



# PakAtom

Newsletter of the Pakistan Atomic Energy Commission

July-August, 2010

## Chairman, PAEC inaugurates Teachers Training Course at PIEAS

Pakistan Atomic Energy Commission (PAEC) organized a two-week Teachers Training Course from July 05-16, 2010 at Pakistan Institute of Engineering and Applied Sciences (PIEAS), Islamabad. The course was attended by 138 teachers from PAEC Schools and Colleges at Dera Ghazi Khan, Jauharabad, Kundian and Islamabad.

Dr. Ansar Parvez, Chairman, (PAEC) graced the occasion as chief guest in the inaugural of the course. In his address, the Chairman stressed upon the importance of enhancing the knowledge and skills of the teachers through innovative training programs. He stated that educating children coming from different backgrounds is a real challenge, which teachers in PAEC schools should be aware of.

He declared that PAEC is committed to raise the standards of education in its schools by improving the quality of teaching. The Chairman assured that all the schools will be equipped with computers and internet facility.

In his welcome address, Dr. Shoaib Ahmad, Member (Physical Sciences), said that this training program would provide an opportunity for teachers from various schools to interact with each other and with the Scientists/Engineers of PAEC. He urged upon

the science teachers to benefit from this training to augment their subject knowledge as well as seek guidance in upgradation of their Laboratories.

Earlier, Dr. Ismat Fatima, Director Research gave a brief introduction of



*Chairman, PAEC, Dr. Ansar Parvez, presiding over the inaugural session of the teachers training course. (From L to R) Dr. Shoaib Ahmad, Member (Physical Sciences), Dr. Ansar Parvez, Chairman, PAEC, Mr. Zia ul Hasan Siddiqui Member (Power) and Dr. Muhammad Aslam, Rector, PIEAS.*

the training course. Lectures on general topics of education were delivered by reputed professionals in the domain of teachers training, whereas technical subjects were covered by scientists and engineers at PIEAS & PINSTECH.

It may be recalled that PAEC is running a network of educational institutions from nursery to college level at its projects for the children of its employees.



*Teachers from PAEC Schools and Colleges and PIEAS Faculty Members attending the inaugural session of Teachers Training Course at PIEAS.*

# 35<sup>th</sup> International Nathiagali Summer College concludes

The 35<sup>th</sup> International Nathiagali Summer College concluded at its traditional summer resort Nathiagali on July 10, 2010 after two weeks of intensive deliberations by an international gathering of scientists.

The concluding ceremony was marked by the presentation of summary of the proceedings by the Executive Secretary of the College, Dr. Syed Javaid Khurshid. This was 35<sup>th</sup> appearance of the College in the series of International Nathiagali Summer Colleges organized annually by Pakistan Atomic Energy Commission and National Centre for Physics. The first ever summer college was organized in 1976. The remarkable success of the Summer College is characterized by its continuity, and its scientific contribution to the Third World.



*Concluding session of 35<sup>th</sup> INSC. (L to R) Dr. Syed Javaid Khurshid, Executive Secretary, INSC and Dr. Hamid Saleem, DG, NCP.*

The total duration of this college was two weeks from June 28 to July 10, 2010. Following were the topics that were covered during this period: Quantum Condensed Matter Systems, Scientific Computing and Mathematical Modeling. The faculty comprised of 16 speakers from abroad and Pakistan. The members of foreign faculty came from USA, China, Turkey, UK, Russia, and South Korea. During the whole duration of Summer College, 47 lectures of one-hour duration were delivered. Besides this, student seminars and 21 posters were presented during the college. This Summer College received 480 applications for the participation, out of which 185 participants were selected including 83 university students. Total 13 overseas participants were invited to take part in the summer college who were from Malaysia, Bangladesh, and Nepal. All the lectures delivered in the college were provided on CDs to the participants.

near Islamabad, on regular basis came from the distinguished Nobel Laureate, the late Professor Abdus Salam. The College has now evolved into an institution and has become a prestigious event in the scientific calendar of this part of the world. This college is perhaps the only one of its kind to be regularly organized in a developing country and, each year, covers a wide range of topics and their applications to the contemporary needs of the society. The College has the privilege of providing a forum for exchange of ideas between experience and youth. It has been highly successful in catalyzing lively interaction among the participants and faculty members, primarily from advanced countries. The college has been purposely designed to cover in a synoptic manner the modern trends in physics and their application in current technological development with

special reference to the needs of the developing world. He also mentioned that National Centre for Physics is committed to provide support to INSC now and in future.

