

PREFACE

Atomic Energy in India: Achievements Since Independence

India gained freedom in 1947 and in the very next year, the country made a formal beginning of its programme on nuclear energy development and deployment by establishing the Atomic Energy Commission (AEC) under the inspiring leadership of father of Indian Nuclear Programme, Dr. Homi Jehangir Bhabha. Within eight years of the constitution of AEC, India took a great leap when Apsara, India's first nuclear reactor, became critical in 1956 wherein entire reactor system including control instrumentation was indigenously designed, fabricated and commissioned (fuel was provided by UK). This landmark achievement paved the way for several other equally important milestones such as commissioning of a 40 MW natural uranium heavy water moderated reactor (CIRUS) in 1960, uranium extraction and purification, fuel fabrication, reactor instrumentation, radioisotopes separation, setting up of accelerators and related technologies, just to name a few. These achievements placed India in the league of a few developed nations who have indigenously developed, demonstrated and deployed nuclear reactors as well as associated fuel cycle facilities for electricity generation, and applications of radiation and radioisotopes.

The present book intends to provide an account of some of the important achievements of India in the area of atomic energy. The first chapter is dedicated to Dr. Homi Jehangir Bhabha, the architect of India's nuclear programme. The second chapter of the book is about life and contribution of Dr. Vikram Sarabhai who provided impetus to a number of programmes. These are followed by chapters dedicated to the journey of atomic mineral exploration, uranium mining and processing, success story of India's heavy water production from shortage to surplus production, fuel fabrication, development of research and power reactors. The nuclear energy programme of India was designed to recycle nuclear fuel towards effective utilization of its resources and as the result India is one of the few countries in the world having mastered all aspects of nuclear fuel cycle technology including fuel reprocessing and waste management. A detailed chapter on the back end of the nuclear fuel cycle lucidly explains this aspect. Over a period of time, in addition to providing power, the atomic energy programme has significantly contributed to health, agriculture and industrial sectors. These aspects are covered in chapters detailing the major achievements in application of radiation processing and radio-isotopes for societal benefits. The book also contains a broad discussion about research carried out in the allied fields of Nuclear Physics, Structural Materials, Laser Based technologies, accelerator, fusion and plasma research which also contribute to the success of the Atomic Energy Programme and its impact on society and industry in particular and the country in general. A dedicated chapter on Homi Bhabha National Institute, academic wing of Department of Atomic Energy, India, would be a great read for those aspiring for a career in nuclear energy.

The first edition of this book was published in 2022. In the present edition, four new chapters have been added to highlight the progress made with respect to the development and manufacture of

electronic instrumentation and equipment for DAE as well as several other domains of the country; progress made in the establishment of the second stage of the nuclear power program envisaged by Dr. Bhabha- the fast reactor program; rare earths mining and applications; and cancer treatment and research. In addition, several chapters have been updated and revised, to include more recent developments and also improve reading. The chapters on nuclear power production in the country, for example, has been updated to include more recent additions to the fleet of reactors and provide updated info on their operation. The revision of the chapters has been brought out clearly in the contents page to help readers who may like to focus the reading on the updated chapters.

We would like to express our sincere gratitude to Dr. Anil Kakodkar, Chancellor, HBNI, Dr. A. K. Mohanty, Chairman, Atomic Energy Commission and Secretary, Department of Atomic Energy, Shri Vivek Bhasin, Director, Bhabha Atomic Research Centre and Prof. U. Kamachi Mudali, Vice Chancellor, HBNI for their support to the book. We are thankful to all the authors for their contributions. Shri Manoj Singh, Head, Scientific Information Resources Division, BARC and his colleagues Smt. Leena Kanal, Shri Bhushan Chavan and Shri Sanjay Singh are thanked for taking efforts for publication of the book. The critical feedback and encouragement received from the readers for the first edition have been greatly valuable in the revision of the book chapters. We hope that this edition will also appeal to the wide spectrum of readers and provide them a glimpse of the outstanding progress made by the country in the domain of atomic energy. The Government has outlined a strategy to enhance the contribution of nuclear power to position nuclear energy as a major pillar in India's energy mix. It is indeed an opportune moment to relive the visionary efforts of the pioneers of our programme and derive inspiration for the march forward.

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