

Diffusion of Knowledge and Technologies

Through the PNRI's nuclear education, information and communication program, among others, various sectors became recipients of information and knowledge on the safety and benefits of nuclear science and technology.



A STUDENT UNDERGOES ON-THE-JOB TRAINING ON TISSUE CULTURE AT THE PNRI AGRICULTURAL RESEARCH SECTION

NUCLEAR TRAINING

For capability building in nuclear science and technology and allied fields, PNRI's Nuclear Training Center (NTC) offers training courses for medical practitioners, science educators, researchers, technicians and other professionals every year. This year, the Institute conducted 13 regular courses for 210 participants from private and government institutions/agencies. The courses conducted were: one on radioisotope techniques in the medical field, 10 on radiation safety and two on nuclear science and technology for teachers (one for high school science teachers and one for university/college faculty). The PNRI also conducted 25 training courses on nondestructive testing (NDT)

and four welding technology courses in cooperation with the Philippine Society for Nondestructive Testing. The total number of participants to the NDT and welding courses was 533. (See Appendices, Table 1 on page 32 for list of training courses).

As part of the Institute's service to undergraduate and graduate students, the PNRI provided on-the-job training at different facilities and laboratories of the Institute. A total of 51 high school and college students from

17 schools/universities availed themselves of this training. Nine students from two universities availed of the thesis advisorship program. (See Appendices, Tables 2 and 3 on pages 33 to 34).

INFORMATION SERVICES

The Institute implemented information, education and communication strategies through its Information Services Group to increase the awareness of the public on the beneficial uses of nuclear science and technology.

Development and distribution of information materials – The PNRI produced six new brochures on PNRI nuclear and allied services and the applications of nuclear technology in agriculture, health care, industry and the environment. A brochure on “Frequently Asked Questions on Nuclear Energy for Electricity Generation” was also developed. This was printed by the Department of Science and Technology for distribution especially in the regions. Around 21,000 copies of these public information materials were distributed to around 9, 200 clients.

PNRI’s Information Services Group also developed a multimedia CD entitled “Nuclear Technology Applications” with financial assistance from the Philippine Council for Advanced Science and Technology Research and Development. In addition

to brochures, other information materials in the form of exhibit banners and interactive video presentations of PNRI technologies and services were likewise developed. Five banners and 17 short video presentations were produced as exhibit materials for display in science and technology (S & T) fair exhibitions. In celebration of the 50th anniversary of PAEC/PNRI, the following materials were produced: exhibit banners on PNRI Milestones, 140-page coffee table book entitled “PNRI @ 50: Making Nuclear Science and Technology Work for You”, commemorative stamps, and a new PNRI institutional video.



THE PNRI 50TH ANNIVERSARY COMMEMORATIVE STAMP WAS PRESENTED DURING THE MEDIA LAUNCH OF THE COMMEMORATIVE PROJECT OF DOST GOLDEN ANNIVERSARY.

Educational Tours and Seminars – Guided tours of the Institute’s facilities and laboratories, viewing of exhibits, lecture-demonstrations and film showings on nuclear science and technology were the information services made available to more than 4,000 clients who came to PNRI for their educational tour. With the cooperation of the Nuclear Training Center and some technical staff, the Information Services Group conducted 26 nuclear awareness seminars for 1,375 clients which included the Provincial Science and Technology Directors/Assistant Regional Directors (PSTD / ARD) from DOST regional offices.

PNRI MULTIMEDIA PRESENTATION IN CD-ROM





PNRI INFORMATION OFFICER BRIEFS PSTDs / ARDs ABOUT MUTANT ORNAMENTAL PLANTS DEVELOPED BY THE INSTITUTE.

Participation in Special Science and Technology Events – Nuclear technology and its beneficial uses were promoted to various clients through exhibits in six science and technology events, namely: ASEAN S & T Fair/19th DOST Annual S & T Fair at World Trade Center; Philippine Business DOST SET-UP Expo at SM Megamall; 4th Northern Luzon Cluster S & T Fair in Tuguegarao City, Cagayan Province; 4th Visayas Cluster S & T Fair in Tagbilaran City, Bohol; and the 36th Atomic Energy Week Celebration at PNRI.

Nuclear S and T Promotion Through Media Linkages

The public gained information about nuclear science and technology through the print and broadcast media. Topics on nuclear power, food irradiation and the PAEC/PNRI 50th anniversary celebration, among others, were featured/discussed in seven radio-TV interviews and in seven news stories published in daily broadsheets.

LIBRARY SERVICES

The PNRI Library acquired 602 volumes of publications composed of 27 volumes of books and 575 volumes of journals through donations and exchanges from local and foreign institutions/organizations. These publications, together with other library holdings, were made available to 2,501 clients, composed mostly of students. The Institute continued to participate in the



PNRI DIRECTOR ALUMANDA M. DELA ROSA BRIEFS CONGRESSMAN EMILIO ABAYA, CHAIR, HOUSE OF REPRESENTATIVES COMMITTEE ON SCIENCE AND TECHNOLOGY, ABOUT THE PNRI TECHNOLOGIES FEATURED AT THE DOST ANNUAL S&T FAIR AT WORLD TRADE CENTER IN PASAY CITY.

following projects/activities to expand the library collection and to support research requirements of clients: (1) International Nuclear Information System, a database consisting of researches on nuclear science and technology (<http://www.iaea.org/inisnkm>), (2) Science and Technology Information Network of the Philippines or SCInet-PHIL (<http://www.scinet.dost.gov.ph>), a network of science and technology libraries in the Department of Science and Technology system, and (3) the Philippine e-Library project (<http://www.elib.gov.ph>).



SOME OF THE PUBLICATIONS ON NUCLEAR SCIENCE AND TECHNOLOGY AT THE PNRI LIBRARY.

Generation of New Knowledge and Technologies

The PNRI has been making nuclear science and technology work for the Filipino through the Institute's high standards of research and development in the following areas: food and agriculture, human health and medicine; radiation technology and processing; industry; protection and management of water resources; and environmental protection.

BASIC RESEARCH

UPTAKE AND RELEASE OF TOXINS IN GREEN BAY MUSSEL

Information on how fast the red tide toxins are being accumulated and released by mussel will help in safeguarding public health while at the same time minimizing losses in the shellfish industry. The Chemistry Research Group is collecting data in Juag Lagoon in Sorsogon which experiences recurring natural blooms of *Pyrodinium bahamense var. compressum* (PbC). PbC is an organism that causes paralytic shellfish poisoning (PSP). The study involves the measurement of cell density and mussel toxicity using a radioassay method

(receptor binding assay) and a chemical method (high performance liquid chromatography). This year, analysis of the data showed that the accumulation of the PSP toxins increases rapidly with increasing PbC cell density and that the levels are below the regulatory level within 20 days after the bloom.

Uptake studies were also conducted in Sorsogon Bay to test uptake of mussel culture in the area. Analysis of PbC cells from six sampling stations showed that the cellular toxin content of PbC is primarily saxitoxin, which is the most potent among the saxitoxin family. The average toxicity obtained is 52.8 fmole/cell.

RADIATION PROCESSING OF NATURAL POLYMERS FOR AGRICULTURAL APPLICATIONS

The PNRI further evaluated the properties of carrageenan for its potential as plant growth promoter.

The solid and aqueous forms of three types of carrageenan, namely kappa, iota and lambda, were characterized for their structural and chemical properties. The data obtained provided basis for determining the appropriate conditions to obtain kappa-carrageenan oligomers needed for plant growth studies. For the preparation of oligomers, the Chemistry Research Group found that a gamma radiation dose between 2 to 10 kilogray using one percent aqueous solution was more economical as compared with irradiation of solid carrageenan at 100 kilogray.



ALGAL CELL COLLECTION FOR TOXICITY MEASUREMENT IN MUSSEL

The radiation yield of kappa carrageenan in aqueous solution was also measured to determine its response to nitrous oxide, nitrogen and air. Results showed that kappa-carrageenan was most degraded in the presence of nitrous oxide and least degraded in the presence of nitrogen.

The fractionation of solid kappa-carrageenan irradiated in air and in vacuum at 100 kGy and a one percent aqueous solution irradiated at 2 kGy were successfully carried out using an Amicon Pressure Filtration set up with Millipore filters. The fraction of oligomers determined to exhibit the most significant growth-promoting effect was 10 kilo dalton (KDa).

Extracts from carrageenan seaweed (*K. alvarezii*) and commercial grade kappa carrageenan (control) were analyzed for their antioxidant property. Results indicated higher scavenging and reducing power activity for the seaweed extracts as compared to control.

HIGH TECHNOLOGY MATERIALS DEVELOPMENT

The Applied Physics Research Group uses x-ray spectroscopic techniques to study the metal adsorption properties of advanced materials such as bare quartz glass for novel applications in trace analysis. The study aims to check the experimental procedure in quartz surface treatment and its ability to adsorb heavy metals. The data obtained for bare quartz will serve as reference which later on will be compared with ultra thin-coated quartz surface.

The Group investigated the adsorption properties of quartz for the metals vanadium, chromium, iron, cobalt, nickel, copper, zinc and lead. The results indicated that pH is the main parameter affecting adsorption of metal cations. The values obtained suggest a roughly linear relationship between the pH-edge and pKa (acid dissociation constant) as others have found. The pH-edge is also greater than the corresponding pKa, which implies that hydrolyzed species are preferentially adsorbed over the unhydrolyzed ones.

NUCLEAR APPLICATIONS IN FOOD AND AGRICULTURE

CROP IMPROVEMENT THROUGH RADIATION-INDUCED MUTATION

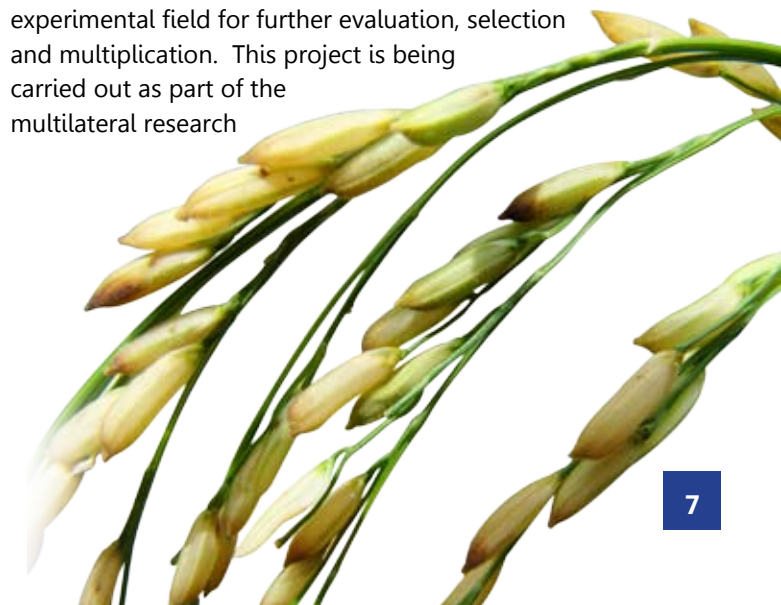
Rice

As part of the studies on developing rice mutants with desirable agronomic traits and good eating quality, the PNRI Agricultural Research Group conducted in 2007 field experiments to determine the effects of 200 and 300 gray gamma radiation on yield, protein and amylose contents of IR-72, a high yielding variety with high amylose content.

For 2008, the following preliminary results were obtained: (1) rice seeds from the M2 (second) and M3 (third) generations had low tillering capacity, reduced height, early flowering and low percentage sterility; (2) the length of panicle and number of grains per panicle of the selected plants were slightly higher than the unirradiated IR72 and IR64 check varieties in the M3 generation; (3) the weight of 100 seeds from 200 Gy and 300 Gy treatments was comparable with the control (unirradiated); (4) protein contents of the 200 Gy treatment were comparable with that of the unirradiated IR72 (7.81 to 8.56 percent) and IR64 (6.3 to 8.25 percent) but slightly higher than those at 300 Gy; and (5) low to intermediate amylose content was obtained from 200 Gy and 300 Gy treatments.

Soybean

The eighth (M8) generation of selected drought tolerant mutant lines of three Philippine varieties (PSb-Sy 4, PSB-Sy 5 and BPI-Sy 4) and the seventh (M7) generation of varieties obtained from Vietnam (AKO-6, DT-5 and DT-84) were planted at PNRI experimental field for further evaluation, selection and multiplication. This project is being carried out as part of the multilateral research



program of the Forum for Nuclear Cooperation in Asia (FNCA) on "Drought Tolerance of Soybean (*Glycine max L.*) in the Philippines".

Pot experiments were also conducted at the PNRI greenhouse for confirmation of varieties that were found to be drought tolerant. For these plants, watering was stopped 25 days after emergence. Results showed that varieties BPI-Sy 4 and PSB-Sy 4 irradiated at 200 Gy and 250 Gy were drought tolerant up to two months after planting. The control (unirradiated) died one and a half months after planting.

Mungbean

In 2008, five promising mungbean genotypes with high and stable yields namely, KPS 2, Psj-S-31, Psj-B-II-17-6, NM51 x VC1973A and VC2917A were planted at the experimental area of the Bureau of Plant Industry in Los Baños, Laguna. The study was undertaken to evaluate the response of these mungbean varieties and to identify or select varieties with some degree of tolerance to drought conditions.

The varieties were subjected to water stress by stopping the water supply from the third week up to the seventh week after planting. To compare their overall performance in the test, a recommended variety, NSIC Mg 11, was also planted as control.

The initial result showed that among the varieties evaluated, the mutant variety Psj-B-II-17-6 yielded more than one ton/per hectare (ha) regardless of whether irrigation is provided or not throughout the growing period. Another mutant, Psj-S-31, also obtained a yield of more than one ton/ha under controlled water supply. The seed yields of the other varieties, including the control, were lower as compared with Psj-B-II-17-6 and Psj-S-31. Another experiment will be undertaken to confirm the results obtained in this study.

Mangosteen and Cashew

PNRI studies on these crops aim to develop varieties with increased yield, improved quality of fruits, short stature (dwarf) to facilitate harvesting, early maturity and non-seasonal fruit production.

Cashew: PNRI continued to maintain 50 irradiated and unirradiated plants at the PNRI field. Almost 50 percent of these plants flowered at different periods and some bore fruits. A significant result was obtained from 400 Gy wherein one plant produced 76 fruits in one season. In comparison with other treatments, 100 Gy had four fruits harvested from two plants; six fruits at 200 Gy harvested from three plants, and the control with two fruits harvested from two plants.

Mangosteen. PNRI continued to maintain unirradiated and irradiated mangosteen plants at the PNRI greenhouse. The irradiated mangosteen seeds were treated with 5, 10, 20, 30 and 40 Gy gamma radiation. Preliminary observation showed the stunting of plants in the M1 (first) generation treated with 20 Gy.

Based on the previous results of irradiated seeds, another batch of mangosteen seeds from Mindanao were irradiated with 20 Gy and 30 Gy doses of gamma radiation. These were planted in the PNRI greenhouse for observation. Results showed that the unirradiated (control) seeds have 97.5 percent survival, 75 percent for 20 Gy, and 5 percent for 30 Gy.

From the irradiated mangosteen seedlings given to farmer cooperators through the Municipal Agriculturists of Lucban, Quezon in 2006, a total of 22 seedlings survived in 2008. These are being maintained for further evaluation and comparison with seedlings from the same batch of plantings at the PNRI compound.

Foliage Ornamentals

Murraya 'Ibarra Santos'. PNRI Agricultural Research Group maintained and propagated 758 plants of the PNRI-developed dwarf mutant of *Murraya paniculata* at the PNRI greenhouse. The Group also accomplished the following: (1) collection of around 700 newly propagated seedlings from stable mutants; and (2) selection of 75 potted plants for sale and 60 stable mutants planted in pots for display and as source of seeds for propagation.

This year, 45 putative mutants for dwarfness were also selected and planted in the field to evaluate their stability. Initial results showed that the height of the plants in the field is slightly higher than the potted plants in the PNRI



screenhouse with an average height of 27 cm and 16.85 cm, respectively.

***Dracaena sanderana* 'Marea'** - This PNRI-developed chlorophyll mutant was multiplied at the PNRI screenhouse. A total of 60 *D. sanderiana* 'Marea' were sold to clients and 50 new cuttings planted in small pots were used for display/exhibit purposes.

***Cordyline terminalis* 'Medina'** (now a synonym of *Cordyline fruticosa*) - A total of 211 of this National Seed Industry Council (NSIC) registered mutant were propagated and planted in the field and in pots. This mutant has glossy green leaves with irregular creamy white, purple and red-violet stripes.

Other Ornamentals - The National Seed Industry Council (NSIC) of the Bureau of Plant Industry approved the registration of two mutant ornamentals as new or improved varieties on November 20, 2008, namely *Sansevieria trifasciata* 'Sword of Ibe' and *Freycinetia multiflora* 'Golden Stairs'. The *S. trifasciata* mutant has silvery gray-green center of varying width and cross-banded with dark green of different distances and has solid green to blue-green margin. On the other hand, the *Freycinetia multiflora* mutant has yellow-green spirally-arranged leaves with irregular longitudinal stripes of grass green at middle portion of varying numbers and width.



SANSEVIERIA 'SWORD OF IBE'



FREYCINETIA 'GOLDEN STAIRS'

***Spathoglottis* orchids, Foliage-type Anthuriums and Hoyas** - The selected hybrid of the mutant *Spathoglottis kimballiana* var. *angustifolia* with *Spa. vanoverberghii* was called *Spathoglottis* 'Lakandula' as it differed from *Spa. Lion* of Singapore in many aspects.

Putative mutants of foliage-type anthuriums and Hoyas were obtained and are being evaluated at different vegetative generations.



SPATHOGLOTTIS 'LAKANDULA'

A protocol for mass propagation of hoyas by nodal cuttings (single node or two nodes) using moist sphagnum moss or moist coarse-grade horticultural perlite as rooting medium was established and adopted by commercial growers of Hoya..

IMPROVEMENT OF MASS REARING METHODS FOR ORIENTAL FRUIT FLY *BACTROCERA PHILIPPINENSIS*

To improve the mass rearing of fruit flies used for the sterile insect technique project, the PNRI Entomology Group worked on improving the artificial diet of the flies. This year, the cost analysis of three bulking agents (sugarcane bagasse, powdered corn and rice straw) was compared with the cost analysis of the standard yellow sweet potato presently used to produce one million pupae. The analysis showed that: (1) the standard sweet potato-rice bran diet appears to be the most expensive as compared to sugarcane bagasse, powdered corn and rice straw diet, and (2) it is very practical and economical to use either corn, sugarcane and rice straw diet as a potential substitute to the standard sweet potato - rice bran diet.

The modified liquid diet formulation had also been proven to be successful in the mass production of *B. philippinensis*. For six generations, a total of 228,243 pupae have been collected from 243 trays of liquid diet prepared.

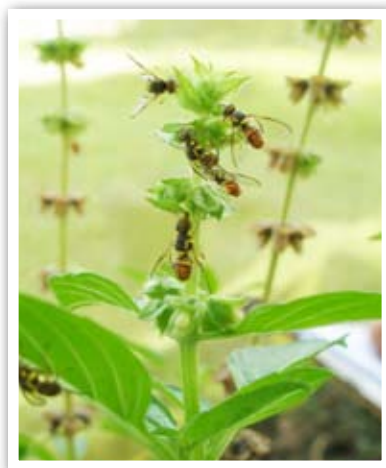
IMPROVEMENT OF STERILE MALE PERFORMANCE OF *BACTROCERA PHILIPPINENSIS*

This project aims to improve the competitiveness of the sterile male fruit fly *B. philippinensis* –

a destructive pest of mango and other important fruits in the Philippines-- in order to reduce the cost and increase effectiveness of the sterile insect technique (SIT) programs. Increased effectiveness may be achieved by exposing sterile male flies to methyl eugenol (ME) before release. Hence, the role of ME in improving competitiveness in *B. philippinensis* is being investigated.

This year, PNRI continued to evaluate natural sources of ME like basil. Studies on the attractiveness of holy and sweet basil to male fruit flies showed a greater number of male fruit flies attracted to the sweet basil as compared to the holy basil. Attraction of male wild flies to basil was also studied in field cage using 0 to-12 day-old male *B. philippinensis*. Results showed that attraction to basil flowers begins when the flies were 6 to 7-day old. The percentage of flies attracted to basil increased with fly age.

BASIL, A NATURAL SOURCE OF METHYL EUGENOL, IS BEING STUDIED IN IMPROVING MALE FRUIT FLY COMPETITIVENESS.



