

7th Nuclear
Energy Conclave
3rd November 2015, Hotel Le Meridien, New Delhi



Creating Conditions for Rapid Capacity
Addition of Nuclear Power in India

Summary Report &
Key Recommendations

DISTINGUISHED SPEAKERS



Dr Jitendra Singh
Minister of State, Prime Minister's Office
Department of Atomic Energy & Ministry of
Personnel, Public Grievances & Pensions



Dr Anil Kakodkar
INAE Satish Dhawan Chair of
Engineering Eminence BARC &
Chairman, Nuclear Energy group, IEF



Mr S A Bhardwaj
Chairman, AERB



Dr Sekhar Basu
Chairman
Atomic Energy Commission



Mr. N. Nagaich
Director (HR), NPCIL



Mr. Y. S. Trivedi
Sr. Vice President, L&T



Mr. Graham Cable
Vice President (New Plants
and Major Projects), Westinghouse



Mr G K Pillai
MD and CEO, Walchandnagar
Industries Ltd



Mr Patrick Ledermann
Vice Chairman & MD, Alstom India



Mr Kaustubh Shukla
COO, Godrej & Boyce Mfg. Co



Ms Manju Gupta
President, AREVA India



Dr P Chellapandi
CMD, BHAVINI



Mr R S Sundar
Site Director, Kudankulam
Nuclear Power Plant Project



Dr S A V Satya Murty
Distinguished Scientist &
Director, IGCAR



Mr S K Malhotra
Head – Public Awareness, DAE

INDIA
ENERGY
F O R U M

THEME

**“CREATING CONDITIONS FOR RAPID CAPACITY
ADDITION IN NUCLEAR POWER IN INDIA”**

PLENARIES ON

**·Strategies for Competitive Value Addition for Setting up
Nuclear Power Projects – “Make In India” Programme.**

·
**Way Forward for Larger Public Acceptance – Actions
in Short and Long Term**

**The 7th Nuclear Energy Conclave Concluded
Summary Report**

&

Key Recommendations

7th NUCLEAR ENERGY CONCLAVE HELD ON 3RD NOVEMBER, 2015

1) THE THEME

The limited availability of primary energy and growing climate change concerns arising out of use of fossil energy, make nuclear energy vital for India's continued sustainable growth. India has developed necessary technologies and manufacturing capabilities in the field of nuclear power and it is clear that growth of nuclear power in India would depend on rapid indigenous manufacturing and construction capacity addition and public acceptance at large. The new government's emphasis on Make in India gives additional fillip to this growth strategy.

The value addition by way of Make in India concept is an essential strategy for rapid and affordable Nuclear Power growth in India. It is in this context that the theme of the 7th Nuclear Conclave – That is “Creating conditions for rapid capacity Addition of Nuclear Power in India with plenary on Make in India & Safety” was chosen as very relevant issue for deliberations.

2) THE SUMMARY OF PROCEEDINGS

INAUGURAL SESSION

While initiating the proceedings, Mr. Amarjit Singh, Secretary General, India Energy Forum (IEF) informed that IEF is the only organization, organizing Nuclear Conclave for the last 6 years exclusively under the guidance and leadership of Dr. Anil Kakodkar, Former Chairman Atomic Energy Commission and Patron IEF.

2.1) **Mr. P S Bami** then formally welcomed the Honb'le Minister of state, PMO, Dr. Jitendra Singh and other distinguished speakers on the dais including Dr. Sekhar Basu, Chairman, AEC; Mr. S ABharadwaj Chairman Atomic Energy Regulatory Board (AERB); Dr. Anil Kakodkar Former Chairman AEC, INAE Satish Dhawan Chair of Engineering Eminence BARC & Chairman – Nuclear Energy Group / IEF. Mr. Bami emphasized the need to raise per capita energy consumption in India as the same is lifeline for economic and social development. India has to import major share of oil & gas having carbon footprints. The country has to depend, in future, on alternate energy sources like Nuclear and Solar – the clean sources available in the country. This strategy is also essential for meeting the commitments India has made at various for as for reduction of carbon emissions. Mr. Bami also outlined the various steps necessary to fast pace the Nuclear capacity addition like bulk project approvals, advance procurement of

critical items, manufacturing in India with enhanced local content, continuous plan of orders necessary to engage trained manpower & utilization of capital intensive heavy engineering facilities in India, expeditious study & clearance of project sites, dispelling the concerns of public at large of their safety concerns. The tariff has to be competitive and value addition in India would mitigate the heavy capital cost (70-75%) of Nuclear power plants.

