

## DEVELOPMENT OF REGULATORY DOCUMENTS

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AERB has been entrusted with the responsibility of laying down safety requirements in the form of regulatory documents that would serve as the basis for conducting the design and operational safety review for granting consent to the nuclear and radiation facilities in the country.

AERB has been engaged since its inception in the development of these documents in the form of safety codes and safety standards for siting, design, operation, quality assurance and radioactive waste management and related guides and manuals for nuclear and radiation facilities. In order to ensure good quality of the documents, the best expertise available nationally is made use of and each document is developed after extensive discussions and consultations. The safety standards of the IAEA and nuclear regulatory bodies of other countries are also taken into account while developing our regulatory documents.

In the early days the Health Physics Division of BARC issued a number of safety documents. In 1982 the Department of Atomic Energy Safety Review Committee (DAE-SRC) brought out a comprehensive document entitled 'Radiation Protection Manual for Nuclear Facilities' which remained for a long time a reference document for radiological safety. Soon after AERB was established in 1983, the work on development of safety documents was taken up in earnest, thanks to the initiative of A.K. De, the first Chairman of AERB. As a result we have today a large number of safety documents issued by AERB that cover all important safety aspects of nuclear power plants, the fuel cycle facilities and application of radiation in medicine, industry and research.

### **AERB Regulatory Documents: First Decade**

The nuclear power stations at Tarapur (TAPS 1&2), Rajasthan

(RAPS 1&2) and Kalpakkam (MAPS 1) were all in operation and the design safety review of Narora Atomic Power Project (NAPP 1&2) was in progress when the Atomic Energy Regulatory Board was constituted. Advisory Committees were constituted during mid eighties for preparation of safety codes in the fields of design, operation and quality assurance. This was carried out to facilitate the safety review process of the operating plants and also for the purpose of design review of nuclear power plants. In addition to specialists from AERB, experts from various DAE research units such as BARC and IGCAR, from Nuclear Power Corporation of India Limited (NPCIL) and from research and academic institutions such as IITs, Government Departments and Undertakings and several retired experts participated in this effort.

The Advisory Committee for preparation of the Code of Practice in Design of Nuclear Power Plants was constituted under the Chairmanship of S.K. Chatterjee. In addition to the task of preparing the code, the committee was also given the responsibility to identify different disciplines for which safety guides need to be prepared to elaborate the provisions specified in the safety code and initiate action for preparation of the same. Similarly under the Chairmanship of N. Ramamurthy and V.S.G. Rao Advisory Committees were constituted for preparation of Code of Practice on Safety in Nuclear Power Plant Operation and Code of Practice on Quality Assurance for Safety in Nuclear Power Plants respectively. P.N. Armugham was Chairman of the apex Committee, the Advisory Committee on Nuclear Safety which finally reviewed these codes prior to submission to Chairman, AERB for approval and publishing. During the period when our safety codes were unavailable, the relevant safety standards of International Atomic Energy Agency (IAEA) and those of other advanced countries were used as reference material during design safety review of nuclear power project proposals.

In late 1980s when more proposals were received for nuclear power projects such as for Kaiga-1&2, RAPP-3&4, Kudankulam

NPP-1&2 and TAPP 3 &4, the need for codal requirements for safety in siting was felt. An Advisory Committee was constituted by AERB in 1988 under the Chairmanship of T. Subbaratnam for preparation of the Code of Practice on Safety for Nuclear Power Plant Siting. This safety code was published in 1990. Following the severe accidents at TMI (1979) and Chernobyl (1986) greater emphasis was placed on the emergency preparedness plans at all the Indian nuclear power plant sites and AERB brought out two safety manuals for on-site and off-site emergency preparedness.

Regulatory documents were also prepared in the area of radiological safety particularly for medical and industrial applications. Safety codes on Brachytherapy sources and Telegamma therapy equipment and installations, and also for the transport of radioactive material were issued as early as in 1986. A few safety guides and safety manuals in the field of industrial and medical applications were also issued during this period.

Thus a good beginning was made for development of regulatory documents within a few years of the establishment of AERB. In fact by the end of the first decade of its formation, AERB had issued as many as 30 safety documents.