Executive Secretary thanked all the members of his team, who have worked day and night to make this event a success and the Directors/officers of PAEC HQ who helped INSC in these arrangements. He especially thanked Dr. Shoab Ahmad, Member Physical Sciences and Dr. Ansar Parvez, Chairman, Pakistan Atomic Energy Commission, as without their guidance and cooperation this college could never have been such a success. At the end Dr. Hamid Saleem, DG, NCP and Dr. Syed Javaid Khurshid, Executive Secretary, Summer College distributed the certificates to the faculty & participants.

The Executive Secretary mentioned that the Nathiagali Summer College is an institution, which has served as a forum for people of different nationalities. Personal contacts are established, ideas exchanged, and new developments communicated in a relaxed environment. Discussions range from specialized technical topics to an expression of intellectual and cultural ideas. The college has been fortunate enough to attract persons who are leaders in their fields. Uptill now 600 eminent scientists and speakers including 06 Nobel Laureates from different universities delivered lectures to over 950 foreign participants from 72 countries and 6500 participants from R & D institutes, universities & colleges from Pakistan.

Dr. Hamid Saleem Director General, National Centre for Physics (NCP) concluding the college said that the idea of organizing a college at Nathiagali, one of the hill resorts



*Dr. Hamid Saleem, DG, NCP presenting certificate to a foreign faculty member of INSC Dr. Sumer Sahin, ATILIM University, Ankara, Turkey. Seen in the middle is Executive Secretary, INSC, Dr. Syed Javaid Khurshid.*

# Dual operation modes of the heat source for Nuclear Desalination Demonstration Plant (NDDP) at KANUPP

A Nuclear Desalination Demonstration Plant (NDDP) has been installed at KANUPP to produce desalinated water from seawater by thermal desalination process using nuclear steam as a source of energy. KANUPP Steam Cycle Economizer (COW-HX3) was isolated from the Condensate and Feed Water System of KANUPP to supply thermal energy for NDDP, costing 2 MWe in power generation.

For recovery of efficiency loss when NDDP system is shutdown due to any reason, a scheme was devised for dual operation modes of COW-HX3. Piping layout of COW-HX3 has been modified for switchable operation i.e. in Condensate Water (COW) loop as per original design or a heat source for Intermediate Coupling Loop (ICL) of NDDP, depending upon the requirement. For this purpose,

additional isolating and drain valves, spectacle flanges have been installed at upstream and downstream sides of COW and ICL loops to eliminate any chance of transfer of tritiated water from COW system to ICL loop.

Despite stringent space limitations, modifications were done without altering position of adjacent equipments in the Turbine Auxiliaries area.

Design, fabrication and installation of modified piping layout of COW-HX3 has been done by KANUPP engineers and technicians and completed within allocated time of three weeks during the recent plant shutdown.

After modification in piping, configuration of COW-HX3 for its dual operation modes, the estimated saving will be Rs. 50 million/year.



Spectacle Flange Joint for Dual Operation Modes of COW-HX3.



Condensate Water Heat Exchanger #3 (COW-HX3).

## *KANUPP achieves 100 days of continuous operation in its extended life*

KANUPP completed 100 days of continuous operation for the first time in its life extension phase beyond design life, on July 01, 2010 having been synchronized with KESC grid at 06:45 hrs on March 23, 2010. Some salient features of this 100 days continuous run are:

- This is the first run of 100 days beyond design life i.e. after year 2002.
- This is the 5<sup>th</sup> time that KANUPP has completed such continuous operation.
- 2<sup>nd</sup> highest continuously generated units (>196 M kWh) in a single run.
- Fastest achievement of 300 M kWh in a year ever in the history of KANUPP.
- Highest availability factor of ~87.5%.
- Run achieved during the hottest months of the year (April to June).
- A highly valued run under worst electricity crisis and load-shedding in the city.