Mr. Bami mentioned that the projects with international co-operation, pending for long, need to be finalized in a time bound manner and commercial negotiations need to be concluded soon. Avoidance of delay in project off take is an important issue and its resolution will go a longway in creating conditions for rapid capacity addition.

2.2) **Dr. Anil Kakodkar** welcomed the galaxy of intellectuals, energy professionals whose views would be important in the field of energy. The idea of the annual Nuclear Conclave is to take stock and look at the way forward. The key points made by Dr. Kakodkar include, India's energy requirements – to reach whatever threshold of quality of life one may decide - are the largest compared to any other country in the world. India's very heavy dependence on fossil energy, the import of which may go upto 60% of India's energy needs in next 15 years or so, is not sustainable from resource as well as balance of payment considerations.

With the debate on climate change warming up, it is becoming increasingly clear that civilization has to move away from fossil energy to cleaner and sustainable source. And to be able to do that, decidedly Nuclear energy has to be a very important component in the journey to future as it is available in abundance in the form of thorium on our land – the Indian landmass. A simple back of the envelope calculation would show that there is no other answer to growing needs of energy in India except through our dependence on Nuclear and Solar to meet the challenges of climate change, sustainability and assured quality of life of Indian society. Other key points made are:-

- ❖ There is great sense of urgency to this transformation as climate change issues are fast overtaking us and any delay will be too late to have an impact.
- ❖ Even after meeting the INDC's filed by all countries, reports say that temperature rise will be closer to 3°C and not 2°C as targeted. So, in terms of carbon dioxide burden in the atmosphere, if we do not implement whatever actions are necessary in the next 10 to 15 years, it might be too late.
- ❖ In implementing the Nuclear Energy programme in India, it is absolutely important that we respect time elements consistent with planned delivery of our nuclear programme—time elements in decision making, in project implementation, in giving approvals on programme mode (than project mode), and all other subsequent activities till commissioning.

- ❖ Enhance the value addition within country to keep cost under control and keep the heavy engineering facilities occupied all the time for optimum results.
- ❖ The nuclear energy programme need to overcome residual barrier and bold decisions taken to create massive and sustainable momentum to the programme.

2.3) **Mr. S A Bharadwaj**, Chairman, AERB mentioned that the country has accepted nuclear power as a solution to the growing need of energy and we are now looking at creating conditions for rapid growth of Nuclear Energy in India.

He mentioned that various estimates around the world, including that in India; indicate that with the uranium and thorium available, the mankind can survive only on this resource, for energy needs for the next five hundred to one thousand years. That is the variation in estimates around in the literature. And out of these say thousand years – we have spent only 50 years. So it is a nascent technology and it has done very well and is constantly on the path of improvement and much more is expected.

Mr. Bharadwaj further mentioned that “SAFETY” is the only necessary and sufficient condition and the most important one for rapid addition of Nuclear Power in India. The safety has not only to be maintained but has also to be enhanced.

India follows the radiation norms as prescribed by International Council of Radiation Protection (ICRP). Radiation is showered upon mankind by the nature from cosmic or terrestrial sources. This natural radiation varies from place to place say from 1 to 13 units. The ICRP has chosen the lower end that is 1 - that one should not add more than one unit of radiation per year by manmade activities. The regulator further assigns only a fraction of one as the norm for a particular Nuclear Power Plant at a site - say 0.1 units per year. What has been consistently achieved now for many years in India is even smaller – one percent of that 0.1. This is the success of last fifty years – that is radiation near a nuclear power facility is negligible. Regulators have been creating layer after layer called defence in depth, redundancy to enhance safety. Today generation three and generation three plus reactors in future—and that future in not vary far off – will result in vary low probability of having an accident . There is, however, a bigger challenge in use of Nuclear radiation in other fields – medical, Industry , sewage, food, oil / gas, electronics circuits and other areas of everyday diagnostics which needs to be checked and licensed by AERB for safety. AERB has made online arrangement for Licensing, education etc. and users to be aware/made aware of facilities therein.