### **AERB Regulatory Documents: The next 15 Years**

Based on the feedback from the early experience, a well structured scheme was put in place for the development of regulatory documents. The responsibility for this important task was assigned to the Safety Analysis and Documentation Division (SADD) (erstwhile Nuclear Safety Division) of AERB. Following four broad areas cover all the documents:

- (i) Regulatory process
- (ii) Nuclear safety
- (iii) Radiological safety
- (iv) Industrial and fire safety

In line with international practice, AERB has adopted a formal hierarchical structure for the regulatory documents which comprises of three distinct categories:

- (i) Safety Codes and Standards
- (ii) Safety Guides and Guidelines
- (iii) Safety Manuals

Safety codes and safety standards are formulated on the basis of experience and internationally accepted safety criteria for design, construction and operation of nuclear and radiation facilities and their specific equipment, structures, systems and components. The requirements specified in these documents are mandatory. Safety codes and safety standards establish the objectives and also set the requirements that shall be fulfilled to provide adequate assurance for safety in nuclear and radiation facilities. The requirements specified in codes and standards are elaborated in safety guides and methods are described in these documents to fulfill these requirements. The recommendations in safety guides are not mandatory and the applicant can choose other methods also, but the onus of demonstrating to AERB that the chosen methods meet the requirements of the code or standard lies with the applicant. Safety guidelines are documents which lay down requirements along with elaborations of how to meet them. These documents are generally developed for the facilities for which no codes are in existence.

Another category of regulatory documents called safety manuals are issued for specific activities and they elaborate on specific aspects that may contain technical information and procedures.

### **Process of Regulatory Document Development**

A Working Group consisting of experts in the subject prepares the initial draft of a safety document and thereafter keeps track of all comments received and their disposition during revision of the draft.

An Advisory Committee consisting of experienced senior experts by the relevant field reviews the draft document. A number of such Advisory Committees have been constituted in AERB for identified areas. The Advisory Committee reviews the document from the point of view of content, clarity, consistency with other documents and completeness. The Committee also identifies organizations and the relevant experts whose comments are sought on the document. All experts' comments are tabulated by the Working Group and are reviewed by the Advisory Committees. The Advisory Committee then decides on the disposition of the comments received with reasons recorded. The document is then revised by the Working Group in light of the decisions of the Advisory Committee on comments received.

The revised draft undergoes 'technical editing' by an independent expert who is conversant with the subject but is not associated with the preparation of the document, to focus on flow and clarity of language from the point of precise and unambiguous communication of technical contents to a reader.

An apex committee comprising specialists of national standing subsequently reviews the revised draft. This committee not only oversees the draft from the point of view of technical accuracy and implementability but also takes into account generic safety issues, policies and philosophies of safety management. The Working Group then revises the document taking into account the suggestions by the apex committee.

The document then undergoes 'copy editing' for improved clarity in language and presentation. The Working Group incorporates the suggestions of the copy editor to arrive at the final version of the document.

The document thus developed is finally submitted to Chairman, AERB along with a summary note on its evolution for approval of publication. In case of safety codes, the Board of AERB issues the approval for publication.

With a view to improving the procedure for regulatory document development and the quality of the documents, a safety document development proposal (SDDP) was recently introduced. This procedure helps by way of resolving matters of fundamental nature such as the need for the document, its scope, structure, contents and reference documents to be used in the preparation process before detailed work on document preparation is taken up. The SDDP is subjected to the same review process as followed for the document itself.

Regulatory documents were developed for nuclear and radiation facilities as detailed below:

## **Regulatory Process**

### **Regulation of Nuclear and Radiation Facilities**

During 1995 under the guidance of S.S. Ramaswamy, who was also then a Board member of AERB, a safety code on regulation of nuclear and radiation facilities was finalized. In this document, procedures for issuance of regulatory consents, and for regulatory inspection and enforcement of safety provisions for various nuclear and radiation facilities were formulated. The code identifies various stages of regulatory consents and the procedure for safety review and assessment during the consenting process. The information to be supplied by applicant for any regulatory consent and the responsibility of the consentee are also stipulated in the document. This code also addresses the requirements for conducting various regulatory activities. A safety guide under this code identifies various downstream documents to be prepared for regulatory activities and a procedure for development of such documents.

### **Regulation of Radioactive Waste**

Responsibility for development of regulatory documents on radioactive waste management for nuclear as well as radiation facilities is assigned to another Advisory Committee. The AERB Code on 'Management of Radioactive Waste' has been published, which

covers various safety aspects relating to management of radioactive waste arising out of all practices. Safety guides dealing with management of waste from various nuclear and radiation facilities have also been published under this code.