□ Despite various problems arising from equipment and component failure, plant also survived & kept operating while city faced heavy rains and wind storm due to cyclone "Phet".

It may be recalled that throughout its life, transients in the operation of KESC grid have been the highest reason for interruption in KANUPP operation. Recent coordinated efforts

by KANUPP as well as KESC have resulted in significant reduction in such mishaps.

This landmark was achieved through sincere efforts and hard work of KANUPP production and engineering support divisions. Timely guidance and foresight of the management also played a pivotal role in achieving it. As a gesture of appreciation, sweets were distributed among the employees to celebrate this significant



A view of Kanupp.

# Chairman visits PAEC Centres in Faisalabad

Dr. Ansar Parvez visited PAEC Cancer Hospital PINUM, Agriculture Centre NIAB and Biotechnology Centre NIBGE in Faisalabad on 26th July, 2010. He was accompanied by Member, Biosciences and Director General Agri & Biotech Division.

Directors of these Institutes made briefings about on-going research programmes, achievements and services. Some selected scientists of NIBGE presented their R&D work related to technologies that could be up-scaled and commercialized.

Chairman, PAEC urged the scientists to accomplish the desired targets within the set period with existing human resource and available allocation keeping in view economic condition of the country.

He also took round of some research facilities where he showed keen interest in experiments on improvement of cotton crop with special emphasis on Cotton Leaf Curl Virus Disease.

Chairman appreciated the research efforts and achievements made by



*Chairman, PAEC, Dr. Ansar Parvez inaugurating NIAB Community Centre. Member (Biosciences), DG (WASO) and DG (Agri & Biotech) and Director, NIAB are also present on this occasion.*

PAEC scientists and assured full support for further improvement in infrastructure and R&D programmes of the institutes.

Speaking at these three Centres and during discussion, Chairman lauded the efforts of doctors and scientists for serving the humanity and contributing

towards food security.

During this visit, he inaugurated NIAB Community Centre in NIAB/NIBGE Colony. Earlier, DG, WASO briefed that this Community Centre has been built at a cost of Rs.14 million and includes a meeting hall, indoor sports complex and a dispensary. ■

## PAEC's Cancer Hospital NORI organizes one-day Symposium on PACS

One-day symposium on "Picture Archiving and Communication System (PACS)" was arranged at PAEC's Nuclear Medicine Oncology & Radiotherapy Institute (NORI), Islamabad on August 4<sup>th</sup>, 2010. The objective of the symposium was to introduce the technology to the participants with an aim to link all the centres of PAEC through networking. PACS is a web-based system, which can be easily integrated with the existing HMIS system implemented in NORI.

Participants from different PAEC cancer hospitals and local hospitals participated in the symposium.

Member (Biosciences) (PAEC), Dr. Abdul Rashid graced the occasion as chief guest. Mr. Wolfgang Kersten and Mr. Rabdikog Sterbberg, IT experts from Germany, gave presentation on the importance of PACS and its working. The requirement of DICOM compatibility for integration of equipment was elucidated.

After its implementation, patients' data and images of different scans can be made accessible online to each doctor in the hospital rendering possible improved quality of work, more patient's convenience as well as a paper less environment for routine

procedures. The user can archive, retrieve, view, process, import, export and print the available images. Moreover, with communication system, the same data can be archived at a national or international remote location having the same facility. Member Biosciences stated that there was a need of this modality to improve the quality of services provided at PAEC medical centers. He also stated that this medium can help in sharing of knowledge and data between different experts around the world. At the end of symposium, practical demonstration of the technology was also given by the foreign experts. ■

# PAEC's Cancer Hospital INOR launches indoor treatment facility

A Memorandum of Understanding (MoU) has been signed between PAEC's Institute of Nuclear Medicine, Oncology & Radiotherapy (INOR) and Ayub Medical Institution (AMI), Abbottabad for commissioning of indoor treatment facilities at INOR for the cancer patients. Under this MoU, AMI will provide human resource to INOR without any additional remuneration, which will work under the administrative control of INOR.