2.4) **Dr. Sekhar Basu**, Chairman, AEC started by saying that the topic of the 7th Nuclear

Conclave that is – Creating Conditions for Rapid Capacity Addition in Nuclear Power in India has been relevant for quite sometime and it is time to act and pursue all relevant actions as fast as possible.

With 21 reactors in operation & 10 under construction, the capacity will go upto 13,500 MW in another 5 to 6 years. It may be small at the moment to make an impact on CO₂ reduction but in long term Nuclear and Solar Energy are the only options for sustainable development.

Availability of uranium in sufficient quantity and large investment required are the twin issues facing the ambitious Nuclear Programme. While supply of additional uranium subsequent to Indo-US Nuclear Agreement has improved the performance of Nuclear Plants, investment required to fund the programme is still an issue. The equity portion could largely be met from Govt. support (which is required), our internal resources & joint Ventures with PSU's. The debt portion is large and could be a challenge. Funding by Indian Banks and other Indian sources is important because Reactors not under safeguard should be Indian in all respects including the loan component. For International co-operation projects, cheaper foreign loans are being sought. While Russians are advancing loan at 4%, still cheaper loan are available in the international market.

Simultaneous construction of many units would be the strategy henceforth for which support of state Govt. is important.

Changing public perception is a tricky issue. The CSR activities have been stepped up for locals around the sites along with educating them on safety issues in local language etc.

Insurance issue has almost been resolved and the same will be in place shortly. The only issue left is the right to recourse which if put in writing, it would get resolved. Indian Reactors are designed, fabricated, quality assured, erected, commissioned by and under the supervision of Nuclear establishment (NPCIL, DAE etc.) Suppliers are just meeting our requirements under our supervision and we take responsibility for that.

Another issue is the waste management. India is one of the most advanced countries in waste management in the world as India follows closed cycle which leaves little waste for disposal – by reprocessing and putting 99% back into the reactor once again leaving only 1% as waste. India has the best technology in the world to handle the waste.

2.5) The Hon'ble MoS – Atomic Energy, Space, Personnel, Pension, Public Grievances, PMO, Dr. Jitendra Singh.

While delivering the Inaugural address the **Hon'ble MoS Dr. Jitendra Singh** appreciated the progress made in the field of Nuclear Power in India. He mentioned that the one and half year have been very eventful for Atomic Energy in more than one way. This was also the Diamond Jubilee year of Bhabha Atomic Research Centre (BARC) – recalling Dr. Homi Bhabha's vision of utilising Nuclear Energy for peace has fructified into reality today. He said that Prime Minister supports the scientific temper in the country and also the Nuclear Development Programme. He has taken up issues with US & other countries including with heads of states of African Countries in the recently concluded summit. With Govt. support and scientific development, these are the best times for the growth of Nuclear Energy in the country. In fact, India's Nuclear programme today is ahead of many advanced countries not only in the field of energy but in many other diverse applications in Medical Science, Industry, food etc. which could not have been imagined when it was started. And all this has been done by putting indigenous resources to use – A best testimony to the “Make in India” initiative launched by the Prime Minister. He expressed happiness that “Make in India” will also be discussed in this conclave as a measure of competitive value addition in the country.

The Hon'ble Minister emphasised four areas for further working for the continued progress and success of Nuclear energy.

