Foreword

Coal is pivotal to meeting India’s energy needs and with major international climate agreements; it has become a paramount objective to use coal in a sustainable manner. Also, while overall coal reserves in India are extremely large (more than 308 billion tonnes and comprising of 7% global reserves), the recoverable reserves are just over 60 billion tonnes [1]. Innovative coal mining technologies thus have to play an important role in ensuring that the recovery and utilization of coal improves in light of energy security for the country. For instance, it is reported that highwall mining technology has resulted in recovery of more than 25 lakh tonne of locked-up coal from three opencast mines [2]. It is here that the role of underground coal gasification (UCG) technology also becomes relevant. The technology has the potential to serve many of India’s energy objectives i.e. increase of indigenous natural gas supply, extraction of energy from deep seated coal, reduction of fugitive methane emissions due to conventional coal mining and reduction in atmospheric emissions during power generation. This route may also ease the future into a hydrogen economy.

In 1984, I had the privilege of chairing a steering group on UCG in India. Subsequently, several other organizations (ONGC, Coal India, CSIR Laboratories and IITs) have performed considerable work in this area. As a result, a significant repository of geological characteristics, economic feasibility and mathematical models have been established within the country. While considerable work has been done in this area, many challenges remain for the commercialization of this technology – something that can be achieved through greater industry-academia collaboration. More than 25 years ago, I wrote, “The engineering challenges in exploiting our huge reserves of unmineable coals in north Gujarat (estimated at more than 60 billion tons), at a depth of 1000 m and more, are enormous and we can be world leaders” [3]. The same stands true for today as well and I am hopeful that this target may be realized to pave way for a sustainable future. In fact, the conditions in India are far more compelling and propitious than anywhere in the world and we may well find a great opportunity to become global leaders in UCG at depth of 1000 m and more.

I am happy to note that scientists at the CSIR-Central Institute of Mining and Fuel Research have been engaged in a 12th Five Year Plan Project on Underground Coal Gasification. As part of this project and with an effort to reach out to industry personnel, they organized a two-day workshop on “Challenges and Opportunities of Underground Coal Gasification in India”. The results of this workshop are expected to be well-documented in the IOP Conference Series: Earth and Environmental Science. I am happy to note that the papers are a mix of industrial learning, lab-level experimentation and modelling, along with rigorous policy analysis. I commend the organizers for this timely initiative and hope that this leads to positive changes for this technology.

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Preface

Coal is the mainstay of India’s energy sector and is likely to shape India’s energy future. With the Paris Climate Agreement, coupled with the Government of India’s thrust on clean energy sources, it is imperative for us to deploy clean coal technologies with lesser environmental impacts. It should be ensured that such sources are offered at the lowest possible cost to ensure energy affordability to the lower strata of the society. While India has abundant coal reserves, much of the coal remains unmineable due to complex geo-mining conditions, mine hazards and economic complexities. If we are to continue using coal sustainably, different variants of utilizing energy from coal also need to be identified. Underground Coal Gasification (UCG) is one such technology. While the Government of India has shown significant support for this technology, that coupled with enthusiasm from the Industry has not translated into commercial utilization.

With an aim to further the cause of UCG in India, we undertook the Project CoalGasUrja (Development of Underground Coal Gasification Technology in India) as a CSIR Network Project under the Twelfth Five Year Plan. The project – which is now on the verge of completion – has resulted in significant outcomes for UCG in India in terms of coal characterization, reactivity studies, thermo-fluid modelling, site selection criteria and cost estimation. The final and perhaps the most crucial part of the project is knowledge dissemination to the industries. With this objective, a two-day workshop on Challenges and Opportunities of Underground Coal Gasification in India (UCG-2017) was organized during 13-14 February, 2017 at Vigyan Bhawan, New Delhi. It is a matter of immense pleasure for us that IOP Conference Series: Earth and Environmental Sciences is publishing the papers presented at the workshop. I am hopeful that this volume serves as a bridge for the next generation of scientists and engineers to carry out the work that we have left incomplete. The papers in this volume are a combination of policy, technical and industrial field experience. I thank all the authors who have contributed to this volume.

I thank our Director, Dr. Pradeep K Singh, Chairman, Organizing Committee and Dr. Rajendra Singh, Head of the Research Group for their guidance and personal support. I also thank Dr. Debadutta Mohanty, Joint Organizing Secretary and other members of the organizing committee for their skilful planning of the workshop. We are grateful to ONGC, JCB India, SAIL, ONGC Energy Centre, SCCL and NLC India, for providing generous financial support for this event. Of course, thanks are also due to all the other companies and academic institutions who have nominated experts to attend this event. Thanks are also due to Udayan for his active involvement at various stages starting from planning the event to preparing the workshop proceedings. Last but not the least, I express my sincere thanks to researchers of our group Jaywardhan, Akanksha, Sujoy, Om Prakash, Bageswari, Suman, Achinta and Anjali.

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