QUARANTINE TREATMENT OF MANGO PULP WEEVIL IN PHILIPPINE CARABAO MANGOES

The use of gamma radiation as a treatment method to cause sterility or prevent the reproduction of the mango pulp weevil (MPW) is being studied by PNRI in cooperation with the Department of Agriculture Region IV-B. Results of the studies showed that the adult MPW was the most tolerant stage to gamma radiation. The adult male was more radiosensitive than the adult female.

Furthermore, MPW exposed as adults to 25, 50, and 75 Gy laid eggs, whereas no eggs were laid

beyond 50 Gy by MPW adults exposed as larva or pupa. The number of eggs laid per female per day decreased with dose. A target dose of 100 Gy prevented the reproduction of MPW based on the dose-response test.

ASSESSMENT OF SOIL EROSION IN AGRICULTURAL WATERSHEDS



A STUDY AREA ON SOIL EROSION



The Chemistry Research Group has completed this project which used cesium-137 -- a fallout isotope present in most soil surfaces -- to establish or measure erosion and sedimentation rates for the watershed in Bohol.

The results of the project complemented the erosion rates obtained using conventional erosion plots. The erosion rates under different land use can be summarized as highest in cassava (22 tons per hectare per year), followed by grassland (11.3 t/ha/yr), woodland (3.6 t/ha/yr), agroforestry (3.0 t/ha/yr), and lowest in the rainfed rice (2.6 t/ha/yr). The rate, magnitude and pattern of soil erosion/deposition for the abovementioned critical watersheds were established. Based on these results, the Group assisted in the formulation of soil conservation and farming methods in the Inabanga watershed in Bohol.

INTEGRATED APPROACH TO IMPROVE LIVESTOCK-CROP FARMING USING INDIGENOUS SOURCES

The Biomedical Research and Agricultural Research Groups, in collaboration with the National Dairy Authority and the Bureau of Soils and Water Management, conducted on-station trial to evaluate the effects of using urea molasses mineral block (UMMB) as feed supplement for cattle. With the use of the stable isotope nitrogen-15, the Groups also conducted a study on decreasing discharges from cattle manure into the environment by utilizing the manure as organic fertilizer to increase crop yield. The effects of conventional and improved manure storage systems on the quality of cattle manure were likewise investigated.

Results of the studies showed: (1) plots applied with manure had higher soil organic matter, soil porosity and soil aggregate stability compared to plots that were not applied with manure, and (2) plants with the highest nitrogen yield was obtained from plots treated with manure of UMMB supplemented cattle and manure that has undergone management practices.

QUALITY EVALUATION OF PHILIPPINE SUPER MANGOES AT MAXIMUM TOLERABLE DOSE

The Biomedical Research Group performed tests to validate last year's results which showed that a maximum radiation dose of 300 Gy can be applied to Philippine Super mangoes without affecting its quality. This was done by conducting two irradiation trials for mangoes (250 kilos per trial) and one pilot-scale (1,000 kilograms) study for dose verification.

The validation process showed that the pulps of mangoes irradiated at 450 and 600 kGy had brown pigments while those exposed to 150 and 300 kGy had no apparent pigmentations. Chemical tests (total soluble solids, acidity, pH) showed no significant differences in the quality of irradiated Philippine Super mangoes with the unirradiated fruits. The use of both irradiation and hot-water dip treatment resulted in a significant delay in the ripening of Philippine Super mangoes from three to five days. Low disease development in irradiated mangoes was also noted within 18 days as compared with the unirradiated ones.



HUMAN HEALTH AND MEDICINE

ANALYSIS OF CIGARETTES FOR POLONIUM-210 CONCENTRATIONS

As part of PNRI's radiation monitoring program for the health and safety of the public, the Health Physics Research Group continued to analyze different brands of cigarettes and tobacco for polonium-210 (Po-210) content. Po-210 is a naturally-occurring radioactive element that emits alpha radiation – a type of radiation which is hazardous to health when ingested or inhaled. This year, ten varieties of tobacco leaves collected from the National Tobacco Administration farm in Batac, Ilocos Norte were analyzed to complete this project.

Overall, 51 cigarette samples were analyzed for Po-210 using alpha spectrometry. Of these, 16 brands were manufactured in the Philippines, 16 in Japan, 14 in the United States, and the rest from other countries. The results showed that Po-210 concentrations of cigarettes analyzed were within normal range of radioactivity.

RADIATION TECHNOLOGY AND PROCESSING

SEMI-COMMERCIAL PRODUCTION OF PVP CARRAGEENAN HYDROGEL DRESSING FOR WOUND AND BEDSORE



PACKAGING FOR THE HYDROGEL WOUND DRESSING WHICH WAS PROVIDED WITH A BRAND NAME "SKIN-UP"

The Chemistry Research Group started Phase 2 of this project which involved the semi-commercial production of hydrogels, and clinical and market acceptability studies to be conducted by BIOTECH Company. This company is a private cooperating agency which signified interest in the commercialization of the PVP-caragenan hydrogel. The following were accomplished under phase 2: (1) development of final packaging for the hydrogel wound dressing which was provided with a brand name "Skin- Up"; (2) improvement of the pilot plant facility to ensure good manufacturing practices (GMP) in the production of hydrogel for medical application; (3) testing of the improved pilot plant in optimizing hydrogel production. Approximately 1,000 pieces of 4 by 4 inch hydrogels or 750 pieces of 8 by 8 pieces can be produced per day; and (4) acquisition of a Universal Testing Machine (UTM) under the DOST-GIA project on "Upgrading of Facilities" and conduct of trial runs to establish the standard procedure for determining gel strength of the hydrogels using the UTM.

ENVIRONMENTAL PROTECTION AND MANAGEMENT

URBAN WASTE MANAGEMENT

The study on the possible migration of leachate into groundwater was continued. Tritium analysis using liquid scintillation counting technique of groundwater samples at the San Mateo landfill in Montalban was done. The samples were found negative of the tracer.

MARINE RADIOACTIVITY MONITORING PROGRAM

This project aims to develop and strengthen PNRI's program on monitoring radioactivity in marine environment and to incorporate new data generated from national marine radioactivity monitoring to the Asia-Pacific Marine Radioactivity Database.

This year, the Health Physics Research Group conducted the following activities: (1) collection of 14 marine samples from the fishing grounds of Ilocos Norte in collaboration with the research staff of the Institute of Fisheries and the Institute of Arts and Sciences of the Mariano Marcos State University in Batac, Ilocos Norte; (2) measurement of the specific activity concentrations of the following radionuclides using radiochemical analysis and gamma spectrometry: key anthropogenic radionuclide cesium-137 and naturally



LOADING OF SAMPLES FOR GAMMA SPECTRAL ANALYSES OF MARINE SAMPLES

occurring radionuclides radium-226 and polonium-210 in seawater, sediment and biota, (3) determination of and thorium-32 and potassium-40 in sediment and biota. Initial results obtained showed that radioactivity concentrations of the marine samples were within the usual range of activity of marine samples measured in the Asia-Pacific region.

ASSESSMENT OF NATURALLY-OCCURRING RADIOACTIVE MATERIALS (NORM) IN THE PHILIPPINE ENVIRONMENT

A research contract entitled "Commission Work for Collection and Collaborative Analysis of NORM Used as Industrial Material" was entered into by PNRI with the



A PNRI RESEARCHER AND A SCIENTIST FROM THE NIRS IN CHIBA, JAPAN MONITOR NORM/TENORM AT THE SUAL COAL-FIRED POWER PLANT.

National Institute of Radiological Sciences (NIRS), Japan. Under this contract, two industrial plants which use NORM as raw materials had been selected. These were the Sual Coal-Fired Power Plant in Barangay Pangascasan, Sual, Pangasinan and PHILPHOS Fertilizer Plant in Leyte Industrial Development Estate (LIDE), Isabel, Leyte. The activities undertaken during the year included the collection of 22 samples containing NORM from the industrial plants, and deployment for three months of 70 CR-39 detectors for measurements of radon (a naturally-occurring radioactive gas) inside the two plants and at the houses located outside the plants. The NORM samples and the CR-39 detectors are still being analyzed in the laboratory by gamma spectrometry and by radon alpha track counting, respectively.

Ambient gamma radiation monitoring was also carried out at Sual Coal-Fired Power Plant using the BNC SAM-935 portable gamma spectrometer. Average reading obtained inside the power plant is 26.97 nSv/h which was within normal limits.

MANAGEMENT OF CTBTO MONITORING STATIONS IN THE PHILIPPINES

The Philippines, through the PNRI, has continued its active involvement in the management of an international monitoring system to verify compliance to the Comprehensive Nuclear Test Ban Treaty (CTBTO). Its involvement includes the continuous operation (24/7) and maintenance of the CTBTO radionuclide monitoring station (RN52) in Tanay, Rizal and the National Data Center (NDC-137) at PNRI.

Other activities undertaken were (1) the migration of the global communication Infrastructure link of RN52 and NDC 137 from its former CTBTO contractor (HNS) to the new one (the Psi Systems Incorporated), and (2) the installation of a new lightning and surge protection system at the RN52 station. Overall, the operation and maintenance of the RN52 station was successfully and efficiently achieved by PNRI.

ENVIRONMENTAL SURVEILLANCE (RADON MONITORING)

PNRI uses radon - a naturally-occurring radioactive gas - as an indicator of a seismic activity or as a possible tool to predict an earthquake. Evaluation of the 113 radon measurements in soil and deep-well water along the



MEASUREMENT OF RADON IN SOIL SAMPLES ALONG THE MARIKINA VALLEY FAULT SYSTEM

established monitoring stations in the Marikina Valley Fault System and at PNRI showed that the random levels were relatively low, indicating the absence of subsurface activity that may indicate ground movement.

MONITORING OF PARTICULATE MATTER TO IDENTIFY MAJOR SOURCES OF AIR POLLUTION

The Analytical Services and Measurements Research Group uses nuclear analytical techniques to identify major sources of air pollution and to estimate their contribution. In 2008, the Group continued to collect air filter samples using the Gent dichotomous air samplers installed at its three monitoring sites in Metro Manila (Ateneo de Manila University [ADMU], Poveda Learning Center and Valenzuela). The samples were analyzed for air particulate mass by gravimetry, black carbon by reflectometry, multi-element content by energy-dispersive X-ray fluorescence spectrometry (EDXRF) or photon-induced X-ray emission spectrometry (PIXE) at



NON DESTRUCTIVE MULTIELEMENT DETERMINATION OF AIR PARTICULATE SAMPLES.

the Australian Nuclear Science and Technology Organization for samples from ADMU.

Analysis of the long-term data showed decreasing levels of PM₁₀ and PM_{2.5} in 2007 and 2008. The PM₁₀ annual mean levels are in compliance with the Philippine NAAQ long term standard in all sampling sites, except for Valenzuela in 2006. PM_{2.5} annual mean levels have been consistently in exceedance of the long term standard of the United States Environmental Protection Agency or US EPA (15 ug/m³). Fine sulfate source was mapped out indicating major contribution from local sources such as vehicular emission, industries, and including natural sources such as volcanic activities. Other potential sources are emission from ships and off-shore red-tide episodes.

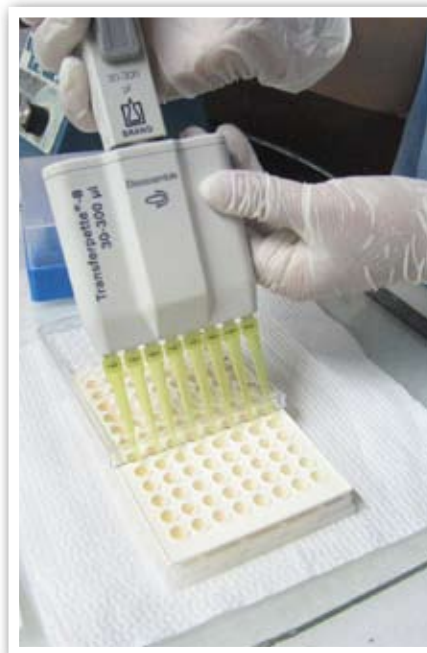
APPLICATION OF NUCLEAR TECHNIQUES IN HARMFUL ALGAL BLOOM STUDIES

The Chemistry Research Group completed three projects under the PNRI Program on Application of Nuclear Techniques to Address Specific Harmful Algal Bloom (HAB) Concerns: Development of Applications of Predicting, Controlling and Mitigating (PCM) Techniques for HABs in Selected Mariculture Sites in the Philippines. These projects are described below:

Production of Radiolabeled Compounds for Receptor Binding Assay on Marine Biotoxins

As part of its role as an IAEA/RCA Regional Resource Unit for receptor binding assay (RBA) in the East Asia and the Pacific region, the Chemistry Research Group continues to apply RBA using tritium-labelled saxitoxin ([³H]-STX) to measure the toxicity of shellfish during the occurrence of harmful algal bloom or red tide.

The Group also worked on developing an iodinated conotoxin compound that can replace the currently used imported and unstable tritium-labelled reagent for RBA. An analog of conotoxin, which had been isolated in small quantities, was characterized and tested for its bioactivity by intraperitoneal injection of peptide samples into mice. Mass spectrometry was used to verify the presence of the peptide analog in the



DISPENSING OF RAT SKELETAL MUSCLE HOMOGENATE AS PART OF RBA

bioactive fractions separated by High Performance Liquid Chromatography method. Results of the tests showed its potential to be developed as a substitute to [³H]-STX in RBA.

Technology Transfer of Receptor Binding Assay to End-Users

The PNRI maintains its capability and manpower to do the receptor binding assay (RBA) of saxitoxins, the paralytic shellfish poisoning (PSP) toxins in red tide areas. Tests conducted by PNRI using RBA showed its potential in the routine monitoring of shellfish PSP toxicity. As part of transferring the technology, the Chemistry Research Group conducted information dissemination activities on RBA. Details on RBA are posted at the PNRI website (www.pnri.dost.gov.ph).

Historical Profile of Harmful Algal Cysts and Anthropogenic Inputs in Sediments Using Isotopic Techniques

The Chemistry Research Group studied the lead-210 profile in sediment core samples collected from areas which have episodes of harmful algal bloom occurrences and/or fish kills, namely, Malampaya Sound in Palawan, Bolinao in Pangasinan and Juag Lagoon in Matnog, Sorsogon. The history of the toxic algal cyst in these coastal areas could be determined by studying the lead-210 profile in the sediment cores. Lead-210 is a natural radioactive tracer that is assumed to

undergo the same physical processes as the algal bloom cyst in the sediments.

The results of the study in the three sites showed that lead-210 can be a useful tool in sedimentation processes that took place in the water system of the sites. It can be deduced from the Pb-210 profiles obtained from the Inner Malampaya Sound and Cape Bolinao that there is no constant rate of sediment accumulation as the profiles do not display a monotonic decrease in Pb-210 radioactivity. This is probably due to the proximity to river sediment sources or sediment distribution driven by water circulation, particle dynamics and/or intense mixing. The sedimentation rates obtained from these areas, however, need to be confirmed by other dating methods. The Outer Malampaya Sound exhibited sedimentation rate of about one cm per year derived from the quasi-exponential decline of radioactivity. Juag Lagoon exhibited a nearly exponential decay profile and relatively low sedimentation rate of 0.3 cm/year which suggest that the area remains an undisturbed environment.



SEDIMENT CORE SAMPLING

MITIGATION OF COASTAL IMPACT OF TSUNAMI USING NUCLEAR OR ISOTOPE-BASED TECHNIQUES

To assess and mitigate the environmental impact of natural disasters in the Philippines like tsunamis, the Chemistry Research Group has been studying the historical profile of the sediment cores and soil samples collected in Wawa, Calapan, Oriental Mindoro. This area was hit by a tsunami in 1994. Historical sediment record was studied through lead-210 (Pb-210) activity profiling.

Results showed a nearly constant and low level of Pb-210 activity down to 20-cm depth and a

sedimentation rate of ~ 1.5 cm/yr. If a sedimentation rate of 1.5 cm/per year from 20 cm layer down to 40 cm layer is assumed, then the 20 cm layer may have been formed in 1994, which was the year that a tsunami occurred in Mindoro. There was also an observed increase in bulk density from this layer upward which could be accounted by sediments brought about by the tsunami.

The increased sedimentation rate coming from sediments deposited by a tsunami event may cause the following: (1) alter the marine environment and thus change the composition of the species and their abundance in the area; (2) change the area productivity in terms of quality and quantity of fish catch and thus change and affect the livelihood of the coastal population; and (3) result in algal blooms due to changes in the system.

ISOTOPE TECHNIQUES APPLICATION IN WATER RESOURCES MANAGEMENT AND PROTECTION

Assessment of Trends in Freshwater Quality Using Environmental Isotopes and Chemical Techniques

This project is part of a regional effort to assess freshwater quality trends in critical areas in the Asia-Pacific region. In the Philippines, Metro Manila is being studied particularly to assess the impacts of urbanization and waste disposal to water sources. The potential use of naturally occurring isotopes as unique indicators of contamination of surface and groundwater from waste disposal sites is being used by PNRI in the study.



COLLECTION OF WATER SAMPLES AND MEASUREMENT OF FIELD PARAMETERS ALONG THE MARIKINA RIVER

This year, investigation on quality trends of surface water and groundwater in the vicinity of the Montalban landfill was continued. The study area was extended to include Marikina City. Leachate from the landfill exhibited significantly elevated tritium concentration -- about 100 fold higher than the expected modern day natural activity of tritium in precipitation in this region. The surface water in the vicinity of the landfill is evidently affected. From the spatial distribution of tritium in the study, one can trace the pathway of contamination from leachate along the stream, shown by the concentration gradient of tritium from the point of discharge to certain distances. Based on this, surface water contamination from the leachate is estimated to reach as far as about 1.5 km from the point of discharge. Tritium concentration of the landfill-affected water correlates well with its chloride concentration which is also a signature of leachate contamination. Segments of the Marikina River which receives effluents from Payatas also indicated slightly higher tritium than that of the non-dumpsite related surface water. Initial assessment of the concentration of dissolved ions in certain segments of the Marikina River indicated possible exceedances from the water quality criteria for toxic and deleterious substances for freshwater for lead and cadmium.

Isotope Applications in Delineating Recharge of Bacolod City Groundwater System The Analytical Measurements Research Group conducted field investigations in Bacolod City to collect water samples for isotopic analyses, as well as to obtain physico-chemical data (pH, conductivity, salinity and temperature) and major cation and anion concentrations from 26 sites.



ANALYSIS OF LIQUID SAMPLES FOR RADIOACTIVITY USING A MASS SPECTROMETER

Integrating the chemical and isotopic information obtained, the evolution of groundwater and recharge processes in the Bacolod City aquifer has been rationalized. Five groups of water were identified. These are: (1) Group A, includes rainwater, surface waters (rivers and springs) with tritium level of about 1.5 Tritium Units (TU); (2) Group B, consists of the deep groundwater (50-220 mbgs) mostly from the Loygoy cluster. It is characterized by low tritium (0 -0.5 TU) and low chloride. It is estimated to have been recharged before the 1950's tritium peak with recharge coming from the Campuestuhan watershed; (3) Group C, is composed of the shallow coastal wells characterized by tritium concentration similar to modern water and high chloride which indicates direct infiltration from recent precipitation and intrusion from modern seawater; (4) Group D, lying along the mixing line between B and C, consists of the deep coastal wells with intermediate tritium concentration (0.6-0.9 TU) and slightly salinized compared to the other deep groundwater. Mixing of deep old groundwater and some modern salt water is evident; and (5) Group E is the Feliza groundwater, characterized by low tritium (0-0.5 TU) and high chloride, indicating salinity attributed to upconing of connate water trapped in the marine deposits in this area of the city.

The optimization of protocol for dating of tritium in water was also developed. The protocol yielded detection limits as low as ± 0.1 TU which is sufficiently low for groundwater management investigations. Tritium dating can now be offered in PNRI as an analytical service.

This year, the isotope ratio mass spectrometer was installed. The facility will facilitate more environmental studies involving water resources as well as drainage basin studies. It will provide cheaper and more accessible isotopic analytical services for local researchers.

Isotope Applications in Verifying Recharge Processes in Bulacan Province Groundwater System In 2008, sampling and field measurements in nine municipalities in Bulacan Province namely, Angat, Baliwag, Balagtas, Bustos, Calumpit, Obando, Plaridel, San Ildefonso, and San Miguel were conducted. Preliminary physico-chemical data and tritium data are now available for water sources in the province.

In line with this project, PNRI conducted a seminar on isotope and geochemical techniques application for water resources management. The seminar sponsored by the



PROJECT STAFF COLLECTING SAMPLES AND FIELD DATA FROM A PRODUCTION WELL IN BALIWAG, BULACAN

Bulacan Association of Water Districts was attended by managers and representatives of local governments. As a result, nine water districts in the abovementioned municipalities officially agreed to a collaborative undertaking with PNRI. For this purpose, PNRI and the Baliwag Water District entered into a Memorandum of Agreement on water resources management. Likewise, PNRI is firming up collaboration with National Water Resources Board which requested for the conduct of isotopic investigation to improve their basis for amending water utilization policies in Bulacan.