The signing ceremony of MoU took place on 20<sup>th</sup> July, 2010 at INOR, Abbottabad. Speaking on the occasion, Member (Biosciences), PAEC, Dr. Abdul Rashid, appreciated the kind gesture of Mr. Shahzad Naim, Chief Executive of Ayub Medical Institution (AMI) for extending resources to make this joint effort possible, which will help alleviate the suffering of a



**Signing of MoU's Document**

(L to R) Dr. Amjad Aziz, Director, INOR, Dr. Abdul Rashid, Member (Biosciences) and Mr. Shahzad Naim, Chief Executive, AMI.

large number of cancer patients. He thanked Chairman, PAEC for his inspiration and guidance to bring about this collaborative arrangement.

Chief Executive, AMI also expressed his views and stated that this joint venture between INOR & AMI to share the resources for the great cause of serving ailing cancer patients is a commendable effort.

Dr. Amjad Aziz Khan, Director, INOR

explained the salient features of MoU in his speech and told that the patients are being admitted at INOR from the very beginning, but due to some constraints, it was not possible to provide round the clock services. Mr. Shahzad Naim, Chief Executive, AMI has promised to extend his whole hearted support to resolve this issue.

Initially, the agreement (MoU) has been signed for a period of three

years, which can be extended with mutual consultation. AMI will also provide all tertiary electromedical equipment resource/facilities to INOR including Angiography, CT Scan, C-Arms, Fluoroscopy, Urodynamic Studies, advanced laboratory equipment and state-of-the-art advanced cardiac life support ambulance services with provisions of ventilators/defibrillators etc. to INOR.

## International Centre for Genetic Engineering and Biotechnology (ICGEB) awards Euro 42000 grant to NIBGE projects

The International Centre for Genetic Engineering and Biotechnology (ICGEB), Trieste, Italy has awarded a research grant of amount Euro 42000 to Dr. Moazur Rahman (PI), Senior Scientist and Dr. Mazhar Iqbal (Co-PI), Principal Scientist NIBGE, on "Structural and functional studies of C-terminal hydrophilic tail of the human zinc transporter Znt8 with perspective of its importance in pathogenesis of diabetes". ICGEB research grants are considered among the most prestigious awards in developing countries and highly competitive. The research grant has been awarded to elucidate the

molecular mechanism of zinc binding to c-terminal domain of Znt8 and its association with diabetes over a period of three years. The research work will be carried in collaboration with international collaborators Professor Samar Hasnain, University of Liverpool and Professor Stephen Baldwin, University of Leeds, UK.



Dr. Moazur Rahman

The proposed research will provide framework in search of therapeutic targets for diabetes treatment.

## Award of new projects to NIA

The Department of Agriculture, Govt. of Sindh advertised award of research projects to Universities, provincial research and NIA in an open competition. Overall 33 research projects were submitted, where NIA participated with four research projects. After evaluation and discussion at Sindh Secretariat, three projects of NIA have been approved.

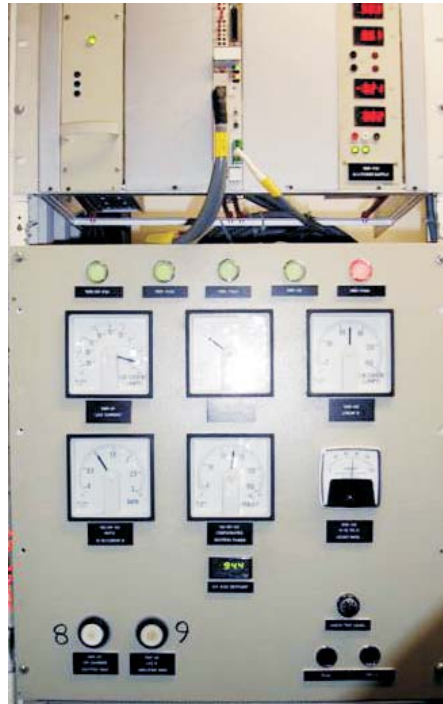
The three projects are related to Integrated Plant Nutrition (Rs.1.50 million P.I - Mr. Muhammad Yousof Memon), Management of Insect Pests of Cotton (Rs. 2.0 million P.I-Dr. Nazir Ahmad) and Development of New Wheat Varieties (Rs.1.999 million P.I - Mr. Shamadad Khan Khanzada). These projects are for 24 months and will enhance agriculture productivity in the province.

