

India is signatory to several international conventions related to nuclear safety and security such as Convention on Nuclear Safety (CNS), Convention on Physical Protection of Nuclear Material and its 2005 Amendment, Convention on Assistance in the case of Nuclear Damage and Radiological Emergency, Convention on early notification of nuclear accident etc. India is also committed to implement the provisions of Code of Conduct on safety of research reactors and code on safety and security of radioactive sources. AERB is obliged to fulfil the responsibilities assigned to it under these instruments. AERB actively participates and contributes in several multi-lateral international platforms working for promotion of nuclear and radiological safety.

AERB also has bilateral cooperation arrangement with the regulatory bodies of other countries for information exchange and experience sharing related to regulation of nuclear and radiation safety. AERB has bilateral arrangements with the nuclear regulatory authorities of France, Russia, Romania, Ukraine, the United States of America, Finland, Canada, Bangladesh and the United Kingdom. AERB also has an agreement with IRSN, which is a Technical Support Organisation in France. Some of the important activities undertaken under the multilateral and bilateral international cooperation activities during the year are brought out in following paras.

10.1 STRENGTHENING NUCLEAR SAFETY AND SECURITY

10.1.1 IAEA General Conference

Shri G. Nageswara Rao, Chairman, AERB attended the 63rd Regular Session of the IAEA General Conference and the Senior Safety and Security Regulators' Meeting held during September 16 - 20, 2019 at Vienna, Austria. The delegation was led by Shri K. N. Vyas, Secretary, DAE and Chairman, Atomic Energy Commission (AEC), GOI.



Shri. G. Nageswara Rao, Chairman AERB, during interaction with Dy. Director General, IAEA on the sidelines of General Conference

Shri Rao attended the Senior Safety and Security Regulators Meeting on September 19, 2019. Sessions were held on 'Managing Regulatory Competence for Nuclear Safety and Nuclear Security' to obtain Member States' perspectives and on 'Application of the Concept of Graded approach in Core Regulatory Functions'.

10.1.2 Conference on 'Effective Nuclear and Radiation Regulatory Systems'

IAEA in cooperation with the European Commission/ Joint Research Centre organised an International Conference on 'Effective Nuclear and Radiation Regulatory Systems: Working Together to Enhance

Cooperation' held at The Hague, The Netherlands during November 4-7, 2019. Around 240 participants from various countries participated in the Conference including 7 from India. This was the fifth conference in its series and the first one with extended scope to include regulatory systems for radiation applications also. The objective of the conference was to share regulatory experiences related to improving the effectiveness of nuclear and radiation regulatory systems, taking into account the outcomes of the past conferences in this series with primary focus on how to work together to address cross-cutting regulatory areas.

The Indian delegation made an impactful impression and the key issues emphasised by Indian delegation as part of invited talks and remarks by Session Chairs and Co-chairs were noted for inclusion in the summary report of the Conference.

10.1.3 CANDU Probabilistic Safety Assessment (PSA) Working Group

CANDU PSA Working Group (CPWG) organized a technical meeting at Vienna, Austria during September 30 to October 4, 2019. The objective of CPWG is to serve as an international forum to support regulatory authorities, utilities and designer in their respective area of PSA, to harmonize regulatory approaches on the use of PSA, to exchange information on national practices, PSA models and tools, regulatory review of CANDU member states and exchange of results of regulatory review, internal guidelines for use and review of PSA and to produce technical reports on selected topics related to CANDU / PHWR NPPs.

AERB officials submitted responses to questionnaires mainly on Level-2 PSA w.r.t. Plant Damage States-



Executive Director, AERB as part of the Panel Discussion on Leadership and Management for Safety and Security



Executive Director, AERB making presentation in Conference



Indian Delegation in Conference

Glimpses of International Conference on 'Effective Nuclear and Radiation Regulatory Systems'

Procedure, Modelling of Emergency Mitigating Equipment and Severe Accident Management Guidelines actions, Uncertainty / Sensitivity/ importance analyses methods and End states definition and Release category definitions. Computer code(s) used for simulation of the severe accident sequences and Off-Site Consequence Analysis.

The position papers on Plant Damage States for Level-2 PSA and Offsite Consequence Analysis were prepared based on responses from CPWG member countries. AERB officials contributed in the preparation of IAEA TECDOC on 'Level-2 PSA Practices for Nuclear Power Plants with CANDU Type Reactors'.