INDUSTRY

RADIOTRACER AND SEALED SOURCE APPLICATIONS

The Isotope Techniques Research Group (ITRG) continued to conduct studies for the establishment of the Prompt Gamma Neutron Activation Analysis facility. A procedure for neutron flux measurement along the beam path was completed and applied to the neutron calibrator with different neutron moderator geometry. The set-up of the shielding was also fixed to accommodate the sample holder.

A foreign-owned company requested to lease one of the cobalt-60 source of the Group for use in one of their activities. The Group was also requested to handle the source for transfer to and from the source container to their source holder.

SURVEY FOR NUCLEAR AND OTHER INDUSTRIAL MINERALS

As part of the project on delineating potential indigenous nuclear raw materials and other associated

mineral resources in the country, the Nuclear Materials Research Group continued its radiometric and geochemical surveys at the Dinkidi copper-gold porphyry deposit situated in the southwestern and northeastern portions within the Dipidio mineralized district in Nueva Vizcaya. Using the gamma ray spectrometric technique, the Group surveyed 213 monitoring/sampling stations covering 1.6 by 1.3 square kilometers and measured 1,065 gamma-ray readings for potassium (K), uranium, thorium (Th) and total gamma radioactivity. A total of 213 soil samples were also taken for multielement analysis. Rock samples were likewise analyzed to verify rock types and determine mineral and alteration assemblages.

Furthermore, the Group conducted radiometric and geochemical surveys within the Lumanggang-Bacada area of the Kingking copper-gold porphyry deposit located in Pantukan, Compostela Valley in Mindanao. About half of the planned total survey area of 1.0 by 1.5 square kilometers was surveyed. A total of 498 measurements for potassium, uranium, thorium and total gamma radioactivity in 83 data stations and 83 soil samples were taken during the survey period. Similarly, the soil samples will be analyzed for multielement analysis by x-ray fluorescence.

Results of the surveys showed consistent radiometric signatures of high K, high K/Th and high total natural gamma radioactivity within these two known Dinkidi and Kingking copper-gold porphyry deposits making these three radiometric signatures as models for exploring copper-gold deposits in the country.



PNRI STAFF CONDUCT RADIOMETRIC AND GEOCHEMICAL SOIL SURVEYS AT THE DINKIDI AREA IN NUEVA VIZCAYA.

Provision of Quality S & T Services

The PNRI provides nuclear and allied services as well as regulatory services to various clients in industry, business, academe, hospitals, research and government institutions.

NUCLEAR AND ALLIED SERVICES

GAMMA IRRADIATION SERVICES

The Multipurpose Gamma Irradiation Facility (MIF) and Gammacell-220 irradiator have been used by PNRI in providing gamma irradiation services to various clients.

Multipurpose Irradiation Facility (MIF)

The MIF was upgraded this year from a pilot-scale to a semi-commercial facility to meet the increasing demand for gamma irradiation services. This consisted of the installation of a single source rack and a new product handling system which is a semi-automatic conveyor system that can load 14 tote boxes per batch and transfer these automatically to irradiation position. The capacity of the upgraded facility has increased four-fold per product load.

From the resumption of operation of the upgraded irradiation facility in April until December 2008, a total of 6,283 products were irradiated for 35 clients (30 from industry, 1 from hospital, 2 students and 2 researchers). The following products were irradiated for industry

for decontamination or sterilization: spices, herbal products and dehydrated vegetables, frozen bone graft, orthopedic implants and cosmetic accessories. Samples irradiated for research and development studies were carabao mangoes, hydrogel wound dressing, cellulose pads, carrageenan, baby shampoo and pork casing.

Gammacell-220 Irradiator - A total of 2,580 samples were irradiated for 33 clients (mostly students) at this facility. Samples irradiated included ornamental plants, fruits, seeds and cuttings, banana meristem and sucker, okra seeds, sorghum, corn, petroleum, mungbean, winged bean, eggplant and string beans (sitao), mice and fruit fly pupae.

RADIATION PROTECTION SERVICES (RPS)

The Institute provided various radiation protection services through the RPS Group to authorized users of ionizing radiation and radioactive materials in medical, industrial, commercial and research institutions throughout the country. These services were done to ensure that workers occupationally exposed to radiation will not receive undue exposure. Among the services rendered for this year were the following:

Personnel Monitoring Services

The external exposure of personnel working with ionizing radiation are monitored and assessed through the film badge and thermoluminescent dosimetry personnel monitoring services of the RPS. This year, around 8,200 occupationally exposed personnel from more than 2,300 institutions all over the country have been monitored through the dosimetry service.

Secondary Standards Dosimetry Laboratory (SSDL) Calibration Services

The PNRI maintains and operates a Secondary Standards



THE UPGRADED MULTIPURPOSE MULTIPURPOSE IRRADIATION FACILITY





CALIBRATION OF A RADIATION MONITORING INSTRUMENT USING CESIUM-137 REFERENCE SOURCE AT THE SECONDARY STANDARDS DOSIMETRY LABORATORY

Dosimetry Laboratory (SSDL) for the calibration and standardization of radiation measurements in the country. The laboratory's primary task is to ensure the compliance of radiation protection and dosimetry practices of radiation facilities with international measurement standards and to protect the health, interest and safety of every client and their environment from the harmful effects of inaccurate measurements.

The SSDL has several equipment and source standards that provides the following services: (a) calibration of radiation monitoring instruments and dosimeters such as pendsimeter, survey meter, rate meter, personal monitor, (b) output calibration of brachytherapy, teletherapy and activity meters in hospitals, and (c) radiation monitoring and hazards evaluation of radiation facilities. This year, the SSDL calibrated 775 radiation monitoring instruments and several units of radioactivity meters and brachytherapy sources.

Radiation Control Services

Radiation control and hazards evaluation services are provided to authorized facilities to ensure that their equipment and devices as well as their working practices are in accordance with radiation safety standards. Services include (a) leak testing of sealed sources, (b) rental of survey meters, and (c) swipe sample counting and analysis. This year, the RPS Group leak tested a total of 201 sealed sources from several institutions in Metro Manila and the provinces. A total of 111 units of survey meters were rented out and swipe samples from 296 radiation devices were submitted for analysis.

Radioactive Waste Management

The Institute maintains and operates the National Radioactive Waste Management Center to ensure proper management of spent or unused sealed radioactive sources. This year, the RPS Group collected and managed 84 disused radiation sources, 38 liters of radioactive wastes and 180 cubic meters of solid wastes generated by licensed users of radioactive materials.

NUCLEAR-BASED ANALYTICAL SERVICES BY NUCLEAR AND RELATED TECHNIQUES

The Analytical Measurements Research Group (AMRG) provides analytical services using nuclear-based and related techniques to various clients. For 2008, radioactivity analyses were done on 201 samples received from 19 clients in the food and agri-business sector which require non-radioactivity certification prior to trading/export. Gross alpha-beta analyses by liquid scintillation counting were done on 199 samples consisting mostly of drinking water for regulatory purposes. To detect vinegar adulteration, the AMRG used carbon-14 measurement on samples from two clients. Elemental analysis by X-ray fluorescence was also done on two samples.

CYTOGENETIC ANALYSIS

This service was extended to 47 clients, 85 percent of whom were subjected to chromosomal analysis as a requirement for radiation-related work abroad. The remaining number of clients underwent chromosome analysis specifically for medical reasons. Numerical chromosome abnormalities were present in four of those who underwent analysis. These abnormalities were Trisomy-21 (Down Syndrome), Trisomy-18, (Edward Syndrome) and Klinefelter Syndrome.

COMPUTER SERVICES

The Computer Services Group managed and enhanced the PNRI website (<http://www.pnri.dost.gov.ph>) and the PNRI Intranet (<http://main.intranet.pnri>). Knowledge data such as the Final Safety Analysis Report of the Bataan Nuclear Power Plant have been uploaded to the PNRI Web Center for Nuclear Knowledge Resources (<http://www.pnri.dost.gov.ph/km>). The Group expanded and regularly maintained the local area network (LAN) connections and hardware. In addition, the Group extended assistance to the Safeguards Section in implementing the Megaports Initiative Project through information and communication technology preventive maintenance of the radiation portal monitoring detection system at South Harbor and Manila International Container Terminal in Port Area, Manila. Assistance was also provided in the maintenance of the CTBTO radionuclide monitoring station in Tanay, Rizal.

ENGINEERING SERVICES

The Institute's Engineering Services Group completed a total of 109 major jobs in support of the PNRI research and service activities. These jobs include the following: Mechanical Shop fabrication jobs for the multipurpose irradiation facility, Applied Physics Research laboratory and Nuclear Training Center; Electronics-Instrumentation repair jobs for nuclear and non-nuclear equipment and instruments; and Electrical jobs which include assistance to Reactor Operations Group such as repair of laboratories for the Research Reactor Decommissioning Demonstration project. The Engineering Services also provided support in the Megaports initiative project through maintenance of the radiation portal monitor at the South Harbor and Manila International Container Terminal in Port Area, Manila. The Group also gave assistance to the Health Physics Research Group through maintenance of equipment in the CTBTO radionuclide monitoring station.

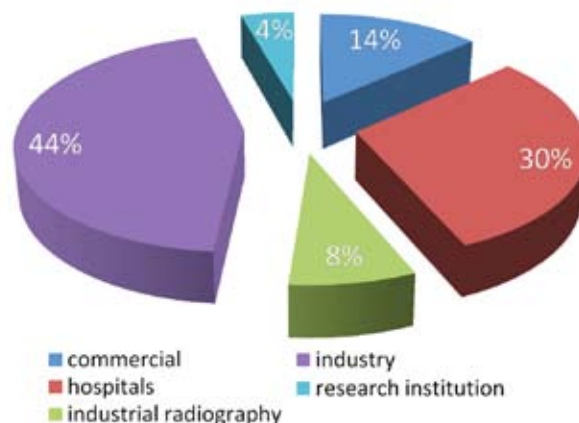
NUCLEAR REGULATORY SERVICES

ISO 9001:2000 CERTIFICATION AWARD TO PNRI REGULATORY DIVISION

The Quality Management System ISO 9001:2000 certification was awarded to the Nuclear Regulations, Licensing and Safeguards Division (NRLSD) and four other administrative support units on December 12. The certification award, presented by Certification International Phils., Inc, was in compliance with stringent quality and reliability requirements of the International Standards Organization (ISO). The ISO certification had the support of DOST Grants-in-Aid project on "Establishment and Implementation of Quality Management System in Accordance with ISO 9001:2000".

The NRLSD, which has five sections, namely, Licensing Review and Evaluation, Standards Development, Inspection and Enforcement, Safeguards, and Radiological Impact Assessment, takes the responsibility to act as the regulatory arm of the PNRI as mandated by laws (RA 2067 and RA 5207, as duly amended).

LICENSING REVIEW AND EVALUATION



PNRI's Licensing Review and Evaluation Section (LRES) reviewed and evaluated applications for authorization to use, possess, store, sell and import radioactive materials. For the period under review, PNRI issued a total of 244 licenses (22 new, 222 renewed and 50 amended) to the following: 40 commercial establishments, 90 hospitals, 23 companies using industrial radiography, 132 industrial firms and 13 research institutions. Pre-licensing/verification inspection activities were also conducted as needed to confirm the licensee's and applicant's commitments in license applications.

Applications for termination of licenses of 14 institutions were also processed. The LRES prepared 541 certificates of release for sealed radiation sources for the Bureau of Customs to release imported radioactive materials to licensed users.

STANDARDS DEVELOPMENT

To further enhance safety in the use of radioactive materials in the country and to assist licensees in complying with regulatory requirements, the Standards Development Section (SDS) pursued the development and revision/updating of regulations, regulatory bulletins, regulatory guides and model procedures. This year, two PNRI regulations were published in the Official Gazette on October 20, 2008. These were the Code of PNRI Regulations (CPR) Part 12, Licenses for Medical Use of Sealed Radioactive Sources in Teletherapy, and CPR Part 15, Licenses for Large Irradiators. Regulatory guides for these two CPRs were drafted. The proposed revisions on three CPRs, namely, CPR Part 11 (Licenses for Industrial Radiography), CPR Part 13 (Licenses for Medical Use of Radiopharmaceuticals) and CPR Part 14 (Licenses for Medical Use of Sealed Radioactive Sources in Brachytherapy), were submitted to the PNRI Director for approval.

The SDS also drafted two Administrative Orders entitled 1) Authorization for Transfers of Nuclear-Related Dual-Use Equipment, Materials, Software and Related Technology, and (2) Guidance Levels for Representative Radionuclides in Foods Following Accidental Nuclear Contamination. Two Office Orders were approved by the Director, namely, Office Order No. 5 Series of 2008, Rules for the Authorization of the Philippine Research Reactor-1 and Office Order No. 5 Series of 2008, Rules for the Authorization of PNRI Radiation Facilities and Laboratories.

INSPECTION AND ENFORCEMENT

The Inspection and Enforcement (IE) Section conducted a total of 188 regulatory inspections of radioactive materials and facilities to verify licensees' compliance with PNRI regulations and specific requirements relative to safety and security of radioactive sources. A majority of the inspections were done at facilities with installed nuclear gauges. Unannounced inspections were conducted in five radiography companies to verify their compliance with PNRI regulations and requirements

in terms of security of radioactive sources and safety of radiation workers. Follow-up inspections were done in seven licensees to verify the actions/responses undertaken to comply with PNRI regulations. The PNRI also issued 2,445 certificates of "Authority to Transport" to licensees for the transport of sealed radioactive materials to authorized locations in the country.

SAFEGUARDS AND SECURITY

The PNRI's Safeguards (SG) Section coordinated and carried out various activities pertaining to the Megaports Initiative Project which is being implemented as part of the Second Line of Defense program of the United States. This project involves the installation and operation of radiation portal monitoring (RPM) system at the Ports of Manila, among others.

The following activities were coordinated/undertaken by SG for this year: (1) validation and testing of RPM system at South Harbor and at Manila International Container Terminal (MICT) by the US Megaports team; (2) conduct of the site survey by the US Megaports team for the proposed wireless backbone installation at the South Harbor, MICT and PNRI. The team verified the feasibility of wireless links between South Harbor and PNRI and between MICT and PNRI; (3) evaluation by the US Department of Energy of the Megaports Initiative's communication system in view of the planned replacement of the old communication system; (4) conduct of two operational readiness training courses; (5) operation of the mirror central alarm system (CAS) and provision of technical assistance to the primary CAS; and (6) tertiary inspection of a 20-foot container van containing gas mantles and detected for thorium-232 at MICT. The investigation showed that the importer of the



MEGAPORTS OPERATIONAL READINESS TRAINING COURSE
AT BUREAU OF CUSTOMS, MICT

gas mantles did not have a license from PNRI which subsequently applied for authorization and was issued a license.

In compliance with the comprehensive safeguards agreement with the IAEA on non-proliferation of nuclear weapons, PNRI hosted the scheduled visit of IAEA safeguards inspectors. The visit involved the physical inventory of nuclear fuels and design information verification at the Philippine Research Reactor-1. PNRI transmitted the nuclear material accounting reports to IAEA through the new secure communication system installed in November. The dedicated communication system which links PNRI with IAEA was set up to enable direct access through encrypted lines between the virtual private network devices located at IAEA and PNRI.

RADIOLOGICAL IMPACT ASSESSMENT

The Radiological Impact Assessment Section collaborated with the Health Physics Research Section and the Radiation Protection Services in the radiological monitoring and assessment of the previously PNRI authorized facility of the Coleman Mantle Manufacturing Corporation. This was in connection with the application of Coleman for the termination of radioactive material license issued by PNRI. To address the regulatory requirements for the release of contaminated facilities, technical inputs were provided by the group in the preparation of the technical report.

The RIA also provided guidance and technical advice to a PNRI licensee in response to a request on proper disposal to the environment of carbon-14 liquid waste containing sodium bicarbonate. Emphasis was given on the protocol for disposal of effluent discharges into the sewer or fresh bodies of water in compliance with Code of PNRI Regulations Part 3-Standards for Protection against Radiation.

RADIOLOGICAL EMERGENCY PLANNING AND PREPAREDNESS

This year, around 286 personnel from various sectors participated in the 14 trainings and seminars related to radiological emergency preparedness, development of emergency plans and procedures and radiological response which were conducted by PNRI's Radiological Impact Assessment (RIA) Section. The participants consist of radiation safety officers, health workers, science teachers, first responders and Philippine National Red Cross workers.

The RIA Section, participated in the following emergency exercises conducted by the International Atomic Energy Agency's (IAEA) Incident and Emergency Response Centre:

(1) Exercise Conv-Ex-1a on March 12 2008, which involved immediate access to the Emergency Notification Assistance Convention website; (2) ConvEx-2b Emergency Exercise on May 28, 2008 which involved the sending of messages of the IAEA's Incident and Emergency Response Centre describing a scenario for a radiological incident. To simulate the ConvEx-2b and for the local component of this IAEA exercise, the RIA organized the RADPLAN Emergency Exercise. This emergency exercise is part of the emergency preparedness activities under the National Radiological Emergency Preparedness and Response Plan. The RIA formulated a transport accident scenario based on the generic scenario given by the IAEA; and (3) ConvEx-3 communication exercise on July 9 and 10, 2008. This was a large scale international nuclear emergency exercise to test the full operation of the emergency information exchange and assistance mechanisms among IAEA member-states. As national competent authority, the PNRI responded to exercise situation reports received from IAEA by submitting in a timely manner the accurately completed EMERCON form to the emergency Notification and Assistance Convention website.



SOFT OPENING OF THE NUCLEAR EMERGENCY RESPONSE CENTER – 12 DECEMBER 2008

ESTABLISHMENT OF A NEAR SURFACE RADIOACTIVE WASTE DISPOSAL FACILITY IN THE PHILIPPINES

For this year, the major activities undertaken by the RIA Section in consonance with the objectives of this IAEA technical cooperation project, were the following:

- (1) updating of the groundwater flow model of the project site. Three model variants were constructed using "GMS 6.0 Environment"
- (2) formulation and updating of the preliminary conceptual and mathematical models for the PNRI waste disposal project into the AMBER computer code;
- (3) monitoring of the condition of boreholes and the installed piezometers in relation with the site characterization studies on the preferred site for the establishment of the disposal facility in the Philippines;



SITE FOOTPRINT
- CONCEPTUAL DESIGN
OF THE NEAR-SURFACE
RADWASTE REPOSITORY



PROPOSED SITE FOR
THE NEAR-SURFACE
RADIOACTIVE WASTE
REPOSITORY

- (4) establishment of a preliminary conceptual design of the envisioned radioactive waste repository following the footprints of the proposed repository; and
- (5) conduct of nuclear awareness seminars, in cooperation with the Information Services Group, which were participated in by the Mayors, members of the Sangguniang Bayan and heads of barangays of the municipalities of Gattaran and Lal-lo in Cagayan province. Nuclear awareness seminars, which included the topic on radioactive waste management, were also held in key regions in the country. Exhibits highlighting the various beneficial uses of nuclear science and technology were also displayed during the seminars which were conducted to address the need to involve the prospective stakeholders of the envisioned project.

GLOBAL THREAT REDUCTION INITIATIVE

The PNRI participates in the Global Threat Reduction Initiative (GTRI) program of the United States Department of Energy (US-DOE). This program is a new comprehensive global initiative to address the issue of nuclear security around the world and reduce the threat of nuclear terrorism.

In connection with this program, the US GTRI team and PNRI Safeguards Section conducted security assessments at the teletherapy facilities of Davao Doctors Oncology Center, Western Visayas Medical Center and Zamboanga City Medical Center. The proposed security assessments for these facilities were established. The PNRI and the US GTRI team conducted another set of security assessments at five facilities utilizing high activity, high-risk radioactive materials. The facilities where the assessments were done include the teletherapy facilities of the Philippine Gamma Knife Center, Jose R. Reyes Memorial Medical Center and Rizal Medical Center; the blood irradiator facility of St. Luke's Medical Center; and the

Secondary Standards Dosimetry Laboratory of Bureau of Health Devices and Technology now known as the Center of Health Devices, Radiation Health and Research of the Department of Health. The team also conducted assurance visits to eight facilities where security upgrades were in progress, namely the teletherapy facilities of Veterans Memorial Medical Center and Dee Hwa Liong Foundation Medical Center; the blood irradiator facilities of National Kidney and Transplant Institute and Dee Hwa Liong Foundation Medical Center; and PNRI critical facilities (Multipurpose Irradiation Facility, PNRI Radioactive Waste Management Facility, Secondary Standards Dosimetry Laboratory and the Central Alarm Station).