# Replacement of Neutron Power Instrumentation at KANUPP

Due to obsolescence of the Neutron Power System equipment of Protective and Regulating System installed since commissioning of the plant, a PLC based Neutron Instrumentation System was developed indigenously at Computer Development Division of KNPC for replacement of obsolete equipment.

During the second Re-licensing outage in the year 2006, the newly developed PLC based Neutron Instrumentation System of KANUPP (NISK) equipment was installed at Protection Channel 'C' to observe the behavior of equipment in shutdown and at various power levels. For installation of new equipment the existing Log Head amplifier, Linear amplifier, Period amplifier, Trip Test circuit, and Manual Rate Test circuit were taken out of service and the new equipment was installed in conjunction with Ion chamber, shutter mechanism and its associated controls, Range card, Trip circuitry, Normalizer/Compensator and Trip relays. The functionality of new NISK equipment was found satisfactory at Protection Channel 'C'.

After completion of four years of successful operation with the new



PLC based Neutron Instrumentation System of KANUPP (NISK)

equipment, the full-scale replacement consisting of Log Amplifier, Linear amplifier, Period amplifier, Trip Test circuitry, Normalizer/ Compensator, Trip logic, intermediate Trip relays, Indicators and switches has been successfully implemented at Protective Channel 'C'. The plant is

operating from 30th August 2010 with complete new electronics equipment at Protective channel 'C' except the final Trip relays and Ion chamber.

## Honor for PAEC Doctor

Dr. Muhammad Adnan Saeed was awarded (Gen. Burki) 2009 Gold Medal in FCPS Nuclear Medicine by College of Physicians and Surgeons, Pakistan (CPSP). The medal was given by Prime Minister Syed Yousaf Raza Gillani at 44th convocation of College at Islamabad on August 05, 2010.

Dr. Muhammad Adnan Saeed did his MBBS from Rawalpindi Medical College, Rawalpindi. He joined Pakistan Atomic Energy Commission (PAEC) as Medical Officer and did his M.Sc from PIEAS. He has also earned his Ph.D in Biological Sciences from Quaid-i-Azam University, Islamabad.

Presently he is working as Consultant Nuclear Physician (PMO) at NORI.



Gen. Burki Gold Medal is awarded to a Fellow who passes all CPSP examinations in 1st attempt and secures highest marks in all FCPS-II disciplines during a calendar year. Dr Muhammad Adnan Saeed secured 81.5% marks in FCPS-II Nuclear Medicine getting highest marks out of 53 disciplines and 120 examinations conducted during year 2009.

## Ph.D. degree awarded to PAEC Scientist

Dr. Sajid Nadeem, Senior Scientist of NIAB, PAEC has been awarded Ph.D. Degree by the University of Agriculture, Faisalabad in the discipline of Agricultural



Entomology. He has worked under the supervision of Meritorious Professor Dr. Muhammad Ashfaq (TI), Dean Faculty of Agriculture, University of Agriculture, Faisalabad and his Co-supervisor was Dr. Muhammad Hamed, Deputy Chief Scientist/Head, Plant Protection Division, NIAB, Faisalabad. The title of his research thesis was "Improvement in production and storage of *Trichogramma chilonis* (Ishii), *Chrysoperla camea* (Stephens) and their hosts for effective field release against major insect pests of cotton".

## Chairman's Assignments Abroad

- Dr. Ansar Parvez, Chairman, PAEC led Pakistan delegation to the Meeting of IAEA Board of Governors held in Vienna (Austria) from 07-11 June, 2010
- Chairman, PAEC also attended WANO Chief Executives Meeting held in Helsinki, Finland from 15-17 June, 2010.

