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AERB Newsletter

ATOMIC ENERGY REGULATORY BOARD

CONTENTS

Editor:
Smt Sutapa Bhattacharya, AERB
sbhattacharya@aerb.gov.in

Editorial Consultant :
Dr. K.S. Parthsarathi, Ex-Secretary, AERB

From the Chairman's Desk

The Indian nuclear power programme is presently at the crossroads. There are presently 14 power reactors in India out of which 12 reactors are 220 MWe pressurized heavy water reactor (PHWR) and two are boiling water reactors (BWR). In addition two 540 MWe PHWRs are nearing the commissioning stage. Seven more reactors of different types, four 220 MWe PHWRs, two 1000 MWe VVERs and one 500 MWe prototype fast breeder reactor (PFBR) are in different stages of construction.

Thereafter there are plans to induct 700 MWe Pressurised Heavy Water Reactors, 500 MWe Commercial Fast Breeder Reactors and Advanced Heavy Water Reactors (AHWR) based on utilizing thorium.

These reactors are of different types with respect to design, materials of construction, instrumentation and control features. The regulatory review process needs to be properly tuned to the requirement of these new designs, for ensuring protection of the operating personnel, the public and the environment.

The 700 MWe PHWR is presently in the design stage. This reactor is an improved version of the 540 MWe PHWR and has some similar design characteristics. The improved reactor has the same reactor geometry and coolant features, but the partial boiling of the coolant changes the reactor physics and thermal hydraulics. This in turn affects the reactor control and instrumentation. These changes require changes in the regulation. AERB will have to study the safety aspect of similar reactors in operation abroad having features of partial boiling and evolve a suitable mode of regulatory control.

The second type next generation reactor would be the commercial fast breeder reactor (FBR). Unlike the PHWR and PWR, the FBR has unique safety characteristics and features to deal with the new coolant, liquid sodium, and no moderator is used. Sodium being highly reactive catches fire in contact with air and also reacts violently in contact with water. Hence an inert gas cover and double walled pipe and guard vessels are provided. All these factors cause corrosion erosion problem and a focussed attention is required to gain public acceptance for this reactor. This is another challenge for the regulatory body.

The AHWR can be considered as an evolutionary design of the PHWR. Principal safety features are essentially engineered passive systems such as cooling based on natural circulation flow. Achieving uniform flow in the natural circulation mode is going to pose a challenge for the designers.

All these reactors are to be constructed in the next decade or two and there is a need to look into the regulatory requirements of these next generation reactors in India starting from siting, design, construction, reliability of components, and operation. Critical components having new design will require particular attention. There will be a need for more continuous interaction between the designer and the regulator with a feedback from both the sides for finalising the design as well as the regulatory aspects. The ultimate objective must be to evolve better and safer designs.

Suhas P. Sukhatme.

NEWS

AERB -Expansion Project - Additional Building

AERB is expanding its activity along with enhancement of India's Nuclear Power Programme and also to cope up with the task of monitoring thousands of radiation facilities in non-DAE sector. An additional building adjacent to the existing one at Anushaktinagar, Mumbai has been planned and the technical verification of various contractors considered for construction was carried out. The dismantling of the temporary sheds where the additional building would be constructed has been done. The building is expected to be constructed and occupied by the year 2006.

Reconstitution of Committees from April to June 2004:

No.	Name of the Committee	Reconstituted on
1.	Advisory Committee on Occupational Health (ACOH)	May 31, 2004
2.	Safety Review Committee for Operating Plants (SARCOP)	June 21, 2004

Press Releases:

Unit-1 of Kakrapar Atomic Power Station shut down as per directive of AERB (April 22, 2004) :

The Kakrapar Atomic Power Station (KAPS) situated near Surat in Gujarat has two units of 220 MW each. On 10 March 2004, when Unit-1 was in operation generating 170 MW of electricity, an event involving rise of reactor power occurred. For controlling reactor power, adjuster rods are provided which move in or out of the reactor core as per the command from the Automatic Reactor Power Control System. While carrying out some maintenance work, power supply to these rods failed rendering them inoperable. At the same time, another design feature of the reactor power control system, called Automatic Liquid Poison Addition System got inhibited due to erroneous operator action. Also, the reactor overpower trip was not appropriate to the operating power level at that time. Reactor power increased slowly and the reactor tripped automatically on sensing of higher than permissible power by the reactor safety system as per design intent. The incident did not result in any damage to the plant or the reactor fuel and there was no radiological consequence. However, the event reflected certain weaknesses in safety culture at the plant and need for improving safety practices. Taking all these factors into account AERB provisionally rated the incident at level-2 of the International Nuclear Event Scale (INES). Levels 1 to 3 of INES relate to safety significant nuclear events and levels 4 to 7 are assigned to accidents. India is a participant in the INES reporting system.