REGIONAL PROJECT ON RADIOACTIVE SOURCE SAFETY AND SECURITY

The PNRI, through the NRLSD, continued to actively participate in a regional project on radioactive source safety and security. This project is in cooperation with the IAEA, the US DOE Regulatory Infrastructure Support Project of the National Nuclear Security Administration Program, the Australian Nuclear Science and Technology Organization and the US Department of Energy under its Radiological Threat Reduction Program. The activities under this project included (1) a complete review and on going revisions/amendments of all its nuclear regulations and regulatory guidance documents to strengthen safety and security of all radioactive and nuclear materials in the country, and (2) development and use of training modules in the conduct of training exercises and the training of trainers for the sustainability of the project.

For 2008, the overall contribution to the professional development of the technical staff of the PNRI as the regulatory body was evaluated and assessed. A training program for operators and users of high risks/high activity radioactive sources was initially designed and developed for implementation in 2009.

NUCLEAR SAFETY CARAVAN

The PNRI conducted nuclear and radiation safety awareness seminars in seven regions in the country to inform and train PNRI licensees on safety and security measures that they should implement/enhance to ensure the health, safety and security requirements in their particular facility. Nuclear awareness seminars were also conducted for other stakeholders such as the local government units and the academe to increase their knowledge and understanding on the various aspects of radiation, nuclear science and technology and radioactive waste safety. The number of participants to these seminars, which were conducted under the DOST-GIA funded Nuclear Safety Caravan Project, totaled about 500.

S & T Linking and Networking

As national focal agency for matters regarding nuclear science and technology in the Philippines, the PNRI continued to maintain its cooperative programs and forge new linkages with both local and international organizations.

LOCAL: . The PNRI has always drawn support from its mother agency, the DOST, and other DOST-attached agencies for the implementation of a number of its projects on the safe and peaceful uses of nuclear technology. This year, support from the following DOST agencies were obtained:

Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARDD) * Philippine Council for Aquatic and Marine Research and Development (PCAMRD) * Philippine Council for Industry and Energy Research and Development (PCIERD) * Philippine Council for Health Research and Development (PCHRD) * Technology Application and Promotion Institute (TAPI).

Other project collaborators were the Department of Agriculture * Bureau of Plant Industry (BPI) * Trans-Asia Gold and Minerals Development Corporation * Bacolod City Water District (BACIWA) * and BIOTECS Co.

FOREIGN: The Philippines, through the PNRI, remains a staunch partner of the following foreign organizations/institutions

- International Atomic Energy Agency (IAEA)
- Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology for Asia and the Pacific (RCA)
- Forum for Nuclear Cooperation in Asia, Japan
- Comprehensive Nuclear Test Ban Treaty Organization (CTBTO), Vienna, Austria
- Australian Nuclear Science and Technology



DOST SECRETARY ESTRELLA F. ALABASTRO (4TH FROM RIGHT) WITH DELEGATES TO THE 9TH FORUM FOR NUCLEAR COOPERATION IN ASIA MINISTERIAL AND SENIOR OFFICIALS MEETINGS, 27-28 NOVEMBER 2008 AT SOFITEL HOTEL, MANILA

Organization (ANSTO)

- United States Department of Energy (US-DOE)
- United States Department of Agriculture (USDA)
- Ministry of Science, Technology, Education, Culture and Sports (MEXT) of Japan
- Nuclear Research Safety Association (NSRA) of Japan
- Partnerships in Environmental Management for the Seas of East Asia (PEMSEA)

Through these partnerships, PNRI was able to avail of 10 research contracts; 8 technical cooperation projects; the services of 38 foreign experts/mission delegates; and 131 fellowships and travel grants for PNRI staff and non-PNRI personnel (See Appendices, pp 37 to 42).

As part of these cooperative endeavors, PNRI hosted 10 meetings and regional training courses (See p. 36).



INTERNATIONAL AWARDS RECEIVED BY PNRI PERSONNEL * 2008

- **BEST PAPER • Journal of the International Society of Environmental Bioindicators in the Aquatic Invertebrate Category**

Title: "Use of *Perma viridis* as a Bioindicator of Paralytic Shellfish Toxins at Low *Pyrodinium bahamense* var *compressum* Density Using a Radioreceptor Assay." Volume 2, Issue 4, pp. 264-272, Published: 2007

Authors: Elvira Z. Sombrito, Ma. Celestina V. Honrado, Azucena C. De Vera, Rhett Simon DC. Tabbada, Ma. Llorina O. Rañada, J. Relos, Jr., and Meriam DC. Tangonan

Awarded by: Board of Editors
Environmental Bioindicators Journal

- **OUTSTANDING RESEARCH AWARD
Application of Isotope for Life Science Research**

Title: "Antiproliferative and Radiosensitizing Activity of Grape Seed Extract on Human Promyelocytic Leukemia Cells (HL-60)"

Authors: Chitho P. Feliciano, Uhee Jung, Sung-Kee Jo and Hyeon Soo Eom

Awarded by: Scientific Committee of the 6th International Conference on Isotopes (6ICI 2008), Seoul, Korea

- **BEST POSTER • 2008 Australasian Radiation Protection Society Conference, 21-24 September 2008, Canberra, Australia**

Title: "Regional Cooperation to Reduce the Safety and Security Risk of Orphan Radioactive Sources"

Authors: Geoffrey Howard, Celia Hacker, Kristine Romallosa, Estrella Caseria, Lorena Africa-del Castillo, Eulinia Valdezco and Allan Murray

Awarded by: Australasian Radiation Protection Society



CHITHO FELICIANO, SCIENCE RESEARCH SPECIALIST I OF BIOMEDICAL RESEARCH GROUP, ATOMIC RESEARCH DIVISION, RECEIVES HIS AWARD DURING THE 6TH INTERNATIONAL CONFERENCE ON ISOTOPES HELD IN SEOUL, KOREA IN MAY 2008.



36th Atomic Energy Week and PAEC/PNRI's 50th Anniversary



THANKSGIVING MASS
OFFICIATED BY REV. FR. JOEY GUINTO, SVD
CHRIST THE KING SEMINARY



←
WREATH LAYING
AT THE MONUMENT OF
GENERAL FLORENCIO A.
MEDINA, CONSIDERED
AS THE FATHER OF
ATOMIC ENERGY IN THE
PHILIPPINES



AEW OPENING CEREMONIES
ELMER C. HERNANDEZ,
FORMER PNRI
EMPLOYEE AND NOW
UNDERSECRETARY OF
THE DEPARTMENT OF
TRADE AND INDUSTRY,
DELIVERS HIS AEW
KEYNOTE ADDRESS.



→
OPENING OF EXHIBITS
DTI USEC HERNANDEZ, DOST
USEC DELA PEÑA, PNRI DIRECTOR
ALUMANDA M. DELA ROSA
(EXTREME RIGHT) AND MRS.
EULINIA M. VALDEZCO, 2008 AEW
CHAIRPERSON, VIEW THE EXHIBITS.

AEW OPENING CEREMONIES
DOST UNDERSECRETARY FORTUNATO
T. DELA PEÑA REPRESENTED DOST
SECRETARY ESTRELLA F. ALABASTRO FOR
THE INSPIRATIONAL MESSAGE.



OPEN HOUSE – GUIDED TOUR OF FACILITIES

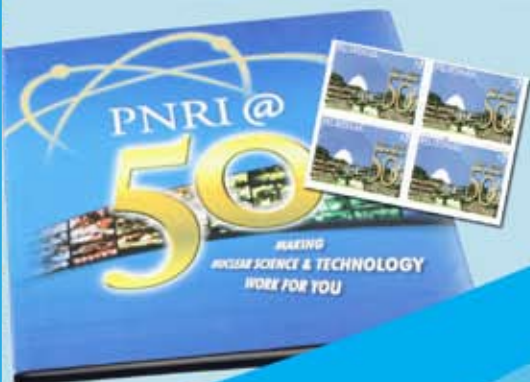
THOUSANDS
OF STUDENTS
AND TEACHERS
VISITED THE PNRI
AND AVAILED
THEMSELVES OF
THE GUIDED TOURS,
FILM SHOWING,
INTERACTIVE
EXHIBITS AND THE
EDUCATIONAL GAME
OF RADIOACTIVE
SOURCE HUNTING.



**TECHNICAL
POSTER
CONTEST**
STUDENTS VIEW
ONE OF THE
32 TECHNICAL
POSTER ENTRIES.



**PNRI
COMMEMORATIVE
STAMPS AND COFFEE
TABLE BOOK WERE
PRODUCED FOR
PAEC/PNRI'S 50TH
ANNIVERSARY**



The PNRI spearheaded the joint celebrations on December 8-12, 2008 with the theme "Making Nuclear Science and Technology Work for You"



SCIENTIFIC SESSIONS

EIGHTEEN TOPICS WERE PRESENTED ON THE APPLICATIONS OF NUCLEAR SCIENCE AND TECHNOLOGY ON HEALTH CARE, FOOD, INDUSTRY, AND THE ENVIRONMENT.



SOFT OPENING OF NEW/UPGRADED PNRI LABORATORIES

SIX NEW/UPGRADED PNRI LABORATORIES/FACILITIES WERE LAUNCHED, NAMELY: ENVIRONMENTAL ISOTOPE CENTER, MULTIPURPOSE IRRADIATION FACILITY, MICROBIOLOGICAL SERVICE LABORATORY, ANALYTICAL MEASUREMENT RESEARCH LABORATORY, CENTRAL ALARM STATION, AND NUCLEAR RESPONSE SUPPORT CENTER. DOST SECRETARY ESTRELLA F. ALABASTRO WITNESSED THE LAUNCHING TOGETHER WITH PNRI OFFICIALS AND STAFF ON DECEMBER 12.



BEST SUGGESTION AWARD:

HAYDEE M. SOLOMON, NSTD "IDENTIFICATION OF BUILDINGS, ROOMS AND GATES AND PUTTING-UP OF DIRECTORIES IN EACH BUILDING AND DIRECTORIES/ MAPS IN EACH GATE"



TECHNICAL POSTER CONTEST

1ST PLACE: "NUCLEAR AND RELATED ANALYTICAL TECHNIQUES FOR THE CHARACTERIZATION AND SOURCE IDENTIFICATION OF AMBIENT AIR PM10 IN METRO MANILA"

PRECIOSA CORAZON B. PABROA
ATOMIC RESEARCH DIVISION, PNRI



NUCLEAR SCIENCE QUIZ

THE FIRST PRIZE WINNERS FROM MANILA SCIENCE HIGH SCHOOL AND THEIR ADVISER



ISO 9001-2000 CERTIFICATION AWARD TO PNRI REGULATORY DIVISION

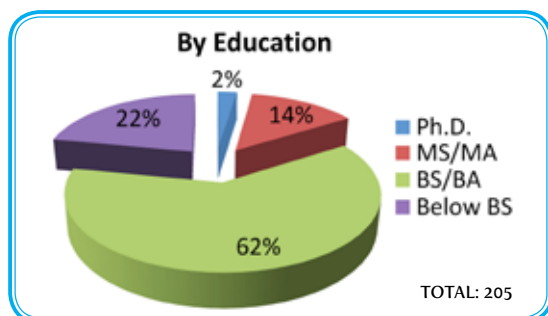
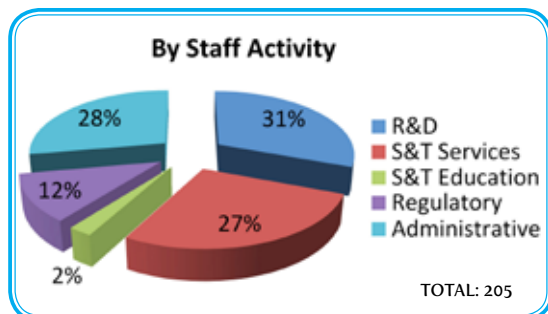
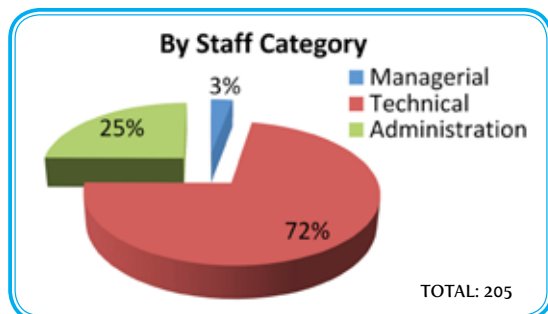
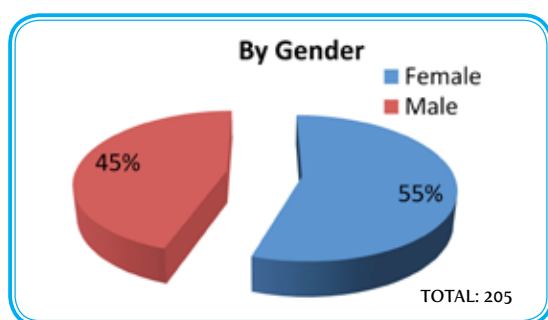
THE NRLSD OF PNRI WAS AWARDED ISO 9001:2000 CERTIFICATION BY CERTIFICATION INT'L PHILIPPINES, INC., REPRESENTED BY ITD MANAGING DIRECTOR, RENATO NAVARETTE (4TH FROM LEFT), DURING THE AEW CLOSING CEREMONIES. THE NRLSD IS HEADED BY EULINIA M. VALDEZCO (4TH FROM RIGHT). ALSO IN PHOTO ARE DOST SECRETARY ESTRELLA F. ALABASTRO, DR. DANILO PILAR, MIRDC, PNRI DIRECTOR ALUMANDA M. DELA ROSA, PNRI FAD CHIEF GRACETA DL. CUEVAS AND NRLSD STAFF.

EMPLOYEES' HOMECOMING NIGHT



Human Resource Development

The PNRI provided the environment for the development of its human resources through local and foreign training courses, seminars and scholarships.



PROFILE OF R&D PERSONNEL BY POSITION IN 2008		
CATEGORY	NUMBERS	%DISTRIBUTION
Total Number of R&D Personnel	86	
By Position		
Scientists and Engineers	54	63%
Technicians	7	8%
Auxiliary Personnel	25	29%

PROFILE OF SCIENTISTS AND ENGINEERS		
CATEGORY	NUMBER	%DISTRIBUTION
Total Number of Scientists and Engineers	54	%
By Sex		
Male	18	33%
Female	36	67%
By Age Group		
20 years old and below	-	0%
21-30	8	15%
31-40	7	13%
41-50	12	22%
51-60	16	30%
61 years old and above	11	20%
By Educational Attainment		
With PhD	3	6%
MS/MA	21	38%
Post BS/BA	-	0%
BS/BA	29	54%
Post High School	1	2%
High School and below Work	-	0%
By Field of Research		
Natural Sciences	40	74%
Engineering and Technology	3	6%
Agricultural Sciences	10	18%
Medical Sciences	1	2%
Social Sciences	-	0%
Humanities	-	0%



LOCAL

- PNRI conducted 42 training courses participated in by 743 professionals from government and private agencies. See page 32.
- PNRI accepted 51 students for on-the-job training and 9 students for thesis advisorship. See page 33.
- PNRI provided its employees the opportunity to participate in 50 locally –sponsored/conducted training/seminar/workshop in various fields. See pages 42 to 45.
- PNRI, through the Finance and Administrative Division, facilitated the conduct of the following seminars/workshops for its personnel: (1) Values Orientation Seminar : Paglalakbay ng Puso”,

- (2) Code of Conduct and Ethical Standards,
- (3) Health Care Provider Orientation Seminar; and
- (3) Scientific Career System Seminar.

- PNRI provided support to its personnel availing of scholarship programs (4 PhDs and 4 MS degrees); and those pursuing graduate studies on their own (3 PhDs and 6 MS/MA degrees). See page 45.

FOREIGN:

- This year, through its linkage with institutions and agencies, PNRI was able to avail of 131 training/fellowship grants for PNRI staff and non-PNRI personnel. (See pages 37 to 42)

PNRI RECOGNITION AWARDS FOR MERITORIOUS CONTRIBUTIONS/ EXEMPLARY PERFORMANCE OF DUTIES

2008 MODEL EMPLOYEE

RHODORA R. LEONIN
Head, Information Services
Nuclear Services and Training Division



RHODORA R. LEONIN, MODEL EMPLOYEE 2008

DIVISION AWARDEES

- Guissepe Filam O. Dean
Science Research Specialist I
Inspection and Enforcement Section
Nuclear Regulations, Licensing and
Safeguards Division
- Rhett Simon DC. Tabbada
Science Research Analyst
Chemistry Research Group
Atomic Research Division
- Ana N. Villanueva
Administrative Officer II
Finance and Administrative Division



GUISSPE FILAM O. DEAN



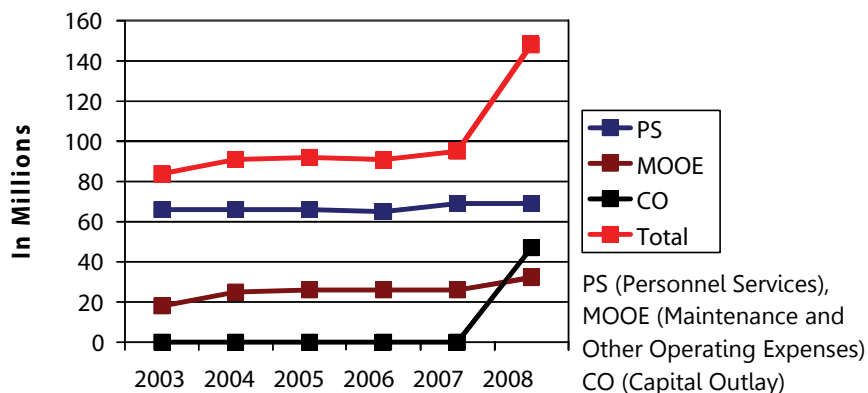
RHETT SIMON DC. TABBADA



ANA N. VILLANUEVA

Financial Resources

TREND OF PNRI BUDGET

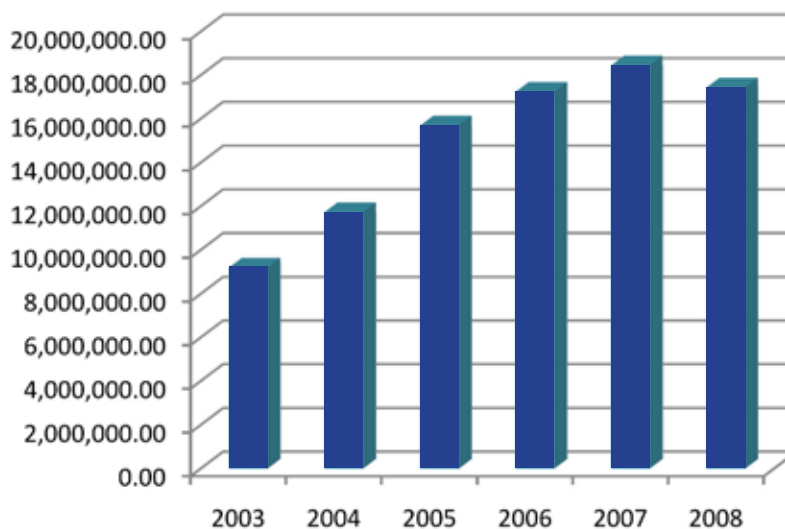


ADDITIONAL RESOURCES GENERATED FROM EXTERNAL SOURCES in 2008

GRANT	AMOUNT
LOCAL	Php 43,042,239.00
FOREIGN	
Cooperation Agreements	3,277,416.00
IAEA Technical Cooperation Projects	18,467,603.00
IAEA Research Contracts	6,231,779.00
TOTAL:	Php 71,019,037.00

Note: See Appendices, Table 14, Page 46 for list of grants.

