

Towards Food Security 'thru N-Techniques

India Committed to Nuclear Safety

-AEC Chairman, Dr. R.K. Sinha

Dr. Ratan Kumar Sinha, Chairman of the Atomic Energy Commission of India and leader of the Indian Delegation to the 56th General Conference of the International Atomic Energy Agency held in Vienna on 19 September 2012, has reiterated India's commitment to nuclear safety. In his address to the Conference, Dr. Sinha has also informed the delegates that India had taken initiatives for ensuring food security by achieving higher crop yields, disease resistance of crops and plants and food preservation through use of nuclear techniques. He told them that the construction of the 500 MWe Prototype Fast Breeder Reactor (PFBR) is proceeding well at Kalpakkam. Following is the full text of Dr. Sinha's address.

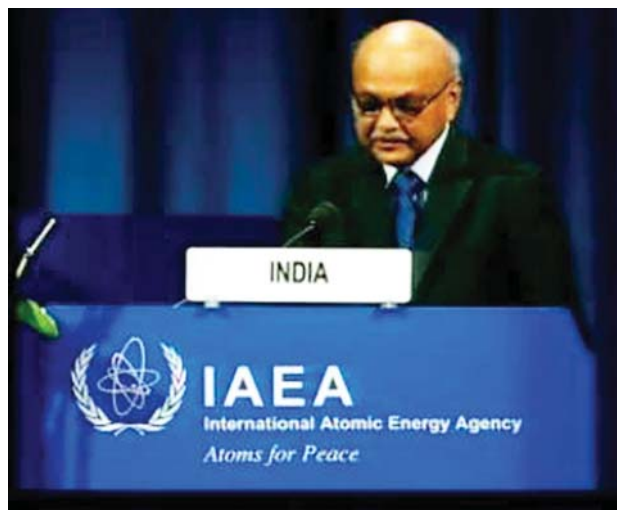
Mr. President, Excellencies, Ladies and Gentlemen,

It gives me great pleasure to congratulate you, Mr. President, on your election as the President of the 56th General Conference. Under your able leadership, I am sure, the current General Conference will accomplish all the tasks before it.

India welcomes the three new members to the IAEA and I take this opportunity to congratulate the Republics of Fiji, San Marino and Trinidad & Tobago on the occasion of their joining the IAEA family.

We are meeting now after more than one year of the Fukushima-Daiichi accident. The IAEA had led the global response to the accident which resulted in adoption of the IAEA Action Plan on Nuclear Safety during the last Session of the General Conference. The plan envisages actions from all the stakeholders including the Member States.

Mr. President, we are committed to implement the IAEA Action Plan on Nuclear Safety. Our experts will continue to participate and assist IAEA Secretariat in



its endeavour to enhance nuclear safety through cluster of measures it has formulated. In this connection I wish to inform you that the first OSART mission to India for Rajasthan Atomic Power Station (RAPS) units - 3&4 is now planned from the end of October this year. Preparation and planning for inviting IAEA's Integrated Regulatory Review Service (IRRS) for peer review of our regulatory system is also in progress, and in due course, India will approach the Agency with a request to undertake this mission. In October this year, India in collaboration with the IAEA will host an International Workshop on "Safety of Multi-Unit Nuclear Power Plant Sites against External Natural Hazards" preceded by a meeting of the Working Group of the IAEA Project on 'Seismic safety of nuclear power plants'.

Global response to the Fukushima accident, by and large, has been very mature. While committing to learn complete lessons from the accident to enhance safety, the growth prospect of nuclear power continues to be driven by the concerns of energy security to meet long term developmental goals. This is aptly demonstrated when we note that post-Fukushima, seven newly constructed reactors in five different countries have been connected to the grid, and that many newcomer countries have decided to continue with their policy for launch of nuclear power programme. Furthermore, many countries including India have continued with

their programme for expansion of nuclear power, while simultaneously placing additional emphasis on nuclear safety. It is thus pertinent to note the latest IAEA projections, which show a continued growth for nuclear power in the world in the coming decades.

India continues pursuit of the three-stage nuclear power programme, formulated under the visionary leadership of Dr. Homi Jehangir Bhabha. This programme underlines our strategy of adopting a closed nuclear fuel cycle in order to extract the maximum energy from the limited uranium resources, to ensure sustainable nuclear waste management and, above all, to achieve long-term energy security through utilization of thorium.

Nuclear power generation in India continues to grow due to the improvement in supply of uranium from domestic as well as international sources and, this year, it has registered an increase of about 23 percent over that generated last year. The average annual availability of the reactors has also increased from 83 percent to 91 percent.

