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Newsletter of the Pakistan Atomic Energy Commission

NOVEMBER - DECEMBER, 2003

Prime Minister presides over the 31st Meeting of Pakistan Atomic Energy Council

Development of a strong base of nuclear power plants in the country PAEC directed to prepare 'VISION-2025 PLAN'

Emphasising the importance of cheap electricity for rapid development, and in view of environment-friendly and cost competitive aspects of nuclear energy, Prime Minister of Pakistan, Mir Zafarullah Khan Jamali has desired that PAEC should prepare a "Vision 2025" plan for the development of a strong base of Nuclear Power Plants in the country. While presiding over the 31st Meeting of Pakistan Atomic Energy Council, he said that PAEC, in its capacity as the largest national Science & Technology organization, should take a lead in promotion of scientific and technological activities in the country.

Commending the role of PAEC towards scientific and technological development and the defence needs of the country, the Prime Minister directed that resources and energy be devoted to the development of human resource and infrastructure for socio-economic uplift of the nation.

The Prime Minister stressed upon the need for scientists and engineers to strive hard for the betterment of the country. Pakistan is to stay in the comity of nations with honour and we should learn to live with dignity within our own limited resources and every citizen should contribute with dedication and devotion towards achieving this goal.

Pakistan Atomic Energy Council is the highest policy formulating body created by the PAEC Ordinance 1965. The Council has twenty two members representing various ministries, research organisations and academic institutions. The Prime Minister as Minister Incharge of PAEC, is the Chairman of the Council.

The PAEC Council reviews the work and provides overall policy guidelines for the scientific and technological programme of PAEC. The 31st Meeting of the Council was held on 2 December, 2003, in the Cabinet Room of the Prime Minister's Secretariat, Islamabad.

Mr. Parvez Butt, Chairman, PAEC, while outlining salient features of the activities of the Commission, briefly traced the history of PAEC from 1961 when work was started at Lahore in a building, which was originally constructed for PCSIR. It was due to the bold vision of the then Chairman Dr. I. H. Usmani, that small, but effective R&D laboratories were established in areas such as agriculture, medicine, physics, chemistry, engineering and manpower training. These small R&D centers have now blossomed into large organizations.

In 1961, PAEC started work on the first nuclear research reactor at PINSTECH, Nilore,

near Islamabad. PINSTECH is now the largest R&D center in the country. In 1965, the Commission took another bold step by signing the contract for the Karachi Nuclear Power Plant (KANUPP). These visionary steps taken in the 60's resulted in the sustained growth of PAEC. The scientists of PINSTECH and the engineers of KANUPP together formed the team that eventually got together to meet the challenge and demonstrated the country's capability in design and manufacturing projects of tremendous importance for national defence and socio-economic development.

Over the years, PAEC has developed expertise and skills in diverse areas of Science and Technology. These range from mining, to geo-technological studies, to chemical processing, to production of nuclear fuel, to nuclear power, to engineering and heavy equipment manufacturing, to computers and controls, to agriculture, to biotechnology, to nuclear medicine, to defence oriented projects and so on.

KANUPP, which was commissioned in 1971, completed 30 years of designed life on 6 December 2002, as determined by PNRA. Massive refurbishment, over-hauling and updating has been carried out during the past one year, all indigenously. The Re-Licensing



Prime Minister of Pakistan, Mir Zafarullah Khan Jamali, presiding over the 31st Meeting of Pakistan Atomic Energy Council

Outage (RLO) was completed in Oct. 2003. The plant is now ready to be operated for another 12-15 years. All basic inputs to operate the plant such as fuel, zirconium, heavy water and most of the equipment and spares are manufactured by PAEC. The government has made no budgetary allocation for the plant since 1975.

The Chairman informed that the 300 Mwe PWR CHASNUPP-I, which is the first of the twin units constructed at Chashma, is operating well and has sold electricity worth more than Rs. 10 billion to WAPDA since September 2000. Since the refueling outage, the plant availability factor is 80%. This is better than that guaranteed by the supplier. As per agreed schedule, negotiations between PAEC and CNNC are continuing to finalize technical and financial details of the Second unit at Chashma, C-2.

The Directorate of Scientific and Engineering Services (SES) has established several state-of-the-art workshops, Pakistan Welding Institute (PWI) and National Centre for Non-Destructive Testing (NCNDT). During the year 2003, the value of jobs carried out by SES was approximately Rs. 300 million.

Highlighting the achievements of Informatics Complex, PAE Council was informed that the center has been engaged in building training simulators for Nuclear Power and other plants. It is also engaged in carrying out development of robotics and other projects related to instrumentation and control.