10.1.4 IAEA Coordinated Research Project (CRP) on Multi-unit PSA

The 2nd Research Coordination Meeting under the IAEA CRP on PSA Benchmark for Multi-Unit/Multi-Reactor sites was held at IAEA, Vienna during June 18-21, 2019 with an objective to share information and obtain feedback on the methodology of multi-unit PSA developed and demonstrated with a benchmark site by each member state. AERB expert contributed in reporting the following activities accomplished as part of the first-year progress:

- Multi-unit PSA model incorporating dependencies in an integrated manner
- Identification of Multi-unit initiating events
- Amalgamation of event sequences of multi-units in single event tree
- Modelling of event tree sequences of each unit into multi-unit sequences.

10.2 MULTILATERAL INTERNATIONAL COOPERATION

10.2.1 AERB Joined as Member of AER, Hungary

AERB joined the Atomic Energy Research (AER), Hungary as member organisation. AER is an international community of researchers, engineers and operators from countries running the VVER type nuclear reactors (the type of reactors in Kudankulam). The objective of AER is to promote information exchange among VVER utility staff, Designers, R&D institutes and Safety authorities. The AER also assists its member

organisations to perform investigations and research to enhance the safety and economic cooperation in VVER type reactors.

10.2.2 IRRS Mission

The IAEA Integrated Regulatory Review Service (IRRS) is designed to strengthen and enhance the effectiveness of the national regulatory infrastructure of the States (Countries) for nuclear, radiation, radioactive waste and transport safety. The intention is to peer-review the regulatory framework of the host country so as to make it a robust regulatory body with respect to all its regulated facilities and activities. The review is carried out against the IAEA Safety Standards and Requirements.

(i) AERB to Host IRRS Follow-up Mission

Government of India has made a request to International Atomic Energy Agency (IAEA) to undertake an IRRS follow up mission for peer review of India's regulatory framework for nuclear and radiation safety. Based on the request, the IAEA has scheduled IRRS follow up mission around November 2020, with the preparatory meeting in June 2020. Earlier AERB hosted the IRRS Mission, the first ever international peer review of AERB by a team of IAEA during March 16-27, 2015 for peer review of India's legal and regulatory framework for safety regulation of nuclear power plants and projects. For the follow-up mission, India requested IAEA to extend the scope by including the 'Radiation Source Facilities and Activities' as an additional area of review.

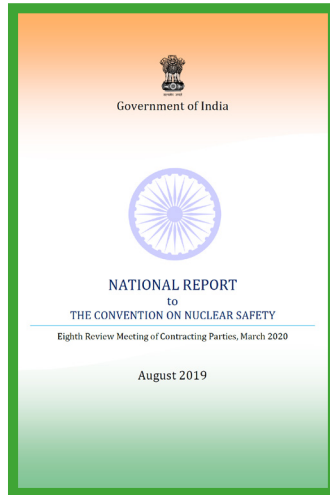
(ii) Participation in IRRS Mission of other Countries

One AERB officer participated as member of IAEA IRRS mission of the United Kingdom (UK) conducted during October 13- 25, 2019. The team comprised of 18 members from different countries and IAEA, to review various aspects of regulatory functions of the host country.

AERB expert reviewed the core IRRS Modules comprising of Safety Review, Authorisations, Regulatory Inspections, Safety Documents and Enforcement in the domain of Exposures to Public. The scope of the mission covered both Nuclear Fuel Cycle Facilities and radiation sources.

10.2.3 Indian National Report to 8th CNS

India is a Contracting Party to the Convention on Nuclear Safety (CNS) and actively participates in its activities towards fulfilling the obligations of the convention. The convention aims to commit participating countries operating land-based civil nuclear power plants to maintain a high level of safety by setting international benchmarks to which the countries would subscribe. Pursuant to this, India has already submitted its National Report for 8th Review Meeting of



CNS on August 15, 2019. The report narrates India's position and actions undertaken during the past three years towards the fulfilment of its obligations under the convention. Indian Report was reviewed by Contracting Parties, on AERB which received total 116 questions and provided answers to all these questions within the stipulated time.

AERB has reviewed the CNS national reports of other contracting parties of CNS and posted the questions as per the CNS calendar.

