NCPTh - 2014

National Conference on

Power from Thorium: Present Status and Future Directions

December 22-24, 2014

Nabhikiya Urja Bhavan Auditorium,

Anushakti Nagar

Mumbai 400 094, India

Compilation of

Plenary Talks, Invited Talks

and

Abstracts of Contributed Papers

Compiled by

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Preface

India is the seventh largest country in the word with an area of 32.87 lakh sq. km. it is the second most populous country with a population of more than 1.23 billion. Since independence the country has made significant progress in every sphere of life, but it becomes very small when compared on per capita basis with the developed economies of the world and energy sector is no exception. Our per capita energy consumption is way below the world average. Energy is the prime mover of economy and is a key factor in improving the quality of life, therefore, for rapid development we need to enhance our energy production several folds. With its meagre coal and oil reserves, the role of nuclear energy in meeting India's energy demands can hardly be overemphasised. Nuclear technology in India is today mature enough to contribute significantly towards our long term energy security. However, here too, we are constrained by the availability of natural uranium. Our uranium reserves are also modest. Though our uranium reserves are small, we have one of the largest thorium reserves in the world. Thorium is a fertile material which can be converted to fissile material in a breeder reactor. Therefore, India's strategies for large scale deployment of nuclear energy are focused towards utilization of thorium. Keeping in mind her modest uranium reserves, India has adopted closed nuclear fuel cycle and chalked out a three stage nuclear power programme. Therefore, since beginning of our nuclear power programme, significant efforts have been made towards effective utilization of thorium. Today, the construction of Prototype Fast Breeder Reactor (PFBR) is in full swing. PFBR will help in converting Th^{232} to U^{233}, which forms the second stage of our programme. In addition to use of thorium in fast reactors, various other options are also being explored for direct use of thorium. Advanced Heavy Water Reactor (AHWR) is one such design which is ready to take – off. Work is also in progress for the design and development of Accelerator Driven Systems. Many other reactor designs are in conceptual stage. These efforts are not only confined to reactor technologies, but also to all other aspects of our fuel cycle. Significant developments have been made both at the front end and back end of thorium fuel cycle. Reprocessing of high activity thorium fuel bundles poses considerable challenges.

The purpose of the conference is to disseminate the knowledge about latest status of our core strengths and technological challenges in the thorium related R&D, technology deployment, on-going activities and exchange of ideas on way forward. The conference will also look towards establishing inter-institutional synergies. The efforts have been made to cover the entire spectrum of thorium utilization starting from assessment of thorium reserves to mining, processing, fabrication, assessment of physical properties, current and future reactor concepts for thorium utilisation, past experiences and reprocessing of spent fuel. Talks by eminent professionals from India who have made significant contribution in development of technologies towards Thorium utilization for power generation have been arranged and almost hundred papers have been received for poster presentation during the conference.

TECHNICAL PROGRAMME

Power form Thorium: Present Status and Future Directions

Technical Programme Schedule

Programme Schedule, Monday

Monday	
8:30 – 9:30	Registration
9:30 – 10:30	Inaugural Session Welcome Address : Dr. A.K. Nayak Introductory Remarks : Dr. P.K. Vijayan Conference Overview : Shri P. K. Wattal Inaugural Address : Shri R. K. Gargye Address by Guest of Honour : Dr. R. Chidambaram Address by Chief Guest : Dr. R. K. Sinha Vote of Thanks : Shri Mukesh Singhal
10:30 – 11:00	High Tea
Plenary - 1	**Indian nuclear power programme – the role of thorium and the challenges ahead** (Session Chair: Shri K. K. Vaze & Shri P. K. Wattal)
11:00 – 12:00	Plenary Talk – 1: Shri S. A. Bhardwaj
Session - 1	**Thorium Potential & Challenges** (Session Chair: Shri K. K. Vaze & Shri P. K. Wattal)
12:00 – 12:40	Invited Talk – 1: Dr. R. N. Patra
12:40 – 13:20	Invited Talk – 2: Dr. G. K. Dey
13:20 – 14:20	Lunch
Session - 2	**Fabrication Technologies** (Session Chairs: Dr. B. N. Jagatap & Dr. R. N. Patra)
14:20 – 15:00	Invited Talk – 3: Shri Arun Kumar
15:00 – 15:40	Invited Talk – 4: Shri N. Saibaba

15:40 – 16:40	Poster Session - 1
Session - 3	**Technologies for Realization of vast potential & Challenges for Physics** (Session Chairs: Shri N. Saibaba & Dr. R. K. Singh)
16:40 – 17:20	Invited Talk – 5: Dr. P. D. Krishnani
17:20 – 18:00	Invited Talk – 6: Dr. P. Singh

Programme Schedule, Tuesday

Tuesday	
Plenary - 2	**Power form Thorium: Different Options** (Session Chairs: Shri S. A. Bhardwaj)
09:30 – 10:30	Plenary Talk – 2: Dr. S. Banerjee
10:30 – 11:30	Poster Session - 2
Session – 4	**Front End Technologies : New Reactor Concepts & Challenges** (Session Chairs: Shri S. Duraisami & Shri P. K. Malhotra)
11:30 – 12:10	Invited Talk – 7: Dr. P. Chellapandi
12:10 – 12:50	Invited Talk – 8: Dr. P. K. Vijayan
12:50 – 13:30	Invited Talk – 9: Dr. B. N. Jagatap
13:30 – 14:30	Lunch
Plenary - 3	**Thorium based Fuel Cycles: Safety Issues and Regulatory challenges** (Session Chairs: Shri Arun Kumar)
14:30 – 15:30	Plenary Talk – 3: Shri S. S. Bajaj
15:30 – 16:30	Poster Session – 3
Session - 5	**Past Experiences** (Session Chairs: Dr. P. K. Vijayan & Dr. J. K. Chakravartty)
16:30 – 17:10	Invited Talk – 10: Shri P. K. Malhotra
17:10 – 17:50	Invited Talk – 11: Shri J. L. Singh

Programme Schedule, Wednesday

Wednesday	
Plenary - 4	**Opportunities with thorium in global context** (Session Chairs: Shri S. K. Mehta)
09:30 – 10:30	Plenary Talk – 4: Dr Anil Kakodkar
10:30 – 11:30	Poster Session - 4
Session - 6	**Back - End Technologies & Societal Benefits** (Session Chairs: Shri S. S. Bajaj & Dr. (Smt.) S. B. Roy)
11:30 – 12:10	Invited Talk – 12: Shri P. K. Wattal
12:10 – 12:50	Invited Talk – 13: Dr. (Smt.) Jaya Mukherjee
12:50 – 13:30	Invited Talk – 13: Dr. A. Dash
13:30 – 14:30	Lunch
Session - 7	**Path Ahead**
14:30 – 15:30	Presentation by Panellists
15:30	Closing

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INVITED TALKS

EXTENNDED ABSTRACTS OF CONTRIBUTED PAPERS