The Chairman laid emphasis on the contributions of PINSTECH in multidisciplinary R&D in nuclear science and technology. PINSTECH won the IDB first prize for the year 2002 for outstanding scientific contribution in the entire Muslim World. The total number of international publications of PINSTECH in 2002 had reached the level of 80, in spite of the fact that PINSTECH was starved of funds for development work. PINSTECH hopes to venture into new fields like nanotechnology, fuel cell technology, photonics, special materials, industrial pollution control and synchrotron light research.

Talking about Human Resource Development, Chairman specially mentioned the names of PIEAS, KINPOE, CTC, CHASCENT, NCNDT, PWI and NIBGE. The institute are either producing graduates, undertaking research or training manpower for not only PAEC but also other Strategic Organizations.

In the agriculture sector, PAEC has been in the forefront of using nuclear techniques for the improvement of crops and has developed 43 high yielding, disease resistant varieties of wheat, rice, cotton, chickpea, mungbean, lentils, rapeseed and sugarcane. It is estimated that PAEC has generated Rs. 6 bil-



31st Meeting of Pakistan Atomic Energy Council in progress

lion/year additional income in the agricultural sector due to the introduction of these varieties. Work is going on for the biological control of pests of sugarcane, cotton and fruit orchards through male sterile techniques and pheromone traps. Production of vaccines for different diseases of livestock and genetic improvement and mass production of banana and sugar cane is being undertaken.

Technology has been developed for utilization of brackish underground water and saline soils to produce products of economic value. Two Biosaline Research Stations have been established at Rakh Dera Chal near Lahore and at Pakka Anna near Faisalabad. Biosaline Agriculture Technology is being disseminated to ten countries of the region through IAEA. The number of international publications in the year 2003 was 110. Saline Agriculture Farms Participatory Development Project has been initiated at Shorkot, Lodhran, Badin, Jaffarabad and Lakki Marwat.

The activities of National Institute of Biotechnology and Genetic Engineering (NIBGE) include deciphering of genome of Cotton Leaf Curl Virus, establishment of genetic diversity of CLCuV, development of GM virus resistant cotton, optimization of rice and tomato transformation system, and marketing of biofertilizer for wheat, rice, legumes and cotton. In the health sector, NIBGE has contributed in the PCR based diagnosis for hepatitis C, tuberculosis, typhoid and B-thalassemia. It is also involved in the development of DNA

vaccine and nanotechnology for its application in biotechnology. In the environment and industrial sector, NIBGE is contributing in the production of enzymes for textile industry, optimization of process of coal biodesulfurization, development of DNA method for determining gene toxicity of different effluents and utilization of bioremediation technology for cleaning of environment. Recently, the method was applied for cleaning of oil spill at Karachi beach.

In the health sector, PAEC has thirteen functional cancer hospitals spread all over Pakistan. These hospitals treat about 320,000 patients, mostly free of cost through Zakat fund, donations, and generated income. Another hospital in Abbottabad is almost complete and five more are in the pipeline.

PAEC is also involved in commercial activities through AI-Technique Corporation, Ravi Rayon Ltd., Pakistan Radiation Services (PARAS) and Agri Business Projects. The PAEC Foundation generates income through schemes like farming, Foundation Travels, and Hydro Power Station. The profits are spent on welfare of PAEC employees.

PAEC has been supplying equipment to various organizations both in the public as well as private sector. Recently PAEC provided equipment and services worth US\$ 1 Million to CERN. In September 2003, an agreement was signed between CERN and PAEC to manufacture and supply equipment worth US\$ 10 Million to CERN in next five years.

PARAS has been involved in sterilization of medical equipment. Recently a trial irradiation of 500 kg of mangoes for export was done at PARAS. Three more irradiation facilities are planned for Karachi, Peshawar and Multan. PAEC has collaboration with thirteen international organizations.

Concluding his presentation, Chairman remarked that PAEC is a unique organization. It is involved in critical and classified work for national defense as well as for the socio-economic and technical development of the country. It is playing a significant role in diverse areas such as: research in basic sciences, development of agriculture and biotechnology, provision of specialized medical services, exploration and exploitation of minerals, production of nuclear materials, instrumentation and control, nuclear electricity generation and projects of importance for national defence. It is now a key player in the industrial development. In spite of international embargoes on nearly all PAEC activities, its success in such diverse fields lies in the cohesiveness within the Organization, proper attention to human resource development and stress on indigenization, strategic planning and judicious use of autonomy and freedom given to it.

Mr. Ansar Hussain Shamsi, Member (Finance) PAEC, briefed the Council on the Budgetary issues and financial prospects.

In his concluding remarks, the Prime Minister stressed upon the need for scientists and engineers to strive hard for the betterment of the country. While appreciating the achievements of PAEC, he observed that PAEC is the epicenter of science and technology in the country. Responding to the request of PAEC for enhancing grants for research activities, the Prime Minister desired that adequate funds should be made available for R&D purposes and assured government's full support in this regard. He constituted a committee to consider the recommendations as made by PAEC Council and submit its report as soon as possible.