CNS peer review framework requires conduct of an Officers Turnover Meeting as an important step towards imparting training to the representative of the participating Contracting Parties. The same was held during March 1-3, 2019 and attended by a senior officer from AERB. The 8th Review Meeting of the CNS is planned during March, 2020.

10.2.4 NEA/MDEP Activities

AERB continued to coordinate the activities related to India's participation in the Nuclear Energy Agency (NEA) of Organisation for Economic Cooperation and Development (OECD). During the period, AERB experts contributed in the following programmes:

- Two officers worked on Recombiner Performance and Hydrogen Combustion related studies at Becker Technologies, Germany as part of OECD/NEA THAI-3 project.
- AERB officer participated and contributed in 20th meeting of AP1000 WG of MDEP in USA, during December 10-13, 2019.



Shri D. K. Shukla, ED, AERB, Shri S. K. Ghosh, Head, DRI and Shri S. Harikumar in IAEA-CNS officers' turnover meeting



Chairman, AERB interacting with GAEC Delegation



Participants of AERB-STUK Bilateral Meeting

10.3 BILATERAL INTERNATIONAL COOPERATION

10.3.1 Ghana Atomic Energy Commission (GAEC)

The Director General and Director of Ghana Atomic Energy Commission visited AERB on January 28, 2019. GAEC delegation was briefed about Indian nuclear regulatory infrastructure and AERB's regulatory oversight for nuclear and radiation facilities. Ghana delegation also shared their plan for nuclear power programme and safety aspects being considered for finalising the NPP.

10.3.2 Bilateral Meeting between AERB and STUK, Finland

A bilateral meeting between AERB and STUK, the nuclear regulatory body of Finland was held during November 18-20, 2019 at AERB, Mumbai. A four member delegation from STUK was led by its Director General, Mr. Petteri Tiippana. AERB delegation was led by Chairman, AERB, Shri G. Nageswara Rao and the technical sessions were led by Executive Director, AERB, Shri D.K. Shukla. Experts from BARC were also invited to make presentations on technical topics. Experience with regulatory review of VVER and EPR type of nuclear reactors, regulation in application of radiation sources, regulation and national practices in radioactive waste management were discussed during the meeting. The exchange of views was mutually beneficial. AERB and STUK expressed their willingness to carry forward the

cooperation in the areas of mutual interest. As a part of the meeting, STUK delegation also visited Tarapur Atomic Power Station-3&4.

10.3.3 Support to Regulatory Authority of Mauritius

AERB provided assistance to Radiation Safety and Nuclear Security Authority (RSNSA), the regulatory authority of Mauritius, in the review and assessment of layout design of the proposed radiotherapy and nuclear medicine facilities at New Cancer Hospital (NCH), Solferino, Mauritius. AERB reviewed the layout plans for installation of radiotherapy equipment (Accelerators, Cyber-knife unit, HDR Brachytherapy, CT Simulator) and nuclear medicine equipment (SPECT-CT & PET-CT machines) from radiation safety viewpoint and provided the assessment report and recommendations to RSNSA.

10.4 PARTICIPATION IN INTERNATIONAL COMMITTEES

AERB has been actively involved with various international bodies for exchange of information and in co-operation in the field of regulation of nuclear activities for peaceful purposes. AERB experts have been actively participating in various activities of IAEA and have been contributing at various other international fora. AERB is the national coordinator for IAEA- International Nuclear and Radiological Event Scale (INES) based reporting of events and IAEA/NEA - Incident Reporting System (IRS)

and Fuel Incident Notification and Analysis System (FINAS).

AERB participates in various Technical and Consultants' meetings organised by IAEA on a range of topics for NPPs, Fuel Cycle Facilities, Radiation Facilities, Transportation of Radioactive Materials and Illicit Trafficking of Radioactive Materials. AERB has been participating in IAEA Coordinated Research Programme (IAEA-CRP) and NEA joint projects and information exchange programmes.

10.4.1 Participation of AERB in IAEA Activities

In this year, AERB officials participated and contributed in the following Technical and Consultancy meetings by IAEA.