## **Nuclear Safety**

### **Nuclear Power Plants**

As described earlier, in the scenario of development of regulatory documents for nuclear facilities, the initial thrust was on the development of regulatory documents in the areas of siting, design, operation and quality assurance activities relating to nuclear power plants only. In recent years preparation of regulatory documents for facilities at the front end and back end of the fuel cycle has also been taken up.

After issuance of safety codes in the areas of siting, design, operation and quality assurance relating to nuclear power plants, the respective Advisory Committees identified the safety guides to be prepared under each safety code and these were prepared and issued. Working Groups assist each of these committees in the preparation of the first draft of the identified documents. For regulatory documents relating to nuclear power plants, the Advisory Committee on Nuclear Safety (ACNS) is the apex body for review of these documents.

The regulatory documents are also updated periodically. For example, the code of practice for operation of NPPs issued in 1989 has been revised recently along with a few of the related safety guides. The code of practice on Quality Assurance in NPP was issued in 1988 and is being revised presently.

### **Nuclear Fuel Cycle Facilities**

Preparation of regulatory documents for nuclear facilities other than nuclear power plants has been initiated in recent years only.

Because of the diverse nature of the facilities, which are quite different from nuclear power plants, a different Advisory Committee has been constituted for preparation and review of these documents. A number of safety guides have been identified for preparation relating to various activities in fuel reprocessing plant such as design, operation, commissioning, quality assurance, decommissioning, physical protection, emergency preparedness, etc. on similar lines as for nuclear power plants. Action has also been initiated for preparation of regulatory documents for other facilities such as uranium mining and milling, fuel fabrication, heavy water plants, etc. These documents are reviewed by the Advisory Committee for Safety Documents relating to Fuel Cycle Facilities other than Nuclear Power Plants (ACSD-FCF) before submission to the Board for approval.

### **Civil Engineering**

A need for regulatory documents in the field of civil engineering was felt and accordingly an advisory committee was constituted for identification and preparation of regulatory documents on civil engineering structures important to safety of nuclear facilities. The Committee has prepared five safety standards which have been reviewed by ACNS before publication. Except the safety standard on Design of Nuclear Power Plant Containment Structure, all other standards are applicable to NPP as well as other nuclear facilities.

### **Radiological Safety**

#### **Radiation Facilities and Transport of Radioactive Material**

Radiation facilities cover a wide spectrum of radiation sources, equipment and installations. Wide ranging activities in the field of medical, industrial, agricultural, research applications, etc. are to be covered while preparing regulatory documents on radiation facilities. Efforts made during the early days of AERB resulted in publication of safety codes on some medical installations such as Teletherapy facilities, Brachytherapy facilities and Nuclear medicine facilities.



Safety codes on Industrial Radiography and Transport of Radioactive sources and safety standards on other industrial applications such as ionizing radiation gauges, consumer products and gamma irradiators were prepared in the later years. In addition to the safety codes and safety standards, a number of safety guides have been prepared covering various areas of applications and also for transport of radioactive materials.

A number of these regulatory documents require updating in view of developments which have taken place over the years. For this purpose and considering the ever changing scenario, a Standing Committee for Review and Revision of AERB's Radiation Safety Documents (SCRSD), currently chaired by A.R. Reddy, has been constituted. A number of regulatory documents in areas such as food processing, particle accelerators, research, education, security of radioactive sources, etc. have been identified for preparation. The regulatory documents, after review by this committee, are forwarded to the Advisory Committee on Radiological Safety, which is the apex body for the purpose currently chaired by U.C. Mishra.

### **Industrial And Fire Safety**

The area of industrial safety covers regulatory requirements and guidance on fire safety, personnel safety and safety management, and the Advisory Committee on Industrial and Fire Safety (ACI&FS) is overseeing the development of the regulatory documents in this area. In addition to the safety standard on Fire Protection Systems of Nuclear Facilities, a few safety guides and safety manuals are already available for areas such as personal protective equipment, works contract, safety report format, pre-employment medical examination, etc.

### **Summing Up**

Development and periodic revision of safety documents is a

continuous process due to the evolution of technology and availability of new information from research and experience, and AERB is alive to this situation. In the past twenty five years a total of 127 regulatory documents have been published by AERB comprising of 25 safety codes and standards, 86 safety guides and guidelines and 16 safety manuals and technical documents. While the availability of regulatory guidance is good with respect to PHWR type nuclear power plants, sustained efforts are now being put in to cover other reactor designs as also fuel cycle facilities, and emerging technological advances in the medical and industrial applications of radiation.

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