The Prime Minister directed PAEC to continue the ongoing negotiations on CHASNUPP-2 with China so that these are completed on schedule and the project work may start next year. The Prime Minister appreciated the efforts of PAEC in agriculture and biotechnology. Agriculture being lifeline of the country should be given due attention and he desired that PAEC may expand its activities in agricultural research, particularly in the development of new varieties of crops and mitigation of pests using bio-control methods. For attaining maximum output of research, he advised PAEC to increase intake of trainees from universities.

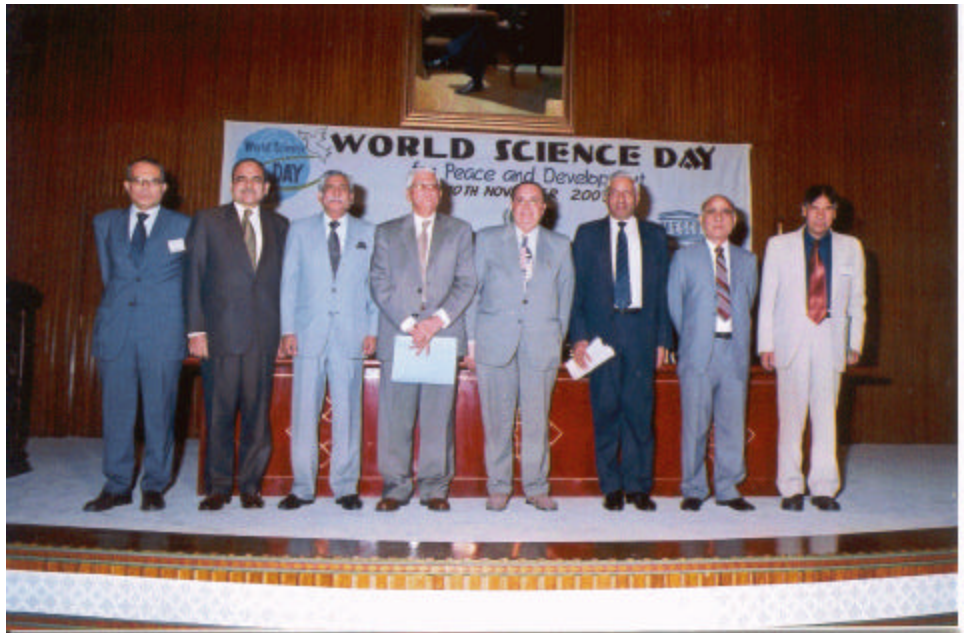
The meeting concluded with a vote of thanks for the Chair.

World Science Day for Peace and Development

Top Pakistani Scientists asked for increased investment in scientific research and development which they said was vital for durable progress of the country. Addressing a Scientists Convention held in Islamabad on 10 November, 2003, in connection with World Science Day for Peace and Development, celebrated by UNESCO throughout the world, they said that investment in science was an essential requirement of modern day knowledge-based economies and the countries which had invested in scientific development, had harvested enormous benefits.

Dr. Ishfaq Ahmad appreciated the efforts of PAEC in popularizing science and its research contribution to the prestigious CERN project. He said that the quality of our manufacturing can be gauged from the fact that international organizations like CERN are acquiring manufactured equipment worth US\$10 million from us.

He also desired that on the next Science Day all stakeholders i.e. economists, planners youth, and people from the industry should be invited.



Dr. Atta ur Rehman, the Minister Incharge of Science & Technology, who is also Chairman Higher Education Commission, lamented the brain drain in the form of highly trained scientists taking up jobs abroad for want of good working environment and salary package. He said that steps were being taken to lure them back and contribute towards national development. He said that linkages between science and technology are must to attain the desired results and quoted examples where knowledge alone could not transform into beneficial technologies.

Following the inaugural part of the gathering, a special session, chaired by Dr. Ishfaq Ahmad, Special Advisor to Prime Minister on Strategic Programme was held. Dr. Ishfaq Ahmad, in his opening remarks stated that a 10-point programme aiming at strengthening science was resolved in 1994 during a meeting of leading scientists. He said that he was happy to know that action on all those points have been taken except a project of building our own accelerator to complement the research facilities available around research reactor of Pakistan Institute of Nuclear Science and Technology (PINSTECH).

Mr. Parvez Butt, Chairman, Pakistan Atomic Energy Commission, urged the engineers and scientists to get together and work for the development of the country. PAEC has been the largest producer of trained human resource in the country and based upon the strength of its technical resources, it has worked for indigenisation which is the only veritable way of introducing new technologies in the country.

He said that that following the withdrawal of foreign support, PAEC operated KANUPP entirely on its own resources. Based upon the technical competence, PAEC engineers have been able to extend the useful life of KANUPP.

