

## 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, as well as 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.

We would like to express our sincere gratitude to Dr. Anil Kakodkar, Chancellor, HBNI, Shri K. N. Vyas, Chairman, Atomic Energy Commission and Secretary, Department of Atomic Energy and Dr. A. K. Mohanty, Director, Bhabha Atomic Research Centre for their support to the book. We are thankful to all the authors for their contributions. Dr. S. Adhikari, Head, Scientific Information Resources Division, BARC and his colleagues Shri Manoj Singh, Smt. Leena Kanal, Shri Bhushan Chavan and Shri Sanjay Singh are thanked for taking efforts for publication of the book. Dr. Kruti Halankar is thanked for her assistance at various stages.

Attempts have been made to strike a balance in the contents of the book to make it appealing to a wide spectrum of readers comprising of science professionals and non-professionals. Although, due care has been taken to make the book as error-free as possible, some errors may have crept in by oversight. We shall be thankful to the readers for bringing such unintentional errors to our notice.

**A. K. Tyagi**  
**P. R. Vasudeva Rao**