KAPS and Nuclear Power Corporation (NPCIL) were asked to carry out investigations to identify the causes of the incident. Results of investigations and analyses by Expert Groups were discussed at length by the Safety Review Committee for Operating Plants of AERB on 31 March and again on 21 April 2004. Since the exact reasons for reactor power rise have not yet been clearly established, AERB directed the unit to be shut down as a measure of abundant caution. The station and NPCIL have been asked to carry out further detailed investigations. Accordingly, KAPS Unit-1 was shutdown in the early hours of 22 April 2004.

Kakrapar Atomic Power Station shut down as per directive of AERB (May 21, 2004):

On 10 March 2004, an event involving failure of the reactor regulating system had occurred in Unit - 1 of Kakrapar Atomic Power Station (KAPS). Consequently, reactor power had increased slowly and the reactor tripped automatically on sensing of higher than permissible power by the reactor safety system as per design intent. Even though the incident did not cause any damage to the plant or the reactor fuel and there were no radiological consequences, it reflected certain weaknesses in safety culture at the plant and the need for improving safety practices. Further as the investigations carried out till 21 April 2004 could not clearly establish the exact reasons for reactor power rise during the incident, AERB had directed the Unit to be shut down as a measure of abundant caution. The Unit continues to remain shut down since 22 April 2004. The incident was provisionally rated at Level-2 of the International Nuclear Event Scale (INES). Levels 1 to 3 of INES relate to safety significant nuclear event and levels 4 to 7 are assigned to accidents. India is a participant in the INES reporting system.

KAPS and Nuclear Power Corporation carried out further detailed investigations and analyses and these were reviewed by an expert group constituted by AERB. With this, the reason for reactor power rise during the incident could be explained and modifications to system hardware and procedures were identified to prevent recurrence of such events. The investigation results and the report of the expert group were discussed in AERB's Safety Review Committee for Operating Plants (SARCOP) on 14 May 2004 and in the Board of AERB on 20 May 2004.

Based on these detailed deliberations, the Board directed that modifications as recommended by the expert group be implemented in Unit - 1 as also in Unit - 2 of KAPS. Unit - 2 will also be shut down for this purpose. The Board also directed that with a view to improving the safety culture at the plant, refresher training pertaining to various aspects of the incident shall be carried out for all licensed operators and management staff of KAPS. They will be required to be relicensed after this training is imparted. KAPS Units - 1 & 2 will be permitted to restart only after implementation of the required system modifications and relicensing of the station personnel. ●

NEWS

Appraisal Programme for Manufacturers/ Vendors of Industrial Ionising Radiation Gauging Devices (IRGD):

The use of ionizing radiation all over the world has registered a phenomenal growth for a wide variety of purposes in medicine, research, agriculture industries and education. A number of physical parameters, viz. measurement of level in huge silos/tanks; density measurement; moisture content of soil; thickness measurement; concentration of hydrocarbons; ash content in coals; exploration of coal and oil, etc. are determined by using ionizing radiation, namely gamma rays, X-rays, charged particles - beta & alpha rays and neutrons. In India, about 7000 IRGD (Nucleonic Gauges) are being used in nearly 1300 institutions for on line industrial process control and quality control parameters. The numbers of IRGD are increasing because of their versatile industrial applications.

Different types of radiation sources with activity ranging from few Giga Becquerel to several Mega Becqueral are being used for this purpose depending on the applications and characteristics of sources. Though the activity of the radiation sources are very small, sealed sources with reasonably long half-lives are used in IRGD. Hence the sources have the potential to cause significant radiological hazards if they are not handled safely and are not provided with adequate physical security during their use, transport and storage. This necessitates the need of long lasting and effective regulatory control to ensure that the sources are safely used and disposed off. It has been observed in several parts of the world that that there is high probability of radioactive sources (used in IRGD) becoming orphan sources (not under regulatory control). This has caused fatalities or injuries to innocent members of the public and also posed adverse environmental impact and serious economic consequences.