- ❖ Allaying the public apprehension on safety: The public at large has to be presented with scientific evidence like the tough regulatory standards adopted for radiation which have not harmed scientists working there for so many years (from Cancer etc.) then how these could be harmful for public at large living at far-away locations. Also awareness programmes have to be conducted at different levels not only by scientists of Nuclear establishment but also by organisations like India Energy Forum because, as Mark Twain said, in the context of Economic – “Economics is too serious a subject to be left to Economists alone”. This approach would help bring some stalled projects on stream.
- ❖ He also mentioned that with Insurance pool coming into being and the approach outlined by Chairman, AEC on right to recourse, the apprehensions of foreign supplier should come to an end and the setting up of project should start herewith.
- ❖ Like all economic ventures, Nuclear Energy should also provide competitive and cheaper electricity to consumers for garnering their support. Economic dividend will drive support for future projects as a measure of social applicability.
- ❖ Synergism with other areas of science will also find support from fellow scientists working in areas other than Nuclear energy like Medicine, Industry, Diagnostics etc.

The Hon'ble Minister ended his address emphasising that India with its progress in Atomic Energy and Space is already a frontrunner & is geared to become a world power.

2.6) Mr. V P Singh, Convenor, Nuclear Group, India Energy Forum

Mr. V P Singh proposed the Vote of Thanks to the Hon'ble Minister for taking out time to inaugurate the conclave and address the Nuclear fraternity with his well-considered thoughts. He also thanked the other distinguished speakers. Mr. Sekhar Basu, Chairman, AEC for bringing clarity on Insurance and right of recourse; Mr. S A Bharadwaj, Chairman, AERB for highlighting the radiation & safety issues; Dr. Anil Kakodkar for guiding the IEF & highlighting the issues on the subject; Mr. P S Bami for his welcome remarks covering issues involved and Mr. Amarjit Singh, Secretary General, IEF for support to the event.

He also thanked Mr. N Nagaich Director (HR) NPCIL, the Industry leaders present from L&T, Godrej, Walchandnagar Industries, Westinghouse, Areva, Alstom, NPCIL and top leaders from Nuclear field – Dr. Chellapandi, CMD, BHAVINI, Dr. SAV Satya Murty, Director, IGCAR, Mr. R S Sundar Site Director Kudankulam, NPP, Mr. S K Malhotra, Head (Public Awareness) DAE and others.

Mr. Singh appreciated the words of inspiration of Hon'ble Minister & other distinguished speakers. He felt that renaissance has taken re-birth in Nuclear Energy – a clean and carbon free source of base load power likely to last for generations in the closed cycle mode. India is on the path of achieving 25% Nuclear in its energy mix in future with emphasis on “Make in India” resulting in competitive power to all.

KEY RECOMMENDATIONS

- 1) The Seventh Nuclear Conclave deliberated in depth and arrived at the consensus that it is time civilisation moved away from fossil fuel and switched over to Nuclear and Solar energy NOW for mitigating the adverse effects of global warming on human race. If deployed - say 40-50 years hence, it would be difficult to counter the damage to the environment. As such the conference Theme “Creating Conditions for Rapid Capacity Addition in Nuclear Power in India” – is rather late – nevertheless needs to be acted upon in right earnest.
- 2) The Indian energy needs are going to be the largest in the world, in times to come. As such it is imperative that the country exploits the energy resources available on its land mass viz Nuclear (Uranium, Thorium in self-sustaining closed fuel cycle) and solar energy. Such a policy initiative should give impetus to Nuclear capacity addition.
- 3) Allaying the public apprehensions on safety & gaining larger public acceptance will also go a long way in getting public support and various clearances at ground level. Actions like free access to credible information in a transparent manner; scientists from lab engaging with people to educate them; educating on very low radiation levels being allowed in & around Nuclear Plants via-vis natural and medical radiations people are exposed to, will instil confidence in public and allay their apprehensions on radiations. Supplementing the atomic energy establishment for enhancing public awareness by creating NGO's to explain the radiation & safety aspects in local language regarding the clean nature of nuclear energy will also garner support for Nuclear Power.
- 4) “Synergism” and “Cross Fertilisation” with other disciplines of science like medical, industry, agriculture and a host of other applications where nuclear aspects like radiation is routinely used in multiple devices would also assure public of its safety and usefulness towards greater acceptance. It would also enlarge domain knowledge application to diverse fields for public goods and acceptance.
- 5) Removing residual barriers like operationalising of the Insurance pool (Indian Nuclear Insurance Pool – INIP) launched in June 2015 with a fund of Rs. 1500 Crs will go a long way in addressing the liability related concerns of suppliers besides covering operators liability as provided in civil Nuclear Liability damages Act – 2010. Ratifying the convention for supplementary compensation (CSC) by Govt of India would also further the Nuclear co-operation for fast pacing the capacity addition.