## Member's Assignment Abroad

- Mr. Waqar Murtaza Butt, Member (Engineering) participated in the Meeting of Technical Working Group on Advanced Technologies for Heavy Water Reactors (TW-HWR) held in Vienna, from 26-28 July, 2010.

## Assignments of PAEC Experts Abroad

- Dr. Azhar Mashiatullali, Principal Scientist, Isotope Application Division, PINSTECH, Islamabad undertook assignment as an IAEA Expert at Kajang, Malaysia from 7-11 June, 2010 for Task: Assistance for Stable Isotope Analysis (Sample Preparation) and Data Interpretation under RCA Project - Establishing a Benchmark for Assessing the Radiological Impact of Nuclear Power Activities on the Marine Environment in the Asia-Pacific Region.
- Mr. Manzur Hussain, Director, Waste Management Division, DGNR, PAEC, Islamabad undertook assignment as Consultant from 14-16 June, 2010 at IAEA, Vienna (Austria) for revising a draft document "Advising Countries Embarking Nuclear Power on How to Install Sound Waste Management and Fuel Cycle System".
- Mr. Ghulam Rasul Athar, Director, ASAD, PAEC, Islamabad undertook assignment as an IAEA Expert at Ministry of Environment, Doha, Qatar from 18-22 July, 2010 for Task: to help the Project Team in Developing National Capacity for Water Demand Assessment under Project-

Conducting an Energy and Water Supply and Demand Planning Study.

- Mr. Amer Manzoor, PE, CHASNUPP (C-2), Islamabad carried out assignment as IAEA Expert for Mission on Nuclear Power Plant Project Management in Vietnam from 19-23 July 2010.
- As national counterpart to RCA Project, Dr. Ihsanullah, DCS-Head Food Service Division, NIFA, Peshawar participated in the IAEA/RCA Executive Management Meeting for Quarantine Authorities and Nuclear Institutes (Regional Technical Cooperation Project RAS5050), Jeongeup, Republic of Korea from 13-16 July 2010. Draft Guidelines for the Audit and accreditation of irradiation facilities used for sanitary and phytosanitary treatment of food and agricultural products" was finalized. He also presented a special talk on "Food Irradiation Technology in Pakistan" in the meeting.

## Visits of Foreigners to Pakistan

- Syed Hussain Imam Abdi, Pakistani National (currently working in USA) and Mr. Amer Pervez, Pakistani British visited NIAB/NIBGE and BSRs, Pakka Anna on 8<sup>th</sup> & 9<sup>th</sup> June, 2010.
- Dr. Tariq Mahmood, MD (USA) visited INMOL, Lahore on 3<sup>rd</sup> June, 2010 to deliver a lecture on "Palliative Care".
- Mr. Gerrit Jan Ten Brinke, (Netherlands) and Mr. Milan Semmlar, (Czech Republic) visited INMOL, Lahore, NORI, Islamabad and IRNUM, Peshawar from 6-8 July, 2010 for presentation on new features of Terabalt Co-60.
- Mr. Glenn John Bowman, (Australia) and Mr. Mahboob UI Hassan Nasir (Australia) visited PARAS Foods, Lahore from 11-17 July, 2010 for Inspection of PARAS

Foods.

- Mr. Glenn John Bowman, (Australia) and Mr. Mahboob UI Hassan Nasir (Australia) visited PARAS Foods, Lahore from 11-17 July, 2010 for Inspection of PARAS Foods.
- Mr. Takashi Shoji, Director WANO-TC visited PAEC HQ, Islamabad on 23<sup>rd</sup> July, 2010 for Exit Meeting of C-2 Pre-startup Review. The following WANO Experts visited C-2 from 12-22 July, 2010 for Pre-startup Peer Review of C-2:-
  1. Mr. Hak Jin Kim' (Republic of Korea),
  2. Mr. Jih-Sheng Chang (Taiwan)
  3. Mr. Katsuhiko Iwaki (Japan)
  4. Mr. Yasuyuki Nakamura, (Japan)
  6. Mr. Timothy James Martin (USA)