In March 2012, the 540 MWe indigenously built Tarapur Atomic Power Station unit-3 (TAPS-3) achieved a period of uninterrupted operation lasting 522 days. With this, till date, 10 of our reactors have had continuous runs of over a year, with three of them registering over 500 days of continuous run, the longest being 590 days.

Work on the construction of the first of the two 1000 MWe Light Water Reactors (LWRs) at Kudankulam is complete. The operation of unit-1 is expected to commence shortly and the commissioning of the second unit is expected to follow early next year.

Construction of four indigenously designed 700 MWe PHWRs, two each at existing sites of Kakrapar in Gujarat and Rawatbhata in Rajasthan, is on schedule and these will be progressively completed by 2017.

The construction of the 500 MWe Prototype Fast Breeder Reactor (PFBR) is proceeding well at Kalpakkam. The construction and installation activities in the Reactor Vault are nearly complete, with all the major reactor equipment in place.

The Fast Breeder Test Reactor (FBTR) at the Indira Gandhi Centre for Atomic Research (IGCAR) has continued to operate smoothly, providing valuable operating experience as well as technical inputs to India's fast reactor programme. Post-irradiation examination of the test fuel subassembly for the Prototype Fast Breeder Reactor (PFBR), which was irradiated in FBTR to reach a peak burn-up of 112 GWd/t, has provided valuable data and generated

confidence in the design and manufacture of the fuel.

India, as a founder Member of INPRO, is pleased to note the significant progress made by INPRO over the years. The INPRO methodology for assessment of innovative nuclear reactors and fuel cycles provides a broad framework for developing specific goals and acceptance criteria for new designs. I am happy to announce that India will continue its support to INPRO by making a voluntary contribution of US \$50,000 in addition to in-kind contribution through active participation in several INPRO initiatives.

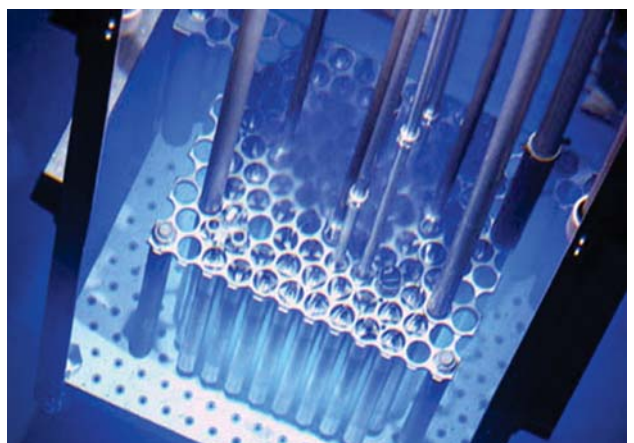
Mr. President,

India has enhanced its activities relating to Uranium exploration in the country. As a result of this, we have been able to identify new resources of Uranium, and in the last five years, our reserves have registered a steep increase of about 70 percent.

India has recorded a production of PHWR fuel of 751 MT in 2011-12, which is an increase of about 15 percent over the production in the previous year. As you are aware, India has already successfully closed the nuclear fuel cycle for its PHWR programme. The new reprocessing plant (PREFRE-2) mentioned last year, has completed the first year of its operation with outstanding performance. The adjoining facility of our second advanced vitrification system at Tarapur has been giving excellent performance in the vitrification of high level nuclear waste.

Food Security

Ensuring food security is a major policy initiative undertaken by the Government of India. Nuclear techniques play an important role to fulfill the objectives enshrined in this policy by achieving higher crop yields, disease resistance of crops and plants and food preservation. So far, a total of 40 radiation-induced mutant crop varieties have been released and notified for commercial cultivation in India. In this





context, the subject of the Scientific Forum on 'Food for the Future: Meeting the Challenges with Nuclear Applications' during this session of the General Conference, is both apt and timely. Climate change, increased frequency of weather shocks, close linkages between energy and increasing price of food products give us enough reasons to initiate this discussion and engage in finding solutions by using nuclear techniques.

India attaches great importance to other non-power applications of nuclear and radiation technologies, particularly in the area of healthcare, water, industry and environmental protection. India has been a strong supporter and contributor to the Regional Cooperation Agreement (RCA) initiatives right from its inception and has been the Lead Country in the area of industrial applications for the past several years. We are, therefore, happy to be a part of the IAEA special event and celebrations this year to commemorate the vital role and achievements of RCA over the last 40 years.

India strongly believes in developing state-of-the-art systems for cancer diagnosis and treatment in a cost-effective manner for ease of their availability and accessibility. Under the commitments already made with the IAEA's Programme on Action for Cancer Therapy (PACT), India is ready to ship two Bhabhatron II teletherapy units, one each to Sri Lanka and Namibia, as soon as the recipient hospitals are ready for installation.