- (1) Annual Meeting of the Regulatory Forum for Safety of Uranium Production and Naturally Occurring Radioactive Materials (REGSUN)
- (2) Annual Joint IAEA-WANO Centre Meeting to Exchange Operating Experience
- (3) International Nuclear and Radiological Event Scale (INES) Advisory Committee (AC) and Train the Trainers Workshop on the INES
- (4) 36th Meeting of Atomic Energy Research Scientific Council (AER-SC)
- (5) IAEA Convention on Nuclear Safety (CNS) Offices Turnover Meeting
- (6) 39th IAEA Meeting of TRANSSEC Committee
- (7) 42nd Meeting of the Committee of Nuclear Regulatory Activities
- (8) 46th Meeting of Commission on Safety Standard (CSS)
- (9) 46th meeting of the Radiation Safety Standards Committee (RASSC)
- (10) 48th Meeting of Nuclear Safety Standards Committee
- (11) Technical Meeting (TM) on CANDU Probabilistic Safety Assessment
- (12) TM on Accident Tolerant Fuel (ATF)
- (13) TM of CANDU Senior Regulators
- (14) TM on Modelling of Fuel Behaviour in Design Basis Accidents (CRP-FUMAC), Design Extension Conditions (CRP-ACTOF)
- (15) TM on Safety in Site Evaluation and Design to Protect Nuclear Installations against External Hazards
- (16) TM on Case Studies: Experience of Member states in Building a Regulatory Framework for the oversight of New NPPs
- (17) TM on Current Practices in the Transition from Emergency Operating Procedures to Severe Accident Management Guidelines
- (18) TM on the Implications of the New Dose Conversion Factors for Radon
- (19) TM on the International Reporting System for Operating Experience National Coordinators
- (20) TM on Managing the Interface between Safety and Security for Nuclear Fuel Cycle Facilities
- (21) TM on Progress on Pellet Cladding Interaction and Stress Corrosion Cracking: Experimentation, Modeling and Methodologies Applied to Support the Flexible Operation of Nuclear Power Plants
- (22) TM on Decommissioning of Uranium Production Facilities and other Facilities containing Naturally Occurring Radioactive Materials (NORM)
- (23) TM on the Management of Direct Current Power Systems and Application of New Devices in Safety Electrical Power System for NPP
- (24) TM on Ageing Management for Nuclear Fuel Cycle Facilities
- (25) IAEA-International Generic Ageing Lessons (IGALL) WG-3 meeting on Civil Structures
- (26) 3rd IAEA IGALL WG-4 on Regulatory Aspects of the preparation for Long term Operation
- (27) Open-ended meeting of Technical and Legal Experts to Share information on States 'Implementation of the Code of Conduct on the Safety and Security of Radioactive Sources'.

10.4.2 Participation in International Conference/ Workshops /Training

During the year, AERB officers attended/participated in following international Conference /Workshop/ Training programmes on various themes of interest.

CONFERENCE

- ☐ 25th International Conference on Structural Mechanics in Reactor Technology (SMiRT-25)
- ☐ IAEA International Conference on Effective Nuclear and Radiation Regulatory Systems: Working Together to Enhance Cooperation
- ☐ International Transportation Security Symposium (ITSS)

WORKSHOPS

- ☐ Preparing for implementation of Decommissioning of Nuclear Facilities
- ☐ Nuclear Security Culture in practice
- ☐ Capacity Building Centre on Emergency Preparedness & Response
- ☐ Implementation of the International Radiation Monitoring Information Systems
- ☐ Lessons Learned applying the IAEA General Safety Requirement-Part-3
- ☐ Deterministic Safety Analysis and the format and content of the Safety Analysis Report
- ☐ Communication with the Public in a Nuclear Radiological Emergency
- ☐ Developing a Protection Strategy for a Nuclear or Radiological Emergency
- ☐ Train the Trainers for the International Nuclear & Radiological Event Scale
- ☐ Best Practice's in the Refurbishment of CANDU Reactors

TRAINING COURSES

- ☐ New and Prospective Points of Contact of the Incident and Trafficking Database
- ☐ Reviewers in Integrated Regulatory Review Service (IRRS) Mission
- ☐ Continuous Safety Culture Improvement Process for Safety Culture Experts
- ☐ Continuous Improvement of Operational Safety Performance
- ☐ Physical Protection of Nuclear Material and Nuclear Facilities
- ☐ Severe Accident Phenomenology

Glimpses of NCRI 2019: Session on Regulation of Accelerator Facilities



Glimpses of NCRI 2019 :Session on Regulation of Transport of Radioactive Material