Shri S.P. Agarwal, Head, RSD and Shri S.K. Sharma, Vice Chairman, AERB in appraisal Programme for Manufacturers/Vendors of Industrial Ionizing Radiation Gauging Devices.

On June 16, 2004 AERB organised an appraisal programme for manufactures and suppliers of IRGD. The objectives of the programme were

i) to familiarise manufacturers / vendors of IRGD/ Nucleonic Gauges with current radiation safety and regulatory requirements,

ii) to explain the role and responsibilities of manufactures / vendors in implementation of the radiation protection programme of AERB relevant to IRGD, and

iii) to obtain feedback from them on existing regulatory procedures in ensuring radiation safety while handling IRGD.

The programme was attended by 35 manufacturers / suppliers of IRGD in India, two representatives from abroad viz England and Germany, experts from the Board of Radiation & Isotope Technology (BRIT), Radiological Physics & Advisory Division (RPAD), BARC and Radiological Safety Division, AERB.

Shri S.P. Agarwal, Head, RSD narrated the objectives of the programme, Shri J.K. Ghosh, Chief Executive, BRIT in the presidential address mentioned that the source housings are mainly imported and BRIT is taking the initiative for indigenisation. Shri S.K. Sharma, Vice Chairman, AERB stressed the necessity of the built-in-design safety features in the design of IRGD mainly to avoid high probability - low consequence events.

The deliberations brought out suggestions and recommendations for

- conducting such appraisal programmes at least once in two years;
- organizing appraisal programme for the Department of Customs, Airport and Port Authorities,
- passing on information to AERB(by manufacturers/vendors) about the industries using IRGD/ sources;
- issuing circular to user institutions of IRGD asking them to declare the possession of unauthorized IRGD/ radiation sources procured (without the knowledge of AERB);
- keeping track of end users to whom IRGD are supplied and ensuring that the schedule for servicing and maintenance is adhered to
- organizing joint meetings between AERB, the Directorate General of Civil Aviation (DGCA) and Manufacturers/ Vendors of IRGD regarding the procedures for air transport of IRGD / Sources and
- initiating measures by the BRIT (Board of Isotope & Radiation Technology), to explore the possibility of indigenous manufacture of IRGD/ source/ source assemblies.

Manufacturers and Venders attending the Appraisal Programme of Industrial Ionizing Radiation Gauging Devices.

AERB Colloquia

AERB colloquia on the following topics were conducted in the AERB Auditorium.

1) Shri S. Sankar, Director, Reactor Group delivered a talk on "Life Management of Research Reactor-CIRUS" on May 03, 2004.

2) Dr. Om Pal Singh, Director, I&TSD made a presentation on the topic "Safety Design aspects of PFBR" on May 28, 2004.

FAST BREEDER REACTOR SAFETY

O.P. Singh
Director, Information & Technical Services Division, AERB

INTRODUCTION

Nuclear reactors are basically of two types, i.e., thermal and fast. In thermal reactors, most of the fissions are caused by thermal (low energy) neutrons and in fast reactors, most of the fissions are caused by fast (energy in keV range) neutrons. In fast reactors, more number of neutrons are emitted per neutron absorbed by a fissile material like Pu-239. Hence more neutrons are available to convert uranium (U-238) into Pu-239. This is a special advantage of fast reactors especially for U-Pu fuel cycle. That is, these can be used not only to produce power but also fissile material. When more fissile material is produced than consumed, these are called Fast Breeder Reactors (FBR). FBRs have special significance in the Indian context. Natural uranium resources in India are limited (~60,000 t). This is enough to set up only 15,000 MWe capacities. However, through breeder route, it can be increased by a factor of 60 to 80.

Unlike in thermal reactors, there is no moderator in a FBR to reduce the energy of fission neutrons. Thus, FBRs are of smaller size. Consequently, power density in fast reactors is high and a coolant with high heat transfer properties and minimum neutron moderating characteristics, is needed. In almost all FBRs, liquid sodium is used as the coolant. FBRs have unique safety characteristics and features. Here, these features are highlighted and the safety design aspects that bring a high level of safety in a FBR, are presented. It may be noted that reactor safety essentially means to protect the operating personnel, public and the environment from the radioactivity that is produced during the fission processes taking place in the reactor. This demands adequate shielding and means to keep contained the radioactive fission products generated in the reactor. Essentially, all the time a proper balance between heat produced and heat removed should be maintained.