INCOME • 2003 TO 2008



INCOME FROM PNRI SERVICES * 2008	
NUCLEAR AND ALLIED SERVICES	
Name of Service	Income Generated (in Pesos)
Irradiation Services	1,085,301.00
- Use of Multipurpose Irradiation Facility and Gammacell 220	
- Sale of radioactive sign stickers	540.00
Radiation Protection Services	10,502,470.13
• Personnel Monitoring	
- Film badge service	
- Thermoluminescent dosimetry	
• Calibration of Radiation Detection Instruments	955,995.00
- Survey meter	
- Pen dosimeter	
- Contamination meter	
- Dose calibrator	
- Teletherapy output calibration	
• Radiation Control Services	284,450.00
- Leak testing of sealed sources	
- Radiological support for non-PNRI clients, radiation and hazard evaluation	9,500.00
• Radioactive Waste Management	256,145.00
- Solid waste	
- Liquid waste	
- Spent sealed sources	
- Teletherapy sources	
• Special Services	
- Rental of survey meter	192,250.00
- Swipe sample counting	267,480.00
- Radiation monitoring	52,000.00
Engineering Services	
- Repair of nuclear instruments	13,100.00
Analytical Services	
• Analytical Measurements Research	
- Gross alpha-beta analysis of water samples	437,150.00
- Gammametric analysis	479,205.00
- Elemental and trace analysis by X-ray Fluorescence Spectrometer (XRF)	37,440.00
- Sediment dating	50,000.00
• Applied Physics Research	
- Structural analysis using X-ray Diffraction (XRD) spectrometer	227,130.00
Cytogenetic Service/Microscopy Services	81,700.00
Microbiological Test	
	SUBTOTAL 14,931,856.13
NUCLEAR REGULATORY SERVICES	
Licensing Review and Evaluation	
- Licensing Fees	961,572.50
- Certification of Release (shipments of radioactive material)	156,550.00
- Certificate of transport fee	741,270.00
- Surcharge- Fines/Penalties for Permits/Licenses	10,850.00
Inspection and Enforcement	
- Inspection fee	642,000.00
Standards Development	4,650.00
- Sale of CPR (Code of PNRI Regulation) Compilation for specific Parts and Infopacs (Information Packages)	
	SUBTOTAL 2,516,892.50
	Grand Total 17,448,748.63



Appendices

TABLE 1. TECHNICAL TRAINING COURSES CONDUCTED IN 2008

TITLE OF TRAINING	TRAINING VENUE/ LOCATION	NO. OF PARTICIPANTS	INCLUSIVE DATES CONDUCTED	FUNDING SCHEME
RADIOISOTOPE TECHNIQUES				
Radioisotope Techniques Training Course (Medical) – 92 nd Session	PNRI, Diliman, Quezon City	41	July 7 – August 1	Individual fee-paying
NUCLEAR SCIENCE AND TECHNOLOGY FOR TEACHERS				
Seminar in Nuclear Science for High School Science Teachers – 32 nd Session	PNRI	24	April 14 – May 16	PNRI-sponsored
Nuclear Technology for University/College Faculty – 41 st Session	PNRI	6	April 14 – May 16	PNRI-sponsored
RADIATION SAFETY				
Safety in the Use of Nuclear Equipment and Devices Training Course – 21 st Session	PNRI	17	March 24 – 29	Individual fee-paying
Safety in the Use of Nuclear Equipment and Devices Training Course – 22 nd Session	PNRI	10	April 1 – 5	Individual fee-paying
Safety in the Use of Nuclear Equipment and Devices Training Course – 23 rd Session	Amalgamated Iron Works, Inc., Novaliches, Quezon City	10	April 1 – 5	Company-sponsored
Radiation Safety Officer Course	PNRI	21	June 16 – 27	Company-sponsored
Safety in the Use of Nuclear Equipment and Devices Training Course – 24 th Session	PNRI	22	August 11 – 15	Individual fee-paying
Safety in the Use of Nuclear Equipment and Devices Training Course – 25 th Session	Rapu Rapu Minerals, Inc., Pagcolbon, Rapu Rapu, Albay	14	August 19 – 23	Company-sponsored
Radiation Safety Officer Refresher Course	PNRI	14	November 5 – 7	Individual fee-paying
Radiation Health and Safety Course for Industrial Radiographers	PNRI	11	November 10 – 21	Individual fee-paying
Safety in the Use of Nuclear Equipment and Devices Training Course – 26 th Session	Leighton (Asia) Limited, Masbate Gold Mine Project, Brgy. Puro, Aroroy, Masbate	10	November 24 – 28	Company-sponsored
Safety in the Use of Nuclear Equipment and Devices Training Course – 27 th Session	Coral Bay Nickel Corp., Rio Tuba, Bataraza, Palawan	10	December 15 – 19	Company-sponsored
NONDESTRUCTIVE TESTING COURSES (in cooperation with the Philippine Society for Nondestructive Testing, Inc (PSNT))				
Radiographic Interpretation Course	PNRI	8	January 2 – 4	Individual fee-paying
Ultrasonic Testing – Level 1	PNRI	12	January 7 – 11	Individual fee-paying
Radiographic Testing – Level 1	PNRI	12	January 28 – February 1	Individual fee-paying
Ultrasonic Testing – Level 2	PNRI	18	February 4 – 15	Individual fee-paying
Radiographic Testing – Level 2	PNRI	10	February 18 – March 3	Individual fee-paying
Liquid Penetrant Testing – Level 2	PNRI	15	March 24 – 25	Individual fee-paying
Magnetic Particle Testing – Level 2	PNRI	15	March 31 – April 4	Individual fee-paying
Eddy Current Testing – Level 2	PNRI	5	April 21 – March 5	Individual fee-paying
Ultrasonic Testing – Level 1	PNRI	19	May 5 – 9	Individual fee-paying
Radiographic Testing – Level 1	PNRI	13	May 12 – 16	Individual fee-paying
Liquid Penetrant Testing – Level 2	PNRI	15	May 19 – 23	Individual fee-paying
Magnetic Particle Testing – Level 2	PNRI	15	May 26 – 30	Individual fee-paying
Ultrasonic Testing – Level 2	PNRI	38	June 2 – 16	Individual fee-paying
Liquid Penetrant Testing – Level 2	PNRI	13	June 17 – 23	Individual fee-paying
Magnetic Particle Testing – Level 2	PNRI	13	June 24 – 30	Individual fee-paying
Radiographic Testing – Level 2	PNRI	38	July 7 - 18	Individual fee-paying
Radiographic Interpretation Course	PNRI	24	July 23 - 25	Individual fee-paying
Ultrasonic Testing – Level 1	PNRI	18	August 20 – 27	Individual fee-paying
Ultrasonic Testing – Level 2	PNRI	13	August 18 – 29	Individual fee-paying
Radiographic Testing – Level 2	PNRI	10	September 1 -12	Individual fee-paying
Ultrasonic Testing – Level 2	PNRI	42	September 15 – 26	Individual fee-paying
Liquid Penetrant Testing – Level 2	PNRI	28	October 13 – 17	Individual fee-paying
Magnetic Particle Testing – Level 2	PNRI	28	October 20 – 24	Individual fee-paying

Ultrasonic Testing – Level 2	PNRI	13	November 3 – 14	Individual fee-paying
Radiographic Testing – Level 2	PNRI	14	November 5 – 7	Individual fee-paying
WELDING TECHNOLOGY COURSES (in cooperation with the PSNT)				
Welding Inspector's Course	PNRI	13	January 7 – 11	Individual fee-paying
Welding Inspector's Course	PNRI	11	April 8 – 14	Individual fee-paying
Welding Inspector's Course	PNRI	41	July 7 – Aug 1	Individual fee-paying
Welding Inspector's Course	PNRI	19	October 27 – 31	Individual fee-paying

TABLE 2. NUCLEAR S & T TRAINING FOR UNDERGRADUATES

ON-THE-JOB TRAINING				
FIELD OF TRAINING	PNRI SECTION/UNIT	SCHOOL	COURSE	NO. OF STUDENTS
Program Development for Recording, Monitoring/ Retrieving Documents; and Administrative Services Activities	Office of the Director, Technical Assistance, Computer Services, Finance and Administrative Division, Accounting Unit, and Property and Procurement Unit	Polytechnic University of the Philippines; Asian Institute of Computer Studies; A.R. Ramos Institute of Science and Technology; AMA University; New Era University; and Bulacan State University	Computer Technology; Computer Hardware; Computer Design; BS in Information Technology; BS Computer Science	12
Mutation Breeding Nursery Management; Biology Tissue Culture for Fruit and Ornamental Crops; Radio-sensitivity Study on Ornamental Plant Culture Practice; Irradiation and Planting of Irradiated Seeds; and Gathering Data on Plant Height and Root Length	Agricultural Research Group	Philippine Normal University; Pamantasan ng Lungsod ng Maynila; Fatima University; UP- Los Baños; University of the Philippines-Visayas; Polytechnic University of the Philippines; Philippine Science High School – Bicol	BS Agriculture, BS Biology	8
Air Pollution Study; Chemical Analysis of Water; Laboratory Inventory; Liquid Scintillation Spectrometry; and Data Analysis	Analytical Measurements Research Group	Pamantasan ng Lungsod ng Maynila; Polytechnic University of the Philippines; University of the Philippines-Diliman; University of Sto. Tomas	BS Chemistry	6
High Dose Dosimetry; Radiation Protection Operations and Routine SSDL Procedure; Data Encoding of Radiation Protection Services Activities	Radiation Protection Services	University of Sto. Tomas; Polytechnic University of the Philippines; Eulogio Amang Rodriguez Institute of Science and Technology; Philippine Normal University	BS Physics, BS Applied Physics	10
High Technology Research, X-ray Diffraction Studies of Aluminum-Doped Earth Yttrium Garnets; Device Fabrication for Thin-Film Coating on Solid Substrates.	Applied Physics Research Group	University of the Philippines	BS Applied Physics	1
Isolation of Saxitoxin; Cell Count Determination; Toxicity Assay; Orientation and Hands-on Training on Instrumentation on Gas Chromatography, Fluorescence, Gamma Cell Radiation, Data Collection and Analyses	Chemistry Research Group	Polytechnic University of the Philippines; Pamantasan ng Lungsod ng Maynila; Philippine Normal University; Dela Salle University; and Ateneo de Manila University	BS Chemical Engineering; BS Chemistry; High School	9
Environmental Radioactivity Measurements	Health Physics Research Group	Pamantasan ng Lungsod ng Maynila	BS Physics	2
Assistance in the Preparation, Calibration/ Routine Dose Measurements in the Multipurpose Irradiation Facility and Preparation of Procedures for QMS	Irradiation Services	Technological Institute of the Philippines	BS Chemical Engineering	1
	Biomedical Research Group	University of Sto. Tomas; Philippine Normal University	BS Biology BS Chemistry	2

TOTAL: 51

TABLE 3. THESIS/RESEARCH ADVISORSHIP IN 2008

FIELD OF TRAINING	PNRI SECTION/ UNIT	SCHOOL	COURSE	NO. OF STUDENTS
Sampling; X-ray Fluorescence Spectrometry Analysis; Ion Exchange Chromatography	Analytical Measurements Research Group	Technological University of the Philippines	BAS-ES	2
Comparative Cytological Analysis of Two Spathoglothis Species; One Mutant and its Hybrid	Agricultural Research Group	New Era University	BS Biology	4
Planting the Spores of Ferns Using Cobalt 60; Observing the Effects of the Experiment	Analytical Measurements Research Group	New Era University	BS Biology	3
TOTAL: 9				

TABLE 4. IAEA RESEARCH CONTRACTS* IMPLEMENTED IN 2008

NAME OF ORGANIZATION	CLIENT	TITLE/DESCRIPTION OF RESEARCH	PROJECT DURATION		NAME OF RESPONSIBLE AGENCY STAFF	PROJECT COST (IN PESOS)
	NAME/TEL. NO. OF CONTACT PERSON		START	END		
IAEA	Teresa Benson Tel:(431) 2600-21568	The Use of FDG-PET vs. Conventional Diagnostic Tests in the Diagnosis, Staging and Monitoring Response to Treatment and Relapse in Patients with Diffuse Large B-Cell Lymphoma	04-15-2008 11-27-2008	04-14-2009 11-26-2009	Charity Gorospe St Luke's Medical Center	643,907.00
IAEA	Teresa Benson Tel:(431) 2600-21568	Establishment of Early Rapid Detection System for Highly Pathogenic Avian Influenza: I, Real-Time PCR, II. Sequence Analysis	09-01-2008	08-31-2009	Cristina Legaspi Philippine Animal Husbandry Center (PAHC)	515,126.00
IAEA	Teresa Benson Tel:(431) 2600-21568	Use of Open Source Web Development Tools in Improving the Nuclear Knowledge Portal for the PNRI	09-15-2008	09-14-2009	Ana Elena L. Conjares	312,954.00
IAEA	Teresa Benson Tel:(431) 2600-21568	Applications of Radiotracer and Radioassay Technologies in Paralytic Shellfish Poisoning Risk Analysis	09-15-2008	09-14-2009	Elvira Z. Sombrito	312,954.00
IAEA	Teresa Benson Tel:(431) 2600-21568	Radiolabelled Conotoxin and Saxitoxin for the Monitoring of Harmful Algal Blooms in Aquaculture Area	10-30-2008	10-29-2009	Adelina M.Bulos	450,735.00
IAEA	Teresa Benson Tel:(431) 2600-21568	Radiation Processed Materials from Carrageenan for Agricultural Applications	10-10-2008	10-09-2009	Lucille V.Abad	540,882.00
IAEA	Teresa Benson Tel:(431) 2600-21568	Feasibility, Reproducibility and Accuracy of Early Acquisition of Gated Perfusion SPECT After Stress	11-18-2008	11-17-2009	Jerry Obaldo Philippine Heart Center	386,344.00
IAEA	Teresa Benson Tel:(431) 2600-21568	Dissecting Drought Tolerance Mechanisms in Rice through Gain of Function Deletion Mutants	11-18-2008	11-17-2009	Jill Cairns International Rice Research Institute	540,882.00
IAEA	Teresa Benson Tel:(431) 2600-21568	Molecular Marker Techniques for Selection of Mutant Bananas with Improved Post Harvest Qualities	11-05-2008	11-04-2009	Emma Sales University of Southern Mindanao	412,101.00
IAEA	Teresa Benson Tel:(431) 2600-21568	Improvement of Mass Rearing Methods for Bactrocera philippinensis	11-15-2008	11-14-2009	Sotero S. Resilva	312,954.00
TOTAL: 6,231,779.00						

*IAEA Research Contracts are grants under the IAEA Research Contract Programme whose funding is sourced from the IAEA Regular Budget and also from extrabudgetary contributions to the IAEA. Through this program, minor equipment and miscellaneous local purchases are provided. The grant to a project is of the average US Dollar 5,000 per year.

TABLE 5. IAEA TECHNICAL COOPERATION PROJECTS* IMPLEMENTED IN 2008

NAME OF IMPLEMENTING AGENCY	CLIENT		TITLE/DESCRIPTION OF RESEARCH		PROJECT DURATION		PROJECT COST (IN PESOS)
	NAME/TEL. NO./ E-MAIL OF CONTACT PERSON		START	END			
IAEA	Avelina G. Lapade aglapade@pnri.dost.gov.ph	Enhancing Agricultural Productivity Through Radiation Technology in Mindanao	2003	2008		439,408.00	
IAEA	Percedita T. Cansino ptcansino@pnri.dost.gov.ph	Enhanced Non-Destructive Testing Training	2004	2008		604,329.00	
IAEA	Luvimina G. Lanuza lglanuza@pnri.dost.gov.ph	Upgrading the Gamma Irradiation Facility	2005	2008		4,325,270.00	
IAEA	Flora L. Santos flsantos@pnri.dost.gov.ph	Nuclear Analytical Techniques for Evaluation of Airborne Pollution from Fossil Fuel-fired Power Plants	2005	2008		871,017.00	
IAEA	Soledad S. Castañeda ssc@pnri.dost.gov.ph	Isotope Applications in Improving Water Resource Management and Protection	2005	2009		1,680,736.00	
IAEA	Corazon C. Bernido ccbernido@pnri.dost.gov.ph	Human Resource Development and Nuclear Technology Support	2007	2009		3,088,412.00	
IAEA	Leonardo S. Leopando lisleopando@pnri.dost.gov.ph	Support for the Preparation of a Decommissioning Plan for the Philippine Research Reactor	2007	2009		4,753,931.00	
IAEA	Maria Visitacion B. Palattao mvbpalattao@pnri.dost.gov.ph	Development of a Near Surface Radioactive Waste Disposal Facility	2007	2009		2,704,500.00	
TOTAL:						18,467,603.00	

*Technical Cooperation Projects are under the IAEA Technical Cooperation Programs and are funded by the Technical Assistance Committee Fund (TACF) and extra budgetary contributions to the IAEA financial support provided in the form of three components, namely, expert assistance, equipment donation and overseas training.

TABLE 6. INTERNATIONAL SCIENTIFIC LINKAGES AND NETWORKS IN 2008

NAME OF INSTITUTION/COUNTRY	SCIENTIFIC INSTITUTION		NATURE/DESCRIPTION OF SCIENTIFIC LINKAGES	DATES OF ENGAGEMENT	
	NAME/POSITION OF CONTACT PERSON			START	END
International Atomic Energy Agency (IAEA)/Vienna, Austria	Thru PNRI as the national competent authority on nuclear-related matters Contact Person: Alumanda M. dela Rosa, PhD. Director, PNRI		Technical cooperation program (including national technical cooperation projects, research contracts, regional RCA and non-RCA projects, and interregional projects)	1958	Present
Regional Cooperative Agreement and Training Related to Nuclear Science and Technology (RCA) for Asia and the Pacific/ Vienna, Austria	Thru PNRI		Regional projects, provision of training and experts, and minimal equipment/ supplies	1972	Present
RCA Regional Office/ Korea	Thru PNRI		Regional projects, provision of training and education	2002	Present
Forum for Nuclear Cooperation in Asia / Japan	Thru PNRI		Regional projects	2000	Present
Comprehensive Nuclear Test Ban Treaty Organization	Thru PNRI		Establishment/maintenance of international monitoring stations and data center; provision of training	1999	Present
Australian Nuclear Science and Technology Organization	Thru PNRI		Regional project, expert and training provision	2006	Present
United States Department of Energy	Thru PNRI		Project; expert; equipment; and training provision	2005	Present
Ministry of Science, Technology, Education, Culture and Sports/ Japan	Thru PNRI		Nuclear Researchers Exchange Program	1985	Present
Nuclear Safety Research Association	Thru PNRI		Expert dispatch and training provision	2004	Present
Other organizations from Australia, Japan, Canada, United States, Korea and other countries through bilateral agreements/ institute agreements	Thru PNRI		Bilateral agreement		

TABLE 7. EXPERTS/MISSIONS

FIELD/PURPOSE	NAME OF EXPERT/MISSION	DATE OF VISIT
• National Workshop on Radiation Detection for Frontline Officers	Adam Bacheller, Michael Schrenk, Marcos	14 – 18 Jan '08
• Technical Officer - Hydrological Data Assimilation and Modelling	Matej Gedeon	21 – 25 Jan '08
• IAEA Review Mission for the Bataan Nuclear Power Plant (BNPP)	John Rames, Ioan Rotaru, Jose Brayner, Costa Mattos, Ki-Sig Sig Kang, Zhang Jing, Akira Omoto, David Graves	28 Jan – 1 Feb '08
• 99Mo-99m Tc Generator	Tsuguo Genka	18 – 21 Feb '08
• 37 Experts Missions / Decommissioning of the Philippine Research Reactor- 1	Yutaka Kawakami (NSRA), Masaru Hyashi (NSRA), Satoshi Yanagihara (JAEA)	10 – 11 March '08
• Upgrading of Gamma Irradiation Facility	Andreas Kovacs	10 – 14 March '08
• Decommissioning of the Philippine Research Reactor- 1	Peter McIntyre	31 March – 4 April '08
• Radiation Processing Applications	Maria Helena Sampa	7 – 11 April '08
• Promotion of KAIST Scholarship Program	Poong Hyun Seong (KAIST)	17 April '08
• INSERV Mission	Carl Stoiber, Mauri Rihonen, Rol Heard, Milhail Mayorov, Hether Kopp	5 – 9 May '08
• Japan Nuclear Energy Safety Organization	Masataka Miyashita	17 May '08
• Technical Cooperation Program	Rejad Kamel	19 – 23 May '08
• Design of Core Box	Thomas McCool	26 – 30 May '08
• Safety Inspections of Nuclear Power Plants	Ricardo Palabrica	27 May '08
• Use and Application of AMBER Computer Code	Graham Smith	1 – 7 June '08
• Waste Inventory and Characterization	Nadja Zeleznik	29 June – 3 July '08
• Preparation for FNCA Ministerial Meeting	Yutaka Kawakami, Narai Aiko, Suco Machi, Yoloo, Kavabata, Kikuchi	4 Aug '08
• Radioactive Waste Management Technology and Infrastructure	Bernard Neerdael	13 – 17 Oct '08