Dr. Atta ur Rehman observed that he would welcome a financial proposal from PAEC to meet the budgetary deficit of PINSTECH. He agreed to the appointment of a group of scientists for working out the feasibility of installing a research accelerator as proposed by Dr. Ishfaq Ahmad.

The Convention was attended by a large number of researchers, scientists and academicians.

IAEA/RCA-PAEC Training Workshop on improvement and diversification of feed resources for livestock at NIAB Saline Land Reclamation Technology being provided to other countries under IAEA Project

Pakistan is providing Saline Land Reclamation Technology to about ten countries through the International Atomic Energy Agency (IAEA). Pakistan Atomic Energy Commission has developed two saline agriculture research centres and recently embarked upon reclamation of 25,000 acres of saline lands.

This was stated by Dr. Kauser Abdulla Malik, Member (Bio-sciences and Administration), PAEC, while inaugurating the IAEA/RCA - PAEC Regional Training Workshop for studying the nuclear and related technologies for elimination of anti-fodder constituents, held at Nuclear Institute for Agriculture & Biology (NIAB), Faisalabad, from 1-12 December, 2003.

Dr. Malik said that livestock constitutes a very significant part of agriculture economy and has the potential for enhancing the GDP of the country. The source of living through livestock is the mainstay of the rural areas and hence it is a big poverty prevention.

He informed that six million acres saline land which otherwise is lying as wasteland can be put to economic use by growing trees, shrubs and animal fodder through the application of nuclear techniques. These compatible crops and fodder can help increase livestock assets of the country manifold.

He said PAEC is beneficiary of many technical programmes initiated by IAEA, and has always been an active contributor to the humanitarian agenda of the Agency. Pakistan is an important member of IAEA and it will make every effort to support its programme. He said Pakistan has always supported South-South cooperation.

Dr. Kauser said that PAEC is maintaining four agriculture research centers in different regions of the country and research findings of these institutes have resulted in high yield and disease resistant crops with manifold increase in national food output.

IAEA Technical Officer, Dr. Harinder Paul Singh Makkar said that increasing human population requires additional food and livestock. The same being important part of human consumption deserves special attention for enhancing its growth. He said the demand for livestock consumption would double in the next 20 years.

Livestock is going to be the next focus of attention of the world and that is why IAEA is giving this subject its due importance. He said due to degradation of environment, the resources of fodder for livestock are shrinking and this calls for evolving non-conven-



Group photograph of Workshop participants and Subject Specialists with Dr. Kauser Abdulla Malik, Member (Biosciences/Admin), PAEC

tional fodder with improvement of existing ones.

Dr. Singh apprised the participants that conventional fodder is neither completely healthy nor sufficient and that is why we must focus to evolve non-conventional fodder to meet nutrition requirements of the livestock.

Director NIAB, Dr. Mohsin Iqbal presented a resume of research contribution of the Institute to agricultural and livestock development. NIAB has developed 21 improved varieties of crops like cotton, rice and pulses which are being cultivated on wide areas in the country and have provided an additional income of Rs. 56 billion to farmers. He said in recognition of their research efforts, the scientists of NIAB have been given national honours and awards.

Dr. Shahnaz Adee Khanum, Workshop Director, said that the event has been organized as a part of IAEA's regional project titled "Improving Animal Productivity and Reproductive Efficiency", with a view to addressing problems like marginal poor lands, salt affected waste lands and non-conventional low cost feed resources.

The Workshop, attended by 14 participants from 11 regional countries including Sri Lanka, China, Malaysia, Indonesia, Thailand, Myanmar and Vietnam, was conducted by Subject Specialists of IAEA from Germany and Zimbabwe.

Addressing the concluding session of the Workshop, Chairman, Pakistan Atomic Energy Commission, Mr. Parvez Butt appreciating the role of IAEA in helping the member countries in their economic development. He

said livestock being significant part of agrarian economy prevents poverty. In view of the useful role of PAEC agriculture research centers in evolving high yield/soil suitable crop varieties, Chairman announced that NIAB and other such institutes will be expanded for undertaking much needed research in food production.

PAEC has a large infrastructure for supporting the local industry in the form of Pakistan Welding Institute, National Centre for Non Destructive Testing and state-of-the-art design and fabrication workshops.

He said negotiations for Chashma Nuclear Power Plant-II are in progress. After the successful operation of Chasnupp-I, the installation of Chasnupp-II would augur well for nuclear power development, he said, adding that it is an essential part of country's energy mix along with hydro, coal and gas electricity options.

He disclosed that Karachi Nuclear Power Plant, which has completed thirty years of its designed life, has been renovated/upgraded entirely by indigenous resources with safety consultation of many international nuclear related organizations.