SAFETY RELATED CHARACTERISTICS

The physics design of fast reactors is such that any disturbance in the system does not lead to divergence in power but tries to stabilize the power at a steady state. There are prompt reactivity feedbacks like Doppler that try to arrest uncontrolled power rise. Like thermal reactors, the kinetics of the reactor is governed by delayed neutrons and not by prompt neutrons. So the control of the reactor is quite easy. In FBR, the reactor core containing fissile material, is not in most reactive configuration. Therefore, there is potential of its acquiring more reactive configuration like in melting conditions and so leading to power rise. However, over the years, large number of experiments conducted in countries like France and USA have shown that under the conditions of fuel melting, the fuel sweeps out of the core that tends to shut down the reactor. Calculations done by experimentally validated computer codes also supports this observation. Moreover, sufficient measures are provided in the design to prevent melting of fuel/breach in clad and reactor is shutdown on detection of any fault leading to core over-heating or core under-cooling.

In a medium size or large size fast reactor, sodium voiding can lead to power rise. Suitable design provisions like core temperature and reactivity monitoring, are provided to prevent voiding of the core due to gas passing through the core and sodium boiling. The superheat of sodium in reactor is small. So there is no fear of sudden sodium vaporization. Molten fuel and coolant thermal interaction, is found to be benign.

Sodium is a reactive material and catches fire if it comes in contact with air. It also reacts violently if it comes in contact with water. To reduce the probability of sodium fire due to a leak, an inert gas cover and double walled pipe and guard vessel are provided. The material chosen for sodium components is highly ductile stainless steel for which leak before break criteria applies. So catastrophic failure is not possible. Provision is also made to drain sodium into the dump tank if a leak develops. Ability to detect very small leaks and time available for a small leak to develop into a large leak, enables to limit the consequences of leaks from sodium systems. Sodium-water reaction can occur in steam generators due to leak in tubes. The reaction products like hydrogen and sodium hydroxide promote corrosion and widen the leak. Therefore, provisions are made to monitor continuously the steam generator to detect the leak before it grows and to take measures to isolate sodium and water to minimize the quantities reacting in the event of a leak.

UNIQUE SAFETY FEATURES

Sodium as coolant provides large margin between the normal operating sodium temperature and the boiling point of sodium. Thus, significant temperature rise can be accommodated in the event of mismatch of heat generation and heat removal. High thermal conductivity, low viscosity and large difference between the temperature of hot sodium and ambient air, permit decay heat removal through natural convection mode. Pool type concept in which primary coolant components like pumps and intermediate heat exchangers are put in a big pool of sodium, is followed. This provides large thermal inertia in case of exigencies. Thermodynamic efficiency is high in FBR. Therefore, thermal pollution of the environment is less in FBRs. During normal operation, the radioactivity release to the environment and the exposure of operating personnel is significantly lower due to leak tightness of sodium circuit ensured by safety provisions such

AERB's SAFETY REVIEW OF PLANTS/ PROJECTS

Clearance Granted for Construction Beyond +17.0 m Elevation for Kudankulam NPP Reactor Building

Clearance for Construction Beyond +5.4 m and up to +17.0 elevation for hermetic portion of Reactor Building was granted in November, 2003 with a stipulation that further construction beyond +17.0 m is to be taken up only after satisfactory review of design of the liner around major penetrations. Following satisfactory review of the liner design around major penetrations, AERB granted Clearance for Construction Beyond +17.0 m elevation for Reactor Building of Kudankulam NPP on June 15, 2004.

Excavation Clearance Extended for PFBR

Clearance for Site Excavation for Prototype Fast Breeder Reactor (PFBR) was first granted during July, 2002 and it was valid for a period of one year, i.e. upto June 30, 2003. As the excavation works could not be taken up in the prescribed time frame, validity of excavation clearance was extended for a further period of one year i.e. up to June 30, 2004 on request from IGCAR. One more extension for a period of 3 months upto September 30, 2004 has been accorded to facilitate completion of balance excavation works for PFBR.