TABLE 8. PNRI HOSTINGS

FIELD	PHILIPPINE PARTICIPANT	AGENCY/ INSTITUTE	ORGANIZER/S	VENUE	DATE
• FNCA Workshop on Radiation Oncology	Dr. Miriam Calaguas Dr. Rey Delos Reyes	St Luke's Medical Center (SLMC)	FNCA, PNRI and SLMC	Crowne Plaza	21-25 Jan '08
• Mid-term Progress Review Meeting for the Regional Project on Radiation Processing Applications for Health and the Environment	Lucille V. Abad	PNRI	IAEA & PNRI	Crowne Plaza	7 - 11 April '08
• Regional Training Course on Strategy and Methodologies for the Development of Low and Intermediate Level Waste (LILW) Disposal Facilities	Ma. Visitacion B. Palattao- Course Director Rolando Y. Reyes, Kristine Marie D. Romallosa, Alfonso A. Singayan Jason Jude Villegas Maria Leonie Lynn Ruiz	PNRI PNRI Department of Energy Environmental Management Bureau	IAEA & PNRI	Richmonde Hotel	16 - 20 June '08
• Training Course on the Establishment of Limitation and Controls on Effluent Discharges and Associated Regulatory Review and Control	Editha A. Marcelo- Course Director Estrella S. Caseria, Jose N. Calaycay, Lynette B. Cayabo Teresita G. De Jesus, Lorna Jean H. Palad	PNRI PNRI	IAEA & PNRI	Crowne Plaza	28 July - 1 Aug '08
• Technical Meeting of the RCA Regulators Forum on Regional Priority Issues and Solutions	Eulinia M. Valdezco- Course Director	PNRI	IAEA & PNRI	Crowne Plaza	5 - 7 Aug '08

<ul style="list-style-type: none"> Regional Workshop on Safety of Research Reactor Decommissioning Activities : Project Planning, Management, Regulatory Review and Safety Assessment 	Leonardo S. Leopando- Course Director Flora L. Santos, Eulinia M. Valdezco, Dr. Vangelina K. Parami, Teofilo V. Leonin Jr. Editha A. Marcelo, Mylene M. Espinal Observers: Estrella S. Caseria, Rosita R. Daroy, Teresita G. De Jesus, Lorna Jean H. Palad, Kristine D. Romallosa, Carl M. Nohay Lopito A. Caluag, John M. Marquez, Virgilio R. Santiago, Dennis DC. Aquino, Arturo F. Salih, Diosdado A. Quiambao, Florante C. Villarama Jr., Crisol P. Villanueva	PNRI	IAEA & PNRI	The Linden Hotel	15-19 Sept '08
<ul style="list-style-type: none"> IAEA/RCA Regional Training Course on Medical Physics in Diagnostic Radiology 	Agnette Peralta	Bureau of Health Devices and Technology (BHDT)	IAEA, PNRI & BHDT	Manila Philippines	25 -29 Nov '08
<ul style="list-style-type: none"> 9th FNCA Senior Officials Meeting 	Dr. Alumanda M. Dela Rosa, Eulinia M. Valdezco, Flora L. Santos, Virginia S. Calix, Avelina G. Lapade, Rhodora R. Leonin, Dr. Vangelina K. Parami, Charito T. Aranilla, Ma. Visitacion B. Palattao, Preciosa Corazon B. Pabroa, Reynaldo P. Jacinto, Victoria Fe O. Medina, Nydia C. Medina, Mylene M. Espinal Dr. Miriam Calaguas	PNRI SLMC	FNCA & PNRI	Softel Philippine Plaza Hotel	27 Nov '08
<ul style="list-style-type: none"> 9th FNCA Ministerial Meeting 	Dr. Estrella F. Alabastro, Dr. Alumanda M. Dela Rosa	DOST PNRI	FNCA & PNRI	Softel Philippine Plaza	28 Nov '08
<ul style="list-style-type: none"> Regional Training Workshop on Application of International Standards Related to Sanitary and Phytosanitary Purposes 	Zenaida M. de Guzman Sophia Taburnal Marina Portia Estera Albina Mendoza Marina Hermoso Gregoria Santos Observers: Jesusa Quintana Trinidad Carlos Maripaz Mostafo	PNRI Bureau of Plant Industry (BPI) Department of Agriculture (DA) Bureau of Food and Drugs (BFAD) DA BFAD	IAEA & PNRI	Crowne Plaza Hotel	8-12 Dec '08

TABLE 9. NON PNRI HUMAN RESOURCES DEVELOPMENT (FOREIGN)

FIELD	NAME	AGENCY	TRAINING VENUE	DATE	SPONSOR
On-the-job Training					
<ul style="list-style-type: none"> Plant Breeding and Genetics 	Celso Carreon	Davao National Crop Research and Development Center	Australia	2 June – 1 Sept '08	IAEA
Regional Training Course					
<ul style="list-style-type: none"> Dose Assessment and Dose Management in Diagnostic and International Radiology 	Joyce Melchor	Bureau of Health Devices and Technology/ (BHDT)-DOH	Italy	7 – 18 May '08	IAEA
<ul style="list-style-type: none"> Application of Analytical Tools for Evaluation of Sustainable Energy Strategies for Addressing Climate Issues 	Cynthia Mañalac Salvador Sarmiento, Jr.	Department of Energy National Power Corporation	Korea	19 – 30 May '08	IAEA

• Fundamental Clinical Applications of PET	Asela Barroso	Nuclear Medicine Department - Philippine Heart Center	Singapore	20 – 24 May '08	IAEA
	Raymund Augustus Conlu	St. Luke's Medical Center			
• Practical Responses to Radiological Emergencies First Responders	Maria Agnes Palacio and Roel Marcial	Office of Civil Defense Rizal Medical Center	Jordan	1 – 12 June '08	IAEA
• Application of Isotope and Geochemical Techniques to Surface Water Ground-Water Interactions and Contaminant Transport	Susan Abaño	National Water Resources Board	Korea	16 – 27 June '08	IAEA
	Melvin Solomon	Manila Water Company			
• 3D Conformal Radiotherapy and QA Part1 for Oncologists	Juan Martin Magsanoc	St. Lukes Medical Center		17 – 21 Aug '08	IAEA
	Robert Deluna	Lung Center of the Philippines			
• 3D Conformal Radiotherapy and QA – for Medical Physicists	Julius Cesar Rojas	St. Lukes Medical Center	Singapore	15 – 19 Sept '08	IAEA
• IMS-IDC Regional Technical Training Programme for Station Operators and National Data Centre Technical Staff	Alejandro Jesuitas	PAGASA	Korea	6 – 10 Oct '08	CTBTO
• Quality Audits in Radiation Oncology	Cesar Abando	Lung Center of the Philippines	Indonesia	13 – 17 Oct '08	IAEA
	Teresa Sy Ortin	Sto. Tomas University			
	Lilian Rodriguez	Jose R. Reyes Memorial Medical Center			
• Physical Protection of Nuclear Materials and Facilities	Almario Retutal	National Power Corporation	Korea	13 – 24 Oct '08	IAEA
• Isotope Methodology in Body Composition And Energy Expenditure and Objective Measurement of Physical Activity	Rosario Encabo Trinidad Trinidad	FNRI, DOST	Australia	27 – 31 Oct '08	IAEA
Seminar/Workshop					
• Regional Workshop on Denials of Shipment of Radioactive Materials for Asian Countries	Dante Lantin	Department of Transportation and Communications	China	11 – 13 June '08	IAEA
• FCNA Public Seminar on Nuclear Energy for Development in Asia	Estrella Alabastro	Secretary, DOST	Japan	1 Aug '08	FNCA
• Workshop to Review Radioactive Source Security Plans and Procedures	Josephine Limbo	Jose Reyes Medical Center	Australia	18 – 22 Aug '08	ANSTO
	Emmanuel Legaspi	Western Visayas Medical Center			
• Regional Workshop on Nuclear Material Accounting and Control at Facilities	Erlinda Matusalin	National Power Corporation	Indonesia	16 – 28 Nov '08	IAEA
Meeting					
• Thematic Meeting on Establishment of Cyclotron Radiopharmaceutical Production Facility and Implementation of CGMP	Althea Robin	St. Luke's Medical Center	Thailand	3 – 17 March '08	IAEA
• National Project Coordinators Meeting to Review the Status of Medical Physics in the Region	Lilian Rodriguez	Jose R. Reyes Memorial Medical Center	Bangladesh	26 – 28 May '08	IAEA
• Regional Meeting on Strengthening Newborn Screening Management System	Carmencita Padilla	Institute of Human Genetics, U.P.	Indonesia	25 – 29 Aug '08	IAEA
• Technical Meeting Workshop on Evaluation Methodology for Nuclear Power Infrastructure Development	Mauro Marcelo, Jr.	National Power Corporation	Austria	10 – 12 Dec '08	IAEA
Conference/Congress/Symposium					
• Conference on Topical Issue in Nuclear Installation Safety	Santos R. Quizana	National Power Corporation	India	17 – 21 Nov '08	IAEA
• 12th International Radiation Protection Association (IRPA) World Congress	Agnette Peralta	Director - Bureau of Health Devices and Technology	Argentina	19 – 24 Oct '08	IAEA

EXPERT MISSION/SCIENTIFIC VISIT

• National Expert Mission- Project-Management (Review)	Mauro Marcelo, Jr.	National Power Corporation	Argentina	17 – 21 March '08	IAEA
• Scientific Visit to the Department of Soil Science and Geology, Prague	Mario Aurelio	National Institute on Geological Sciences – UP	Czech Republic	24 – 29 March '08	IAEA

TABLE 10. PNRI HUMAN RESOURCES DEVELOPMENT (FOREIGN)

FIELD	NAME	TRAINING VENUE	DATE	SPONSOR
ON-THE -JOB TRAINING				
• Environmental Assessment and Remediation Strategies	Flora L. Santos	USA	4 – 29 Feb '08	IAEA
• Applications of Gamma- Ray Spectrometer in Geological and Environmental Studies	Angelito F. Ramos	Finland	1 Aug– 30 Sept' 08	IAEA
• Nuclear Knowledge Management	Mylene M. Espinal	Austria	22 Sept – 14 Nov '08	IAEA
• Radioanalytical Techniques	Marilyn K. Castillo	Korea	22 Sept – 21 Dec '08	IAEA
REGIONAL TRAINING				
• Establishment of Transfer Factors and Dose Assessment for Marine Organisms Form Contaminants Released from Nuclear Activities	Lorna Jean H. Palad	Korea	18 – 29 Feb '08	IAEA
• National Training Course on Radiation Detection Equipment for Front Line Officers	Ma. Teresa A. Salabit (Consultant)	Vietnam	17 – 21 March '08	IAEA
• National Training Course on Radiation Detection Equipment for Front Line Officers	Ma. Teresa A. Salabit (Lecturer)	Indonesia	26 – 30 May '08	IAEA
• Application of Agreed Nuclear Techniques to Measure Nuclear Contaminants in Marine Systems	Fe M. Dela Cruz	India	27 May – 6 June '08	IAEA
• Source Components and Visibility and Introduction to Back Trajectories	Preciosa Corazon B. Pabroa	Malaysia	9 – 13 June '08	IAEA
• Off-Belt Analysis of Metalliferous Ores and Cement Quality by NAS	Denis DC. Aquino	China	13 – 17 Oct '08	IAEA
• Mutation Breeding Approaches to Improving Salinity, Drought and Heat Stress Tolerance	Ana Marie S. Veluz Adelaida C. Barrida	China	13 – 22 Oct' 08	IAEA
• Portable Digital Industrial Radiography (DIR) and Tomography Systems	Ramoncito F. Sulit	Malaysia	3 – 7 Nov '08	IAEA
• Interregional Training Course on Radioactive Waste Disposal Technologies in Underground Research Facilities	Rolando Y. Reyes	USA	3 – 14 Nov '08	IAEA
• Basic Professional Training Course on Nuclear Safety	Lynette B. Cayabo Alfonso F. Singayen	Korea	3 – 28 Nov '08	IAEA
• Chronic Exposure Scenarios (Naturally Occurring Radioactive Materials (NORM) Residues, Past Particles, Radon) and Remediation Strategies	Teofilo Y. Garcia	Malaysia	10 – 14 Nov '08	IAEA
• Methods for Assessing of Occupational Exposure Due to External Sources of Radiation	Arlean L. Alamares	Malaysia	17 – 28 Nov '08	IAEA
• Advanced National Data Centre (NDC) Training Course for Technical Staff	Lorna Jean H. Palad	Austria	24 Nov – 5 Dec '08	CTBTO
• Radioactive Waste Management Registry (RWMR) Software Applications	Demetrio S. Salom	Austria	1 – 05 Dec '08	IAEA
• Tailored Training Course on Nuclear Safety	Rosalino B. Rejas	Korea	15 – 19 Dec '08	KINS
• Foundation and Computer Security for Nuclear Organizations Managers	Christopher G. Halnin	Indonesia	16 – 18 Dec '08	IAEA
SEMINAR/WORKSHOP				
• International Seminar on Nuclear Safety 2007- Safety Analysis Course	Giuseppe O. Dean	Japan	14 Jan – 2 Feb '08	MEXT, Japan
• International Seminar on Nuclear Safety 2007- Plant Safety Analysis Course	Socorro M. Intoy	Japan	21 Jan – 8 Feb '08	MEXT
• Hydrus Short Course and Workshop Under the Auspices of the International Atomic Energy Agency (IAEA)	Carl M. Nohay	Czech Republic	24 – 29 March '08	IAEA
• The Forum for Nuclear Cooperation in Asia (FNCA) Final Workshop on Nuclear Safety Culture	Vangelina K. Parami	China	26 – 27 March '08	FNCA
• The European Commission (EC) Rational Workshop on Nuclear Energy Safety and Security in South-East Asia	Eulinia M. Valdezco Christina C. Petrache Victoria Fe O. Medina	Thailand	3 – 4 June '08	EC
• The National Data Centre Development Workshop for the Association of Southeast Asian Nations	Ana Elena L. Conjares	Indonesia	5 – 6 June '08	CTBTO
• Regional Workshop on Denials of Shipment of Radioactive Materials for Asian Countries	Vangelina K. Parami	China	11 – 13 June '08	IAEA

• Seminar on Aspects of Planning and Implementing Effective Nuclear Infrastructure	Virginia S. Calix	USA	23 – 26 June '08	NNSA
• Stakeholder Workshop for the RCA/UNDP Post-Tsunami Environment Impact Assessment Project	Elvira Z. Sombrito	Sri Lanka	18 – 21 Aug '08	RCARO
• The Regional Seminar on Nuclear Security Safety and Safeguards	Eulinia M. Valdezco	Vietnam	18 – 22 Aug '08	IAEA
• Workshop to Review Radioactive Source Security Plans and Procedures	Julietta E. Seguis, Alan M. Borras, Thelma P. Artificio, Nelson P. Badinas, Guiseppe O. Dean	Australia	18 – 22 Aug '08	ANSTO
• Workshop on Requirements for Preparedness and Response for a Nuclear or Radiological Emergency and Emergency Preparedness and Response Topical Group Meeting	Eulinia M. Valdezco Teofilo V. Leonin Jr.	Thailand	22 – 26 Sept '08	IAEA
• Workshop on Radiological Preparedness and Response and Equipment Delivery	Teofilo V. Leonin Jr., Kristine Marie D. Romallosa, Teresita G. De Jesus, Lynette B. Cayabo, Ma.Teresa A. Salabit, Guiseppe O. Dean	Australia	29 Sept – 3 Oct '08	ANSTO
• Workshop on Size Reduction of Components for Decommissioning of Nuclear Facilities- A Visual and Hands-on Experience	Lopito A. Caluag John M. Marquez	Belgium	08 – 10 Oct '08	IAEA
• Workshop on the Licensing and Regulatory Control of Radioactive Waste Disposal Facilities and Activities and the Radioactive Waste Management Topical Group Meeting	Editha A. Marcelo	Australia	13 – 17 Oct '08	IAEA
• 2008 Forum for Nuclear Cooperation in Asia (FNCA) Workshop on Research Reactor Utilization	Preciosa Corazon B. Pabroa	Vietnam	16 – 23 Oct '08	NSRA
• Workshop on Methods and Procedures for Nuclear or Radiological Emergency Response and Observation of an Emergency Exercise in an ASEAN Nuclear Safety Network (ANSN) Member Country	Teofilo V. Leonin, Jr. Estrella S. Caseria	Japan	20 – 24 Oct '08	IAEA
• FCNA Workshop on Mutation Breeding Project	Alfonso O. Grafia	Vietnam	27 – 31 Oct '08	Govt. of Japan
• FCNA Workshop on Application of Electron Accelerator-Radiation Processing of Natural Polymers Project	Charito T. Aranilla	China	27 – 31 Oct '08	Govt. of Japan
• FCNA Workshop on Human Resources Development	Percedita T. Cansino	Bangladesh	2 – 4 Nov '08	Govt. of Japan
• FCNA Workshop on Radiation Safety and Radioactive Waste Management	Ma. Visitacion B. Palattao	Australia	3 – 7 Nov '08	Govt. of Japan
• Operations and Maintenance Workshop	Fe M. Dela Cruz	Austria	10 – 14 Nov '08	CTBTO
• International Seminar on Nuclear Safety 2008-Administration Course	Ma. Celerina M. Ramiro	Japan	10 – 29 Nov '08	MEXT
• KAERI/RCARO Regional Training Workshop on Research Reactor Utilization and Radiation Application Technology	Neil Raymund D. Guillermo	Korea	17 – 28 Nov '08	KAERI
• Workshop on Cytogenetic Biodosimetry for Asia	Juana S. Gregorio	Japan	27 – 28 Nov '08	NIRS of Japan
• RCARO Staff Seminar on the Future Activities of the RCARO for Sustainable Development	Efren J. Sta. Maria Grace M. Carlos	Korea	1 – 5 Dec '08	RCARO
MEETING				
• Asia and the Pacific National Liaison Officers Meeting	Nydia C. Medina Mylene M. Espinal	Austria	7 – 9 Jan '08	IAEA
• First Meeting of the Nuclear Energy Safety Sub-Sector Network (NES-SSN) of the Association of the Southeast Asian Nations (ASEAN) Ministers on Energy Meeting (AMEM)	Alumanda M. Dela Rosa	Singapore	22 – 23 Jan '08	Philippine Govt
• 2008 Bi-Annual Ocean Sciences Meeting	Elvira Z. Sombrito	USA	2 – 7 Feb '08	RCARO
• 8th Forum for Nuclear Cooperation in Asia (FNCA) Coordinators Meeting	Alumanda M. Dela Rosa	Japan	7 – 9 Feb '08	Govt. of Japan
• Meeting of the Project Lead Country Coordinators to Design Regional Cooperative Agreement (RCA) Projects for 2009 – 2011 TC Cycle	Elvira Z. Sombrito	Austria	11 – 15 Feb '08	IAEA
• Standing Advisory Group on Technical Assistance and Cooperation (SAGTACV) Meeting	Alumanda M. Dela Rosa	Austria	25 – 29 Feb '08	IAEA
• IAEA Board of Governors (BOG) Meeting	Alumanda M. Dela Rosa	Austria	3 – 7 March '08	PNRI
• 9th Coordinators Meeting of the Forum for Nuclear Cooperation in Asia (FNCA)	Virginia S. Calix	Japan	10 – 11 March '08	Govt. of Japan
• International Radioactive Waste Committee (WATEC) Meeting	Alumanda M. Dela Rosa	Austria	11 – 14 March '08	IAEA
• Asian Nuclear Safety Network Topical Group Meeting on Safety Analysis	Carl M. Nohay	Korea	11 – 14 March '08	IAEA