The up-graded plant will be as safe as any other one in the world. "We have demonstrated this through thirty years of safe operations and we enjoy an excellent safety record at world level." He said the practice of extracting more years of production from such plants is being followed all over the world and more than 25 plants in US have been relicensed with similar pattern in other countries. The cost of electricity from such renovated plants is cheapest of all modes of production.

Bhittai: An Early Maturing, High yielding and Disease Resistant Wheat Variety

Wheat, being the most important cereal food, serves major role in satisfying the food requirements of the world. In the wake of global warming, many environmental stresses like drought, rising temperatures, salinity, water logging and erosion have raised new challenges for wheat production. Abiotic stresses are not only responsible for direct losses but also make crops more vulnerable to biotic stresses like disease and insect attacks. In biotic stresses, new races of cereal rust (s), powdery mildew and loose smut have evolved in space and time dimensions. These races are capable of infecting the wheat in the environments in which otherwise they were unable to.

Keeping in view these challenges, wheat group working for 'Transfer of Disease Resistance in Bread Wheat' at NIA, Tando Jam has contributed by evolving early maturing, high yielding, resistant to diseases (leaf and yellow rust), drought tolerant, possessing high protein and dry gluten wheat variety, 'Bhittai'.

Variety Evaluation Committee (VEC) in its meeting on October 5, 2003 approved the proposal of wheat variety Bhittai and variety was also recommended for submission to the National Seed Council.

Bhittai (SD-1200/14) has been developed through pyramiding of defeated and functional rust resistant gene (s) in high yielding susceptible genotypes (Soghat-90 and VEE) at NIA, Tando Jam. Bhittai proved its resistance against prevailing virulence of leaf and yellow rust(s) in National Wheat Disease Screening Nursery (NWDSN) for two con-



secutive years (1998-1999 and 1999-2000). Bhittai has yield potential of more than 8 tonnes pre hectare in the cotton belt of Sindh and it has also performed well under reduced irrigated conditions of rice tract. It has exhibited higher yield performance at different sites in National Uniform Wheat Yield Trial (NUWYT) in normal and late sowings at different locations across Pakistan during Rabi 1999-2000 and 2000-2001, that confirms its wide adaptability and yield potential. Its earliness makes it suitable for both Cotton-Wheat cropping systems.

Besides the high yield and disease resistance features, Bhittai is distinguishable among the commercially grown wheat varieties in Pakistan due to characteristics like

long white spike, white chaff, bold amber grain, thick and stiff stem. Besides this, Bhittai is blessed with high percentage of protein (14.57%) and dry gluten (10.57%) with strong consistency that makes the variety excellent for baking and export.

According to the recommendations of Pakistan Agricultural Research Council and Crop Disease Research Programme, NARC, Islamabad, Bhittai will not only boost production but would also act as a new source of resistance for rust management and it will enhance genetic diversity in wheat fields. Hence, its deployment will not only enhance sustainable wheat production but will also help in widening the genetic base for existing virulence of leaf and yellow rusts.

PINSTECH Excels in Radiation Dosimetric Measurements

To achieve and ascertain acceptable levels of accuracy in dosimetric measurements, PINSTECH has been participating in various international inter-comparison exercises in radiation dosimetry conducted/arranged by IAEA/RCA. There are different levels of tolerable uncertainties acceptable for various dosimetric measurements required for different activities such as therapy and protection level calibration and personnel dosimetry. PINSTECH has so far participated in 21 such exercises. As many as 65 developed and developing countries have participated in these IAEA/RCA inter-comparison exercises.

The results of IAEA/RCA exercises indicate that dosimetric measurements at PINSTECH

are as good as those in most of the developed countries like Japan and Australia. In 57 measurements conducted in 21 IAEA/RCA inter-comparison exercises spread over 18 years, there is not even a single case of OUT-LIER (i.e. result outside the acceptable limit). Special mention is deserved by dosimetric measurements in 1990 and 1992, wherein uncertainty level was zero (i.e. it matched the target value of the exercise); dose measurements in 1995, 2001 and 2002, wherein the uncertainty levels were 0.1%, 0.19% and 0.2% respectively.

PINSTECH is the only establishment in Pakistan, which provides radiation dosimetric services to all end users in the country on subsidized rates. Similarly, PINSTECH owns

and operates the only Secondary Standard Dosimetry Laboratory in the country which provides calibration and dose output measurement services to all radiation users in the country. The measurements at PINSTECH SSDL are traceable to IAEA Dosimetry Laboratory, Seibersdorf and National Physical Laboratory, U.K.

PINSTECH has been successful in achieving and maintaining International Standard of accuracy in the field of radiation dosimetry in Pakistan. PINSTECH is now in a position to arrange, conduct and lead similar inter-comparison exercises in dosimetry amongst various national laboratories having similar facilities and capabilities.