Hot Conditioning of Primary Heat Transport System of TAPP Unit - 4

NPCIL has submitted an application on July 2, 2004 for starting Hot-Conditioning of Primary Heat Transport System of TAPP Unit – 4. This is under review by AERB. This is the first time that an indigenously evolved PHWR design of 540 MWe capacity is under review by AERB and is being commissioned by NPCIL.

Study on the Effect of Soil Structure Interaction

The Civil & Structural Engineering Division has undertaken a study on the effect of soil structure interaction vis-à-vis modeling of soil springs during seismic analysis of building structures. It involves modeling of underlying soil media with different distribution of translational and rotational springs and study of the response of structural elements during an earthquake. A detailed analysis by modeling the soil media below using finite elements is also in progress. This would be helpful during the review of seismic analysis of nuclear power projects, particularly at Kalpakkam (PFBR) and Kudankulam (NPCIL).

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FAST BREEDER.....

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as guard vessel and pipes and inert argon cover gas above sodium free level. Fast reactors make better utilization of fuel. Consequently, the environmental impacts of operations like mining and subsequent processing is correspondingly lower.

SAFETY ASPECTS IN DESIGN

As in any other reactors, a defense in depth approach is followed by providing multiple barriers to radioactive Fission Products (FP) and by providing safety measures at three levels. Multiple barriers to the fission products are the fuel matrix that tries to retain the FPs, the clad material in which fuel is contained, closed primary coolant circuit and the containment building. Further, the following safety design measures are provided for proper control of the reactor, safety against operational transients, to prevent occurrence of accident and to mitigate their consequences.

Components and systems are designed as per established standards, codes and guides and quality assurance measures are followed in design, construction, commissioning and operation. In service inspection provisions are provided for all the important safety and safety related components and systems. To prevent total flow blockage in the coolant channels, multiple radial openings in sleeves in grid plate and in the feet of all the subassemblies are provided. Emergency power supply from diesel generators backed up by battery are also provided to the primary pumps. These features reduce the probability of fault occurrence and provide first level safety. At second level, core monitoring is done to detect any fault and ensure reactor shutdown. To maintain core integrity after reactor shutdown, the decay heat is removed by decay heat removal systems. The unreliability of these redundant and diverse systems is $<10^{-6}$ per reactor year. These measures reduce the probability of fault propagation. At third level, the reactor containment building is provided as containment so that even for a severe accident, radioactivity is contained and the dose rates for the public at the site boundary are less than the acceptable limit prescribed by regulatory bodies.

All the conceivable events that can lead to or have potential to lead to the fuel failure are postulated and analyzed using computer codes validated against theoretical benchmark and experimental results. This is to establish that safety systems like shutdown system, decay heat removal system and containment perform their designed function.

SUMMARY

Fast reactors have a number of good features that bring in them a good level of safety. Some initial fears related with reactor core and the use of sodium as coolant have turned out to be imaginary. Choice of good design concepts and structural materials, use of established standards, codes, guides and good quality assurance practices in design, construction, commissioning add to their safety. Extensive core monitoring, highly reliable shutdown and decay heat removal systems and analysis of all the conceivable events assure enhanced safety.

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VIEWS OF ELECTRONICS CORPORATION OF INDIA LIMITED ON THE REGULATORY PROCESS OF AERB

Shri G.P.Srivastava
Chairman and Managing Director, Electronics Corporation of India Limited

Electronics Corporation of India Limited (ECIL) is an industrial unit of the Department of Atomic Energy, Government of India and was set up in the outskirts of Hyderabad on 11th April 1967 by Dr A.S. Rao, the founding father. The basic mandate was to set up a comprehensive state-of-art electronics industry within the country to support the programmes of Indian Atomic Energy, Dept. of Space, Military equipment developments and the electronics required by general public.

The thrust has been to set up manufacturing facilities right from the Electronic Components level, Consumers' Electronic Devices, Antenna Products, Control Instrumentation, Radiation Monitors, Nuclear Detectors, Communication Equipment (for Civil and Defence), Electrical Instruments, Oscilloscopes, etc.