• Mid- Term Progress Review Meeting of the Project on Development and Application of Advanced Industrial Radiography and Tomography Techniques	Renato T. Bañaga	Vietnam	24 – 26 March '08	IAEA
• Midterm Progress Review Meeting on Assessment of Trends in Freshwater Quality Using Environmental Isotopes and Chemical Techniques for Improved Resource Management	Soledad S. Castañeda	Thailand	24 – 28 March '08	IAEA
• 30th Meeting of the Regional Cooperative Agreement (RCA) National Representatives	Alumanda M. Dela Rosa	Vietnam	8 – 10 April '08	Philippine Govt
• Nuclear Safety Strategy Dialogue Meeting	Alumanda M. Dela Rosa	Austria	21 April '08	IAEA
• 1st Research Coordination Meeting (RCM) on Development of Radiation Processed Products of Natural Polymers for Application in Agriculture, Health, Industry and Environment	Lucille V. Abad	Austria	21 – 25 April '08	IAEA
• Technical Meeting on Guidelines for the Protection of Confidentiality of Nuclear Security Sensitive Information	Alumanda M. Dela Rosa	Austria	22 – 25 April '08	IAEA
• Final Progress Review Meeting of the RCA Project on Integrated Approach for Improving Livestock Production using Indigenous Resource and Conserving the Environment	Celia O. Asaad	Indonesia	5 – 9 May '08	IAEA
• Midterm Progress Review Meeting for the Project - Raising Productivity in the Coal Minerals and Petrochemical Industries by Using Nucleonic Analysis Systems and Radiotracers	Silvestre L. Abaya	Korea	12 – 16 May '08	IAEA
• 2nd Working Group Meeting on the Terms of Reference of the Nuclear Energy Sub-Sector Network	Eulinia M. Valdezco	Singapore	13 – 14 May '08	Philippine Govt
• Meeting of Senior Officials on Nuclear Knowledge Management Cooperation for Development	Alumanda M. Dela Rosa	Austria	14 – 16 May '08	IAEA
• Open-Ended Meeting of Technical and Legal Experts on the Code of Conduct on the Safety and Security of Radioactive Sources	Eulinia M. Valdezco	Austria	26 – 28 May '08	IAEA
• Training Meeting/Workshop on Isotopic Age Determination Techniques for Improved Understanding of Ground Water Resources	Soledad S. Castañeda	USA	16 – 27 June '08	IAEA
• Regional Meeting of Asia and the Pacific National Liaison Officers	Nydia C. Medina	Thailand	18 – 20 June '08	IAEA
• Working Group Meeting on Long Term Sustainability of Emergency Preparedness and Response Programmers	Eulinia M. Valdezco	Italy	23 – 25 April '08	IAEA
• Regional Radiological Security Partnership Review Meeting on Radioactive Source Security	Alumanda M. dela Rosa Eulinia M. Valdezco Julietta E. Seguis	Indonesia	22 – 24 July '08	ANSTO
• Working Group Meeting on Enhancing Technical Cooperation among Developing Countries Through the RCA Programme	Alumanda M. Dela Rosa	Malaysia	30 July – 1 Aug '08	IAEA
• Consultation Meeting on Application of Quality Management System in Radioactive Waste Management	Editha A. Marcelo Ma. Visitacion B. Palattao	Austria	25 – 29 Aug '08	IAEA
• Meeting on Characterization and Source Identification of Particulate Air Pollution in the Asian Region	Flora L. Santos	Sri Lanka	25 – 29 Aug '08	IAEA
• 2nd Meeting of the Study Panel for Cooperation in the Field of Nuclear Energy in Asia	Alumanda M. Dela Rosa Vangelina K. Parami	Japan	1 – 2 Sept '08	Cabinet Officer of Japan
• Board of Governors Meeting	Alumanda M. Dela Rosa	Austria	22 – 26 Sept '08	Philippine Govt.
• 37th RCA General Conference Meeting	Alumanda M. Dela Rosa	Austria	26 Sept '08	Philippine Govt.
• Senior Regulators Meeting	Alumanda M. Dela Rosa	Austria	3 Oct '08	Philippine Govt.
• Consultancy Meeting on the Regulatory Knowledge Network	Corazon C. Bernido	Austria	6 – 10 Oct '08	IAEA
• Technical Meeting on Waste Characterization and Clearance	Flora L. Santos Estrella S. Caseria	Spain	13 – 17 Oct '08	IAEA
• 8th Meeting of the Steering Committee of the ASIAN Nuclear Safety Network (ANSN)	Corazon C. Bernido	Malaysia	20 – 23 Oct '08	IAEA
• 3rd RCM of the CRP on Comparative Analysis of Methods and Tools for Nuclear Knowledge Preservation	Angel B. Anden	Austria	20 – 24 Oct '08	IAEA
• Meeting on Applications of the Integrated Management Systems (IMS)	Graceta DL. Cuevas	Korea	21 – 24 Oct '08	IAEA

• RCA/UNDP Project Wrap-up Meeting on Post- Tsunami Environment Impact Assessment	Elvira Z. Sombrito	China	3 – 7 Nov '08	RCARO
• Technical Meeting of the ALARA Network for Asia and the Pacific Region	Estrella S. Caseria Alan M. Borras	Japan	4 – 7 Nov '08	IAEA
• Technical Meeting on Reference Design for a Storage Facility for Low Level Radioactive Waste from Nuclear Applications and/or Disused Sealed Radioactive Sources	Editha A. Marcelo	Austria	10 – 13 Nov '08	IAEA
• FCNA Project Leaders Meeting on Public information of Nuclear Energy	Rhodora R. Leonin	China	10 – 14 Nov '08	MEXT
• Meeting of the Education and Training Topical Group and Workshop on the Systematic Training Needs Assessment Tool to Define the National Training Frameworks	Corazon M. Garcia	Indonesia	12 – 13 Nov '08	IAEA
• First Technical Meeting of the Project on Use of the Safety Assessment in Planning and Implementation of Decommissioning of Facilities Using Radioactive Material	Flora L. Santos	Austria	17 – 21 Nov '08	IAEA
• Technical Meeting of the Asian Network for Education in Nuclear Technology (ANENT)	Corazon C. Bernido	China	25 – 28 Nov '08	IAEA
• Regional Executive Meeting for Policy Makers and Entrepreneurs	Virginia S. Calix	Japan	8 – 12 Dec '08	IAEA
• 2nd RCM of the CRP on Applications of Radiotracer and Radioassay Technologies to Seafood Safety Risk Analysis	Rhett Simon DC. Tabbada	Italy	8 – 12 Dec '08	IAEA
• First Meeting of the IAEA Legislative Assistance Program	Alumanda M. Dela Rosa	Austria	15 – 17 Dec '08	IAEA
CONFERENCE/CONGRESS/ SYMPOSIUM/FORUM				
• 6th International Conference on Isotopes (6ICI)	Chitho P. Feliciano	Korea	12 – 16 May '08	IAEA
• International Transit and Transshipment Conference	Eulinia M. Valdezco	Moroco	20 – 22 May '08	IAEA
• International Symposium on Induced Mutations in Plants	Fernando B. Aurigue	Austria	12 – 15 Aug '08	IAEA
• International Nuclear Safety Group (NSAG) Forum	Alumanda M. Dela Rosa	Austria	29 Sept '09	Philippine Govt
• 52nd Session of IAEA General Conference	Alumanda M. Dela Rosa Corazon C. Bernido	Austria	29 Sept – 3 Oct 08	Philippine Govt
• IAEA Scientific Forum 2008	Alumanda M. Dela Rosa	Austria	30 Sept – 1 Oct '08	Philippine Govt
• 12th International Congress of the International Radiation Protection Association (IRPA)	Eulinia M. Valdezco Kristine Marie D. Romallosa	Argentina	19 – 24 Oct '08	ANSTO
• 9th International Export Control Conference	Julietta E. Seguis	Croatia	20 – 22 Oct '08	U.S. State Dept.
• Annual Forum for Regulators and Operators in the Field of Decommissioning: International Decommissioning Network (IDN) Activities and Outcomes of the International Peer Review of Decommissioning	Corazon C. Bernido Eulinia M. Valdezco	Austria	3 - 7 Nov '08	IAEA
SCIENTIFIC VISIT/EXPERT MISSION				
• Scientific Visit –Radioactive Waste Repository, PA	Ma. Visitacion B. Palattao	France & Switzerland	7 – 11 April '08	IAEA
• Scientific Visit - Preparatory Activities for the Decommissioning of the Philippine Research Reactor	Mylene M. Espinal	Spain	16 - 27 June '08	IAEA
• National Expert Mission	Eulinia M. Valdezco	Argentina	17 – 20 Mar '08	IAEA
DEGREE COURSE				
• Ronpaku Dissertation (PhD) Program for FY 2008	Lucille V. Abad	Japan	14 Sept – 12 Dec '08	JSPS
• Doctoral Program in Environment Sciences	Ryan U. Olivares	Japan	3 Oct '08 - Oct '09	ADB- JSP

TABLE 11. PNRI HUMAN RESOURCE DEVELOPMENT (LOCAL)

FIELD TRAINING	NAME	VENUE	DATE
• Exercise Capital City: Operational Commanders Course and Simulating Exercise for the National Counter- Terrorism Action Group	Eulinia M. Valdezco	Camp Crame, Quezon City	22 – 24 Jan '08

• Basic Life Support – For Lay Rescuers	Gerardo Jose M. Robles, Gloriamaris Caraos, Ruby Liza M. Gabriel, Renato T. Bañaga, Rhodora R. Leonin, Justina S. Cerbolles, Julietta C. Mendoza, Azucena C. De Vera, Lucia C. Cobar, Mary Jayne C. Manrique, Richard M. Balog, Vallerie Ann I. Samson, Eileen Beth A. Hernande, Josefina G. Natera	Phil. Heart Center	12 Feb '08
• Weapons on Mass Destruction - Commodity Identification Training	Eulinia M. Valdezco Julietta E. Sequis Ma. Visitacion B. Palattao Teresita G. de Jesus	Mandarin Hotel	26 – 27 Feb '08
• Exercise Design and Management Course for Anti- Terrorism Council and National Counter Terrorism Action Group (NACTAG)	Eulinia M. Valdezco	Camp Crame	27 – 29 Feb '08
• Perspectives in Communication: The Moving Trends	Justina S. Cerbolles	DOST	2 – 4 April '08
• PCARRD Training Cum Write-shop on Technology Valuation and Technology Transfer Modes	Grace M. Carlos Ana Maria S. Veluz	Benguet State University	15 – 17 April '08
• Licensing and Clearance System for the Implementation of the National Single Window	Lynette B. Cayabo Giuseppe Filam O. Dean	Customs, Port Area	23 April '08
• Diamond Core Drilling System	Lopito A. Caluag, John M. Marquez, Arturo F. Salih, Roberto N. Fontanilla, Crisol V. Villanueva, Florante C. Valderrama Jr., and Diosdado A. Quiambao	Comp, Makati	5 – 8 May '08
• DOST Webmasters Consortium Web Development Training	Ana Elena L. Conjares Christopher G. Halnin	ASTI, Quezon City	5 – 9 May '08
• Research and Development Project Formulation, Management, Implementation, Monitoring and Evaluation Course	Efren J. Sta. Maria	DCAAP Training Center , U.P., Q.C.	14 – 25 July '08
• Fiber Optic Network Technology Course	Christopher G. Halnin, Guiseppe Filam O. Dean, Joseph R. Tugo	Richville Hotel Mandaluyong	13 – 15 Aug '08
• Chemical, Biological, Radiological, Nuclear intermediate Training and Train the Trainer Course	Estrella S. Caseria Kristine Marie D. Romallosa	NDCP Hall Aguinaldo	23 – 26 Aug 08
• Awareness Course on ISO 17025	Ryan Morco, Danilo A. Cuyco, Gloria dL. Jimenez, Edward T. Cabildo, Erlinda N. Vera Cruz, Ma. Teresa L. Borrás, Rizalina G. Osorio, Franklin A. Pares, Arnaldo R. Valenzuela, Julieta C. Mendoza, Neil Raymund D. Guillermo, Eillen Beth A. Hernandez, Chitho P. Feliciano, Eliza B. Enriquez, Lorna Jean H. Palad, Arlene L. Alamares, Demetrio S. Salom, Jose N. Calaycay, Abelardo N. Inovero, Kristine Marie D. Romallosa, Joseph Michael D. Racho	PNRI	9 Oct '08
• Formulation of the Citizen's Chart	Graceta DL. Cuevas Emma L. Cancino	DAP, Pasig	3 – 5 Dec '08
• Use of New OSIST Content Management System (CMS)	Meriam F. Rejas	PCARRD, Los Baños, Laguna	12 Dec '08
SEMINAR/WORKSHOP			
• Product Information Seminar	Conrado M. De Guzman Ana N. Villanueva	National Irrigation Administration, Quezon City	11 Jan '08
• Test Analysis and Calibration Information System at DOST (TACIS) SAD Workshop	Angel B. Anden	DOST	15 Jan'08 (Once a week thereafter until June 27, 2008)
• 2008 Updates on Government Financial Accounts Administration	Celestino M. Santos Marife R. Roa	Manila	22 – 25 Jan '08

• PNRI Planning Workshop 2008	Alumanda M. Dela Rosa, Corazon C. Bernido, Graceta DL. Cuevas, Eulinia M. Valdezco, Virginia S. Calix, Reynaldo P. Jacinto, Rhodora R. Leonin, Ma. Celerina M. Ramiro, Nydia C. Medina and Bernard M. De Lara	Grand Villa, Laguna	16 – 17 Jan '08
• 2008 Orientation Seminar on ISO9001:2000 and Documentation of the Quality Management System Based on ISO 9001:2000	Susan D. Pascual Ryan P. Morco	MIRDC - DOST	16 – 18 Jan'08
• Tests, Analyses and Calibration Information System (TACIS) Portal	Celestino M. Santos, Michael Angelo F. Samson, Soledad S. Castañeda, Joseph Michael D. Racho, Raymund J. Sucgang Preciosa Corazon B. Pabroa, Ryan P. Morco Rosalinda V. Almoneda, Haydee M. Solomon, Ana Elena L. Conjares, Christopher G. Halnin	PHIVOLCS, Quezon City	17 Jan '08
• Orientation/Demonstration on the Reach Out and Read Program and the Get Caught Reading Program	Vallerie Ann I. Samson, Gloriamaris Caraos, Gina B. Abrera	DOST	31 Jan '08
• Seminar on ISO 9001: 2000 Quality Management System Documentation	Gloriamaris L. Caraos	Philippine Trade and Training Center	10 – 11 March '08
• Bureau of Internal Revenue Regional Kick-off Program	Celestino M. Santos	SM Megatrade	11 March '08
• Values Information Seminar	Graceta DL. Cuevas Emma L. Cancino	San Lorenzo Ruiz Lay Formation Center	24 April '08
• Seminar on the Essence of ISO 9000 in the Government Service	Alan M. Borrás	UP –Diliman, Quezon City	30 April '08
• Seminar-Workshop on Perspective in Communication: The Moving Trends and Command Communication: Oral Communication Skills Development	Rosita R. Daroy Lynette B. Cayabo	DOST	7 – 9 May '08
• National Control List (NCL) Workshop	Julietta E. Seguis Teofilo V. Leonin Jr.	Mandarin Hotel	2 – 5 June '08
• Tests Analysis and Calibration Information System at DOST (TACIS) SAD Workshop	Angel B. Anden	DOST	1 July '08
• Seminar - "Briefing on Food Safety"	Vangeline K. Parami, Emma L. Cancino, Teofilo Y. Garcia, Laura R. Pineda, Erlinda N. Vera Cruz	Philippine Trade and Training Center	12 July '08
• Seminar Writeshop on Modules Development	Emma L. Cancino	Rockpoint Hotel	16 – 18 July '08
• National Validation and Consultation Workshop Reassessment in the Philippines	Eulinia M. Valdezco	Sulu Hotel	14 – 15 Aug '08
• Seminar - Workshop on QA International Quality Audit	Rosita R. Daroy	MIRDC - DOST	19 & 21 Aug '08
• Seminar on "Leadership Training for Officials of DOST and its Agencies"	Corazon C. Bernido, Graceta DL. Cuevas, Christina A. Petrache	DOST	22 Aug '08
• Values Formation Seminar - Paglilingkod sa Puso	Emma L. Cancino Angel B. Anden	San Carlos Pastoral	4 Sept '08
• Seminar-Workshop on Biosecurity and the Dual Use of Research	Eulinia M. Valdezco	Linden Hotel	2 – 3 Oct'08
• Training Workshop on Secret of Highly Efficient and Effective Training Program	Roel A. Loteriña	University of the Philippines --Diliman	22 – 23 Oct '08
• Orientation Workshop on the Philippine eLib Project to the DOST System Nat'l Library	Isabel M. Amiscaray	National Library	19 – 20 Nov '08

MEETING/DIALOGUE

• 75th National Research Council of the Philippines (NRCP) Annual Meeting	Graceta DL. Cuevas, Christina A. Petrache, Rolando Y. Reyes, Juana S. Gregorio, Alfonso O. Grafia, Ana Maria S. Veluz, Glenda B. Obra, Soledad S. Castañeda, Preciosa B. Pabroa, Rosalinda V. Almoneda, Raymond J. Sucgang, Ryan P. Morco, Fernando B. Aurigue	Manila Hotel	12 March '08
• 2nd National Multistakeholder Dialogue on Disaster Risk Reduction	Eulinia M. Valdezco	Shangri-La Hotel	29 - 30 Apr '08
• National Academy of Science and Technology (NAST) 30th Annual Scientific Meeting	Preciosa Corazon B. Pabroa, Joseph Michael D. Racho, Ryan P. Morco	World Trade Center	9 – 10 July '08

CONFERENCE/SYMPOSIUM/FORUM			
• 2008 Eurasia Conference on Chemical Sciences	Charito T. Aranilla	Philippine International Convention Center	7 – 11 Jan '08
• Symposium on Practical and Cost Effective Solutions to Laboratory Chemical Wastes	Haydee M. Solomon Joseph Michael D. Racho	Camp Crame	18 – 19 Feb '08
• National Conference on Intellectual Property & Technology Commercialization & Developing an IP Assistance Program for Universities and RDIs	Virginia S. Calix	Makati	21 – 22 May'08 26 – 27 May'08
• Forum on Public Sector Unionism	Angel B. Anden Gloriamaris L. Caraos	DOST	22 May '08
• Biocontainment Planning and Operations Symposium	Zenaida M. De Guzman	Pan Pacific Hotel	14 – 15 July '08
• 14th Annual BEENET Phil. Conference and Techno – Fora	Zenaida M. De Guzman Chitho P. Feliciano	Puerto Princesa Palawan	24 – 26 July '08
• Philwater 2008 International Conference and Exhibition	Soledad S. Castañeda	Boracay Regency	7 – 9 Oct '08
• 1st Philippine Congress on Digital Libraries	Isabel M. Amiscaray, Elizabeth C. Vidal	National Library, Manila	17 – 18 Nov' 08
• 20th Founding Anniversary of the PCAMRD	Elvira Z. Sombrito	PCAMRD	30 – 31 Jan' 08

TABLE 12. PNRI GRADUATE PROGRAM IN 2008

NAME OF SCHOLAR	LEVEL FIELD OF STUDY	EDUCATIONAL INSTITUTION	STATUS
WITH SCHOLARSHIP			
Vangeline K. Parami	Ph.D in Environmental Science	University of the Philippines - Diliman	Graduated/DOST
Lucille V. Abad	Ph.D in Chemistry	The University of Tokyo	On-going/JSPS
Ryan U. Olivares	Ph.D In Environmental System	The University of Tokyo	On- Going/ADB-JSPS
Preciosa Corazon B. Pabroa	Ph.D In Environmental Science	University of the Philippines -Diliman	On-going/SEI
Charito T. Aranilla	M. S. Chemistry	University of Sto. Tomas	Graduated/PCASTRD
Kristine Marie D. Romallosa	M.S. Physics	University of the Philippines -Diliman	Graduated/DOST
Ryan P. Morco	M.S. Chemistry	University of Sto. Tomas	On-going/SEI
Joseph Micheal D. Racho	M.S. Chemistry	University of Sto. Tomas	On-going/SEI
SELF-FINANCED STUDIES			
Thelma P. Artificio	Ph.D. in Technology Management	Technological University of the Philippines- Manila	On-going
Soledad S. Castañeda	Ph.D in Environmental Science	University of the Philippines-Diliman	On-going
Vallerie Ann I. Samson	Ph.D. in Material Science Engineering	University of Tsukuba Monbukagakusho Scholarship	On-going
Denis DC. Aquino	M.S. in Engineering	University of the Philippines-Diliman	On-going
Chitho P. Feliciano	M.S. in Microbiology and Biotechnology	University of the Philippines- Diliman	On-going
Lorna Jean H. Palad	M.S. in Environmental Science	University of the Philippines- Diliman	On-going
Rhett Simon DC. Tabbada	M.S. in Marine Science	University of the Philippines- Diliman	On-going
Christopher G. Halnin	M.S. in Information Technology	Polytechnic University of the Philippines	On-going
Justina S. Cerbolles	M.A. in Education	Philippine Normal University	On-going

TABLE 13. SCIENTIFIC PUBLICATIONS IN 2008

TITLE OF SCIENTIFIC PAPER	NAME/E-MAIL OF AUTHORS	PUBLICATION/ NAME/ TYPE OF JOURNAL	DATE PUBLISHED
Documentation of pupal eye color of three <i>Anastrepha</i> fruit fly species used in SIT Programmes	Sotero S. Resilva (PNRI) ssresilva@pnri.dost.gov.ph E. Hernandez, J. P. Rivera and J. Hendrichs.	Florida Entomologist	2008
Manual para la determinacion de la edad del adulto farado de <i>Anastrepha ludens</i> , A. oblique y <i>A. serpentina</i> por el color de ojos.	Sotero S. Resilva (PNRI) ssresilva@pnri.dost.gov.ph E. Hernandez, J. P. Rivera and J. Hendrichs. (Plant Protection Service, Mexico)	Manual	2008
RP has own breed of 'Lion of Singapore	Fernando B. Aurigue (PNRI) fbaurigue@pnri.dost.gov.ph	Asian Journal Publications	2008

