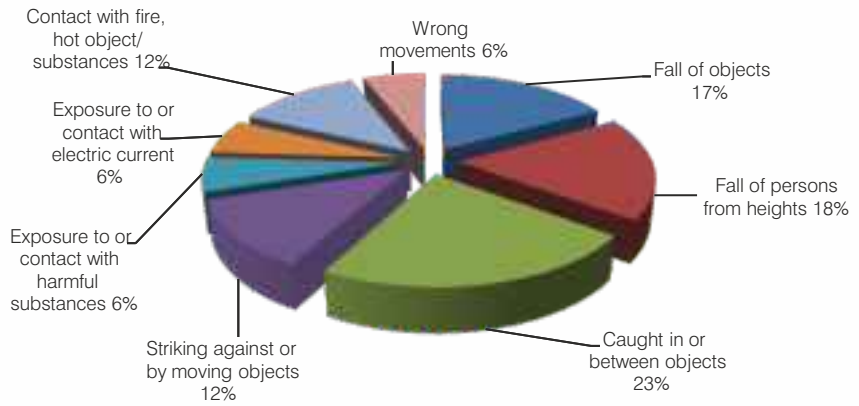
Significant Events

In year 2015, a total of 42 significant events were reported from 21 operating NPPs. These incidents were reviewed in detail by AERB addressing the root cause of the incidents and corrective actions to be taken to prevent recurrence of similar incidents at NPPs



Classification of Root causes of SERs

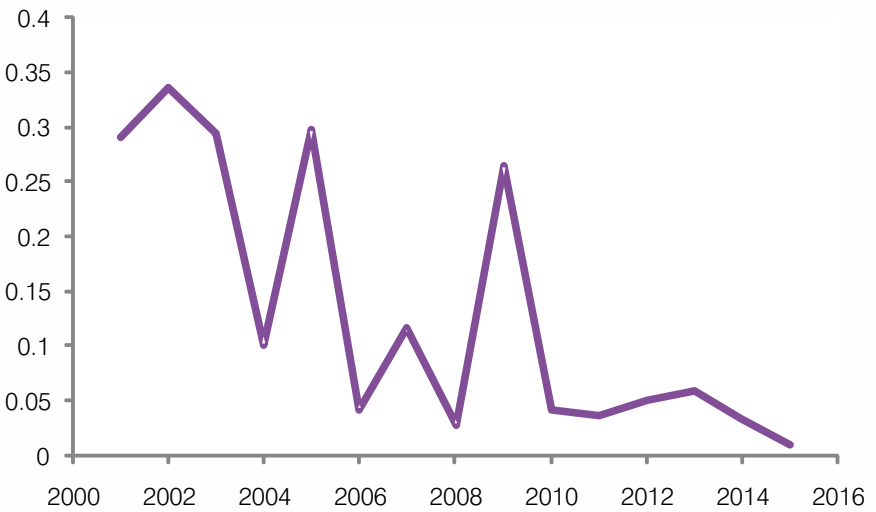
Injury Statistics



Distribution of loss time injuries with respect to Type of Accidents in DAE units-2015

During the calendar year 2015, there were 18 reportable injuries including two fatalities with a loss of 17,243 man-days

Incidence rates (IR) of DAE units are compared with that of similar industries across the country. The Non-fatal Incidence Rate in NPPs was 0.08 in 2015 as compared to 1.55 (2012) in other electricity generation companies in India. Non-fatal Incidence Rate in HWPs was 0.2 in 2015 as compared to 1.14 (2012) in other chemical manufacturing units in India. These figures, highlight, are better safety performance of some of the DAE units among other similar industries in the country. Following table gives the comparison of incidence rates in some DAE units with other similar industries in the country.



Year wise Comparison of Injury Index

Industry Type	Incidence Rate	
	Fatal	Non - Fatal
Heavy Water Plants (2015)	0	0.2
Manufacture of Chemicals & Chemical products (2012)	0.23	1.14
Nuclear Fuel Complex (2015)	0	0.92
Manufacture of Fabricated Metal Products except Machinery and Equipment (2012)	0.1	0.47
Nuclear Power Plants (2015)	0	0.08
Electricity, Gas, Steam and Air Conditioning Supply (2012)	0.33	1.55

Technical Cooperation

AERB continued its participation in international cooperation activities with organizations such as International Atomic Energy Agency (IAEA), Organization for Economic Cooperation and Development (OECD)/Nuclear Energy Agency (NEA), CANDU Senior Regulator's meeting, the VVER regulators forum and Multinational Design Evaluation Program.

AERB successfully hosted a four-day international workshop on NPPs -SAFETY & SUSTAINABILITY, combining the international Workshops CANSAS-2015 (CANDU Safety Association for Sustainability) & IW-NHNRTHS-2015 (International Workshop on New Horizons in Nuclear Reactor Thermal Hydraulics Safety) during December 8-11, 2015. AERB also hosted the 14th AERB-USNRC bilateral meeting and workshop at Mumbai during October 27-29, 2015. As a full member of the Multinational Design Evaluation Program (MDEP), AERB actively participated and contributed in the deliberations and activities.

AERB signed an arrangement for regulatory cooperation with Canadian Nuclear Safety Commission (the nuclear regulatory authority of Canada). AERB already has bilateral arrangements with the regulatory bodies of other countries namely, France, Finland, Russia, Romania, Ukraine and United States of America.

India is a contracting Party to the Convention on Nuclear Safety (CNS). AERB led the Indian Delegation to the Organizational Meeting of the CNS, in preparation of the Indian participation in the forthcoming 7th Review Meeting of CNS.

Public Outreach

AERB has the mandate to keep the public informed on major issues of radiological safety significance. AERB provides all necessary information to its stakeholders through its periodic newsletters, annual reports, web-site, press releases/ briefings etc. Regular updates were provided on post KAPS Unit-1 PT leak incident.

12 Press releases were issued on the different topical issues.

9 awareness programs on radiation safety covering a wide target audience.

3 exhibitions in Science and Technology fairs.

AERB continued strengthening its public outreach activity through awareness programmes with an aim to reach out to all sections of society (public, stakeholders, including manufacturers & suppliers, operator etc.) and bring awareness on the aspects of nuclear, radiation & industrial safety. In addition, financial support was provided to 35 seminars, symposia and conferences.

Advertisements in print media to sensitize the users on requirements of AERB for use of medical x-ray equipment as well as for users of radioactive sources or radiation generating equipment

AERB sought the views/ comments from public and other interested parties on the draft of the newly developed safety codes towards assessing the effectiveness of such process.

AERB continued its safety promotional activities by holding theme meetings, safety meets and distribution of safety awards to DAE units.


NIYAMAK BHAVAN-B

For your Information

Are you 'Handling' or 'In Possession of'
RADIOACTIVE SOURCE ?
(Medical, Industry or Research Applications)

If Yes, do you have a valid **Consent** from the Atomic Energy Regulatory Board (AERB)?

If No, What are you waiting for? **It's a matter of single click.**

Just file your application **'on-line'** through our user friendly **eLORA (E-Licensing of Radiation Applications) System**.
For more information, visit our website **www.aerb.gov.in**

Do you Know ?

It is mandatory to obtain Consent from the Atomic Energy Regulatory Board (AERB) for handling of radioactive sources.

Non compliance is a violation and is liable to attract penal action

If you have information of any person or an institution in 'possession' or 'handling' radioactive sources without AERB's Consent, please contact us.

Phone : +91-22-25990100

(09.15 hours - 17.45 hours during the working days)

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Help us in our Mission for ensuring safety in the use of radiation

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