Capacity and Capability have also to be developed for executing 8-10 projects simultaneously covering activities from site studies, seismic studies, design – manufacture – Project Management, Commissioning and Regulatory approvals including skills and manpower required for these activities.

- 6) **“Make in India”** requires a big push for local value addition in India – essential for controlling the manufacturing, construction cost which should ultimately result in competitive tariffs for the users comparable to tariffs from PHWR reactors already operating in India and coal based thermal power plants. For this to happen, the leading Indian and Foreign manufacturers recommended a number of steps. The major ones which could help rapid capacity addition are as follows:-
 - 6.1) The Nuclear capacity addition targets could be met only if geological and seismo-tectonic studies of project sites are fast paced for which National Institutes carrying these studies have to be strengthened and multiplied. This will make multiple project sites ready for project implementation.
 - 6.2) Switch over from project mode to programme mission mode wherein clearances for a batch of projects – 8 to10 projects – could be accorded for implementation. Manufacturers will have visibility to gear up resources for supplies and project execution in time.
 - 6.3) Long gap in between orders fritters away the skilled manpower and other resources readied at great cost. As such, a rhythmic order flow would help compress the project implementation cycle. The Indian manufacturers have geared themselves for meeting the requirements of Nuclear Programme.
 - 6.4) The practice of giving “Free issue materials” like key forgings/castings (for which there are limited global suppliers) to manufacturers has helped in compressing the manufacturing time in the past. The practice could be again followed instead of every manufacturer approaching the same set of suppliers which lengthens the delivery cycle of critical inputs.
 - 6.5) 3D modelling with frozen design rather than “designing as we go” would enable timely inputs. Likewise time element of each activity from concept to commissioning needs to be analysed to cut down the project implementation time and bring at par with other power projects. This will also optimise the project cost.

- 6.6) Building the metallurgical base in the country for nuclear grade materials, skilled manpower, qualifying for nuclear grade accreditations like ASME needs to be multiplied further to cope up with the expected rise in capacity addition.
- 7) Support is needed from Govt. of India for equity contribution for setting up projects over and above the internal resources from NPCIL; NPCIL & PSU/JV's. The debt portion has to be augmented from foreign sources as that from Indian Banks would not suffice even for Indian projects.
- 8) Support from state Govt. in land acquisition and other local clearances was identified as another critical aspect which would help rapid capacity addition.
- 9) While making presentation in 'Make in India' Plenary, Westinghouse, AREVA, Alstom explained their well established practices with local companies for international cooperation projects which could be followed in India also. They also explained the safety and other advanced features of their Light Water Reactors planned for India. A definite and realistic VISIBILITY of Indian Nuclear Programme along with the removal of residual barriers would go a long way in facilitating the International cooperation project in India.

Compiled by:

V P Singh
Convenor, Nuclear Group, IEF

Edited by:

Dr. Anil Kakodkar
Chairman, Nuclear Group, IEF

PROGRAMME

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| 8.30 am | Registration & Networking Tea |
| 9:30 am | Inaugural Session Introductory Remarks Mr. Amarjit Singh , Secretary General, IEF Welcome Remarks Mr P.S.Bami ,, President, IEF Theme address Dr Anil Kakodkar , INAE Satish Dhawan Chair of Engineering Eminence BARC & Chairman, Nuclear Energy Group, IEF Special Address Mr S A Bhardwaj , Chairman, AERB Special Address Dr Sekhar Basu , Chairman, Atomic Energy Commission Inaugural Address Dr Jitendra Singh , Minister of State, Prime Minister's Office, Department of Atomic Energy & Ministry of Personnel, Public Grievances & Pensions Vote of Thanks Mr V.P.Singh , Convenor, Nuclear Group, IEF |
| 10:45 a.m | Networking Tea |
| 11:15 a.m | Plenary I : “Strategies for Competitive Value Addition for Setting up Nuclear Power Projects – Make in India Programme”. |
| Chairman | Mr N. Nagaich , Director (HR), NPCIL |
| Co-chairman | Mr. Y. S. Trivedi , Sr. Vice President and Member of Board, L&T |
| Distinguished Speakers | Mr. Graham Cable , Vice President(New Plants and Major Projects), Westinghouse Mr G K Pillai ,, MD and CEO, Walchandnagar Industries Ltd Mr Patrick Ledermann , Vice Chairman & MD, Alstom India Mr Kaustubh Shukla , COO, Godrej & Boyce Mfg. Co Ms Manju Gupta , President, AREVA India |
| Session Facilitator | Mr S M Mahajan , Former ED, BHEL |
| 12:45 p.m. | Plenary II : Way Forward for Larger Public Acceptance – Actions in Short and Long Term |
| Chairman | Dr P Chellapandi , CMD, BHAVINI |
| Distinguished Speakers | Mr R S Sundar , Site Director, Kudankulam Nuclear Power Plant Project, NPCIL Dr S A V Satya Murty , Distinguished Scientist & Director, IGCAR, Kalpakkam Mr S K Malhotra , Head – Public Awareness, DAE |
| Session Facilitator | Ms Minu Singh , MD, Nuvia India |
| 02:00 pm | Closing Remarks LUNCH |

GLIMPSES OF 7th NUCLEAR ENERGY CONCLAVE



ABOUT THE ORGANIZER

INDIA ENERGY FORUM is a unique, independent, non-profit research organization and represents energy sector as a whole. The FORUM's mission is the development of a sustainable and competitive energy sector, promoting a favourable regulatory framework, establishing standards for reliability and safety, ensuring an equitable deal for consumers, producers and the utilities, encouraging efficient and eco-friendly development and use of energy and developing new and better technologies to meet the growing energy needs of the society.

Its membership includes all the key players of the sector including NTPC, NHPC, Power Grid Corporation, Power Finance Corporation, Reliance Energy, Tata Power, ONGC, Indian Oil Corporation, Neyveli Lignite, Coal India, Unocal, Alstom and over 80 highly respected energy experts. It works closely with the main regional chambers and industry organizations including Bombay Chamber, Bengal Chamber, Bangalore Chamber, Madras Chamber, Maratha Chambers (Pune), PHD Chamber, Observer Research Foundation, IRADE, INWEA, Indian Coal Forum, ORF, PETROTECH, PETROFED. It publishes a bimonthly journal TOTAL ENERGY and annually Indian Energy Year Book which provides authentic information on the whole energy sector at one source. It also publishes research papers and monographs. For more information, please visit: www.indiaenergyforum.org.

STEERING COMMITTEE



Dr Anil Kakodkar

Former Chairman, AEC & Chairman
Nuclear Group, IEF



Shri S C Tripathi

Patron, IEF & Former Secretary
Ministry of Petroleum & Natural Gas



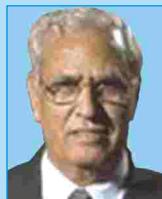
Shri P S Bami

President, IEF & Former
CMD, NTPC



Shri Anil Razdan

Former Secretary, Ministry of Power



Shri H L Bajaj

Former Member (Tech), Appellate
Tribunal for Electricity



Shri Amarjit Singh, MBE

Secretary General, IEF



Shri V P Singh

Convenor Nuclear Group IEF
& Former ED, BHEL



Ms Minu Singh

Managing Director, Nuvia India Pvt Ltd



Mr S M Mahajan

Former ED, BHEL and
Consultant (Power Sector)