The first medical cyclotron facility (MCF) of India, set

up in BARC for production of tracers for positron emission tomography (PET), will complete 10 years of successful operation in October this year. It is heartening to report the considerable parallel growth of similar facilities in India, including those in private medical institutions. Currently, there are 16 medical cyclotrons and 70 PET-CT units in India providing nuclear medicine services to patients.

Isotopic techniques are being increasingly used to improve better understanding and management of water resources, as well as to study the effect of climate change on water resources. As a part of our efforts to facilitate end-user communities to avail sustainable benefits from such applications, an Isotope Hydrology Laboratory with advanced equipment has been set-up at the Himalayan Environmental Studies and Conservation Organization in Dehradun to train the local people and build capacity for undertaking spring recharge related studies.

Mr. President,

India's nuclear programme is strongly backed by our continued emphasis on R&D work and I am pleased to share some glimpses of our recent achievements.

- The refurbishment and upgradation work of the Apsara reactor, the oldest reactor in Asia, is progressing well. The previous core utilized imported highly enriched uranium (HEU) fuel, while the new core will use low-enriched uranium (LEU) fuel and still provide high neutron flux comparable to that of the CIRUS



reactor that was shut down at the end of December 2010. The fabrication of LEU fuel for the new 2 MW Apsara core, using indigenous enriched uranium, started earlier this year.

- India is exploring the possibility of using nanofluids as an alternate coolant for water-cooled reactors. Experiments on natural circulation and heat transfer behaviour of nanofluids have shown distinct advantages even with a trace concentration of nanoparticles in water.

- As a part of on-going programme to support the ageing management of the existing fleet of reactors, a 'weld inspection manipulator' has been indigenously developed for in-service-inspection of welds in the Reactor Pressure Vessel (RPV) of TAPS-1 & 2. This was deployed successfully in TAPS-1 during a recent outage, enabling the cleaning and ultrasonic examination of RPV welds. For the PHWRs, the BARC Channel Inspection System (BARCIS) for in-service inspection (ISI) of coolant channels of 220 MWe reactors has been extensively used for the last two decades. Recently, BARCIS has been developed for use in the larger diameter coolant channel of the 540 MWe PHWRs and used in TAPS-4.

- With the use of Accelerator Driven Systems (ADS), the self-sustainable thorium fuel cycle and growth of nuclear power generation capacity seem distinctly feasible. Accordingly, India has initiated a programme to pursue a road map on physics studies and stage-wise technology development for ADS.

Continuing its support towards fostering information exchange on recent advances in nuclear science and technology, India hosted the large, well-attended 21st International Conference on Structural Mechanics in Reactor Technology (SMiRT) in New Delhi in 2011.

Mr. President,

India has consistently supported IAEA's important role in facilitating national efforts to strengthen nuclear security and in fostering effective international cooperation. At the last Nuclear Security Summit in Seoul, the Honourable Prime Minister of India, Dr. Manmohan Singh, had announced a contribution of US \$1 Million towards activities concerning nuclear security. I am pleased to announce that India signed an Arrangement with the IAEA concerning the voluntary contribution to the Nuclear Security Fund and we are looking forward to working with the IAEA on identified activities.

India Gives \$1 m to IAEA's N-Security Fund

AEC Chairman Dr. Sinha took time off to call on IAEA Director General Yukiya Amano on the margins of the 56th Session of the IAEA General Conference in Vienna to express India's commitment to Nuclear Security Fund.

Dr. Sinha and Amano signed an Arrangement between the IAEA and the Government of India regarding India's extra-budgetary contribution to the Nuclear Security Fund.

The Arrangement seeks to strengthen IAEA's Nuclear Security Plan. India supports the central role of the IAEA in strengthening the international global nuclear security architecture.