Booster Fuel Assemblies removed from KANUPP Reactor Core

KANUPP reactor had eight booster fuel assemblies of 10.45 percent enriched uranium aluminum alloy. The main purpose of the booster fuel assemblies was to provide sufficient excess reactivity to bring the reactor back to about 65% of previous power within 30 minutes following a reactor trip. However, the available heat sink to the booster cooling could be lost in case of some postulated accident(s) and the unavailability of heat sink can lead to melt down of the booster fuel. This design feature in the KANUPP booster rod cooling system vis-a-vis the modern CANDU design safety practice was highlighted during a review of KANUPP safety features under an IAEA task. It was concluded that the benefits of using boosters for rapid restart to override poison out were far out weighed by this concern. Since 1993, KANUPP had stopped using booster fuel and subsequently planned permanent removal.

The job of removal of booster fuel assemblies was considered a critical activity for several reasons: (1) due to an extra ordinary long period of booster assemblies in the parked position proper assessment of radiation exposure rates at various locations of the booster assemblies was difficult; (2) the boiler room crane hoist was to be used between its extreme limits with maximum load several times with 100% reliability; (3) the equipment and systems were to be checked/verified for proper behavior and functional requirements. A dedicated group comprising personnel from Maintenance, Health Physics, and Quality Assurance Division was formed to make an action plan for the booster fuel removal.

Most of the equipment and tooling supplied by the vendor for booster fuel removal were required to be qualified. A comprehensive program was chalked out to update, review, qualify and practice booster removal on mock-up and/ or on actual site. The procedures were reviewed by the Radiation Control Officer for estimation of time and radiation doses.

The job of removal of first booster fuel (bottom parked booster rod) was started in March 2003. In the light of problems faced during removal of the first rod, thorough discussion were held and considering different scenarios, and a more stringent quality control program, all remaining rods were successfully removed without any difficulty.

During the whole operation of booster rods removal, the role and coordination of Health Physics Division was very effective. Dose rates up to as high as 2000 R/h were experienced. Due to prolong residence time in the reactor core, sometimes the dose on

the structural material was much higher than the dose on the fissile material. The ALARA principle was strictly applied at work with great success. The collective dose of the work group was limited below the estimated dose. None of the workers crossed the regulatory dose limit. A very unique radiation data have been collected during the job such as: (1) the exposure rate at various steps, (2) number of workers and time required to carry out that step, and (3) individual and collective doses. This will be a very useful reference for the similar tasks in other CANDU plants.



The team, entrusted with the job of Booster Fuel Assemblies removal from KANUPP Core, photographed with Dr. Inam-ur-Rahman, Scientist Emeritus, PAEC.

Descaling Technique Developed for KANUPP Boiler Tubes

PAEC has sustained successful and safe operation of KANUPP for the last 30 years. Since the disruption of vendor support in the early years of operation, the plant has been operated by PAEC's own scientists and engineers through indigenous efforts aimed at strengthening self-reliance programme. The recent example of such indigenous effort is the successful descaling and decontamination of Primary Heat Transfer (PHT) loop containing Steam Generators of KANUPP.

The operation of a water-cooled nuclear reactor results in slow corrosion of the interior metal surfaces of the PHT loop. The resulting corrosion products circulate through the reactor core and are activated by neutron flux inside the core. While some of these corrosion products are removed by the water clean up system, a substantial part continues to deposit on the PHT loops' internal surfaces. As a result of this accumulation, radiation levels in the vicinity of primary heat transport

system rise, thus, inhibiting or complicating the routine inspection and maintenance of the primary system. It is estimated that 80% of the occupational radiation dose comes from the in-service inspection of the primary system. There was, therefore, an urgent need to decontaminate the PH system including steam generators. Foreign consultants were contacted for this job who demanded exorbitant cost with involvement of a very long time period comprising R&D and subsequent execution. In view of this, the job was entrusted to a team of scientists and engineers from DNFC, KANUPP and PINSTECH.

The descaling assignment involved development of a chemical solution, which may dissolve the deposited corrosion products, and the design/fabrication of equipment capable of circulating the dissolving solution through the system remotely. A reliable service in the form of analytical facilities and health physics arrangements to protect the working person-

nel of this assignment were essential for the accuracy and safety of the job execution.

The descaling job of one Boiler was taken in hand which has been completed and the procedure so developed has been successful. The decontamination of the remaining system is underway. The results of this decontamination exercise have been compared with those of other plants in the world and found satisfactory. Such innovations/improvements form part of the operational capability and confidence and augur well for the life extension of the plant.

As a result of this strenuous efforts, an indigenous technology has been developed for the successful decontamination of the internal systems of nuclear power plants. All the procedures, techniques and steps of this method have been vetted by Pakistan Nuclear Regulatory Authority (PNRA).