## Appointment Abroad

- Dr. Mushtaq Ahmad, Director (Coord), PIEAS proceeded to Saudi Arabia on 04-06-2010 for undertaking employment as Associate Professor in the College of Engineering at King Saud University, on deputation for one year from 05-06-2010 to 04-06-

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## General Manager, National Atomic Energy Commission, Argentina, gives a Colloquium at PIEAS

Dr. Carlos Ruben Calabrese, General Manager, National Atomic Energy Commission, Argentina, is a renowned scientist in the field of nuclear engineering. He visited PIEAS and gave a talk on "Sixty Years of Nuclear Energy Program in Argentina: Contribution of Argentina in INPRO" in PIEAS Auditorium. He was shown various laboratories and facilities at PIEAS.

# C-1 Restarts after the Sixth Refueling Outage

Refueling Outage (RFO) is a common feature for PWRs world wide, meant to re-fuel the reactor and carry out preventive as well as outstanding corrective maintenance, surveillance, inspection and modification activities. Its purpose is to enhance equipment and system reliability and make the plant available for continuous, safe and reliable operation till next Refueling.

The sixth RFO was particularly significant as C-1 made important advances towards indigenization and self-reliance by performing some major works itself, such as Refueling operations, first overhaul of Reactor Coolant Pump-B (RCP-B), cleaning of Reactor Pressure Vessel thimbles, maintenance of Emergency Diesel Generators, 132kV GIS, Nuclear Island valves & equipment, overhauling of Motor for Circulating Water Pump etc. Successful execution of these major jobs, using own staff, resulted in better utilization of C-1 resources and reduced dependence on expensive foreign contractors. These indigenous efforts resulted in substantial savings and also further enhanced confidence level of our work force.

The Reactor Coolant Pump (RCP) is one of the most critical safety class equipment and requires highly specialized maintenance techniques in its overhauling. It is highly contaminated, necessitating very specialized processes and equipment to dislodge its contamination. All jobs related to RCP-B were completed precisely and in a timely manner as scheduled.

Another significant milestone was installation of indigenized Loose Parts Monitoring System (LPMS), meant to provide early warning of degradation within pressure boundary due to stray or loose parts therein. This remained a long standing Regulatory requirement since early 90s'. It was indigenously designed, assembled, tested and installed besides significant fabrication and software development



*Dismantling of Coolant Pump Rotor.*



*Detentioning of studs for lifting of Reactor Pressure Vessel Head.*



*Removal of Protective Shroud of Reactor Coolant Pump Rotor.*

by engineers and scientists from DNPER, HMC-3 and C-1.

The RFO-6 of C-1 started on 11<sup>th</sup> April and was completed with formal grid connection on 14<sup>th</sup> June, 2010, precisely according to the 64 day original schedule. A total of 3200 jobs (984 mechanical, 763 electrical, 1114 I&C, 12 Support & Services, 15 modifications, 140 In-service Inspections and 237 surveillance tests) were completed. About 400 additional corrective maintenance jobs, identified during the outage, were also completed along with the bulk of scheduled jobs. To monitor progress of activities, a comprehensive schedule, comprising Critical Path Activities, Level-I and Level-II sub-schedules, were prepared. To minimize radiation exposure to workers, ALARA plans for major jobs with potential exposure were prepared and implemented. The following external partners supported C-1 during the outage, besides about 1000 skilled workers hired temporarily:

□ Foreign contractors: ZHEC, CNPO and CZEC;

□ Local contractors: Etimaad Engg., Pioneer Engg.;

□ PAEC establishments: KNPC, HMC-III, NCNDT & DNPER.

Effective control and coordination with contractors led to safe & timely completion of out-sourced activities.

Special efforts were focused on completing critical path activities either before or within schedules, such as Lifting of RPV Head/Cavity filling, removal/installation of Lower Internals, achievement of SRC Low Level (twice), performance of Cold/Hot Shutdown and Zero Power Physics Tests.

This achievement became possible through better planning, advanced preparation, effective coordination & control, and hard work during execution of the outage. It also reflects firm commitment and confidence of plant management and staff in their capabilities to establish standards of excellence through self-reliance. Constantly improving performance of C-1 is due to the relentless efforts of its personnel and management and