Urban Air Quality in the Asian Region	P. Hopke., D.D. Cohen, B.A. Begum, S.K. Biswas, B. Ni, G.G. Pandit, M. Santos, Y.S. Chung, P. Davy , A. Markwitz, S. Waheed, N. Siddigie Flora L. Santos (PNRI) flsantos@pnri.dost.gov.ph Preciosa Corazon B. Pabroa (PNRI) pcbapabroa@pnri.dost.gov.ph M.C.S Seneviratne, W. Wimolwattanapun, S. Bunprapob, T.B. Vuong, P.D. Hien, and A. Markowicz	Science of the Total Environment 404:103-112.	2008
Fingerprinting and Source Apportionment of Fine Particle Pollution in Manila by IBA and PMF Techniques: A 7 –Year Study.	D. Cohen, E. Stelcer Flora L. Santos (PNRI) flsantos@pnri.dost.gov.ph M. Prior C. Thomson Preciosa Corazon B. Pabroa (PNRI) pcbapabroa@pnri.dost.gov.ph	X-ray Spectrom 38: 18 – 25	2008
Isotopic Evidence for Identifying the Mechanism of Salinization of Groundwater in Bacolod City, Negros Occidental	Soledad .S. Castañeda (PNRI) sscstaneda@pnri.dost.gov.ph Raymond .J. Succgang (PNRI) rjsuccgang@pnri.dost.gov.ph Rosalinda .V. Almoneda (PNRI) rvalmoneda@pnri.dost.gov.ph J. Gemora, D. Desengano and F. Lim	Book of Abstracts of the 10 th Eurasia Conference on Chemical Sciences and 23 rd Philippine Chemistry Congress. Kapisanang Kimikang Pilipinas. ISBN 978-971-93848-1-6	2008
Age Determination Techniques for Improved Management of Groundwater Resources	Soledad S. Castañeda (PNRI) sscstaneda@pnri.dost.gov.ph	Proceedings of the PWWA 16 th International Conference and Exhibition(Philwater 2008). Philippines 6-9 October 2008.	2008
Comparative Studies on the Conformational Change of Aggregation Behavior of Irradiated Carrageenans by Dynamic Light Scattering	Lucille V. Abad (PNRI) lvsabad@pnri.dost.gov.ph Satoshi Okobe, Mitsuhiro Shibayana, Hisaaki Kudo, Seichi Saiki Charito T. Aranilla (PNRI) ctaranilla@pnri.dost.gov.ph Lorna S. Relleve (PNRI) lasrelleve@pnri.dost.gov.ph Alumanda M. dela Rosa, PhD (PNRI) amdelarosa @pnri.dost.gov.ph	International Journal of Biological Macromolecules Vol 42 (2008) pp 55-61	2008
Philippine Initiatives for the Safe and Sustainable Management of Radioactive Waste	Eulinia M. Valdezco (PNRI) emvaldezco@pnri.dost.gov.ph Maria Visitacion B Palattao (PNRI) mvbpalattao@pnri.dost.gov.ph Rolando Y Reyes (PNRI) ryreyes@pnri.dost.gov.ph Carl M. Nohay (PNRI) cmnohay@pnri.dost.gov.ph Luzviminda L Venida (PNRI) livenida@pnri.dost.gov.ph	Technical poster published in the Abstracts of the 12 th International Congress of the International Radiation Protection Association (IRPA), Buenos Aires, Argentina, 19-24	October 2008

TABLE 14. ADDITIONAL RESOURCES GENERATED FROM EXTERNAL SOURCES IN 2008

DONOR NAME OF INSTITUTION	PROJECT TITLE	PROJECT LEADER/ E-MAIL	DESCRIPTION OF ASSISTANCE	VALUE OF ASSISTANCE (IN PESOS)
A. LOCAL GRANTS-IN-AID				
DOST/Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARDD)	Varietal Improvement of Selected Ornamental Crops (<i>Spathoglottis</i> , Foliage-Type Anthuriums and Hoyas) Through Gamma Irradiation	Fernando B Aurigue fbaurigue@pnri.dost.gov.ph	Financing	1,041,042.00
Department of Agriculture/Bureau of Plant Industry (BPI)	Establishment of Radiation Dose for Quarantine Treatment of Mango Pulp	Glenda B. Obra gobra@pnri.dost.gov.ph	Financing	908,058.00

Department of Science and Technology DOST/Philippine Council for Aquatic and Marine Research and Development (PCAMRD)	Development of Toxicity Model for Paralytic Shellfish Toxins in Mussels: Uptake and Release of Toxin in Green Bay Mussel	Elvira Z. Sombrito ezsombrito@pnri.dost.gov.ph	Financing	537,797.00
DOST/PCAMRD	Isotope and Nuclear Techniques Application in Water Management and Protection	Soledad S. Castañeda sscstaneda@pnri.dost.gov.ph	Financing	136,650.00
DOST/PCAMRD	Isotope and Nuclear Techniques Application on Water Management and Protection – Proj.1. Isotope Applications in Delineating Recharge of Bacolod City Groundwater System.	Soledad S. Castañeda sscstaneda@pnri.dost.gov.ph	Financing	7,502,306.00
DOST/PCAMRD	Isotope and Nuclear Techniques Application on Water Management and Protection – Proj.2. Isotope Applications in Verifying Recharge Processes in Bulacan Province	Soledad S. Castañeda sscstaneda@pnri.dost.gov.ph	Financing	212,450.00
BACIWA	Isotope and Nuclear Techniques Application on Water Management and Protection – BACIWA	Soledad S. Castañeda sscstaneda@pnri.dost.gov.ph	Financing	256,260.00
Trans-Asia Gold and Minerals Development Corporation	Characterization of the Natural Radioactive Elements of Core Samples in Jose Panganiban, Camarines Norte	Rolando Y. Reyes ryreyes @pnri.dost.gov.ph	Financing	212,000.00
DOST/PCIERD	Characterization of the Natural Radioelement Signatures of Porphyry Copper-Gold Deposits in the Philippines by Gamma Ray Spectrometry: Implications to Mineral Exploration	Rolando Y. Reyes ryreyes @pnri.dost.gov.ph	Financing	624,089.00
DOST	Land Degradation Abatement Assessment of Conservation Measures after Rainfall in the Uplands using Fall-out Radionuclides	Adel DM. Bulos admbulos@pnri.dost.gov.ph	Financing	869,565.00
DOST	Metal Absorbing Ultra-Thin Films for Trace Analysis	Pablo P. Saligan ppsaligan@pnri.dost.gov.ph	Financing	869,565.00
DOST	Particulate Monitoring by Nuclear and Related Analytical Techniques and Source Apportionment in Valenzuela	Flora L. Santos flsantos@pnri.dost.gov.ph	Financing	869,565.00
DOST	Establishment, Implementation and Maintenance of Management Systems in all DOST RDI's and Regional Offices: Proj.1 Implementation and Maintenance of Laboratory Accreditation in all DOST Laboratories in Accordance with ISO/IEC	Flora L. Santos flsantos@pnri.dost.gov.ph	Financing	595,048.00
DOST/Philippine Council for Industry and Energy Research and Development (PCIERD)	Nuclear Security of International Cargoes: Megaports Initiative	Julietta E. Seguis jeseguis@pnri.dost.gov.ph	Financing	807,648.00
DOST/PCIERD	Upgrading of Facilities of the DOST/RDIs in Support of R & D and S & T Services	Ma. Celerina M. Ramiro mcmramiro@pnri.dost.gov.ph	Financing	26,078,896.00
DOST/Technology Application and Promotion Institute	Fabrication of Exhibit Materials for the Project "2008 ASEAN Science and Technology Celebration"	Rhodora R. Leonin rleonin@pnri.dost.gov.ph	Financing	400,000.00
DOST/Philippine Council for Health Research and Development (PCHRD)	DOST Jubilee Anniversary Celebration GIA Project "Gabi ng Ginintuang Sinag"	Alumanda M. dela Rosa amdelarosa@pnri.dost.gov.ph	Financing	227,300.00
DOST	Hosting of the 9 th Forum for Nuclear Cooperation in Asia (FCNA) Ministerial Level Meeting and Senior Officials Meeting	Victoria Fe O. Medina vfomedina@pnri.dost.gov.ph	Financing	894,000.00

Total Local Grants: 43,042,239.00

B. FOREIGN GRANTS**B-1. COOPERATION AGREEMENT**

Comprehensive Nuclear Test Ban Treaty Organization	Post Certification Activities at RN52, Tanay, Rizal, Philippines	Teofilo Y. Garcia tygarcia@pnri.dost.gov.ph	Financing	1,642,845.00
Comprehensive Nuclear Test Ban Treaty Organization	Comprehensive Nuclear Test Ban Treaty Organization Post Certification Activities	Teofilo Y. Garcia tygarcia@pnri.dost.gov.ph	Financing	811,294.00
International Atomic Energy Agency	PSP Toxicity Risk Applications of Radiotracer and Radioassay Technologies in Paralytic Shellfish Poisoning Analysis	Elvira Z. Sombrito ezsombrito@pnri.dost.gov.ph	Financing	130,119.00
United States- Department of Energy	Megaports Initiative	Julietta E. Seguis jeseguis@pnri.dost.gov.ph	Financing	517,392.00
US-DOE	US-DOE National Nuclear Security Admin, Regulatory Infrastructure Support Project	Eulinia M. Valdezco emvaldezco@pnri.dost.gov.ph	Financing	175,766.00

Total Foreign Grants: 3,277,416.00**B.2 IAEA RESEARCH CONTRACTS**

IAEA	See Table 4 for List of IAEA Research Contracts, Page 34	See Table 4. IAEA Research Contracts Page 34	Information exchange thru attendance to meetings; (minimal) financial support towards local expenses/ activities	6,231,779.00
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TOTAL RC Value: 6,231,779.00**B-3. IAEA TECHNICAL COOPERATION PROJECTS**

IAEA	See Table 5 for List of IAEA Technical Cooperation Projects, Page 35	See Table 5. IAEA Technical Cooperation Projects Page 35	Equipment grant, expert dispatch, fellowship/ training	18,467,603.00
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TOTAL TC Value: 18,467,603.00**TABLE 15. TECHNICAL PAPERS/POSTERS PRESENTED IN 2008****PAPERS PRESENTED:**

Castañeda, Soledad S., Raymond J. Sucgang, Rosalinda V. Almoneda, J. Gemora, D. Desengañó and F. Lim . "Isotopic Evidence for Identifying the Mechanism of Salinization of Groundwater in Bacolod City, Negros Occidental". Presented during the 10th Eurasia Conference on Chemical Sciences and 23rd Philippine Chemistry Congress. Kapisanang Kimika ng Pilipinas, PICC, Manila, Philippines, 7- 11 January 2008.

Castañeda, Soledad S. "Isotopes as Tracers for Assessing Groundwater Contamination from Landfills". Presented at the Mid-Term Progress Review Meeting for IAEA/RCA Project on Assessment of Trends in Freshwater Quality Using Environmental Isotopes and Chemical Techniques for Improved Resource Management", Chiang Mai, Thailand, 24-28 March 2008.

Castañeda, Soledad S. "Assessment of Trends in Freshwater Quality Using Environmental Isotopes and Chemical Techniques for Improved Resource Management". Presented at the Mid-Term Progress Review Meeting, Chiang Mai, Thailand, 24- 28 March 2008.

Castañeda, Soledad, S. and Raymond J. Sucgang. "Isotope and Geochemical Techniques Application in Water Resources Management". Presented at the Seminar on Isotope Hydrology, Bulacan Association of Water Districts, Baliwag Bulacan, Philippines, 12 June 2008.

Castañeda, Soledad, S. "Isotope Techniques Application in Groundwater Investigations in the Philippines". Presented during the Meeting/Workshop on Isotopic Age Determination Techniques for Improved Understanding of Groundwater Resources. Argonne, Illinois, USA, 16- 27 June 2008.

Castañeda, Soledad, S. "Age Determination Techniques for Improved Management of Groundwater Resources". Presented during the PWWA 16th International Conference and Exhibition(Philwater 2008). Philippine Waterworks Association, Inc. Katipunan Road., Balara, Quezon City, Philippines, 6-9 October 2008.

Castañeda, Soledad, S. " Isotope Applications for Prevention of Water Contamination- Water Driller's Association of the Philippines". Presented during the Seminar on Groundwater Resources Development, Utilization and Management held in Davao City, Philippines, 6 November 2008

Lapade, Avelina G., Alfonso O. Grafia, Adelaida C. Barrida and Faye G. Rivera. "Grain Quality Improvement in Rice (*Oryza sativa* L.) Through Induced Mutation Breeding". Presented at the FNCA Mutation Breeding Seminar/Workshop, Blue Moon Hotel, Dalat City, Vietnam, 27- 31 October 2008.

Obra, Glenda B. and Sotero S. Resilva. "Improving of Sterile Male Performance of *Bactrocera philippinensis*". Paper presented (by an IAEA staff) during the Third Research Coordination Meeting of the CRP on Improving Sterile Male Performance in Fruit Fly SIT Programmes, Valencia, Spain, 1- 5 April 2008.

Palattao, Maria Visitacion B. "Current Status of Radiation and Radioactive Waste Safety in the Philippines". Presented at the First Meeting of the FNCA Radiation Safety Topical Group, Sydney, Australia, 3-7 November 2008.

Palattao, Maria Visitacion B. "Radiation Monitoring and Control of a Thorium Contaminated Facility". Presented at the First Meeting of the FNCA Radiation Safety Topical Group, Sydney, Australia, 3- 7 November 2008

Palattao, Maria Visitacion B. "Quality Management System for the National Radioactive Waste Disposal Project in the Philippines". Presented at the Consultants Meeting on the Application of Quality Management System in Radioactive Waste Disposal, Vienna, Austria, 25- 29 August 2008.

Resilva, Sotero S. and Glenda B. Obra. "Improvement of Mass Rearing Methods for Oriental Fruit Fly, *Bactrocera philippinensis*". Paper presented by the senior author at the 3rd Regional Coordinators Meeting (RCM), Valencia, Spain, 1-5 April 2008.

Santos, Flora L., Preciosa Corazon B. Pabroa, Joseph Michael Racho and Ryan P. Morco. "Nuclear and Related Analytical Techniques for Air Quality Management". Qualifier in the 7th Regional Science and Technology Fora and Competitions in Industry and Energy Research and Development, DOST, Taguig City, Philippines, 15 February 2008.

Santos, Flora L., Preciosa Corazon B. Pabroa, Joseph Michael Racho and Ryan P. Morco. "Characterization and Source Identification of Ambient Air PM₁₀ in Valenzuela Sampling Site". Paper and electronic posters presented during the National Academy of Science and Technology Conference, Philippines, July 2008.

Santos, Flora L. "Application of Nuclear and Related Analytical Techniques in Characterizing Air Particulate Pollution in Metro Manila". Presented during the Technical Sessions of the 36th Atomic Energy Week Celebration, PNRI, Diliman, Quezon City, Philippines, 10 December 2008.

Valdezco, Eulinia M., and Maria Visitacion B. Palattao. "Regulatory Aspects of the PRR-1 Decommissioning Project". Presented at the Regional Workshop on Safety of Research Reactor Decommissioning Activities held in Pasig City, Philippines, 12– 21 September 2008

Valdezco, Eulinia M., Maria Visitacion B. Palattao, R. Reyes, Carl M. Nohay and Luzviminda L. Venida. "Philippine Initiatives for the Safe and Sustainable Management of Radioactive Waste". Presented at the 12th International Congress of the International Radiation Protection Association (IRPA) Buenos Aires, Argentina, 19– 24 October 2008.

Valdezco, Eulinia M. and Maria Visitacion B. Palattao. "Licensing and Regulation of Toxic and Hazardous Radioactive Materials in the Philippines". Presented at the Interagency Committee on Toxic and Hazardous Substances (IAC-THS) Workshop on Toxic and Hazardous Substances, Bureau of Customs, Manila, Philippines, 11– 12 December 2008.

TECHNICAL POSTERS PRESENTED AT THE TECHNICAL POSTER CONTEST DURING THE 36TH ATOMIC ENERGY WEEK CELEBRATION, PNRI, DILIMAN, QUEZON CITY, PHILIPPINES, 8–12 DECEMBER 2008:

TECHNICAL POSTER CONTEST WINNERS

First Place

Santos, Flora L., Preciosa Corazon B. Pabroa, Joseph Michael D. Racho and Ryan P. Morco. "Nuclear and Analytical Techniques for Characterization and Source Identification of Ambient Air PM₁₀ in Metro Manila".

Second Place

De Vera, Azucena C., Ma. Celestina V. Honrado, Rhett Simon dC. Tabbada, Efrén J. Sta. Maria, Ma. Llorina O. Rañada, Juan Relox, Jr., and Elvira Z. Sombrito. "Technology Transfer of Receptor Binding Assay to Regulatory Setting".

Third Place

Aurigue, Fernando B. "Gamma Irradiation as a Tool in Spathoglottis Orchid Breeding".

Castañeda, Soledad S., Raymond J. Suggang, Rosalinda V. Almoneda, N. Mendo and L. dela Cruz. "Tritium as Tracer of Leachate Contamination from Municipal Solid Waste Disposal Facilities".

OTHER AEW TECHNICAL POSTER ENTRIES

Bulos, Adelina DM., Rhett Simon Tabbada, Efrén Sta. Maria and Elvira Z. Sombrito. "Historical Profile of Algal Cyst and Anthropogenic Inputs in Sediments Using isotopic Techniques".

Castañeda, Soledad S., Lourdez F. Fernandez, and Angelito Ramos. "Stable Isotopes of Water Reveal its Origin: The Case of Davao Groundwater"

De Leon, A.I., M. C.V. Honrado, R.S.D. Tabbada, R.U. Olivares, M.D.C. Tangonan, E.Z. Sombrito and L.J. Cruz. "Transfer of Receptor Binding Assay Technology to Local End-Users: Production of Radiolabelled Compounds for Receptor Binding Assay of Marine Biotoxins".

Enriquez, Eliza et al. "Polonium 210 in Cigarettes and Dose Estimates in Smokers"

Lanua, Luviminda G., Estelita G. Cabalfin, Haydee M. Solomon, Ma. Teresa L. Borrás, Rizalina G. Osorio and Andras V. Kovacs. "The Role of Dosimetry in the Operational Qualification of the Semi-Commercial Facility".

Lanua, Luviminda G., Estelita G. Cabalfin, Aurelio L. Maningas, Gonzalo G. Madera, Jr., Franklin A. Pares, Francisco S. Pancho, Jr., Arnaldo R. Valenzuela, Geoffrey O. Tranquilan and Crisol P. Villanueva. "Upgrading of the Gamma Irradiation Facility from a Pilot- Scale to a Semi- Commercial Facility".

Lapade, Avelina G., Adelaida C. Barrida, Alfonso O. Grafia, and Josefina C. Mananguit. "Mutation Breeding for Drought Tolerance in Soybean (Glycine Max L)".

Lapade, Avelina G., Alfonso O. Grafia, Adelaida C. Barrida, Faye G. Rivera and Mary Jayne C. Manrique. "Grain Quality Improvement in Rice (*Oryza sativa* L.) Through Induced Mutation Breeding".

Manrique, Mary Jayne C. and R. Kalendar. "Developing LTR Primers Using Retrotransposon-based Markers for Genotyping and Fingerprinting of Irradiated Mangosteen (*Garcinia mangostana* L)".

Mendoza, N., Raymond J. Suggang, L. Dela Cruz, Soledad S. Castañeda, and Rosalinda V. Almoneda. "Establishment of Tritium Dating Facility for Hydrological Studies in PNRI".

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LIST OF ABBREVIATIONS

ADB	- Asian Development Bank
ANSTO	- Australian Nuclear Science and Technology Organization
ANSN	- Asian Nuclear Safety Network
CTBTO	- Comprehensive Nuclear Test Ban Treaty Organization
DOST	- Department of Science and Technology
EC	- European Commission
FNCA	- Forum for Nuclear Cooperation in Asia
IAEA	- International Atomic Energy Agency
JSPS	- Japan Society for the Promotion of Science
KAIST	- Korea Advanced Institute of Science and Technology
KINS	- Korea Institute of Nuclear Safety
MEXT	- Ministry of Education, Culture and Sports of Japan
NNSA	- National Nuclear Safety Administration of Japan
NSRA	- Nuclear Safety Research Association of Japan
PCASTRD	- Philippine Council for Advanced Science and Technology Research and Development Institute
PCIERD	- Philippine Council for Industry and Energy Research and Development
PCHRD	- Philippine Council for Health Research and Development
PHIVOLCS	- Philippine Institute of Volcanology and Seismology
RCA	- Regional Cooperative Agreement for Research, Development and Training Related to Nuclear Science and Technology for Asia and the Pacific
RCARO	- RCA Regional Office in Korea
SEI	- Science Education Institute
USDOE	- United States Department of Energy



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