Human Resource Development Programme at NIFA

Historically, Pakistan's prosperity rests upon a beautiful and diverse base of natural resources including agriculture related components. These resources have contributed significantly to the economic development of this country. Our population is increasing at a very rapid pace for which abundant food supplies would be needed. Agriculture has a history of increasing productivity per unit of land area so that a growing human population can be fed. Therefore, harnessing agriculture frontiers on scientific line is the key to success. PAEC's four agricultural centres, NIA, Tandojam, NIFA, Peshawar, NIAB and NIBGE, Faisalabad, are performing their due role in national development. All these Centers are geared towards indigenization and attaining self-sufficiency in every field.

The Nuclear Institute for Food and Agriculture (NIFA), Peshawar, was established in 1982. The prime theme of the research programme has been to ameliorate the lot of farmers with increased productivity and stabilized incomes by enhancing productivity of arable crops and finding methods of preservation of various food commodities using nuclear and other techniques. NIFA has carved out a reputable place for itself in agricultural research in the fields of crop breeding, food science, soil science and entomology.

Utilizing the expertise and the facilities available, NIFA organizes annually a two-week postgraduate course on the application of nuclear and other advanced techniques in food and agricultural research. The course is designed primarily to create awareness about radiation and its peaceful uses among the masses and provide practical training to researchers, academicians, and postgraduate students in the application of radiation and radioisotopes and other advanced techniques in the field of food and agriculture.

NIFA has well qualified trained manpower and well equipped facilities for conducting such courses. Nineteen courses have been held so far, for about 450 participants from all over the country. The course has been designed to acquaint the participants with theoretical and practical aspects of nuclear and other advanced techniques, comprising Specialized lectures by scientists from other PAEC organizations (NIAB, NIBGE, PIN-STECH, DGCC, NIA, etc.), research organizations and universities. The participants are equipped with new ideas and acquaint themselves with the available techniques at NIFA and maintain a productive interaction with NIFA in future.

The training programme comprises lectures and practicals in the following areas:



- Basic Physics: Fundamentals of radiation; radioisotopes and their applications in Agriculture, Health, Industry and Environment. Biological Effects & Nuclear Safety.
- Spectroscopy: Ultraviolet, Visible, near Infra-red and Atomic Absorption
- Chromatography: Separation Techniques, Column chromatography, Thin layer chromatography, Gas chromatography, high performance liquid chromatography
- Specialized Lectures: Mutation breeding and tissue culture, Chemical and biological control of insects and termites, Use of nuclear and other techniques in soil research, Food chemistry, nutrition and microbiology, Pollution, Role of statistics in scientific research
- Laboratory experiments in Nuclear techniques: Use of radiation sources, counters and dosimetry, neutron moisture probe and radio-sensitivity of insects. Spectroscopy: Ultraviolet, visible, near infra red and atomic absorption. Proximate analysis; chromatographic techniques like GC, TLC etc. microbiological analysis of food and water

NIFA has also organized 13 special courses on "Food & Nutrition" and trained over 120 army officers on different aspects of food-supply. In addition, whenever required, NIFA organizes courses on Radiation Protection. NIFA has very close collaboration with various agricultural organizations like Agri. Research Institute, Agriculture Extension, Agricultural Research System, Joint Venture Seed Production and NWFP Agriculture University. NIFA is providing its facilities to universities for post-graduate studies. Specialists in different fields are invited regularly to share their knowledge. Farmers Day, which provides a forum to discuss various issues relating to agriculture and provide a

feedback from end-users to update our R&D program the end users, is a regular feature.

NIFA-RAYA: Mutant variety of oilseed mustard

The NWFP Seed Council in its meeting on October 8, 2003 approved NIFA Mustard Variety "NIFA-RAYA" for commercial cultivation in the rainfed and irrigated areas of NWFP. NIFA-RAYA has been developed at a dose of 140 krads gamma rays by the Oilseed Brassica Group, NIFA. The first ever-mutant variety of mustard (*Brassica juncea* L.) in Pakistan, NIFA-RAYA expressed sustainable productivity in various yield tests viz. Preliminary, Advanced, Multilocations and National Uniform Mustard Yield Trials in diversified climates from 1997-98 to 2001-02. Its yield potential is 2.0 to 2.5 t/ha.

It contains high oil content of 47% (range: 44-47%) as compared to 41% of control (BARD-1), an increase of 14.6% over the check. It has low erucic acid in oil (1.30-2.04%) coupled with low levels of total glucosinolates (22 $\mu\text{M}/\text{gm}$) in meal. Thus its oil is safe for human consumption and meal is suitable for animals and poultry feed.

NIFA-RAYA is a mid maturing *juncea* line. It exhibited significantly early maturity (3-4 weeks) than the parent, is moderately resistant to main diseases i.e. *Alternaria* blight and Downy mildew. The major insects of rapeseed/mustard in Pakistan are aphids and cabbage butterfly and NIFA-RAYA is fairly tolerant to these insects attack. It is also resistant/tolerant to lodging, shattering and drought.