By and large, the industrial operational environment here can be broadly categorized as follows:

- Most of the Divisions are equipped with their own mechanical workshops consisting of machines like sheet metal, cutting, painting, drilling, milling, etc. These workshops would also be linked with plating and painting shops.
- Electrical Sub-systems and distribution thereupon.
- Few Divisions would have mechanical activities related with handling of Assembly Shops dealing with large size objects like Antennas, their mounts and testing after assembling on the test ranges.
- By and large, large section of Company deals with fabrication of printed circuit boards, wiring the racks and carry out their tests as per QA plans involving the environmental chambers and process of lacquering.
- A few laboratories utilize the radioactive substances for their usage in either development or production of detectors in non-destructive inspection systems.
- There are a few products, which use small quantities of explosives.

The factory is set up in the area of around 200 acres in a well laid out manner. This helps in creating support facilities distinctly away from each other making overall operational safety requirements relatively simpler. While the issues related to radioactive substances and explosives, have been placed in full accordance to the stipulations of AERB, the safety considerations at other places are by and large in tune with industrial safety requirements. Adequate care in respect of employees working around is in place. The regular inspections of the professionals from AERB, Mumbai has been providing continuous feedback towards upgrades required from time to time. The general awareness of safety in ECIL is reasonably high. We, at ECIL, strongly believe and try to promote for pollution free environment to all our employees taking care of industrial safety requirements – mechanical, chemical, electrical, radiations and environmental. We look forward to AERB towards suggestions to upgrade and maintain the excellent safety record at ECIL. ●

THE ATOMIC ENERGY ACT, 1962

(Some select provisions)

An Act to provide for the development, control and use of atomic energy for the welfare of the people of India and for other peaceful purposes and for matters connected therewith.

Be it enacted by Parliament in the Thirteenth Year of the Republic of India as follows :-

1. Short title, extent and commencement

(1) This Act may be called the Atomic Energy Act, 1962.

(2) It extends to the whole of India.

(3) It shall come into force on such date as the Central Government may, by notification in the Official Gazette, appoint.

2. Definition and interpretation

(1) In this Act, unless the context otherwise requires -

(a) "atomic energy" means energy released from atomic nuclei as a result of any process, including the fission and fusion processes;

(b) "fissile material" means uranium-233, uranium-235, plutonium or any material containing these substances or any other material that may be declared as such by notification by the Central Government;

(bb) "Government Company" means a company in which not less than fifty one percent of the paid up share capital is held by the Central Government;

(c) "minerals" include all substances obtained or obtainable from the soil (including alluvium or rocks) by underground or surface working;

(d) "notification" means notification published in the Official Gazette;

(e) "plant" includes machinery, equipment or appliance whether affixed to land or not;

(f) "prescribed equipment" means any property which the Central Government may, by notification, prescribe, being a property which in its opinion is specially designed or adapted or which is used or intended to be used for the production or utilisation of any prescribed substance, or for the production or utilisation of atomic energy, radioactive substances, or radiation, but does not include mining, milling, laboratory and other equipment not so specially designed or adapted and not incorporated in equipment used or intended to be used for any of the purposes aforesaid;

(g) "prescribed substance" means any substance including any mineral which the Central Government may, by notification, prescribe, being a substance which in its opinion is or may be used for the production or use of atomic energy or research into matters connected therewith and includes uranium, plutonium, thorium, beryllium, deuterium or any of their respective derivatives or compounds or any other materials containing any of the aforesaid substances;

(h) "radiation" means gamma rays, X-rays, and rays consisting of alpha particles,

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beta particles, neutrons, protons and other nuclear and sub-atomic particles, but not sound or radiowaves, or visible, infrared or ultraviolet light;

(i) "radioactive substance" or "radioactive material" means any substance or material which spontaneously emits radiation in excess of the levels prescribed by notification by the Central Government.

(2) Any reference in this Act to the working of minerals shall be construed as including a reference to the mining, getting, carrying away, transporting, sorting, extracting or otherwise treating of minerals.

(3) Any reference in this Act to the production or use of atomic energy shall be construed as including a reference to the carrying out of any process, preparatory or ancillary to such production or use.

3. General powers of the Central Government

Subject to the provisions of this Act, Central Government shall have power -

(a) to produce, develop, use and dispose of atomic energy either by itself or through any authority or Corporation established by it or a Government company and carry out research into any matters connected therewith;

(b) to manufacture or otherwise produce any prescribed or radioactive substance and any articles which in its opinion are, or are likely to be, required for, or in connection with, the production, development or use of atomic energy or such research as aforesaid and to dispose of such described or radioactive substance or any articles manufactured or otherwise produced.