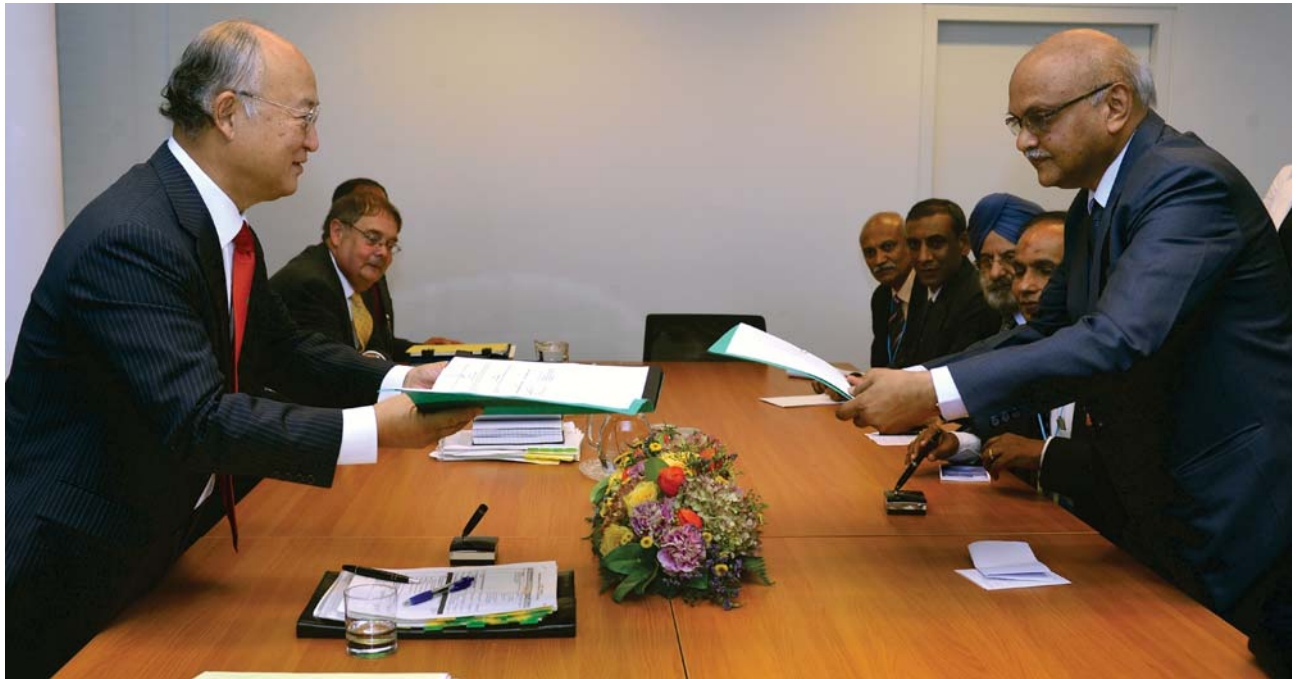
It would be recalled that at the Nuclear Security Summit held in Seoul on 27 March 2012, the Prime Minister had announced India's contribution of USD 1 million to IAEA's Nuclear Security Fund.

Amano expressed appreciation of India's continuing



support to and participation in IAEA plans and activities.

Other issues of mutual interest, including nuclear safety were also discussed during the meeting. ■



IAEA Director General Yukiya Amano and Dr. Ratan Kumar Sinha, Chairman of the Atomic Energy Commission of India.

The project on setting up a Global Centre for Nuclear Energy Partnership, GCNEP, near New Delhi is progressing with architectural design work now completed. The Centre will have state-of-the-art training and research facilities for Indian and International participants. It has already begun off-campus activities and last year, in collaboration with the IAEA, organized a Regional Training Course on Nuclear Security - "Physical Protection of Nuclear Facilities against Sabotage, Assessing Vulnerabilities and Identifying Vital Areas". A similar joint event related to radiological safety is planned to be held later this year. India and the IAEA have signed "Practical Arrangements" and we look forward to an intensive collaboration with IAEA in various programmes connected with GCNEP.

Mr. President,

I wish to draw attention to the published results of the recently concluded Indian studies based on screening new-borns for any congenital malformations in the high level natural radiation areas (HLNRA) in Kerala, India, where the radiation fields range from less than 1 mGy/year to 45 mGy/year, against the global average of approximately 2.4 mGy/year from natural sources of radiation. During the period of August 1995 to December 2011, over 140,000 new-borns in the HLNRA and normal radiation level area were screened for different health-related parameters. The studies have shown that there is no significant difference between the populations belonging to HLNRA and normal radiation level area with respect to the

frequency of congenital malformations, Down Syndrome and still-births. No significant difference was observed in the frequency of occurrence of chromosomal aberrations and micronuclei too.

Furthermore, the earlier studies carried out in the same region on a cohort of nearly 400,000 people did not show any significant increase in the incidence of any type of cancer in the HLNRA.

In this context, before concluding my statement, Mr. President, I would like to recall the opening remark of the Director General during this General Conference, and I quote, "The ultimate goal is to make nuclear power as safe as humanly possible everywhere and to restore public confidence'. Unquote. I would like to add further, that, in addition to enhancing safety, as a part of the efforts to address the currently prevailing public concern in some parts of the world, it is also essential to project credible and authentic scientific information on the effects of nuclear radiation on human health to dispel misconceptions against nuclear power. The IAEA should take the lead and coordinate with other appropriate international organizations to consolidate and review all relevant updated scientific findings to help address the prevalent fear of low-dose radiation effect in public mind, and thus remove a potential major impediment in enhancing the role of nuclear energy to serve mankind. ■