Announcement: INSC-2004

29th International Nathiagali Summer College on Physics and Contemporary Needs Nathiagali, 28 June - 15 July, 2004

International Nathiagali Summer Colleges on Physics and Contemporary Needs (INSC) have been organized every year since 1976, mostly at the scenic hill resorts near Islamabad, Pakistan. The idea of holding these Colleges came from the distinguished Nobel Laureate. Professor Abdus Salam who emphasized the vital need of communication, as well as for transferring and sharing scientific knowledge, among the scientific community of the Third World.

The scientific activities of INSC aim at a broad coverage of topics at the frontiers of knowledge in physics and allied sciences. One or two subjects of current interest and their applications for technological development, with special reference to needs of the developing world, are highlighted by a renowned international faculty every year. About two hundred scientists from a large number of developing nations benefit from this scientific discourse. During the last twenty eight years, about 485 eminent scientists including six Nobel Laureates shared their knowledge and experience with nearly 5400 scientists from over seventy developing countries.

Over the years, Pakistan Atomic Energy Commission has regularly organized this scientific activity. From the 26th College, the scientific programme of the College is being looked after by the National Center for Physics, Quaid-i-Azam University, Islamabad.

These Colleges have traditionally been held at the scenic summer resorts of Nathiagali, near Islamabad, the capital of Pakistan. Lodged in the sylvan slopes of lower Himalayan range, these hill resorts (2000-3000 meter high) are sheer slopes of colourful harmony, rolling fields and towering forested hills, pervading senses with a deep feeling of rediscovering nature. The venue provides an excellent blend of tranquil atmosphere conducive to learning and enjoying nature at its best. Some Colleges have also been held at nearby hill resort Bhurban, and Islamabad.

Scientific Programme

The scientific programme of the 29th College has been divided into three activities: (i) Information Technology, (ii) Synchrotron Radiation and Laser Physics, and (iii) Workshop on Ultrashort Pulse lasers.

During the first week (28 June - 3 July, 2004) focus of attention will be Information Technology covering VLSI Design and Manufacturing, Network Security, and Grid Technology.

Today we can see the proliferation of VLSI devices in all kinds of equipment e.g. computers, electronic and consumer devices, automobiles, medical and industrial equipment. The use of highly integrated VLSI devices in these systems has led to the miniaturization of this equipment due to lower power consumption that has also resulted in the reduction of overall system costs. Lectures will be presented on different aspects of VLSI design.

Network security is the process of preventing and detecting unauthorized use of information stored on computers and transmitted via networks. Lectures will cover recent progress in this area.

The vision behind GRID is a computing environment where anyone can play in from anywhere and access any resource on the grid. The end-users would be able to rent processing power as well as software resources, such as web services. Lectures will be presented to introduce this new technology and the recent progress made in its development.

During the Second Week (5 July - 10 July, 2004) the theme of discussions will be Laser Physics, Advanced Light Source, SESAME Project and Laser Cooling. The College will focus on Synchrotron Radiation, its applications, and SESAME Project of which Pakistan is a member. Eminent scientists and machine designers as well as SR users will lecture on the science, technology and training that can be done with SESAME. The course aims at physicists, chemists, biologists and material scientists so that they start concept designs of experiments, dealing with their fields of specialization, to be done on SESAME.

The second half of this week will be devoted to laser physics, covering Diode lasers, Ultrashort pulse Lasers and Laser Cooling. The College will be followed by a 4-day Workshop on Lasers.

Registration

The College is primarily intended for scientists actively engaged in teaching and research activities in developing countries. Advanced graduate students from Pakistan are also encouraged to attend. Participants must have an adequate knowledge of English which is the working language of the College. The boarding and lodging arrangements and the expenses in this regard are, in general, the responsibility of the Organizers.

29th INSC SCIENTIFIC PROGRAMME

Ist Activity: 28 June - 03 July, 2004

INFORMATION TECHNOLOGY

- VLSI Design and manufacturing
- Network Security
- Grid Technology

IInd Activity: 05 - 10 July, 2004

SYNCHROTRON RADIATION AND LASER PHYSICS

- Laser physics
- Advanced Light Source
- SESAME Project
- Laser Cooling

IIIRD Activity: 12-15 July, 2003

WORKSHOP ON LASERS

- Ultrashort Pulse Lasers
- Semiconductor Lasers
- Laser-produced Plasma

The travel costs are expected to be arranged by the participants. However, modest funds may be available to cover the expenses, either in full or in part, of a limited number of participants from the developing countries. Requests for participation, on the prescribed form (or photocopy) should reach the Summer College by 30th March, 2004. The selected candidates will be informed by 30th April, 2004.

For further information, please contact:

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