(bb) (i) to buy or otherwise acquire, store and transport any prescribed or radioactive substance and any articles which in its opinion are, or are likely to be, required for, or in connection with, the production, development or use of atomic energy; and

(ii) to dispose of such prescribed or radioactive substance or any articles bought or otherwise acquired by it either by itself or through any authority or corporation established by it, or by a Government company;

(c) to declare as "restricted information" any information not so far published or otherwise made public relating to -

(i) the location, quality and quantity of prescribed substances and transactions for their acquisition, whether by purchase or otherwise, or disposal, whether by sale or otherwise;

(ii) the processing of prescribed substances and the extraction or production of fissile materials from them;

(iii) the theory, design, construction and operation of plants for the treatment and production of any of the prescribed substances and for the separation of isotopes;

(iv) the theory, design, construction and operation of nuclear reactors; and

(v) research and technological work on materials and processes involved in or derived from items (i) to (iv);

(d) to declare as "prohibited area" any area or premises where work including research, design or development is carried on in respect of the production, treatment, use, application or disposal of atomic energy or of any prescribed substance;

(e) to provide for control over radioactive substances or radiation generating plant in order to —

(i) prevent radiation hazards;

(ii) secure public safety and safety of persons handling radioactive substances or radiation generating plant; and

(iii) ensure safe disposal of radioactive wastes;

(f) to provide for the production and supply of electricity from atomic energy and for taking measures conducive to such production and supply and for all matters incidental thereto either by itself or through any authority or corporation established by it or a Government Company;

(g) to do all such things (including the erection of buildings and execution of works and the working of minerals) as the Central Government considers necessary or expedient for the exercise of the foregoing powers.

16. Control over radioactive substances.

The Central Government may prohibit the manufacture, possession, use, transfer by sale or otherwise, export and import and in an emergency, transport and disposal, of any radioactive substances without its written consent.

17. Special provisions as to safety

(1) The Central Government may, as regards any class or description of premises or places, being premises or places, in which radioactive substances are manufactured, produced, mined, treated, stored or used or any radiation generating plant, equipment or appliance is used, make such provision by rules as appear to the Central Government to be necessary —

(a) to prevent injury being caused to the health of persons employed at such premises or places or other persons either by radiations, or by the ingestion of any radioactive substance;

(b) to secure that any radioactive waste products resulting from such manufacture, production, mining, treatment, storage, or use as aforesaid are disposed of safely;

(c) to prescribe qualifications of the persons for employment at such premises or places and the regulation of their hours of employment, minimum leave and periodical medical examination and the rules may, in particular and without prejudice to the generality of this sub-section provide for imposing requirements as to the erection or structural alterations of buildings or the carrying out of works.

(2) The Central Government may, as respects the transport of any radioactive substance or any prescribed substance specified by an order issued under this Act as being dangerous to health, make such rules as appear to be necessary to prevent injury being caused by such transport to the health of persons engaged therein and other persons.

(3) Rules made under this section may provide for imposing requirements, prohibitions and restrictions on employers, employed persons and other persons.

(4) Any person authorised by the Central Government under this section, may, on producing, if so required, a duly authenticated document showing his authority, enter at all reasonable hours any premises, or any vehicle, vessel or aircraft for the purpose of ascertaining whether there has been committed, or is being committed, in or in connection with the premises, vehicle, vessel or aircraft, any contravention of the rules made under this section.

(5) In the event of any contravention of the rules made under this section, the Central Government shall have the right to take such measures as it may deem necessary to prevent further injury to persons or damage to property arising from radiation or contamination by radioactive substances including, without prejudice to the generality of the foregoing provisions, and to the right to take further action for the enforcement of penalties under section 24, the sealing of premises, vehicle, vessel, or aircraft, and the seizure of radioactive substances and contaminated equipment.

23. Administration of Factories Act, 1948

Notwithstanding anything contained in the Factories Act, 1948, the authority to administer the said Act, and to do all things for the enforcement of its provisions, including the appointment of inspecting staff and the making of rules thereunder, shall vest in the Central Government in relation to any factory owned by the Central Government or any authority or corporation established by it or a Government Company and engaged in carrying out the purposes of this Act.

27. Delegation of powers

The Central Government may, by order, direct that any power conferred or any duty imposed on it by this Act shall, in such circumstances and subject to such conditions as may be specified in the direction, be exercised or discharged also by—

(a) such officer or authority subordinate to the Central Government, or

(b) such State Government or such officer or authority subordinate to a State Government as may be specified in the direction.

5180 THE GAZETTE OF INDIA: DECEMBER 31,1983/PAUSA 10,1905 [PART II-SEC.3(II)]

DEPARTMENT OF ATOMIC ENERGY, New Delhi the 15th November, 1983

S.O.4772 — In exercise of the powers conferred by ***Section 27 of the Atomic Energy Act, 1962 (33 of 1962)****, and all other powers enabling him in this behalf, the President is pleased to constitute an Atomic Energy Regulatory Board (AERB) to carry out certain regulatory and safety functions envisaged under* ***Section16, 17 and 23 of the Act.;****........ The Board shall be responsible to the Atomic Energy Commission.*

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New Appointments in AERB during April to June 2004

Name	Grade	Date of Joining AERB
Shri Pravin Patil	SO/C	01/04/2004
Shri F.A.A. Sheikh	Driver	07/04/2004

Retirements from AERB during April to June 2004

Name	Grade	Date of Retirement
Smt. Sarojini L.	PPS	30/04/2004
Shri C.P. Raghvendran	SO/F	30/06/2004

HINDI DAY CELEBRATION

A prize distribution function for AERB employees was organised on May 31, 2004 for various competitions in Hindi, held in the year 2003. Prof S.P.Sukhatme, Chairman AERB as Chief guest distributed the prizes among the winners and released the second issue of "Niyamika", the Hindi House Magazine of AERB. Shri S.K.Sharma was the Chairman of this function. Shri S.P.Agrawal, Chairman Official language Implementation Committee presented the activities of the Hindi Section of AERB.

Hindi competitions on quiz, translation, debate, dictation, extempore speech, typing, slogan, memory test and cross word puzzle were conducted. A total of 34 prizes were presented in three groups A, B and C i.e, Hindi speaking(group-A), mother tongue similar to Hindi (group-B) and non Hindi speaking(group-C). Shri Kavi Upreti got the maximum number of prizes in Group A, Shri Vikas Satvilkar in Group B and Smt Sheela Menon in Group C. A cultural programme was held at the end.

Smt. Sheela Menon receiving award for Hindi Competitions from Chairman AERB.

Workshop on "AERB Code and Guides for Safety in Design of NPPs" :

A workshop on "Safety Design Codes and Guides" was conducted in the AERB auditorium during 28-29 June 2004. It was attended by sixty technical staff from NPC Head quarters, NPP sites, BARC, IGCAR and AERB. Shri S.B.Bhoje, Former Director IGCAR inaugurated the Workshop.

The faculty from NPCIL, BARC and AERB made presentations on *fifteen published design documents and one manual at the publication stage*. The discussions which followed by the presentation were informative and a need for improvements and modifications in the documents was felt, keeping in view the latest developments highlighted during the discussion.

A panel discussion was held at the end. The panelists were Shri S.K. Sharma, Vice-Chairman, AERB, Shri S.S. Bajaj, Sr. Executive Director (Safety), NPCIL, Shri S.A. Bhardwaj, Sr. Executive Director (Engineering), NPCIL, Shri P. Hajra, Head, Safety Analysis and Documentation Division, AERB. It was chaired by Shri S.B. Bhoje. The major suggestions were made are as follows:

Workshop in AERB Codes or Guides.

- In 220 MW and 500 MW PHWRs, information and regulatory requirements for Pressurised Water Reactors and Fast Breeder Reactors should be given in the documents.
- The development of the documents should be based on established practices, experience gained in analysis, testing and usages.
- The design code under revision should also contain aspects of civil engineering, industrial safety and security and physical protection.
- Frequency of occurrences of all events at stations should be compiled and compared with the design basis events to serve as a good feedback to reactors of new design.
- Analysis of certain identified 'beyond design basis accidents' (BDBAs) should be added.
- Deterministic analysis should be added during Probabilistic Safety Analysis studies/ reviews.

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